UNIVERSITY OF TROMSØ UIT

FACULTY OF HUMANITIES, SOCIAL SCIENCES AND EDUCATION
DEPARTMENT OF LANGUAGE AND LINGUISTICS

Schwa

Distribution and acquisition in light of Swiss French data

Helene N. Andreassen

A dissertation for the degree of
Philosophiae Doctor

May 2013

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Acknowledgements

Someone asked me once how I could spend years of my life studying one single vowel. A few times I have asked myself the same question, but I always end up with the same answer: it is small but oh, so complex and fascinating. Despite its smallness, it grows in complexity and importance the more one digs into the topic. The idea of looking at schwa in children's speech came to me after a meeting with the Phonology Reading Group at the University of Tromsø. When it was time to write a research proposal, I presented the idea – still quite vague – to my supervisor, Professor Chantal Lyche. Throughout my entire PhD, Chantal has been in Oslo, on the opposite side of Norway, or on one of the world's other continents, and has made a couple of visits to Tromsø each year. However, I cannot think of a supervisor more present and available to her PhD student. Since the very beginning of this project, Chantal has encouraged me to pursue my ideas, she has guided me to discover relationships in my data, she has pushed me to work hard on the tricky parts, and through her expertise in linguistics and her ability to see the common thread, she has made me write – and finish – a thesis where the different components connect. Chantal, you definitively deserve the *caisse de champagne* we agreed on.

Chantal is also the co-founder of the international project *Phonologie du français contemporain* (PFC), and I wish to thank this vibrant research network. In particular, I want to thank Jacques Durand for his questions and encouragement. As a member of PFC since 2002, I have come to know a long list of intelligent and kind people from around the world, and each time I have a question related to French, there has always been an expert or two among the PFC members who were ready to help me. The annual meeting in Paris each December is forum for presenting on-going work, and I want to thank the participants for listening and commenting on my talks on schwa in child language – maybe next year, it will be time to give a presentation on another topic. I also want to thank the PFC community for the legendary post-conference moments in *La Ville Lumière*. The many hours spent in bistros have contributed to strengthening our professional as well as personal relationships. It goes without saying that a very many thanks goes to *la bande joyeuse* consisting of Sylvain Detey, Laurie Buscail, Julien Eychenne, and last, but not least, Isabelle Racine. Co-authorships, discussions, mutual encouragement and many, many laughs I will treasure forever.

This thesis would not have been possible without the thirteen children and their families in Switzerland, and I would like to thank them for allowing me to enter their daily life with my recording equipment. First, to the six families I visited at home weekly, I would like to thank you for your open mind and your interest in the project, and especially for your immense hospitality. Second, I would like to thank the kindergarten teachers Agnès, Lise, Patricia, Sandrine, Sylvette, and Véronique for helping me find participants and for allowing me to do recordings in the kindergarten – I know that my PowerPoint test was a tough competitor to the other activities going on simultaneously. Finally, I must mention the children themselves. I cannot thank them by name, but their enthusiasm, their positive attitude, their willingness to talk a lot, and their smart comments have provided me with interesting data as well as a treasure chest of sound files that have repeatedly cheered me up during the longest hours of thesis-hood. *Merci à vous tous!*

This thesis is the result of a fellowship from the University of Tromsø during the period from 2005 to 2009. There are many there I am grateful to, but I am particularly grateful to Endre Mørck, head of the Department of Language and Linguistics, for his good leadership, his encouragement and support, and his willingness to make it possible for me to continue working on this project between funding. From the administration, I would like to thank Eirik Liland and

Marit Nilsen. I also wish to thank Johanne Raade and Helge Salvesen at the University Library, who have given me the time needed to finish this thesis.

Doing research on French while working in Tromsø makes one approach the language with an outside eye. I am very grateful to the CASTL phonologists, Bruce Morén-Duolljá, Curt Rice, Martin Krämer, Ove Lorentz, and Patrik Bye, whose approach to phonology has made me think differently. I would like to thank Curt and Bruce in particular for taking the time to discuss different aspects of my thesis. Additionally, I wish to thank the many fellow PhD students throughout the years, in Tromsø and elsewhere, phonologists like Berit-Anne, Dragana, Islam, Kathrine, Pavel, Peter, Sylvia, and Violeta, other linguists like Björn, Christine, Kaori, Kristine, Madeleine, Monika, Philipp, and Yulia, and the one non-linguist PhD student that I know, Lodve. Other colleagues throughout the years have contributed in various aspects to make me progress in this work. Thanks to Lisbeth Nordøy, Roswitha Skare and Rognald Bergesen for creating an excellent, smoothly-running, ex.fac-team – thanks to Trond Trosterud for teaching me how to use Terminal – thanks to Per Pippin Aspaas and Eirik Reierth for helping me focus (and thereby finish) – and finally, thanks to Mona Markussen for being a great colleague in every possible way.

Today, when I am one day from submitting my thesis, I would like to take one step back and think about what I have experienced during these years.

First, fieldwork is not only data collection. Discussions with Marilyn May Vihman and Paula Fikkert gave me ideas about how to approach the research topic. Antoine Auchlin and Jean-Philippe Goldman welcomed me at the University of Geneva during the six months of fieldwork. Tearooms in the different Vaudois villages had coffee I could buy while waiting for the *car postal* to take me to the next recording session. CASTL and the Department of Language and Linguistics funded the transcription work. Omran Allatif, Nathalie Bühler, and Aude Kammerlander transcribed parts of the child language data. Yvan Rose and Greg Hedlund at the Memorial University in St. Johns, Newfoundland, provided me with 24/7 support on the Phon software. Jan Helge Bergheim and Holger Hagan helped me with technical equipment and challenging computer issues. Jan-Are Kolset Johnsen spent hours programming my perception experiment and performing a statistical analysis of the data.

Second, writing a thesis is not only generating text. Feedback from Isabelle Racine, Paula Fikkert, Yvan Rose and anonymous reviewers throughout the years made me rethink ideas and make them better. Access to every possible publication via the University Library, and in particular via the help of Bente Storvestre, saved me from interruptions to workflow while writing. An important conversation with Rich F. Riesenfeld in October last year made me realise it was time to finish the thesis. Kevin Gabbard worked intensely over a short period of time proofreading my thesis and improving my English. All remaining errors are mine.

Third, living a life is not only writing a thesis. I am lucky to have a family that makes me remember that being glued to a computer is only one part of it. First of all, to my parents, Terje and Liv-Inger, you deserve the biggest *takk* of them all – even though you may have a hard time following the details when I go on about the quirks in my data, you have always supported me, encouraged me to study what interests me, and helped me with practical matters in stressful times. Second, to Rune, my ever-enthusiastic big brother, you are always there to make me think positive. The fact that you like hanging out with linguists in Paris makes you even cooler. Third, to Jan-Are, your patience over the years is admirable. You have taken care of grocery shopping and dinner, kept track of bills, listened to schwa-talk early morning and late night, and encouraged me to achieve my goals. Thank you.

I would also like to thank the rest of my joyful family, uncles, aunts, and cousins, for being who they are. Sadly, two members of the family have passed away since I started this project. Bestemor and tante Rigmor, I really wish you were here today. I would also like to thank my second family in Switzerland, which includes the Egger family and the Bersier family. They always make me feel welcome and have helped me in every possible way during my many fieldwork trips. In particular Hilde and Trude, I thank you for your support, kindness, and your lovely sense of humour.

Finally, I would like to thank my friends Heidi and Silja, who have never given up on me. I will always remember your heart-warming ability to help me keep my spirits up during the last year of writing.

Helene N. Andreassen
Tromsø, May 3rd, 2013

Table of contents

PROLOGUE

1. Prologue

Valentine	Tu lui as parlé, à l'ordinateur?
Adèle	Non!
Researcher	Il y a un monsieur qui a parlé?
Adèle	Un monsieur a parlé. [a ɛsja a pane]
Valentine	Un monsieur qui parlait?
Researcher	Il a dit quoi?
Adèle	A dit c'est un animal. [a di θe a lanimalœ]

During a recording at home, Valentine asks Adèle (2;09.23) about the PowerPoint test that Adèle and the researcher have been playing with earlier in the day on the kindergarten premises.

1.1 General introduction

Many lines have been written throughout history about schwa in French. A multifaceted phenomenon, it intrigues phonologists, phoneticians, as well as sociolinguists, and every analytical tool available has been used in the attempt to understand this enigmatic vowel. Enigmatic to the researcher, it may also be enigmatic to the child who acquires the language. First, schwa sounds identical to another vowel in the language. Second, faced with an input in which schwa varies at different rates across different words, and this even in words which are phonotactically similar, a pertinent question for the researcher to ask is how children approach the challenge.

During a phonology conference in 2012, after I had given a talk on the vowel quality of schwa in child language, a fellow linguist told me that according to her teenage daughter, teenagers use the phrase *tout petit* 'very small' [tupiti] to make fun of someone who is really small. This pronunciation of *tout petit*, whose standard pronunciation is [tupœti] or [tupti], is also characteristic for early child language. In all its cuteness, *petit* produced [piti] provides us with information about how children produce lexical items with schwa, as well as ideas about how to approach the child language data with existing analytical tools. In adult French phonology, schwa is a separate vowel category that either deletes or merges with /œ/ in the output. In the child's version of the schwa-item *petit*, schwa is not deleted nor is it produced in a target-like-manner.

In this thesis, which is the first comprehensive study on the subject, our main objective is twofold; we wish to explore how children produce schwa items and we wish to understand why they produce them the way they do.

1.2 The study of schwa as a target variable in child phonology

In this section we first discuss variation in child language. Thereafter, we discuss schwa alternation in French in light of previous research. Finally, we discuss the relevance of child language data for the study of schwa.

1.2.1 Variation in child language

> Dialect acquisition differences can be especially puzzling when a dialect has a rule or process that allows for a phoneme or morpheme to be variably deleted. Since features are variable when they first enter a child's linguistic repertoire, how does one decide when such variation becomes dialectal rather than developmental? (Roberts 2005:159)

Child language data contain a substantial amount of variation, which complicates any attempt to understand the development of phonological competence; specifically, not every instance of phonetic variation is relevant to phonology. First, variation may be a reflection of what Wells (1986) calls "inherited attributes". For instance, linguistically girls often develop more rapidly than boys do; in sociolinguistic variationist theory this is explained as a gender-driven difference in child-directed speech (cf. Foulkes et al. 2005). Also, learning styles vary between children and lead to inter-speaker variation; some children initiate word production in their first year while others wait until the end of the second year (Fenson et al. 1994). Some children who start word production late do catch up with their peers rapidly, while others develop language more slowly (Bates et al. 1995). Further, individual variation may result from the different socio-economic conditions between families; children from less privileged families often score lower on tests that target linguistic performance (Ramey & Ramey 2004), which may be a result of reduced cognitive and linguistic stimuli in their home environment (Fernald & Marchman 2011).

Second, variation may be a reflection of anatomical or physiological differences. For instance, children have shorter vocal tracts and smaller vocal folds that lead to higher pitch and higher formant frequencies compared to those of adults (Kent & Read 2002). Also, children have difficulties in fine-tuning laryngeal control, which, for instance, leads to an extensive amount of variability in the production of sibilant fricatives across children (Koenig et al. 2008). Finally, another factor that contributes to variability between children is the fact that their anatomy and their physiology change rapidly. According to Gerosa et al. (2006), there is a decrease in spectral and temporal variability as the child grows older.

Third, variation may be a reflection of a developing, unstable grammar. For instance, one child, within the same recording session, may use different versions of the same word (cf. Beltzung & Yamaguchi 2008). Also, while there are numerous examples that show that many aspects of phonological development are similar across children, there are other examples that show that children choose different learning paths. For instance, C. C. Levelt and van de Vijver (2004) show that Dutch L1 learners in the acquisition of syllable types share the initial and final stages of acquisition, but that two different learning paths are attested in the intermediate stages. Another example is the production of consonant clusters; Fikkert (1994) shows that Dutch L1 learners share the initial stage, retaining the least sonorous consonant, and the final stage, producing a target-like cluster, while intermediate stages, like gliding and vowel epenthesis, are not attested for all children. A third example is the order of acquisition of different types of consonant clusters; while it is most common that ObsLiq-clusters are acquired first, Fikkert and

Altvater-Mackensen (2013) show that two children follow an alternative learning path and produce [s]+Obs-clusters before ObsLiq-clusters.

Fourth, variation may be a reflection of grammatical alternation between two phonological variants. The acquisition of phonological variables has become a research area of fast-growing importance in recent years; variation is no longer considered a mere “by-product of the learning process, but an integral part of acquisition itself” (Roberts 2005:153-154). J. Smith et al. (2013) study the behaviour of six target lexical, phonological, and morphosyntactic variables as they appear in child language and child-directed speech in the variety of English spoken in Buckie, Scotland. The general conclusion is that variation is acquired early, and simultaneously with other categorical aspects of grammar. However, J. Smith et al. (2013) emphasise that although the children quickly pattern with the caregivers regarding linguistic constraints and the distribution of variants, the rate of use of the variants may vary between children and adults. Phonological variables in child language data have also proven useful as a testing ground for different theoretical models of acquisition. For instance, the study of liaison as it appears in French child language has culminated in two opposing models; one, a constructionist model, proposed by Chevrot et al. (2009), whereby children may initially segment stored speech chunks incorrectly in front of the liaison consonant, yielding multiple variants per word, e.g. *arbre* ‘tree’ may be produced /aʁbʁ/, /naʁbʁ/, and /zaʁbʁ/, and two, a non-linear phonological model, proposed by Wauquier (2009), whereby children may initially assign an incorrect floating autosegment to the onset position of the vowel-initial noun, yielding multiple variants per word, e.g. *ami* ‘friend’ may be produced /lami/, /nami/, /zami/, and /jami/. See Chevrot et al. (in press) for a review of the constructionist model in light of the criticisms and suggestions put forth by Wauquier (2009).

1.2.2 Schwa in French target phonology

More than a century ago, Grammont (1894) presented the *loi de trois consonnes*, or the three consonant rule, which states that the mid front round vowel that corresponds to orthographic <e> is subject to variable deletion when it results in a two-consonant cluster, but is blocked from deletion if it results in a three-consonant cluster. Grammont claims that the phenomenon can be explained with phonotactic constraints that are related to syllable structure.

> *L’-ė-*, étymologique ou non, *n’apparaît que lorsqu’il est nécessaire pour éviter la rencontre de trois consonnes comprises entre deux voyelles fermes* [= celles qui ne sont pas susceptibles de tomber par l’effet de cette loi]. Cela revient à dire qu’il sert à empêcher qu’une syllabe ne commence ou finisse par deux consonnes, difficulté qu’on écarte par tous les moyens possibles. (Grammont 1894:53 and Footnote 1, Page 53)

However, the citation from Verluyten (1988), given below, clearly illustrates that there is more to schwa alternation than just the three consonant rule.

> De toutes les voyelles qui apparaissent dans les langues du monde, le schwa français est probablement celle qui a fait couler le plus d’encre dans les publications phonologiques. Il faut dire que toutes les conditions sont réunies pour faire du schwa une “voyelle problème”. À peu près toutes les conditions sont sujettes à contestation, à commencer par son IDENTITE même. (Verluyten 1988:1)

Thus, for more than a century scholars working within a variety of theoretical frameworks have attempted to explain schwa alternation with a phonological account. In particular, the emergence of Generative Grammar provides the scholar with an analytical tool that facilitates the treatment and understanding of the data. First, in a rule-based framework (cf. Chomsky & Halle 1968), schwa is considered to be an underlying segment to which a variety of deletion rules can be applied; two noteworthy examples are Schane (1968) and Dell (1973), who additionally posit abstract schwas in positions wherein no phonetic schwa generally surfaces. In the 1970s, scholars also focus on other aspects of schwa alternation; for instance, Lucci (1976) observes that schwa is subject to stylistically defined variation, e.g. there is a higher degree of schwa presence in read speech compared to spontaneous speech, and he observes that it is also subject to socially defined variation, e.g. there is a a higher degree of schwa presence in the spontaneous speech of speakers from a privileged socio-economic class compared to speakers who are not. Also, Malécot (1976) observes that the rate of schwa alternation decreases with age. During the late 1970s, the phonetic quality of schwa and its implications for the phonological analysis become a prioritised area of investigation; for instance, Malécot and Chollet (1977) show that schwa is phonetically confused with [œ] and [ø], and they propose that its phonemic status must be justified by its behaviour in phonology. After this observation, scholars take the intriguing fact that schwa is phonetically confused with another vowel in the system in two directions; either, he argues for a natural analysis (cf. Stampe 1979) whereby schwa represents /œ/, e.g. see Morin (1978) who proposes that schwa is a diacritically marked version of /œ/, or he argues for an autosegmental analysis (cf. Goldsmith 1976), whereby schwa is a defective segment whose presence or absence depends on phonotactic requirements related to syllable structure, e.g. see Anderson (1982) and Tranel (1987a). Also, this period in the history of schwa research is characterised by non-linear analyses in which the schwa syllable is considered to be the weak member of a foot (cf. Durand 1976, Selkirk 1978).

In the 1990s, Walker (1993, 1996) and Hansen (1994) discuss the hypothesis that schwa is subject to stabilisation. Hansen (1994) concludes that schwa remains an active phonological variable, but that lexical frequency must also be factored into the analysis in order to account for the various rates of schwa alternation. Walker (1993, 1996), on the other hand, focuses on the implications of stabilisation and the possibility that the underlying schwa in some cases is restructured as /œ/. Also in the 1990s, the framework of Government Phonology (cf. Kaye et al. 1985) is used to analyse schwa. For instance, Charette (1991) and Scheer (1999, 2000) treat schwa as an empty position that never deletes, but which remains unfilled with content when it is properly governed. In 1993, developments in the traditional generative framework lead to the introduction of Optimality Theory (OT) (Prince & Smolensky 1993), whereby phonological phenomena are accounted for through the interaction of constraints that operate on the input in order to select the optimal output candidate. For instance, Tranel (2000) proposes that schwa alternation is the result of the variable position of the floating constraint SYLLABLE ECONOMY. Also, with the introduction of OT, Côté (2000, 2008) rejects the syllabic approach to schwa and proposes a perceptually oriented analysis (cf. Steriade 1999a, 1999b) whereby schwa alternation is dependent on the perceptual salience of the surrounding consonants.

While in the 2000s the formal analysis of schwa continues to develop, e.g. Eychenne (2006) using OT, Scheer (2005) using Government Phonology, and Angoujard (2006) using Declarative Phonology (cf. Bird 1990, Scobbie 1991), four new areas of investigation are introduced or gain importance. First, the construction of large digital databases, e.g. the PFC database (Durand et al. 2002, 2009a, see www.projet-pfc.net), has opened for the possibility of studying intra-speaker and inter-speaker variable behaviour of schwa in spontaneous speech data across francophone varieties. Second, a large number of recent usage-based analyses of schwa both test the importance of frequency for schwa alternation, and also question the shape and number of underlying forms for a given schwa-item; several recent works use psycholinguistic methods to obtain information about these aspects – see for example Racine and Grosjean (2000), Racine (2008), and Bürki et al. (2010). Third, with the recent focus on interfaces in grammar and on gradient phenomena, the relationship between the phonological and phonetic representations of schwa is the subject of a couple of debates. One, scholars disagree as to whether an absent schwa leaves traces in the phonetic signal – see for instance Fougeron and Steriade (1997) and J. Barnes and Kavitskaya (2002) who argue in favour of this claim, and Côté and Morrison (2007) and Bürki et al. (2009) who argue against this claim. Two, scholars disagree as to where to draw the line between a present schwa and an absent schwa. On the basis of production and perception data, Bürki et al. (2011) show the difficulty of classifying a produced schwa as categorically deleted or merely phonetically reduced.

Fourth, with the current focus on acquisition of language, schwa is an obvious subject of interest in studies on French as a second language. To our knowledge, besides Grüter (2010) who examines L1 Moroccan learners of French as an L2, there is, to date, no phonological study that provides information on how second language learners acquire schwa alternation. Hannahs (2007) suggests that part of the reason for this lacuna in the literature "may well be that the conditioning factors surrounding variable schwa are not exclusively phonological – a not inconsiderable role is played by other factors such as style, register, formality and sociolinguistic context" (2007:69). However, Hannahs mentions a number of studies with a pedagogical or sociolinguistic perspective; Thomas (2001, 2004) and Uritescu et al. (2004) examine data from L1 English learners of French as an L2, and all three studies show that the level of schwa alternation is lower in the speech of L2 speakers compared to the speech of native speakers. The three studies also show that schwa behaviour in the speech of immersion students is nearer to the speech of natives. Finally, we mention a psycholinguistic study by Stridfeldt (2005) on L1 Swedish learners of French as an L2, which shows that absence of schwa complicates word recognition.

While the debate on the theoretical approach to schwa alternation is heated, the discussion on the output distribution of schwa is less controversial. Table 1.1 is adapted from Côté (2000) and presents the distribution of schwa in modern *français de référence*.

/C*C/	/C*CC/	/CC*C/
a. Before derivational suffixes		
Schwa is excluded	N/A	Schwa is obligatory
fruiterie /frɥit + ri/ ‘fruit store’ [frɥitri]		*garderie* /gard + ri/ ‘kindergarten’ [gardəri]
b. Before future/conditional endings (except conditional 1st and 2nd plural)		
Schwa is excluded	N/A	Schwa is obligatory
gâterai /gat + re/ ‘spoil$_{\text{FUT.1SG}}$’ [gatre]		*doublerai* /dubl + re/ ‘double$_{\text{FUT.1SG}}$’ [dubləre] Schwa is optional *garderai* /gard + re/ ‘keep$_{\text{FUT.1SG}}$’ [gard(ə)re]
c. Before conditional 1st and 2nd plural endings		
N/A	Schwa is obligatory	Schwa is obligatory
	gâteriez /gat + rje/ ‘spoil$_{\text{COND.2PL}}$’ [gatərje]	*garderiez* /gard + rje/ ‘keep$_{\text{COND.2PL}}$’ [gardərje]
d. At clitic boundaries		
Schwa is optional	Schwa is optional	Schwa is obligatory
Annie le salue /ani l = saly/ ‘A greets him’ [anil(ə)saly] *plein de linguists* /plɛ̃ d = lɛ̃gɥist/ ‘full of linguists’ [plɛ̃d(ə)lɛ̃gɥist]	*Annie le gronde* /ani l = grɔ̃d/ ‘A. scorns him’ [anil(ə)grɔ̃d] *plein de psychologues* /plɛ̃ d = psikɔlɔg/ ‘full of psychologists’ [plɛ̃d(ə) psikɔlɔg]	*Annick le salue* /anik l = saly/ ‘A. greets him’ [aniklәsaly] Schwa is optional *Ester le salue*‘ /ɛstɛr l = saly/ E. greets him’ [ɛstɛrl(ə)saly]
e. At word boundaries		
Schwa is excluded	Schwa is excluded	Schwa is optional
attaque pénible /atak penibl/ ‘painful attack’ [atakpenibl]	*attaque frontale* /atak frɔ̃tal/ ‘frontal attack’ [atakfrɔ̃tal] Schwa is optional *aime rien* /ɛm rjɛ̃/ *likes nothing* [ɛm(ə)rjɛ̃]	*acte pénible* /akt penibl/ ‘painful act’ [akt(ə)penibl]
f. Morpheme-internally		
Schwa is optional	Schwa is optional	Schwa is obligatory
la fenêtre /la = fənɛtr/ ‘the window’ [laf(ə)nɛtr]	*la secrétaire* /la = səkretɛr/ ‘the secretary’ [las(ə)kretɛr]	*une demande* /yn dəmɑ̃d/ ‘a request’ [yndəmɑ̃d] Schwa is optional *une fenêtre* /yn fənɛtr/ ‘a window’ [ynf(ə)nɛtr]

Table 1.1: Distribution of schwa in modern *français de référence*, across various morphological and segmental contexts, adapted from Côté (2000:85)

In this thesis we follow Côté (2000) who defines schwa as a vowel that alternates within the same phonological and morphological context, e.g. *renard* ‘fox’ [ʁœnaʁ] ~ [ʁnaʁ] and *autrement* ‘otherwise’ [otʁœmɑ̃] ~ *doucement* ‘gently’ [dusmɑ̃]. Further, we follow Côté (2000) in that we consider schwa in a word-medial or a word-final position to be epenthetic, whereas we consider schwa in a word-initial syllable to be underlying. This definition of schwa excludes orthographic <e> that does not alternate, for example orthographic <e> in the initial syllable preceded by an ObsLiq-cluster, e.g. *prenez* ‘take$_{\text{2-PL-PRE}}$’ [pʁœne] ~ *[pʁne]. In sum, the set of vowels that we define as schwa contrasts with a number of current analyses in which schwa is considered to have psychological reality in word-medial and word-final positions.

The history of research on schwa alternation while multifaceted leaves open a number of fundamental questions, some of which are summarised in Example (1):

(1) Unanswered fundamental questions related to schwa alternation

- **What is the underlying representation of schwa?** Is schwa a separate vowel category in French or do other approaches account for the data better? Hypothetical alternatives are schwa as a variant of /œ/ or schwa as an epenthetic vowel; additionally, there could be two underlying forms per schwa-item, one with schwa and one without.

- **What is the nature of the distribution of schwa in light of the consonants that surround it?** What is the nature and strength of the phonotactic constraints that regulate schwa alternation? Given the lexical idiosyncrasy with regard to schwa alternation, i.e. that two schwa-items with similar word-initial segmental make-up are subject to different degrees of schwa alternation, the question remains where in the grammar gradient well-formedness is regulated.

- **What is the motivation behind the distribution of schwa in light of its preceding context?** What in grammar imposes the three consonant rule? Competing analyses refer to syllable structure or to perceptual salience.

- **How do we model variation in grammar?** What is the nature of the mechanisms that regulate the selection of the two variants, with or without schwa? The major recent proposals are unordered constraints, in OT, and exemplar strength, in usage-based models.

- **Does schwa provide information about the phonology-phonetics interface?** When schwa is absent in the phonetic output, does this necessarily imply absence of the syllable? CVCV models claim the vocalic position does not delete.

- **What is the role of frequency for schwa alternation?** What is the role of lexical frequency for schwa alternation? Frequent usage of a schwa-item has proven to imply frequent schwa alternation, and the question remains how to implement this into the model. Is lexical frequency factored into the grammar or is it strictly encoded in the lexicon? If lexical frequency is a property of the lexicon, how do the lexicon and the grammar interact to yield the observed output? Parallel questions remain for the frequencies of variants; are the lexically idiosyncratic frequencies of variants factored into the grammar or are they strictly encoded in the lexicon? If the frequencies of variants are a property of the lexicon, how do the lexicon and the grammar interact to yield the observed output?

- **What are the implications of schwa's vowel quality for an analysis?** Is schwa a phonetically autonomous vowel or does it merge with [œ] or [ø]? If yes, do speakers perceive and make use of the difference in the categorisation of schwa vs. [œ] and [ø]? If no, what does the phonetic merger of schwa and [œ] or [ø] imply for the formal status of schwa? Which mechanism in grammar prefers [œ] or [ø] over other vocalic qualities available in the language?

- **What impact does orthography have on phonology?** Does <e> in word-medial and word-final positions have a psychological reality? If yes, does this affect the phonological behaviour of schwa? Is schwa behaviour different for readers and non-readers?

The primary focus in this thesis is on the underlying status of schwa, the distribution of schwa in light of phonotactic structure, schwa at the phonology-phonetics interface, and the alleged phonetic merger of schwa and [œ] or [ø]. Given that a large part of the thesis discusses schwa alternation in light of child language data, it is our belief that these topics take precedence over topics that bear on, for instance, modelling variation in grammar or the relationship between phonology and orthography.

1.2.3 The relevance of acquisition data for the study of schwa

The review of the research on schwa presented in Section 1.2.2 shows that one of the few areas that remain to be covered is the L1 acquisition of schwa alternation. We can only speculate why no such study has been undertaken, but it is our belief that the fact that there is no consensus on how to analyse schwa in adult speech implies that the formulation of hypotheses on schwa behaviour in child language is more challenging. Further, as reported by Hannahs (2007) regarding the L2 acquisition of schwa, the fact that schwa is influenced by a variety of extra-grammatical factors also poses important challenges for the development of a solid methodological approach to data elicitation.

However, given that child language is constrained by cognitive and articulatory factors, one may rightly ask how child language data can enrich the phonological analysis of schwa. Further, the child's grammar is in a developing state and one should expect that the grammatical constraints that operate on schwa-items differ between child and adult grammars, which makes a direct comparison of the two systems more complicated. We propose that the various pressures that may or may not operate on schwa in child language make these data valuable for schwa research. First, pre-reader children have a grammar that is construed solely on the basis of the primary input data, and free from orthographic influence. Second, in the course of acquisition the constraints on consonant sequencing and syllable reduction become gradually less dominant, and, as such, we expect the gradual emergence of secondary clusters. Thus, developmental data allow us to investigate both the potential modifications of the secondary clusters and whether the acquisition of schwa alternation is guided by phonotactic constraints or by the frequencies of variants in the input, i.e. child-directed speech. Third, [œ], the target phonetic value of schwa, is the last of the vowels to be acquired by children. Assuming that syllable faithfulness takes precedence over schwa deletion in the early stages of acquisition, child language data may show vowel qualities, representing schwa, that reveal a default quality or assimilation to context. Also, the assumed phonetic merger of schwa and /œ/ in the child's input opens for the possibility that the child interprets schwa and target stable [œ] as variants of the same vowel category. If this is the case, the developmental data may point to the factor on which the child bases his distribution of the two variants, and also to the factor that triggers the categorical split between schwa and /œ/.

The above-mentioned factors, intra-grammatical as well as extra-grammatical ones, jointly exert pressure on the child grammar until target-like schwa alternation is acquired.

1.2.4 Main hypotheses

In this thesis, we approach the acquisition of schwa from three angles. First, we challenge the traditional approach whereby schwa is considered to be a separate vowel category, /∅/. Examining the distribution of schwa vs. stable /œ/ and schwa vs. word-initial /CC/ in Swiss French adult data, we test the data against two alternative approaches; one, the one-category approach in which schwa is a variant of /œ/, and two, the epenthesis approach in which schwa is an optional epenthetic [œ]. Both alternatives are less costly in that they imply fewer vowel categories, i.e. they do not necessitate an autonomous category /∅/, and in that they allow for a more transparent mapping between the phonology and the phonetics, i.e. they do not necessitate a phonetic neutralisation of the categories /∅/ and /œ/. The objective of this examination is to explore the idea that vowel categorisation proceeds in minimal steps; do not create more categories than necessary. If children hypothesise that schwa represents /œ/ in an initial phase of development, the categorical split must be triggered by an overlap in distribution that is defined by phonotactics, morphology, or the lexicon.

(2) *Delayed-split hypothesis*
The child initially categorises schwa as /œ/. A categorical split is performed if required by an overlap in distribution of schwa and [œ], as defined by phonotactics, morphology, or the lexicon.

Second, we test the traditional approach whereby child-directed speech is characterised by a higher frequency of standard variants. Examining the rate of schwa alternation in Swiss French child-directed speech data, we aim to establish whether the rate of schwa presence is greater in child-directed speech than it is in inter-adult speech. The objective of this examination is to explore the idea that a greater rate of schwa presence in child-directed speech both presents the child with non-target-like frequencies of variants, with and without vowel, and blurs the distinction between schwa and /œ/, which may consequently delay the categorical split between the two vowels.

(3) *Non-target-like-input hypothesis*
The rate of schwa alternation in child-directed speech is lower compared to inter-adult speech.

Third, we analyse schwa alternation in light of language acquisition in general. Examining the segmental output of schwa-items in Swiss French child language data, we test the data against two reported challenges in the acquisition of phonology; one, the acquisition of consonant sequencing, and two, the acquisition of syllable deletability. Both processes are required for the child to master target-like schwa alternation. The objective of this examination is to explore the idea that a certain level of phonological complexity needs to be in place before both variants of the schwa variable are available for free use.

(4) *Phonology-first hypothesis*
Consonant sequencing and syllable deletability must be in place before target-like schwa alternation is acquired and frequencies of variants can be learned.

Note that our starting point throughout the thesis is the traditional two-category approach whereby schwa is a separate, albeit phonologically defective, vowel category in the Swiss French vowel system.

1.3 Organisation of the thesis

This thesis is organised into three main parts. Part I contains three chapters that discuss empirical, theoretical, and methodological challenges to a study on schwa in Swiss French. First, to set the background for this study, Chapter 2 presents the linguistic characteristics of the Swiss French varieties, with a particular focus on a series of recent studies carried out by members of the project *Phonologie du français contemporain* (PFC). Second, to determine whether a vowel inventory with a separate schwa category best accounts for the data, Chapter 3 tests the strength of two alternative approaches to the underlying status of schwa; the one-category approach and the epenthesis approach. Third, to emphasise the importance of methodological choices in studies on phonological variables, Chapter 4 presents and discusses in detail the selection of informants, sampling density, sampling strategy, and data treatment.

Part II contains two chapters that discuss schwa as it occurs in the input to the children. First, to determine the salience of acoustic properties for the categorisation of schwa, Chapter 5 focuses on the quality of schwa vs. stable /œ/ in the production and perception in adult speakers. Second, to establish what constitutes the input to the child, Chapter 6 examines the behaviour of schwa in child-directed speech (CDS) from six caregivers that were recorded at home in conversation with their children.

Part III contains three chapters that discuss the acquisition of schwa. First, to reveal the behaviour of schwa in the course of acquisition, Chapter 7 presents spontaneous and semi-controlled child production data, which are examined in light of intra-grammatical as well as extra-grammatical factors. Second, to conclude the discussion, Chapter 8 summarises the thesis and proposes a developmental path for the acquisition of target schwa alternation. Third, to form a bridge between this thesis and future research, Chapter 9 presents some ideas for how one can build on the present analysis and extend the study on schwa alternation in child language to include other aspects that are not covered herein.

PART I

SCHWA AND SWISS FRENCH ACQUISITION DATA: EMPIRICAL, THEORETICAL AND METHODOLOGICAL CHALLENGES

2. The Swiss French varieties

C'est vrai que chez nous avec toutes nos différences d'accent,
quand Émile a commencé à travailler à Genève…
ha, qu'est-ce qu'ils ont pu rire avec son accent vaudois.
Puis nous encore ça va!

svaab1, 65-year-old woman living in Gland (Nyon District)
informal discussion on Swiss French varieties

2.1 Introduction

While most classic studies of schwa are empirically based on data from *français de référence*, we now witness a growing documentation of schwa's behaviour in the production of speakers living in different parts of the French-speaking world, cf. for instance, the work carried out under the project *Phonologie du français contemporain* (henceforth PFC, cf. Durand et al. 2002, 2009a).[1] The extensive data collection performed by the PFC community has moreover allowed various aspects of Swiss French to receive renewed attention, contributing in this way to confirm or disconfirm the continued existence of the linguistic characteristics that are traditionally attributed to these varieties. As is illustrated in what follows, the Swiss French varieties share a large majority of linguistic features with Hexagonal French, but a number of historical factors have nonetheless contributed to their individuality; some of these factors are *a priori* important for the study of schwa. In this respect, in the present chapter we provide a survey of the characteristics of Swiss French, focusing primarily on the prosodic and phonological properties. When data are available, particular attention is paid to the Vaudois variety, which is the ambient language for the majority of the children examined in Chapter 7. However, before we enter the presentation of the language itself, given that Switzerland is a quadrilingual country, we find it appropriate to provide some key elements of the country's linguistic history in addition to the geo- and sociolinguistic situation that has resulted from these past events.

2.2 The linguistic history of Switzerland

2.2.1 Rise and establishment of a quadrilingual country

The complexity of the current linguistic situation in Switzerland has its roots in a historical period characterised by important demographic changes.[2] When the Roman expansion reached the areas corresponding to present-day Switzerland, the land was populated by Indo-European Celtic tribes.[3] In 58 BCE, with the defeat of the Helvetii living on the Swiss Plateau between the Jura and the Alps, and in 15 BCE, and with the defeat of the Rhaetians in the Grisons valleys,

[1] For results and discussion on schwa distribution in different varieties, cf. Durand et al. (2009b), Detey et al. (2010), Gess et al. (2012) and the PFC website: www.projet-pfc.net.
[2] If not otherwise indicated, all elements in the historical synthesis are drawn from Haas (1985).
[3] An important part of the Celtic lexical heritage comprises toponyms, among which we find *Nyon* (from *Noviodunum*), the Vaudois town and district capital that is at the centre of our linguistic investigation.

the Celtic tribes had all become subjects to the Holy Roman Empire.[4] The Roman conquest constitutes a milestone in the linguistic history of Switzerland: politically and socially superior, the conquerors were unacquainted with the local languages and implicitly required the natives to learn the prestigious Latin. However, in the absence of any second language instruction, the Vulgar Latin acquired by the Celts became heavily influenced by their mother tongue, hence the modern labelling *Gallo-Roman*.

The peaceful and prosperous Gallo-Roman cohabitation ended when Germanic tribes started exercising pressure on the territory. In 260 CE, the *Alemanni*, a Germanic tribal federation, broke through the Limes[5] and forced the Romans to withdraw southward to the Rhine. As a consequence of this withdrawal, the native Helvetii and Rhaetians found themselves living in a menaced frontier zone, which they gradually migrated from (westward and to Rhaetia Superior, respectively), thus leaving the area more or less depopulated. In 401 CE, the Romans abandoned the provinces north of the Alps altogether. Thereafter, the Alemanni populated the Eastern part of present-day Switzerland, while the Germanic Burgundian tribe settled in the West, making Geneva the centre of the Kingdom of Burgundy. Different from the Romans, however, the Burgundian newcomers adopted the local Roman language, leaving few traces of their own speech in the "Burgundian Roman" (Haas 1985:41, our translation).

The Alemanni were attracted by the fertile lands of the Western part of the Swiss Plateau, and began to migrate into the region. However, the Alemannic migration ended around the year of 600 in the Grand Marais region (south of Lake Biel). There was no room for additional inhabitants, and thus, the newcomers migrated to the nearly uninhabited heights of Gibloux and Jorat between Lausanne and Fribourg, and to the Jura Mountains. As a result, a multicultural and multilinguistic zone developed between the Biel, Neuchâtel, and Geneva lakes and the Lausanne area. However, the creation of a linguistic border was facilitated around year 750, when the river Aar was chosen as the border to separate the Burgundian Diocese of Lausanne from the Alemannic Dioceses of Constance and Basel, entailing social and linguistic integration of the enclaves on either side of the border. The linguistic border in the central region of the Swiss Plateau was thereafter gradually fixed: following alongside the foot of the Jura Mountains and the line between Morat and Fribourg, the area between the Aar and the Sarine remained (and remains) a linguistic contact zone.[6] As regards the Valais Canton, the region gradually split into a Germanic and a Gallo-Roman zone as a consequence of the migration of the Germanic Walser into the area (Pöll 2001).

The Alemannic migration into Rhaetia – an area geographically more protected than the Helvetii settlements, and with a culturally more independent and linguistically more self-conscious people – turned out to be far slower. Nonetheless, with a part of the Alps becoming Germanised during the High Middle Ages, the foundation of the present-day country's multilingual characteristics was established. Resulting from a combination of geographical factors and historical events, four linguistically separated populations now lived side-by-side in the area corresponding to modern Switzerland: a Gallo-Roman population in the West, a Lombard[7]

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[4] Place names and linguistic features of the modern Rhaeto-Romance dialects indicate that the Grisons valleys were not completely Indo-Europeanised at the time of the Roman invasion.
[5] Limes = border of the Roman Empire.
[6] *Langues en Suisse*, downloaded from http://fr.wikipedia.org/wiki/Langues_en_Suisse on November 29th, 2010.
[7] The Lombard dialects are characterised by a Germanic superstratum that linguistically reflects the conquest of Northern Italy by the Germanic Lombards in the 6th century.

population in the Central South, a Romansh population in the South-East and a large Alemannic population covering the North-East and the central parts of the region.[8]

Figure 2.1: The four linguistic regions in Switzerland, based on data from the Federal Population Census 2000, Office fédéral de la statistique[9]

The first attempt at political unification came about in 1291, when the cantons of Uri, Schwytz, and Unterwald founded a confederation in protection against the Habsburg Counts who were eager to conquer new territories (Fahrni 1984). The Confederation gradually expanded, either by accepting new allies or by conquering lands and their subjects. The Vaud Canton – at the time subject to the Savoy Counts – was occupied by troops from Bern and annexed to the Confederation in 1536.[10] The inclusion of non-Germanic subjects into the Confederation necessitated regulations for linguistic practices. Potential problems arising from ruling a linguistically diverse population were avoided pragmatically: local authorities were required to address the subjects in the mother tongue of the latter. Administratively, however, the Confederation remained predominantly Germanic until 1798: anticipating the arrival of the French Revolutionary Army into their region, and also encouraged by the Hexagonal French ideas of liberty and equality of all subjects, canton after canton proclaimed themselves to be democratic. Those eager to preserve the existing political hierarchy were rapidly defeated by the foreign army (Fahrni 1984). Under French control, a new constitution was drafted, founding the Helvetic Republic. It ordered the abolishment of cantonal borders (Fahrni 1984) and required the translation of all central legal documents into (at least) the three dominant languages, i.e. German, French, and Italian. Due to numerous conflicts between Centralists and Federalists, the Helvetic Republic was dissolved in 1803, and the cantons regained their autonomy. In contrast to the pre-republic period, however, the French- and Italian-speaking populations were no longer subjects of a German-speaking executive power, and any linguistic problems in

[8] The stability of the linguistic borders has been very strong throughout recent history: between 1860 and 1970, according to Pap (1990), only 71 out of 3,072 municipalities experienced a change in lingual predominance, 36 of these shifting from a Romansh to a German-speaking majority in the Canton of Graubünden.
[9] *Fichier "Répartition géographique des langues officielles en Suisse (2000)"* by Marco Zanoli, version of July 4th, 2010, downloaded from http://commons.wikimedia.org/wiki/File:Sprachen_CH_2000_fr.png on November 11th, 2010.
[10] The canton did not become a full-fledged ally until 1803 (Gaullieur 1857).

government were resolved in a pragmatic manner: the polyglot members could speak in their own language if they so desired. In addition, although the large majority of documents were again written in German, all interventions from Francophone and Italophone members were written in their original language.

In 1848, the Federal State was founded, simultaneously assuring cantonal independence and subjection to the federal authority (Fahrni 1984). Also, at this point in history, the Confederation became juridically multilingual because German, French, and Italian had received status as national languages.[11] Finally, in 1938, the constitutional *quadri*lingualism – adding Romansh to the list of national languages – was submitted to, and approved by 92% of the Swiss people in a referendum (Forster 2007).

(1) Federal Constitution of the Swiss Confederation of April 18th 1999, on languages[12]

a. Article 4

The National Languages are German, French, Italian, and Romansh.

b. Article 70

1. The official languages of the Confederation shall be German, French and Italian. Romansh shall also be an official language of the Confederation when communicating with persons who speak Romansh.
2. The Cantons shall decide on their official languages. In order to preserve harmony between linguistic communities, the Cantons shall respect the traditional territorial distribution of languages and take account of indigenous linguistic minorities.
3. The Confederation and the Cantons shall encourage understanding and exchange between the linguistic communities.
4. The Confederation shall support the plurilingual Cantons in the fulfilment of their special duties.
5. The Confederation shall support measures by the Cantons of Graubünden and Ticino to preserve and promote the Romansh and the Italian languages.

2.2.2 From diglossia to uniformity: the status of the Franco-Provençal dialects

An important event in the linguistic history of Switzerland was the gradual abandonment of the Gallo-Roman varieties previously spoken in Romand territories.[13] Note that after the fall of the Roman Empire and the subsequent Germanic invasion, the large Gallo-Romance area gradually split into three dialect zones, i.e. the innovative *Langue d'oïl* in the North, the conservative *Domaine d'oc* in the South, and the transitional *Franco-Provençal* in the East. Franco-Provençal, which contains features from both Oïl and Oc (Lodge 1993)[14], extends in a triangular zone covering, within France: the Southern part of the Franche-Comté, the Ain, the Lyonnais, the

[11] Article 109 in the Swiss Constitution of 1848: "Les trois langues principales de la Suisse, l'allemand, le français et l'italien, sont les langues nationales de la Confédération" (cited by Haas 1985:64).
[12] State of March 7th, 2010. The English translation "is provided for information purposes only and has no legal force" (citation and translations downloaded from http://www.admin.ch/ch/e/rs/101/a4.html and http://www.admin.ch/ch/e/rs/101/a70.html on November 4th, 2010).
[13] For written works on the different traditional varieties spoken in French-speaking Switzerland, we refer to Burger (1979), Knecht (1985), and to the selective bibliography on the *Glossaire des patois de la Suisse romande* website, cf. www.glossaire-romand.ch, under *choix bibliographique*.
[14] According to Knecht (1985), Franco-Provençal does not form a transition zone per se, but was separated from the *langue d'oïl* in a second phase (sometimes after 700).

Forez, the Dauphiné, and the Savoy; within Italy: the Aosta Valley and the Alpine valleys of the Piedmonts; and within Switzerland: Geneva, Neuchâtel, Vaud, and the French-speaking parts of Fribourg and Valais (Knecht 1985:130).[15] The Canton of Jura is linguistically identified as related to Franc-Comtois (branch of the Oïl family), while the French-speaking part of the Canton of Bern – the Jura Bernois – forms a transition zone with varieties related to Franc-Comtois in the North-East and to Franco-Provençal in the South-East – intermediary varieties are observed in the more central parts of the region (Kristol 1999).

The decline in the use of the traditional vernacular – the Franco-Provençal dialects – first took place in the Protestant cities, e.g. Geneva and Neuchâtel (Kristol 1999), and by this fact, the Reformation – initiated in the 16th century – has often been interpreted as an important cause of the change: first, it entailed the arrival of a large number of French-speaking Huguenots in Geneva, and second, the individual reading of the Bible required French literacy skills, which allowed for the introduction of French into the family circle. Knecht (1985:144) questions, however, the strength of the hypothesis that learning a language either for integration of Huguenot refugees or for reading purposes led to the irreversible regression of the mother tongue in such a vast area. If we take into account the facts that, already in the 13th century some of the educated Swiss who had mastered French literacy were probably also able to speak the language, and, that the diglossia relationship between the dialect and the supra-regional language existed for a long time *after* the Reformation – in all social classes in several Gallo-Roman regions (Knecht 1985) – we understand that the adoption of French is the result of a long-term process that requires a much more complex explanation. Both Knecht (1985) and Kristol (1999) attribute the decline of the Franco-Provençal dialects to a combination of the political, ideological, and linguistic ideas of uniformity that spread from France to Switzerland, in particular after the Revolution in 1789. For centuries, Paris had proclaimed itself as the centre of the Francophone world, and in the socialite circles, correct language use constituted an integral part of what was perceived as good manners, which was a prerequisite for anyone aspiring to climb the social ladder.[16] The traditional dialect, on the other hand, was perceived as the opposite of the linguistic *bon usage*. In fact, even its label, *patois*, – supposedly derived from *patte* ‘paw’ – was pejorative in that it symbolised the perceived clumsiness of peasant behaviour and language, perhaps contributing to the strength of the feeling of linguistic inferiority that the local inhabitants experienced with regard to their mother tongue.[17] The cultivated Swiss, who adhered to the ideas of progress and modernity adopted from their puissant neighbour, thus, gradually abandoned the stigmatised local variety, which was viewed as an obstacle to intellectual awakening, i.e. it was seen to hinder a perfect acquisition of French. The *chasse au patois* had started:

> L’usage du patois est sévèrement interdit dans les écoles; la langue française et l’allemand grammatical (Schriftdeutsch) sont seuls admis dans l’enseignement. Les instituteurs veillent à ce qu’il en soit de même en dehors de l’école et dans les conversations entre enfants. *Règlement général des écoles primaires (1886) du canton de Fribourg*. Cf. Spichinger (1985:26, cited by Pöll 2001:55)

[15] For the emergence of Franco-Provençal, cf. Chambon and Greub (2000, cited by Maître & Matthey 2004).
[16] Note that the Parisian variety had been prestigious ever since the 12th century; the main reason for this exaltation was that Paris was the location of the powerful French monarchy’s political centre.
[17] Note that the term *patois* is not associated with any depreciative connotations in present-day Romandy, at least not for people who speak one of the Franco-Provençal dialects or to a certain extent are familiar with them. In fact, the term has been used officially in Federal Population Censuses since 1990, when dialectal practice became integrated in the questionnaire, cf. the note *À propos du mot ‘patois’*, downloaded from www.gpsr.ch on January 10th, 2009.

Thus, the Franco-Provençal dialects were first abandoned in the more progressive Protestant areas: in the cities – Geneva, Lausanne, and Neuchâtel – French already dominated in the first half of the 19th century (Kristol 1999). At the cantonal level, Franco-Provençal disappeared from Neuchâtel in the beginning of the 20th century (Gauchat et al. 1925, cited by Kristol 1999), and from Geneva in the 1930s (Keller 1931) – some rural areas in the Vaud mountains resisted yet for a period (Kristol 1999). Knecht (1985) estimated the number of Franco-Provençal speakers were less than 2% of the population at the time, these residents were males of a certain age residing in a Catholic canton (Fribourg, Jura, and Valais).[18] Recent censuses have confirmed that the number of bilinguals is still declining: in 1990 these represented 1.5% of the Swiss residents in Romandy[19], whereas in 2000 they amounted to a scarce 0.9% (Lüdi & Werlen 2005).

2.3 Current geolinguistic situation

The preservation of the national languages in Switzerland is ensured by the principle of territoriality (cf. Art. 70.2 of the Constitution), by which each canton decides on its official language(s) and is required to protect indigenous linguistic minorities. There are 7 954 662 inhabitants[20] spread across 26 cantons. The four languages face an asymmetric distribution: as reported in the Federal Population Census of 2000[21], German – the sole official language of 17 cantons – still dominates as the principal language of 63.7% of the population.[22] French, spoken by 20.4% of the population, is the sole official language of four cantons, Geneva, Jura, Neuchâtel, and Vaud. In addition, it shares official status with German in the cantons of Bern, Fribourg, and Valais, which are comprised of 7.6%, 63.2%, and 62.8% French-speaking residents, respectively. Ticino constitutes the sole official Italophone canton, but Italian, spoken by 6.5% of the population, additionally shares official status with German and Romansh in the Graubünden Canton. Romansh is the principal language of only 0.5% of the Swiss population.[23]

Figure 2.2 depicts the fractional distribution of the languages in the various cantons.[24]

[18] Evolène in the Valais Canton is noteworthy as it constitutes the sole municipality where a Franco-Provençal dialect is still transmitted to children, cf. Maître and Matthey (2004, 2007) and Matthey and Maître (2007).

[19] Note that French-speaking Swiss refer to their region as *la Suisse romande* or *la Romandie*, hence the English translation *Romandy*.

[20] The state of population as of December 31st, 2011, taken from *La population de la Suisse 2011*, downloaded from www.bfs.admin.ch/bfs/portal/fr/index.html on December 18th, 2012.

[21] All numbers presented here that are not explicitly cited are taken from Lüdi and Werlen (2005).

[22] The informants were asked the following question: *Quelle est la langue dans laquelle vous pensez et que vous savez le mieux?* (Lüdi & Werlen 2005:7).

[23] It is worth noting that despite the multilingual status of the nation-state, few Swiss are plurilingual, at least when we exclude residents on the linguistic border, the Romansh – who also master German –, and the internal migrants (Pap 1990, Andreassen et al. 2010). Measures have been taken, however, to increase individual plurilingualism, cf. Forster (2007) and *Une seconde langue nationale d'abord, l'anglais ensuite*, published on Swissinfo.ch on June 6th, 2007, and downloaded on November 30th, 2010, from http://www.swissinfo.ch/fre/Une_seconde_langue_nationale_dabord,_langlais_ensuite.html?cid=5962008.

[24] Concerning the 9% of the residents using a non-national language, the overall number remains stable, but changes are reported within this population: while Spanish with its 1.7% was the major foreign language in 1990, Serbo-Croatian (1.4%) and Albanian (1.3%) constituted the most important non-national languages in 2000, reflecting the modifications in the immigration patterns during the 1990s.

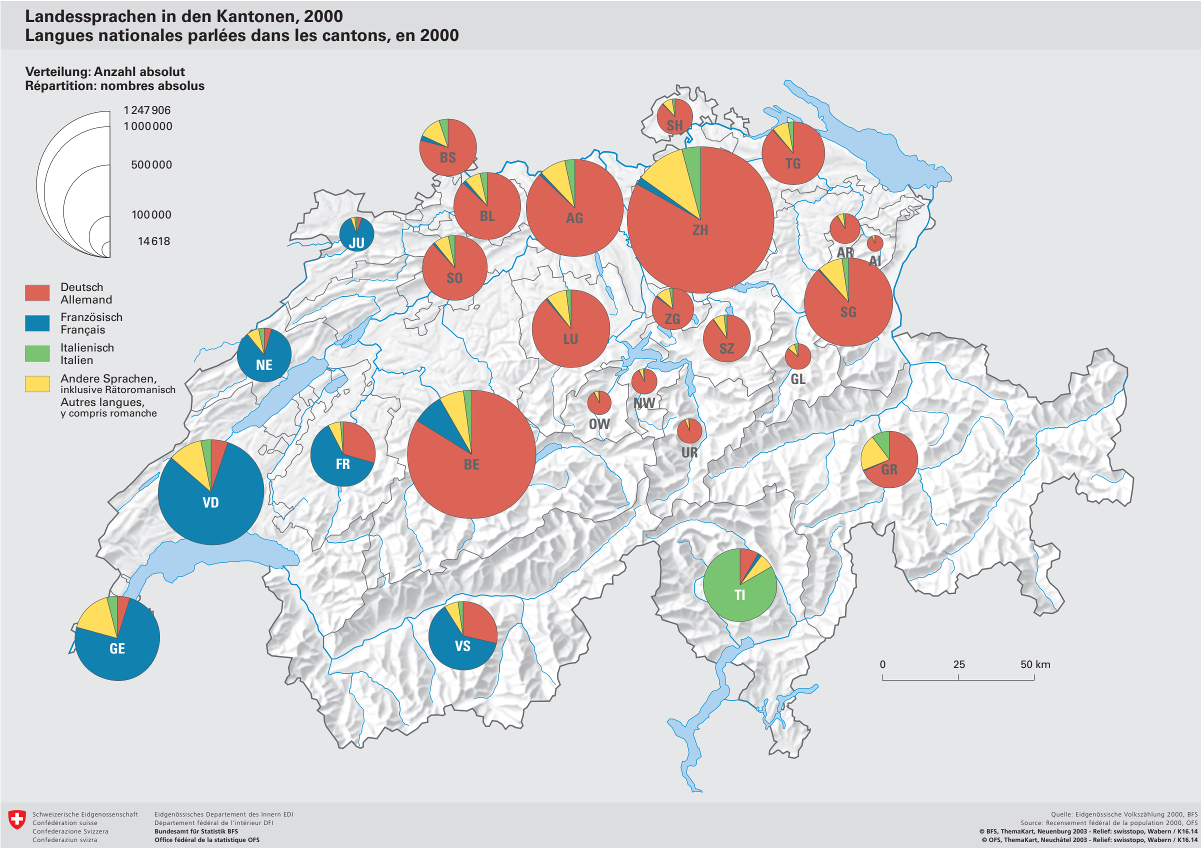

Figure 2.2: Cantonal distribution of the national languages, ©OFS, ThemaKart, Neuchâtel 2010

In the Vaud Canton (abbreviation VD), French is reported to be the principal language of 81.8% of the population, and, as for the presence of the other national languages, 4.7% speak German and 2.9% speak Italian. In addition, Vaud is host to 10.5% residents whose principle language does not have a national status. In fact, looking at the map in Figure 2.2, we notice that there is a relatively large proportion of speakers of a non-national language both in Vaud and in Geneva (abbreviation GE), and this can at least partly be explained by the *headquarters agreement*, which Switzerland holds with 25 international organisations – 22 of which are located in Geneva.[25] Another internationalising factor is that large Swiss companies (e.g. Nestlé and Novartis) have in recent years expanded to become global operators, pressuring the Swiss to use English in their work lives (Murray 2003). Nevertheless, the internationalised professional community seems to have a low impact on the use of French in Romandy: even if English is highly present in the work life of some professional groups (e.g. 46.1% of directors), nearly 98% of the Romand population report that French is (one of) their professional language(s). When we additionally consider the fact that almost 80% of the residents in Romandy who are born in Switzerland, but who have a foreign nationality, have French as their principal language – with the same reported by 40% of those born abroad – we understand that the level of linguistic adaptation is strong in the Francophone region.

[25] Federal Department of Foreign Affaires, downloaded from www.eda.admin.ch on January 20th, 2009.

2.4 Current sociolinguistic situation

> Un Génevois, en faisant usage des termes de son dialecte, sera toujours compris à Genève, mais le sera-t-il suffisamment dans un pays étranger, et surtout en France, où nous voyageons si souvent, et ne courra-t-il point le risque de faire rire à ses dépens? risque, aux yeux de beaucoup de gens, bien plus grand encore que celui de ne pas être entendu. (Gaudy-Lefort 1820:ii)

Recall from Section 2.2.2 that the introduction of French led to a diglossic situation that gradually disappeared in disfavour of the Franco-Provençal dialects. In the German-speaking part of Switzerland, on the other hand, the traditional vernacular experienced a different destiny: while Swiss Standard German (*Schriftdeutch*) is the written norm, 80.5% of the residents speak one of the many Swiss German (*Schwyzerdütsch*) varieties (Lüdi & Werlen 2005:37). Historically, the German-speaking and the French-speaking Swiss have reacted in opposite manners from one another with respect to the diglossic situation rendering them linguistically unique in comparison to the residents of Germany and France, respectively. Whereas the German-speaking Swiss have fought for the preservation of the local varieties, cf. the discussion in Pap (1990), the Romands have not only abandoned the traditional vernacular, but even today, they have ambivalent sentiments toward the linguistic features that reveal their Swiss origin. The notion of linguistic insecurity (Labov 1966) often appears in discussions on the sociolinguistic situation in French-speaking Switzerland. Singy (1996) provides support of this insecurity through an analysis of a questionnaire completed by more than 600 Vaudois residents; using statistical valuation he unambiguously confirms the presence of linguistic insecurity in Romandy. Singy observes that the large majority of the Vaudois informants recognise a certain originality in their French variety, which he considers is a reflection of a *socio-spatial class consciousness*. This consciousness is inferred from the data, not only on the basis of the subjects' ability to recognise their own variety and the features that identify it[26], but also on the basis of their recognition of an outside variety being more "prestigious" – more precisely Hexagonal French.[27] The Vaudois' identification of an outside linguistic reference is manifest in two *socio-spatial class reactions*, linguistic insecurity as defined as the tendency to simultaneously appreciate and depreciate the local variety, and linguistic inferiority as defined as the tendency to attribute linguistic "superiority" to an outside variety. Illustrating appreciation toward the Vaudois variety, 75% confirm that the Vaudois should be proud of their regional dialect, and 85% claim that one can speak formal French with a strong Vaudois accent.[28] Conversely, illustrating depreciation, 25% report that they do not like their accent, and 75% are against making local words official by integrating them into the school-learning program. Linguistic inferiority is manifest, for example, by the fact that 69% are convinced Hexagonal French speakers think negatively of the Swiss French varieties. Also, 77% claim that certain Romands try to remove their accent when in conversation with a French speaker – 34% of the informants even confess that they have done this themselves.[29]

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[26] 97% report that they could recognise a Vaudois speaker, and 87.5% of these indicate *accent* is (one of) the feature(s) that identifies a Vaudois from a speaker of another variety – *accent* being interpreted as covering both pronunciation and intonation (Singy 1996:94).

[27] When asked *Où parle-t-on le mieux français dans le monde?*, 58.4% answered France and 11.5% answered Paris. 20.7% abstained from answering (Singy 1996:99).

[28] The informants replied to the question *Peut-on très bien parler le français avec un fort accent vaudois?* This question was read as – Singy underlines it with examples from the pilot study – "il leur était demandé s'il était possible de parler un français qualifié – dans leurs termes – de châtié, impeccable, 'propre à la haute' ou encore distingué, tout en présentant un fort *accent* vaudois" (Singy 1996:160)

[29] Singy (1996) includes four social variables in his analysis, i.e. sex, age, socio-professional category, and residence, and he largely confirms that overall Vaudois women tend to exhibit stronger socio-spatial class reactions

The presence of linguistic insecurity in the Vaud Canton was indicated in an earlier study by Bayard and Jolivet (1984), wherein informants were asked to evaluate eight speakers in a matched-guise test. In addition to productions of two French speakers, productions of six Vaudois speakers were included in the test material. Informants were asked to classify each as having a strong, medium, or weak accent. Among other things, the informants were asked to guess the profession of the speakers, and the results show that the intensity of a Vaudois accent is perceived as being inversely proportional to the prestige of the profession associated with the person. Also, the informants had to rate how sympathetic the character of the person was. A strong Vaudois accent is interpreted as equivalent to a very sympathetic character. M.-L. Moreau (1999) interprets this result to show that the local variety – being an integral part of the cultural identity – is intimately linked to moral values:

> [S]i les variétés standards sont régulièrement associées au prestige, au pouvoir, à l'autorité, à l'intelligence, à l'éducation, à l'élégance etc., elles laissent tout aussi régulièrement l'avantage aux autres variétés pour d'autres critères d'appréciation tels que chaleur humaine, générosité, honnêteté, sympathie, force physique, etc. (M.-L. Moreau 1999:11)

In sum, the literature on Swiss French shows that speakers of these varieties experience a relatively high level of linguistic consciousness in relation to their puissant neighbour. M.-L. Moreau (1999) formulates this clearly:

> [D]'une part la culture ambiante indique un modèle linguistique aux individus, d'autre part, elle leur enjoint de ne pas l'adopter: elle pose en effet que "le bon français est celui des Français", mais qu' "[i]l ne faut pas parler comme les Français." (M.-L. Moreau 1999:9)

Yet another group that the French-speaking Swiss experience as exerting pressure on their cultural identity are the German-speaking Swiss, who are both demographically and economically dominant (cf. Armstrong & Pooley 2010). In fact, according to Matthey (2003:99), the French-speaking Swiss operate a "double mouvement de distanciation identitaire" in that they want to be identified as *Romands francophones*, aspiring to simultaneously maintain their linguistically defined distinction to the remainder of the francophone world *and* to their German-speaking compatriots. Thus, steps have been taken to manifest their position as a linguistically identifiable unity. For instance, in 1990, when the *Conseil supérieur de la langue française* in France was to present a number of orthographic rectifications, a "small psychodrama"[30] took place because the Swiss were excluded by reason of the fact that they did not have a competent body to take part in the process (Thibault 1998). In order to be on equal footing with the French-speaking Belgians and Canadians – who *did* take part in the preparatory steps – the Romands put away any cantonal disputes and unified in 1992 to form the *Délégation à la langue française* (DLF).[31] The Romands have additionally manifested their aspiration for linguistic autonomy through the legitimisation of feminised terms like *agente (de circulation)* 'traffic police woman" and *ingénieure* 'female engineer' (Knecht 2000:723), which "marquait un divorce total avec la France, où les tentatives de féminisation avaient pitoyablement avorté"

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than men. As our work focuses on the acquisition of the Swiss French variety spoken in the Lac Léman (Lake Geneva) area, it would have been interesting to additionally investigate the strength of socio-spatial class reactions among women aged 30-40. This research would provide information regarding the attitude the investigated caregivers have toward the language they transmit to their children. However, as the caregivers included in this study are few in number and do not form a homogeneous group, neither socio-professionally nor when it comes to residence, we find the inclusion of Singy's (1996) fine-grained results to be beyond the scope of our thesis.

[30] Thibault (1998:35, our translation).

[31] DLF is established within the ranks of CIIP (*Conférence intercantonale de l'instruction publique de la Suisse romande et du Tessin*), the body that coordinates the educational system, cf. www.ciip.ch.

(Thibault 1998:36).[32] A concern for the preservation of Swiss French linguistic integrity is also reflected in what Matthey (2003) labels a *phobia against Germanisms*, and which has been concretely manifested by translators in the federal administration, who in 1959 created the *Fichier français*, a study circle whose main objective is to advocate "le bon usage de la langue française" and to "lutte[r] contre les altérations de la langue et fai[re] front aux traductions hasardeuses".[33] The consciousness around "Germanised French" has been so strong that it has received its own lexical entry – *français fédéral* – in the Swiss French dictionary (Knecht & Thibault 2000:135).

To sum up this section, we conclude that there are at least two sources exerting pressure on the Swiss French varieties, Hexagonal French and Swiss German. We keep in mind these external forces when we turn to the current linguistic situation in Romandy in the next section.

2.5 Current linguistic situation

2.5.1 Characteristics of the Swiss French varieties

Swiss French is different from *français de référence* (henceforth FR) by the presence of four types of regional variation (Kristol 1995, Matthey 2003): dialecticisms from the Gallo-Roman varieties, Germanisms from German or Swiss German, proper innovations, and archaisms from Old Central French.[34,35] Swiss French, however, does not constitute one homogeneous variety, which is evidenced by the fact that Romands are capable of distinguishing between residents from the various French-speaking cantons.[36] Interestingly, as illustrated below in the excerpt from an informal conversation drawn from the PFC database, a person's identification of a compatriot's residence also seemingly depends on the residence of the person herself:

[32] See also *Le Nouveau Dictionnaire féminin-masculin des professions, des titres et des fonctions* (T. Moreau 1999), first published in 1990 by the Federal Offices for the Equality of Women and Men in Geneva and Jura.
[33] *Fichier français de Berne*, downloaded from http://www.fichier-francais.ch on February 2nd, 2009.
[34] Kristol (1995) underscores that the presence of loan words, innovations, and archaisms are also characteristics of other peripheral French varieties.
[35] A recent sociolinguistic study by Prikhodkine (2011), targeting Swiss French speakers residing in Fribourg, Geneva, and Vaud, shows that lexical items classified as innovations and archaisms are more legitimised than lexical items classified as dialecticisms and Germanisms. This finding is explained as a positive attitude toward lexical resources that contribute to the autonomy of the Swiss regional varieties of French.
[36] Identification of varieties also applies at a more local level: a resident of the Neuchâtel Canton is able to distinguish between people who live in the Neuchâtel mountains from those who live in the lake area (Andreassen et al. 2010).

(2) A discussion on linguistic variation in Romandy (PFC data from Nyon[37])

svaab1 C'est vrai que chez nous avec toutes nos différences d'accent, quand Émile a commencé à travailler à Genève… ha, qu'est-ce qu'ils ont pu rire avec son accent vaudois. Puis nous encore ça va! Mais suivant où…Dans le Gros-de-Vaud où dans l-…

svaje1 Ah! alors là-bas! Oui, parce qu'il y a des amis du Gros-de-Vaud, euh quand ils XX ils disent que j'ai l'accent genevois, donc euh bon… Pourtant, les Genevois disent qu'on a l'accent vaudois.

svaab1 L'accent vaudois, ouais mais … c'est …

inf3 Puis les Français, c'est nul encore parce qu'ils X qu'on a l'accent suisse. XXX il y a pas d'accent suisse.

svaab1 On a l'accent de de de notre coin. Les les Neuchâtelois avec leur *qué toi*, c'est aussi… c'est marrant comme chaque, euh…

inf3 Puis moi, j'avais été dans le Jura au mois de décembre, […] alors là j'ai pu entendre vraiment le jurassien autour de moi.

svaab1 Ah oui, puis le jurassien c'est encore autre chose que le le neuchâtelois.

inf3 Ah oui, tout à fait. Mais, c'est pour ça que je dis, c'est c'est complètement erroné de dire l'accent suisse. Nous, nous on dit pas l'accent français, nous on a quand même assez d'intelligence pour distinguer le parisien et le le marseillais et cetera. C'est, ça vient au même.

svaab1 Des accents locaux.

inf3 Ben oui, tu peux pas dire l'accent suisse.

Knecht (1979) observes two general schemas for the distribution of regionalisms: either it is observed across Romandy and crosses the border to the adjacent French region(s), or it is observed in a defined area within Romandy.[38] In what follows, we discuss the two schemas in light of lexical regionalisms, which are studied more extensively in the literature than phonological and phonetic regionalisms[39]: *Pive* 'pine cone' (FR *cône du sapin*) is an example of the kind of dialecticism that is subject to the first schema in Knecht (1979). *Pive* is at present the "official" Swiss French term designating the object (cf. Voillat 1971), but the term is also observed across the border, more precisely in the French Jura, the Doubs, and in the Haute-Savoie (Knecht & Thibault 2000:209). The origin of *pive* has been located in the dialects in the Arc Jurassien, and therefore it constitutes an imported regionalism in the other regions where it is found. In Valais, for instance, *pive* has replaced the original dialecticisms like *lobal* and *baroula*, and this diffusion bears witness to Swiss French varieties behaving within an independent system with its own dynamics (cf. Kristol 1995). The dialecticism *cratsètt* 'way to address a child in a playful manner' illustrates the second schema in Knecht (1979): it is only observed in this form in Central Valais (Andreassen et al. 2010). Turning to the Germanisms, the third type of regionalisms, *poutzer* 'to clean' is, according to the Dictionnaire suisse romand,

[37] The excerpt presents two informants from Nyon, svaab1 and svaje1, and one non-native francophone speaker (inf3). The dialogue is available in its entirety at www.projet-pfc.net.
[38] Certain groups of innovations form an exception to the schemas in that they are found across Romandy but not outside the political borders, e.g. the commercial term *en action* 'on sale' corresponding to FR *à un prix promotionnel*, and statalisms (legal terms of art) – the official federal terminology – like *votation* 'vote' corresponding to FR *vote*, and *département* 'ministry' corresponding to FR *ministère* (Manno 2004).
[39] The contribution of the four components have been extensively studied in three major lexicographical works: *Le Dictionnaire historique du parler neuchâtelois et suisse romand* (W. Pierrehumbert 1926), *Le Dictionnaire suisse romand* (Knecht & Thibault 2004), and *Le Glossaire des patois de la Suisse romande* (henceforth GPSR, cf. www.glossaire-romand.ch).

"[un g]ermanisme emblématique et conscient, d'un emploi néanmoins très courant" (Knecht & Thibault 2000:218). The distribution of the Germanism *fatre* 'father', on the other hand, is limited to the Broye Vaudoise and Fribourgeoise, and to the Neuchâtel mountains and the Jura Bernois (Andreassen et al. 2010).

It should be noted that in addition to enriching the vocabulary, the dialecticisms and Germanisms are sometimes imported with their pronunciation; hence, these terms can be seen to affect the phonotactics of Swiss French. For instance, the affricates /ʦ ʣ ʤ ʧ/ are observed in some Germanisms and dialecticisms, shown in Example (3).

(3)	*zwieback*	[tsɥibak][tsvibak]	'slightly sweetened biscuit (Germanism)' (Knecht & Thibault 2000:280)
	mèdze	[mɛdz]	'healer (dialecticism)' (Knecht & Thibault 2000:187)
	djesse	[ʤɛs]	'hen roost (dialecticism)'[40]
	Tchaux	[ʧo]	'abbreviation of the toponym *Chaux-de-Fonds*' (Matthey 2003:95)

While the affricates are used by speakers for these words, they are not in the Swiss French consonantal inventory. The imported affricates are thus restructured as non-native consonant clusters, which is orthographically evidenced for instance in *T'chaux*, where [t] and [ʃ] are clearly not perceived as belonging to the same sound (Matthey 2003:95).

As regards lexical innovations, we confine ourselves at this point to mentioning a type of suffixal derivation originally borrowed from Franco-Provençal (cf. Voillat 1971, Knecht 1985). The suffix *–ée* describes the quantity or the intensity of an action in its final state, and it is often used to nominalise actions that signify a fall, a violent shock, repeated beats, noises, screams, extreme weariness or drunkenness, or a large quantity (Voillat 1971:222), see Example (4).

(4)	*tombée*	[tɔ̃beː(j)]	'small quantity of liquid that falls' (Voillat 1971:221)
	gonflée	[gɔ̃fleː(j)]	'big quantity of food or drink that has been put in the mouth (and swallowed), heavy drunkenness' (Knecht 1979:253)
	lugée	[lyʒeː(j)]	'heavy fall, failure, drunkenness' (Knecht & Thibault 2000:181)

Finally, adding to the two schemas observed by Knecht (1979), archaisms can be subject to a particular third schema in that they sometimes are observed only in peripheral parts of the francophone world (Manno 2004). For instance, the use of *déjeuner*, *dîner*, and *souper* to refer to the three main meals of the day is observed – in addition to Switzerland – in Belgium, in the Northern American varieties, and in some African countries (Knecht & Thibault 2000).[41]

To sum up this section, the regionalisms observed in Swiss French can be identified as belonging to one of four categories: dialecticisms, Germanisms, innovations, or archaisms.[42] In a global fashion, if we do not count the vitality of innovations (Manno 2002, 2004), the Swiss

[40] GPSR, cited by Andreassen et al. (2010).
[41] In FR, the three main meals are referred to as *petit déjeuner*, *déjeuner*, and *dîner*. The latter term started to replace *souper* in the early 19th century (Knecht & Thibault 2000).
[42] Cf. Andreassen et al. (2010) for a comprehensive illustration of various regionalisms in Swiss French.

French varieties, despite their varied linguistic contact with other languages, seem to evolve toward the standardised system (Andreassen et al. 2010); if the disappearance of Franco-Provençal has led to a rapid decrease in the stock of dialecticisms, then undoubtedly the very evolution of modern society with its technology and internationalisation has entailed a more important exposure to and influence from Hexagonal French.

In what follows, we turn our attention to the prosodic and phonological particularities of Swiss French. Although these varieties are traditionally characterised as comprising a certain number of phonological archaisms, recently collected data seem to indicate that some of the archaic features are currently unstable or already on the verge of disappearing from the system.

2.5.2 Prosodic particularities observed in the Swiss French varieties

While the Swiss French varieties share most of their phonological features with Hexagonal French, Knecht and Rubattel (1984) claim that there are two pan-Romand prosodic features that are not found in the adjacent French regions, an absence of the *allegro* speaking rate and optional stress on non-final syllables. In this section, we review the literature and evidence purporting to support this claim.

2.5.2.1 Speaking rate

There is a common belief that French-speaking Swiss speak at a slower pace than their Hexagonal French-speaking neighbours. This belief is even shared by the Romands themselves. When asked about the features that typify their own variety, 25% of Singy's informants include *slow speech* in their answer (1996:95), and in his survey among young Romands, 16-20 years of age, Singy (2008) further establishes the salience of this perception. Half of the 62 informants identify this feature as particularly Swiss French.

The apparent absence of an *allegro* speaking rate in Swiss French has recently been investigated in a number of studies, albeit with divergent results. Focusing on read speech (the text in the PFC protocol[43]), Goldman and Simon (2007) compare temporal variables in the data from 23 speakers of "standard" varieties from Lyon and Tournai and 24 speakers of "regional" varieties from Nyon and Liège. The results show a difference in speech rate (speech including pauses) between standard and regional varieties. The latter produce fewer syllables per second, cf. the comparison of Lyon and Nyon in Example (5). No significant difference in articulatory rate (speech excluding pauses) is observed.

(5) Speaking rate and articulatory rate: Lyon vs. Nyon (Goldman & Simon 2007)

Lyon	speaking rate = 4.53 syll/sec	articulatory rate = 5.48 syll/sec
Nyon	speaking rate = 3.97 syll/sec	articulatory rate = 5.02 syll/sec

[43] For the sake of thoroughness, we mention here the various components of the PFC protocol: informants read a word list and a text, have a formal conversation, during which the informant converses with an outside person, and an informal conversation, during which the informant interacts with one or two persons who are a part of his family or his social network, cf. Durand et al. (2002, 2009a).

These results are contested by Sertling Miller (2007). Her data, consisting of read speech of the text *La bise et le soleil*[44] by six Northern French speakers and six Vaudois speakers, indicate no significant difference in speaking rate between the two groups. The articulatory rate is slightly slower for the Vaudois, but the difference fails to reach a level of significance.

(6) Speaking rate and articulatory rate: Northern French vs. Vaudois (Sertling Miller 2007)

French	speaking rate = 4.72 syll/sec	articulatory rate = 6.15 syll/sec
Vaudois	speaking rate = 4.74 syll/sec	articulatory rate = 5.70 syll/sec

Sertling Miller proposes that the observed speech rates result from a different prosodic organisation by the two groups of speakers. Whereas the Vaudois produce Accentual Phrases (APs) and Intonational Phrases (IPs) with a slower articulatory rate than the French, the French pause more often, thereby slowing down the overall pace.[45] Note that a factor potentially influencing the results in Sertling Miller (2007) is the homogeneity of her corpus. The French informants are 22-40 years old with a mean of 26.7 and the Vaudois informants are 19-35 years old with a mean of 25.2. No seniors are included in this study.[46] Schwab and Racine (2009, 2012), therefore, set out to examine whether age or gender could have an effect on speech rates. Their corpus consists of read speech[47] by eight informants from Brunoy (Ile-de-France), eight from Nyon, and eight from Neuchâtel.[48] Their group of informants is gender-balanced, 3x4 men and 3x4 women, as well as age-balanced: the mean ages are 50.13 for Brunoy, 48.25 for Nyon, and 47.13 for Neuchâtel. The overall results confirm the absence of a difference in speech rate between Northern French and Swiss French. The difference between Brunoy and Neuchâtel is however nearly significant. Articulatory rate, on the other hand, is observed to be statistically lower in the Swiss French varieties compared to Brunoy, cf. Example (7). Focusing on gender, the men display a faster articulatory rate than the women in Brunoy and Neuchâtel, while Nyon shows no difference. Further, articulatory rate decreases significantly with age in both Swiss French varieties, while Brunoy shows no difference; this effect is particularly strong in the Nyon data.

(7) Speaking rate and articulatory rate: Brunoy vs. Nyon vs. Neuchâtel (Schwab & Racine 2012)

Brunoy	speaking rate = 4.25 syll/sec	articulatory rate = 5.45 syll/sec
Nyon	speaking rate = 4.15 syll/sec	articulatory rate = 5.18 syll/sec
Neuchâtel	speaking rate = 3.93 syll/sec	articulatory rate = 5.00 syll/sec

The above-mentioned studies all focus on read speech – a register that is known to tend to suppress regional features (cf. Simon 2003). As regards spontaneous speech, an unpublished study by Schoch et al. from the 1980s[49] compares the articulatory rate of 30 Parisian and 40

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[44] This is the French version of the fable *The North Wind and the Sun*.
[45] Sertling Miller additionally examines the tonal alignment in Vaudois and Northern French. For the former group, she observes a delay in the realisation of the AP-initial LH-contour. On the basis of this difference in text-to-tune alignment between the two groups, she hypothesises that the delayed LH might contribute to the perception of a slower speaking rate, i.e. listeners have the impression that the Vaudois speakers use more time to reach the target point, the first accented syllable of the phrase, linked to a H tone.
[46] If not age-balanced, her corpus is nevertheless gender-balanced (2x3 men, 2x3 women).
[47] The test material consists of the second paragraph in the PFC text (Durand et al. 2002, 2009a).
[48] All data are available at www.projet-pfc.net.
[49] For details, cf. Mahmoudian and Jolivet (1984).

Vaudois speakers. No difference is found between the two groups as the articulatory rate in the Parisian vs. the Vaudois group amounts to 5.29 and 5.66 syll/sec, respectively. Two recent studies show opposite results. Schwab et al. (2012) compare the articulatory rate in the read speech and spontaneous speech of four seniors from Neuchâtel and four from Paris. The results show that, in both settings, the Swiss articulate more slowly than the Parisians, 4.44 syll/sec vs. 5.24 syll/sec, respectively. Avanzi et al. (2012) also reveal a difference in articulatory rate in read and spontaneous speech between Swiss and Parisian speakers. This study is interesting as it comprises 32 speakers from four different investigation points in Switzerland, eight speakers each from Geneva, Martigny, Neuchâtel, and Nyon, plus eight from Paris. The results reveal inter-cantonal variety in that the articulatory rate observed in the speakers from Martigny is similar to the rate observed in the Parisian speakers.

Thus, in light of recent results, it is clear that the following comment made by a Vaudois, referring to one of the most famous Swiss French stereotypes, is rooted in reality:

> Ouais, je trouve que c’est affreusement lent. Euh, le vrai Vaudois, y parle très lentement. (Singy 2004:64)

2.5.2.2 Tonal configurations

Woerhling and Boula de Mareüil (2006) show that the Swiss French ‘accent’ is easily recognised by Francophone speakers outside of Romandy. They asked 25 Hexagonal French listeners to specify the origin of 36 PFC informants who reside in one of six different regions. The listeners were provided all possibilities to choose from: Biarritz (Basque Country), Douzens (Languedoc), Marseille (Provence), Treize-Vents (Vendée), and Brécey (Normandy) in France, and Nyon (Vaud) in Switzerland. Relevant for the present introduction to Swiss French, the Vaudois speakers received the highest identification rate, 72%, which is around 25% higher than the next variety on the list, Brécey (48.5%). Interestingly, in a different study, where listeners were confronted with data from PFC informants residing in Treize-Vents (Vendée), Douzens (Languedoc), Boersch (Alsace), Nyon (Vaud), and Gembloux, Liège, and Tournai (Belgium), the identification rate for the Vaudois speakers dropped to 38% (Woehrling et al. 2008). A possible explanation for the higher confusion rate is that Alsatian, Belgian, and Vaudois speakers share a feature of non-final syllable prominence. As shown by Woehrling et al. (2008), this non-standard prominence is differently manifested in the acoustic signal across the three varieties, cf. Table 2.1.[50]

	Word-initial syllable				**Penultimate syllable**
	F0 modulation	**Onset lengthening**	**Nucleus lengthening**	**Intensity augmentation**	**Lengthening**
Alsace			√	√	
Belgium					√
Vaud	√	√		√	√

Table 2.1: Non-final prominence and its acoustic properties across three varieties, adapted from Woehrling et al. (2008)

At this point, it is appropriate to recall the second pan-Romand feature mentioned by Knecht and Rubattel (1984:142-143), i.e. “[u]ne résistance à l’accentuation de la dernière syllabe d’un

[50] See Boula de Mareüil et al. (2012) for similar results.

syntagme [… qui] se manifeste par l'exploitation de tous les moyens stylistiques permettant en français standard l'accentuation d'une autre syllabe que la dernière." In Table 2.1, the Vaudois are singled out by F0 measurements for the two initial syllables in a clitic + non-clitic sequence. For instance, in *pour trouver* 'to find', F0 rises on the initial syllable of the lexical polysyllable. Modulation of F0, alongside lengthening of the word-initial consonant (considered to be proper to the Vaudois informants), augmentation of intensity (also observed for the Alsatians), and lengthening of the penultimate syllable[51] largely confirm the widespread intuition of non-final syllable prominence in contemporary Swiss French. In what follows, we restrict our review of the literature to F0 modulation, the acoustic feature that has received the most attention in recent years.

First, the origin of F0 modulation on non-final syllables is debated: Knecht and Rubattel (1984) claim that it constitutes a survival from the Franco-Provençal substratum, but they do not provide any examples to support this hypothesis. Andreassen et al. (2010) disagree with this claim, and argue that the melodic rise in contemporary Swiss French cannot be a surviving feature from the near-extinct Gallo-Roman dialects. Whereas penultimate stress in Franco-Provençal reflects a supra-segmental property in the lexicon, e.g. contrastive [ˈʃapa] 'holly' vs. [ʃaˈpa] 'dig$_{\text{INF}}$'[52], the intonational contour in Swiss French constitutes a property of the phrasal prosody. Hence, the two prosodic patterns are of a fundamentally different nature (cf. Andreassen & Eychenne in press, for an initial analysis of non-final prominence within a grid-only framework). Second, regarding its distribution, Métral (1977:146) claims that the penultimate melodic elevation is less frequent in Fribourg and Valais, and consequently rejects the pan-Romand nature of this feature.[53] Andreassen et al. (2010), in their study of conversation excerpts from Geneva, Jura Bernois, Valais, and Vaud, attest that there is a realisation of penultimate melodic rise in all regions except Valais, further weakening the claim that it is a pan-Romand feature.

If much has already been said about F0 modulations in Swiss French, Schwab et al. (2009) are, to the best of our knowledge, the first to perform a comparative analysis of these tonal configurations. In their examination of read speech by PFC informants from Brunoy, Nyon, and Neuchâtel[54], they observe that the Swiss as a group differ from the French at only one point: the former group displays non-final prominence in continuation contours, on the first syllable of a trisyllable, e.g. *S'il faut montrer patte blanche pour <u>circuler,</u> nous…*[55] As for disyllables associated with continuation contours, e.g. *Le maire de <u>Beaulieu –</u> Marc Blanc – est…*, the intonational curve is identical across both groups. Interestingly, as regards terminal contours, only the Nyon informants exhibit non-final prominence, but now only in disyllables, e.g. *nous ne répondons pas de la réaction des gens du <u>pays.</u>* In trisyllables, e.g. *…risquent de provoquer une <u>explosion.</u>*, none of the groups display initial rise in F0. In addition to research on read speech, research on spontaneous speech is needed to determine more precisely the tonal characteristics of the different varieties. There are two recent examples: Schwab et al. (2012) compare speakers from Paris, Nyon, and Neuchâtel, and Avanzi et al. (2012) compare speakers from Paris, Geneva, Neuchâtel, Valais, and Vaud. The two studies show that in both read and spontaneous speech, Swiss French speakers display a higher degree of penultimate prominence

[51] Note that in the Vaudois variety, both the penultimate and the final syllable is lengthened before a pause, which is not the case for Belgian French, where lengthening is observed for the penultimate only (Woehrling et al. 2008).
[52] Krier (1985, cited by Sertling Miller 2007:19).
[53] According to Métral (1977), the Valais Canton displays intonational contours unknown to the rest of Romandy, but present in neighbouring French regions.
[54] For details regarding the informants, cf. the above-mentioned study by Schwab and Racine (2009).
[55] Examples provided by Sandra Schwab (personal communication).

compared to the Parisian speakers. The two studies further reveal that speakers of the various Swiss French varieties use different acoustic parameters to implement prosodic prominence.[56]

Before we turn to the phonological system, let us mention the discovery of an intonational contour not attested outside of Romandy. Interestingly, while penultimate tonal elevation has been put forth as a stereotypical Romand feature for years, Sertling Miller (2007) observes that several of her Vaudois informants produce an optional LHL-contour in the IP-final position – the standard pattern being LL%.

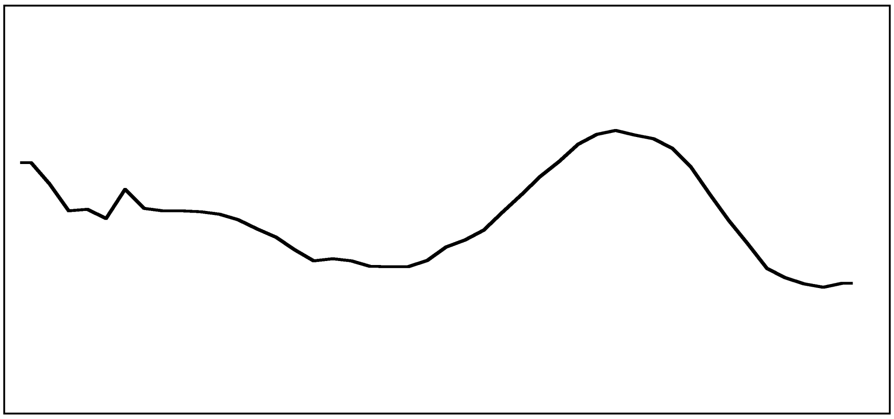

Figure 2.3: IP-final LHL or *cloche* in the production of *fédérale*, produced by the PFC informant svaje1, taken from Andreassen et al. (2010:200, DVD)

The *cloche* ('bell') has received its name on the basis of the LHL-shape of the contour. Sertling Miller (2007) analyses it as a combination of a bitonal pitch accent LH* and a low boundary tone, which most frequently occurs in the IP-final position. Andreassen and Lyche (2009) further examine the structure of the syllable with which the *cloche* is associated, and they observe that the structure exclusively occurs within a nucleus that is considerably lengthened, for instance in *fédérale* 'federal$_{\mathrm{FEM}}$' as produced by the PFC informant svaje1 (cf. Figure 2.3). In contrast, svaje1 does not produce a *cloche* in *fédéral* 'federal$_{\mathrm{MASC}}$'. The comparison of the relative length duration of the word-final vowels shows that the vowel in the feminine form, in which the *cloche* is observed, represents 30% of the word duration, while the vowel in the masculine form, without *cloche*, represents 18% of the word duration. Andreassen and Lyche also observe that the *cloche* is insensitive to word length and syllable structure; it appears in mono-, bi- and trisyllables, with or without a coda consonant. We emphasise that the geographical extension of the *cloche* is yet to be determined. A somewhat similar configuration is observed in Geneva (Skauge 2009) and in Valais (Andreassen et al. 2010), which indicates that the LHL-pattern is not a cantonal feature limited to the Vaud variety.[57]

[56] Avanzi et al. (2012) do not take into account the type of syllables present in the three-syllable window selected for analysis. According to Sandra Schwab (personal communication), the majority of three-syllable windows comprise lexical material in the penultimate position: among the 896 Accentual Phrases attested with penultimate prominence, 76 have a monosyllabic item in the penultimate prominent position. These 76 monosyllables again represent function words, numerals, and adjectives. Thus, we cannot rule out the possibility that functional material in the very same position (e.g. *ce film* 'this movie') triggers the production of a different tonal contour.
[57] Cf. Andreassen and Lyche (2008) for the introduction of other contours observed in the PFC data from Nyon.

2.5.2.3 Summary

To conclude this section, let us call attention to the two prosodic particularities that *a priori* have an impact on schwa behaviour. The first particularity – the hypothesised absence of an *allegro* speaking rate – seems at first glance relevant by the fact that rate of schwa absence according to the literature augments proportionally with speaking rate (cf. Lyche 1979, Knecht & Rubattel 1984, Racine 2008). Acknowledging that a study of pace is beyond the scope of the thesis, we nevertheless briefly return to this factor in Section 4.3.3. The second particularity – non-final syllable prominence – also seems relevant by the fact that it allows for non-emphatic stress on schwa syllables. In fact, if non-final prominence is sufficiently frequent and touches non-final syllables regardless of their segmental content, one could imagine that one effect of this phenomenon would be an augmented rate of schwa presence; a non-final tonal rise would need to be associated with segmental material, and perhaps preferably a syllable nucleus, hence the presence of schwa. Again, acknowledging that developing an understanding of non-final prominence is not the goal of the thesis, we keep this factor in mind when we briefly discuss the prosody of the child-directed speech data in Section 6.3.3.3, and when we examine our child language data in Section 7.3.3.2 and Section 7.4.2.4.

We turn to the distribution of vowels in the next section.

2.5.3 The Swiss French vowel system

In Section 2.5.1, we present the four categories that jointly contribute to the uniqueness of the Swiss French varieties, i.e. dialecticisms, Germanisms, innovations, and archaisms. Although Swiss French has traditionally been distinguished from FR by the presence of a certain amount of phonological archaisms, in this section we provide data illustrating the current state of affairs. The examination of vowel qualities also yields information relevant for the discussion on the quality of schwa in Chapter 5.

We first present the close vowel series. Thereafter, we provide a detailed presentation of the three mid vowel series. The section ends with the presentation of two archaic vowel contrasts: /a, ɑ/ and /ɛ̃, œ̃/. As they are intimately linked in the grammar, qualitative and quantitative properties of the vowels are presented in tandem.

2.5.3.1 Close vowels

Whereas the output quality of the segment series /i, y, u/ is identical in Swiss French and FR, the former is assumed to quantitatively diverge from the latter by having a series of long vowels /iː, yː, uː/, a remnant from the Central French system, i.e. an archaism. As mentioned by Racine and Andreassen (2012), among others, vowel length can be interpreted as being driven by morphology as it allows for the creation of a contrast for instance between masculine and feminine nouns and adjectives.

(8)	/i, iː/	ami	amiː	*ami* ‘friend$_{\text{MASC}}$’ vs. *amie* ‘friend$_{\text{FEM}}$’
	/y, yː/	ny	nyː	*nu* ‘naked$_{\text{MASC}}$’ vs. *nue* ‘naked$_{\text{FEM}}$’
	/u, uː/	bu	buː	*bout* ‘bit$_{\text{MASC}}$’ vs. *boue* ‘clay$_{\text{FEM}}$’

There is no large-scale production study that determines to what extent contrastive length is preserved in contemporary Swiss French varieties. At present, Métral (1977) constitutes the one reference study for the distribution of vowels; however, this study is based on self-reports and not production data. The questionnaire, inspired by Martinet (1971) and filled out by 400 school teachers from all parts of Romandy, reveals a complex qualitative and quantitative vocalic distribution with a range of regional nuances. As discussed throughout this section, Métral (1977) observes contrastive length in all cantons, but there is no inter-cantonal unanimity with regard to the type of vowels that contrast in duration. Concerning the close vowels, while /i, iː/ is still a valid contrast in all cantons except for Fribourg, /y, yː/ and /u, uː/, on the other hand, are partly rejected by the residents of Fribourg and Valais.

As already mentioned, even if the results in Métral (1977) provide important indications about the system, they nevertheless constitute thirty-year-old judgement data that might not reflect the current situation. Andreassen and Lyche (2009) examine the vowel distribution in the read speech data from the PFC survey point in Nyon, and they confirm the persistence of the quantitatively contrastive /i, iː/ in word-final open syllables. They observe the pair /y, yː/ for only some speakers. As for the opposition /u, uː/, it has only been tested with three informants, whose productions do not reveal a clear-cut distinction between a short and a long variant. The absence of a stable length difference /u, uː/ is reconfirmed by our measurements of relative length, cf. Table 2.2. In sum, the Nyon data seem to indicate that the length contrasts in the close vowel series might not be as stable as observed by Métral.

PFC code	**ami – amie**		**nu – nue**		**bout – boue**	
svaje1	44	62	64	81	79	83
svarb1	53	69	53	76	71	64
svarv1	43	64	58	75	68	86

Table 2.2: Relative length of high vowels, produced by three Nyon informants, adapted from Andreassen and Lyche (2009), by percentage

Vowel length in the Neuchâtel variety is scrutinised by Racine and Andreassen (2012), who show that length is contrastive for the close front vowels: /i, iː, y, yː/. In contrast, the durational difference between the hypothesised short vowel in *bout* and the hypothesised long vowel in *boue* does not reach the level of significance, thereby strengthening the observation made for the Nyon data above.

Before turning to the distribution of mid vowels, note that the Swiss French varieties display additional phonological autonomy through an extended use of diaeresis (cf. Walter 1982).[58] In FR, a high vowel preceded by a simplex onset and followed by a vowel is regularly subject to gliding, e.g. *nuage* ‘cloud’ /nyaʒ/ → [nɥaːʒ]. In the Nyon variety, Andreassen and Lyche (2009) observe a strong tendency for diaeresis in this position. Two factors seem to influence the choice between syneresis and diaeresis. First, syneresis is more frequent with [j] than with [w, ɥ], which confirms the hierarchy proposed by Klein (1991), e.g. *miette* ‘crumb’ [mjɛt] vs. *mouette* ‘seagull’ [mu(w)ɛt] and *muette* ‘mute$_{\text{FEM}}$’ [my(ɥ)ɛt]. Second, when present at a morphological juncture, the choice between [i] and [j] seems to be governed by the syllable count. Although all 12 informants from Nyon produce diaeresis with a transitional glide in bisyllabic *scier* ‘saw:INF’ [sije] and in *nier* ‘deny:INF’ [nije], only 50% produce diaeresis in trisyllabic *épier* ‘spy on:INF’ [epije] ~ [epje].

[58] The extended use of diaeresis is also observed in Belgian French (Walter 1982, Hambye et al. 2003).

2.5.3.2 Mid vowels

In FR, the distribution of the mid vowel series [e, ɛ], [ø, œ] and [o, ɔ] is traditionally discussed with reference to the Positional Law, whereby the mid-close [e, ø, o] occur in open syllables and the mid-open [ɛ, œ, ɔ] in closed syllables. Swiss French displays a considerable number of violations of the Positional Law, and this to a degree that one must question its relevance to these varieties. Thus, for the sake of clarity, the three vowel series are examined separately. The data subject to examination are mainly drawn from the Nyon PFC corpus.

2.5.3.2.1 Distribution of the mid front unround vowels [e, ɛ]

According to the Positional Law – most frequently applied in the word-final prominent syllable – we should expect to see [e] in word-final open syllables, and [ɛ] in word-final closed syllables. Whereas the latter prediction is supported by the data, i.e. only [ɛ] is observed when a coda consonant follows, the former prediction is not borne out. As in several other francophone varieties, [e] and [ɛ] both occur in word-final open syllables, permitting the creation of a contrast between the infinitive/past participle and the indicative imperfect, and between the first-person singular future and the present conditional; this latter contrast is neutralised to [e] in many French varieties (Knecht 1985).

/e/			/ɛ/		
pike	*piquer/piqué*	‘stick $_{\text{INF/PAST PART}}$’	pikɛ	*piquais*	‘stick $_{\text{IMP}}$’
mɛtʁe	*mettrai*	‘put$_{\text{FUT}}$’	mɛtʁɛ	*mettrais*	‘put$_{\text{COND}}$’

Table 2.3: Contrastive /e, ɛ/ in word-final open syllables, data from the Nyon PFC corpus[59]

If [e] and [ɛ] are found in word-final open syllables across Romandy, its inter-variety distribution is subject to variation (Andreassen et al. 2010).[60] In Valais, [e] is also selected in the indicative imperfect, thus standing in contrast to the conditional suffix [ɛ]. The vowel distribution in word-final closed syllables is also subject to inter-variety variation in that long [eː] is observed in the Jura Bernois, e.g. *même* ‘self’ [meːm], compared with Vaudois [mɛːm]. Finally, in non-final syllables, the mid-open variant is selected in the Vaudois variety, e.g. *échelle* ‘ladder’ [ɛʃɛl], compared with the Valais informant who uses the mid-close variant, e.g. *écorce* ‘bark’ [ekɔʁ̥s] (Andreassen et al. 2010).

In addition to the qualitative contrast, the archaic quantitative distinction /ɛ, ɛː/ that we find in *faites* ‘do$_{\text{2PL-PRE}}$’ [fɛt] vs. *fête* ‘party’ [fɛːt] and *vrai* ‘true$_{\text{MASC}}$’ [vʁɛ] vs. *vraie* ‘true$_{\text{FEM}}$’ [vʁɛː] – still present phonetically (but unstable) in FR in the second half of the 20$^{\text{th}}$ century (Delattre 1965) – persists to some degree in Swiss French. In Andreassen and Lyche (2009), seven out of twelve informants produce a contrast. The apparent instability of the long vowel [ɛː] – which reflects the general picture drawn by Métral (1977) for the entirety of Romandy – stands in contrast to the stronger preservation of /e, eː/ in word-final open syllables, which is attested as stable in Geneva, Neuchâtel, and Vaud (Métral 1977), e.g. *armé* ‘armed$_{\text{MASC}}$’ [aʁme] vs. *armée*

[59] Note that in this variety, /ɛ/ also stands in correspondence to the orthographic <et>, e.g. *piquet* ‘stake’ [pikɛ].

[60] Recall that the comments in Andreassen et al. (2010) are based on excerpts from conversations with four francophone Swiss, originating from four different investigation locations: Gland (Vaud), Meinier (Geneva), Veyras (Valais), and Bévilard (Jura Bernois).

'armed$_{FEM}$' [aʁmeː]. In some regions, i.e. Geneva, Valais, and Vaud (Racine, personal communication), the latter length distinction is frequently accompanied by gliding on the long vowel, e.g. [aʁmeːj]. This feature is considered to be an adaptation from the Gallo-Roman dialects, where "le suffixe –ATA (fr. *ée*) se dit *–âye*" (Knecht 1985:160). Andreassen (2006) observes that the realisation of [j] is not dependent on the phonetic presence of vowel length, e.g. [aʁmej]. However, this latter realisation seems more frequent in a phrase-medial position where /eː/ does not receive phrase-final prominence.

Table 2.4 sums up this section.

Syllable structure	**Mid-close**		**Mid-open**	
	e	**eː**	**ɛ**	**ɛː**
Word-final open	√	√	√	(√)
Word-final closed			√	(√)
Non-word-final			√	

Table 2.4: Distribution of mid front unround vowels in Vaudois[61], adapted from Andreassen and Lyche (2009) and Andreassen et al. (2010)

2.5.3.2.2 Distribution of the mid front round vowels [ø, œ]

Swiss French, like most French varieties, has a different distribution for its series of mid front round vowels than for its unround vowels.[62] While [e, ɛ] contrast in word-final open syllables, [ø, œ] in this position are subject to the Positional Law; only [ø] is attested. In word-final closed syllables, on the other hand, the vowel quality of the round vowel is more unpredictable. This is observed by Métral (1977), who claims that the Romands, when confronted with the orthography <eu>, experience insecurity with regard to the choice of vowel quality: "Doit-il dire [flö:v] ou [flœ:v] pour *fleuve*, [vö:v] ou [vœ:v] pour *veuve*, etc.?" (Métral 1977:156). Interestingly, when exposed to the potential minimal pair *jeûne* 'fast' vs. *jeune* 'young', the informants who distinguish the two words more often perceive a length difference, and not a quality difference between [ø] and [œ]. Informants also perceive a pure length distinction between [ø] and [øː] in word-final open syllables, e.g. *bleu* 'blue$_{MASC}$' vs. *bleue* 'blue$_{FEM}$'. On the basis of the self reports, Métral (1977) establishes the distribution for the Swiss French varieties presented in Table 2.5.

Syllable structure	**Mid-close**		**Mid-open**	
	ø	**øː**	**œ**	**œː**
Word-final open	√	√		
Word-final closed		√	√	√

Table 2.5: Distribution of mid front round vowels in Swiss French, adapted from Métral (1977:167)

Métral (1977) first observes that short [ø] and [œ] are subject to a complementary distribution. While [ø] occurs in word-final open syllables, e.g. *feu* 'flame' [fø], [œ] is limited to word-final

[61] As /ɛː/ is not attested in all speakers examined, neither in word-final open nor closed syllables, its presence in these positions is indicated by parentheses.
[62] The Southern French varieties are different by the fact that the Positional Law is strictly applied for all three mid vowel series (cf. Eychenne 2006).

closed syllables, e.g. *œuf* 'egg' [œf]. Second, the long vowels [øː] and [œː] are also in complementary distribution. While [øː] is attested in a wide array of word-final closed syllables, e.g. in *neuve* 'new$_{\mathrm{FEM}}$' [nøːv], it does not occur before [ʁ], where [œː] is found, e.g. *fleur* 'flower' [flœːʁ]. As concerns contrasting sounds, [ø] and [øː] both occur in word-final open syllables, cf. the above-mentioned example with *bleu* vs. *bleue*. Despite the absence of a phonetic transcription, these seemingly also concur in word-final closed syllables, cf. the above-mentioned example with *jeune* vs. *jeûne* (Métral 1977:156). Given this distribution of the round vowels, Métral proposes to exclude the category /œ/ from the inventory, retaining only /ø/ and /øː/. The former opens to [œ] in closed syllables, and the latter opens to [œː] in syllables closed by [ʁ].

Andreassen and Lyche (2009) set out to examine whether this distribution is reflected in the contemporary production data from Nyon. Extracting the first formant and the length of all mid front round vowels in the PFC word list, they first confirm a length difference in word-final open syllables (*bleu* vs. *bleue*). Second, they observe that some of the Nyon informants distinguish *jeune* 'young' and *jeûne* 'fast' by means of vowel length only, i.e. [ʒøn] vs. [ʒøːn], thus strengthening Métral's observation of contrastive length in word-final closed syllables (see Andreassen & Østby to appear, for similar results obtained in an inter-variety study of PFC data). Concerning the long vowels in word-final closed syllables, note that the informants in Métral's study express hesitation in their selection of vowel quality. Andreassen and Lyche (2009), with access to data with mid front round vowels preceding /n, ʁ, z, v/ and the sequence /tʁ/, observe a considerable amount of intra-speaker spectral variation. Using the mean F1 value of the /ø/ in *bleu* as a reference, they observe that the long vowel /øː/ takes on a colour ranging from very close (and sometimes even more close than /ø/ in *bleu*) to very open (e.g. in *épreuve* 'test'), however, "sans s'approcher des valeurs spectrales de la voyelle devant [ʁ], prononcée très ouverte par la grande majorité des locuteurs" (Andreassen & Lyche 2009:73). Thus, the distribution in Métral (1977) is seemingly still correct in that the long vowels produced in front of [ʁ] *are* distinct in their height from those produced in front of other consonants. However, a study of the mid front round vowels in front of the remaining set of consonants is necessary before any conclusions can be drawn about their distribution in the Vaudois variety. As the quality of these vowels, *a priori*, has an effect on the categorisation of schwa, in Section 5.3.1 we discuss a preliminary production study whereby we examine how these vowels are produced and distributed by the six mothers who were studied in the formation of our corpus of child-directed speech.

2.5.3.2.3 Distribution of the mid back round vowels [o, ɔ]

Like in FR, the series of mid back round vowels [o, ɔ] do not display contrastive length in Swiss French.[63] The latter varieties diverge however from FR in maintaining the archaic contrast /o, ɔ/ in word-final syllables, e.g. *peau* 'skin' [po] vs. *pot* 'pot' [pɔ]. Métral (1977) reports this contrast is stable in all cantons except for Geneva, where both *peau* and *pot* are realised [po]. When we take into account the recent production data, it turns out that the opposition is unstable at present in the Vaudois variety. Only six out of twelve PFC informants from Nyon display a substantial difference in the F1 dimension for the pair *maux* 'pain$_{\mathrm{PL}}$' [mo] vs. *mot* 'word' [mɔ] (Andreassen & Lyche 2009). These data pattern with the less recent results from an intra-cantonal production study by Schoch and de Spengler (1980), who identify a higher degree of

[63] Note that there are pairs where [ɔ] opposes [oː], e.g. *cotte* 'overalls' [kɔt] vs. *côte* 'coast' [koːt].

neutralisation to [o] in Nyon compared to Château-d'Œx, Faoug, Orbe, and Cossonay.[64] Schoch and de Spengler consider this result to be unsurprising given the fact that Nyon is geographically close to Geneva, the region in which the word-final contrast has already been lost altogether.

Voillat (1971) and Métral (1977) attempt to link the word-final distribution of [o] and [ɔ] to their orthographic representations, whereby [o] corresponds to <eau> and <au> and [ɔ] to <o> and <ot>. However, although this correspondence is true in a historical context, Voillat observes a tendency for speakers to close any vowel associated with orthographic <o> or <ot>. Conversely, he observes the preservation of word-final [ɔ] in two cases: in adjectives, in order to assure similarity in phonological shape across the paradigm, e.g. *sot* 'silly$_{\text{MASC}}$' [sɔ] and *sotte* 'silly$_{\text{FEM}}$' [sɔt], and in apocopes, in order to assure output-output faithfulness between the full and the truncated form, e.g. *photographie* 'photography' [fɔtɔgʁafi] and *photo* 'photo' [fɔtɔ]. In sum, word-final [ɔ] is according to Voillat (1971) most stable in cases where it is called for by some grammatical rule. If this is true, it thus seems reasonable to hypothesise that in cases where its presence is lexically idiosyncratic, e.g. *sirop* 'syrup' [siʁɔ] and *trop* 'too (much)' [tʁɔ], [ɔ] is more susceptible to being replaced by [o]. In these cases, there is no pressure to store /ɔ/ in the word's representation, neither on the phonological, morphological, or lexical level.

Some examples from two female PFC informants, svanp1 and svarb2, conclude this section. They both illustrate a clear contrast in F1 for the minimal pair, however, with more inter-speaker variation when other available items are considered.[65]

Type of relation with another output vowel	**Item**	**F1**		**Pressure**
		Svanp1	**Svarb2**	
Reference [o]	*maux*	416	515	
Contrastive	*mot*	597	777	lexicon
Truncation	*photo*	531	535	phonology
Truncation (archaic)	*vélo*	547	707	
Lex. idiosyncrasy (frequent)	*trop*	588	514	

Table 2.6: Degrees of preservation of [ɔ] in word-final open syllables, data from two female PFC informants from Nyon: svanp1, age 46, and svarb2, age 52

2.5.3.3 Open vowels [a, ɑ]

The low vowel series [a, ɑ] is an archaic contrast lost in most Hexagonal varieties. As regards these vowels, Métral (1977) reveals inter-cantonal variation in that the qualitative distinction is stable only in Geneva and Vaud, and near-stable in Fribourg. In word-final open syllables, the majority of the Vaudois informants perceive a quality distinction between *rat* 'rat' [ʁa] and *ras* 'bare' [ʁɑ]. 20% perceive a difference in quality *and* length, i.e. [ʁa] vs. [ʁɑː], and another 20% perceive a length distinction only, i.e. [ʁa] vs. [ʁaː]. The recent PFC data from Nyon partly confirm these results; while the vowel in *ras* is significantly more close and more back than the

[64] Recent judgement data from Schouwey (2008) indicate that, alongside Geneva, the contrast is also partly lost in Valais, while it is still maintained in Fribourg, Jura, and Neuchâtel. Recent production data from Neuchâtel confirm the persistence of this contrast (Racine & Andreassen 2012). As for Vaud, Schouwey (2008) observes a 50% maintenance of the contrast.
[65] Note that the formant values presented in Table 2.6 are taken from raw data. Since back rounded vowels are not subject to investigation in this work, we do not consider it necessary to normalise these data.

vowel in *rat*, no length difference is observed between the two vowels (Racine & Andreassen 2012).

Concerning the word-final closed syllables, Métral observes a contrast in all cantons, although implemented differently between the speakers. While the informants from Jura, Neuchâtel, and Valais report a mere length distinction, e.g. *patte* 'paw' [pat] vs. *pâte* 'dough' [paːt], the majority of the Vaudois perceive a distinction in length and quality, e.g. [pat] vs. [pɑːt]. The residents of Fribourg and Geneva are divided between [paːt] and [pɑːt] for *pâte*. The results obtained by Racine and Andreassen (2012) in their study of the Neuchâtel and Nyon varieties partly confirm these data. Although the qualitative distinction is present in Nyon, but not in Neuchâtel, – as predicted by Métral (1977) –, only the Neuchâtel speakers show a significant difference in relative vowel duration.

Table 2.7 summarises this section.

Syllable structure	**Low front**		**Low back**	
	a	**aː**	**ɑ**	**ɑː**
Word-final open	√		√	
Word-final closed	√		√	

Table 2.7: Distribution of open vowels in the Vaudois variety, adapted from Racine and Andreassen (2012)

2.5.3.4 Nasal vowels [ɛ̃, œ̃]

An archaic feature attributed to the Swiss French varieties is the preservation of the contrast /ɛ̃/ - /œ̃/[66], and the Romands polled in Métral's study (1977) are convinced of their own use of the two vowels:

> A la question 'Prononcez-vous de façon identique *brin* et *brun*', on répond en marge: à Fribourg : 'Oh non!', 'Non, pas du tout', 'non, cela me choque'. Un Vaudois note: 'non, du fait que j'enseigne' (!); un autre: 'bon pour les Parigots!'. A Neuchâtel, on écrit 'confondre *in* et *un* me semble être le sommet de l'erreur', ou 'laid, stupide et prétentieux… manque de logique'. (Métral 1977:158, Footnote 17)

Out of 388 respondents, only eight claim to merge the two vowels. Métral proposes that this result does not reflect the actual production patterns – which he hypothesises to be much more varied – and that their responses are more for convincing themselves of their linguistic identity, i.e. different from the Parisians. This assumption seems partly borne out in data from the PFC word list. Whereas the distinction between *brin* 'spear of grass' [bʁɛ̃] and *brun* 'brown$_{\text{MASC}}$' [bʁœ̃] is preserved in the Neuchâtel variety, the difference is not significant in the Nyon data (Racine & Andreassen 2012). Concerning the Neuchâtel data, a merger of the two vowels nevertheless seems to be in process, as the young speakers exhibit far less contrast than the older generations. Strengthening the observation of a merger in process, the spontaneous speech data examined in Andreassen et al. (2010) reveal an important acoustic overlap between the alleged

[66] This distinction is lost in the majority of French varieties and one generally assumes that the rounded vowel has disappeared in favour of the unrounded vowel. However, Malécot and Lindsey (1976) examine a corpus of spontaneous speech in the Ile-de-France variety (FR) and observe that the two vowels have merged into a vowel with an intermediary positioning of the lips (neither spread nor rounded).

vocalic categories (except for the masculine indefinite article *un*, realised [œ̃]). Finally, while the weakening of the opposition in Geneva has already been observed by Schoch et al. (1980), the PFC data from this region reveal that the merger is now complete in the young generation (Andreassen et al. 2010).

2.5.3.5 Summary

In this section, we have presented results from a range of studies on the distribution of vowels in the Swiss French varieties. When available, we have focused on information relevant to the vowel system in the Nyon variety, spoken in the Vaud Canton on the banks of Lac Léman, cf. Figure 2.4.

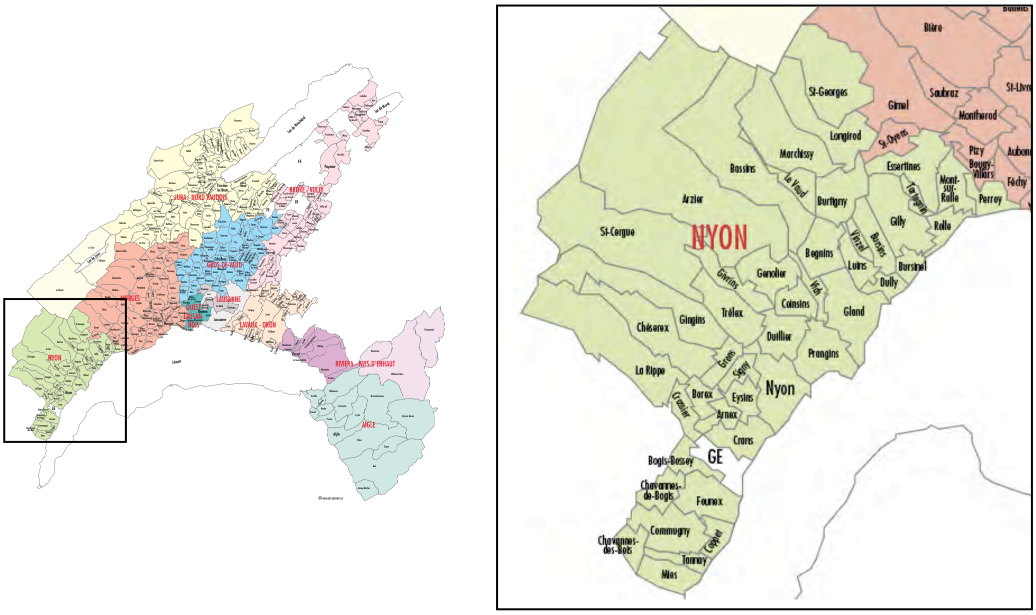

Figure 2.4: Geographic situation of the Nyon District and town within the Vaud Canton[67]

The contrastive vowel inventory for Nyon established on the basis of read speech is depicted in Table 2.8. When a contrast is observed as uncertain or unstable (merger in favour of the FR variant), the disappearing vowel is given in parentheses.

		Front				**Back**			
		Unround		**Round**		**Unround**		**Round**	
		Short	**Long**	**Short**	**Long**	**Short**	**Long**	**Short**	**Long**
Oral	**Close**	i	iː	y	(yː)			u	(uː)
	Mid-close	e	eː	ø	øː			o	
	Mid-open	ɛ	(ɛː)					(ɔ)	
	Open	a				ɑ	(ɑː)		
Nasal		ɛ̃		(œ̃)		ɑ̃		ɔ̃	

Table 2.8: The Nyon contrastive vowel inventory, adapted from Andreassen and Lyche (2009) and Racine and Andreassen (2012)

[67] *Carte générale de la répartition des communes dans les 10 districts*, created by the Service cantonal de recherche et d'information statistiques (SCRIS), canton de Vaud, downloaded from *Site officiel du Canton de Vaud* on November 5th, 2010, cf. http://www.vd.ch/fr/themes/territoire/districts-prefectures/cartes-des-districts.

2.5.4 Schwa in Swiss French phonology: evidence from psycholinguistic research

As mentioned in the introduction, the Swiss French varieties have received substantial attention in recent years, in particular since the creation of the PFC database. Concerning schwa in Swiss French, it is hitherto most extensively studied in the field of psycholinguistics, and – alongside the production data presented in Section 3.3 – these results provide a second, interesting source of information regarding the system to be acquired by the children.

It is well established in the literature that the rate of schwa alternation is related to the segmental environment and to the prosodic position in which the schwa-item occurs, as discussed in Section 1.2.2. Yet another factor constitutes the importance of frequency, both for the rate of schwa alternation as well as for the construction of the underlying representation of the lexical item. Racine (2008) examines the effects of schwa absence in production and perception of the Neuchâtel variety, and in a first study, she concentrates on the importance of various factors potentially governing the level of schwa alternation, i.e. estimated production frequency of the two variants with and without schwa, lexical frequency, consonantal environment, absence of preceding schwa, locution speed, articulatory strength, and type of discourse. In order to obtain data, Racine provided the participant with a printed story that he had to memorise as best as he can. Thereafter, the participant was asked to reproduce the story orally. From each of the 16 informants, Racine extracts 66 items that each contains a schwa in the word-initial syllable. Out of the seven above-listed factors, five factors show a significant correlation with the rate of schwa absence: estimated production frequency, lexical frequency, absence of a preceding schwa, consonantal environment, and locution speed. Racine emphasises the importance of the estimated production frequency. Her reason for including this factor is based on the results in Patterson et al. (2003), who claim that, in American English, the input to the speaker – his “experience” that consists of different frequencies of schwa presence and absence across various items – has an effect on the speaker’s own schwa production rate.[68]

Thus, to further investigate the importance of the input, Racine compares in a second study the estimated production frequencies for two different regional dialects, the Neuchâtel variety and the Nantes variety (North-Western France). As already mentioned, the speaker is allegedly influenced by input frequencies, and a previous finding that is central for Racine’s study is the observation of diatopic variation when it comes to the level of schwa absence. Martinet (1971), for instance, polls 409 informants from twelve Hexagonal regions, and the self reports show that the distribution of schwa varies according to the participant’s region. Walter (1982, 1990), who uses an interview guide that consists of an oral questionnaire and a spontaneous conversation, examines the phonology of 111 idiolects from across francophone Europe. Again, an important regional variation in schwa alternation is observed: while 49 out of 111 informants realise schwa in word-initial syllables, e.g. *la semaine* ‘the week’, in 50% or more of the occurrences, seven informants never realise it. The Swiss informants are all in this latter group.

As the behaviour of schwa has been reported to be subject to diatopic variation, Racine (2008) focuses on determining whether this can be confirmed through estimated production frequencies. From the Brulex database (Content et al. 1990), she extracts every noun phonetically transcribed with one or several schwas, e.g. *che̲val* ‘horse’ [ʃəval], in addition to items with a word-medial

[68] In order to determine the “experience” of the Swiss French speakers, Racine collected estimated production frequencies from a second group of speakers, cf. below, where this procedure is explained.

graphic <e> that are phonetically transcribed without schwa, e.g. *casserole* '(sauce)pan' [kasʁɔl]. Two orthographic lists were elaborated; one list in which schwa is indicated as present, e.g. *le genou* 'the knee', and a second list in which schwa is indicated as absent, e.g. *le g'nou*. In the first phase, the informants were presented one of the lists and asked to indicate – on a scale from 1, very infrequent pronunciation, to 7, very frequent pronunciation – the estimated frequency of the item in question. Some days later, the same procedure was carried out for the second list. The total number of 1986 items (x2 per informant) are distributed into five groups: schwa in one of three word-medial syllable contexts (i) VC_C, (ii) C_Cj, and (iii) (C)CC_C, and schwa in one of two word-initial syllable contexts (iv) V#C_C, and (v) V#(C)CC_C. On the basis of the two values obtained per informant per item, Racine calculates a *combined estimated frequency* (henceforth *c.e.f.*) by subtracting the value "with schwa realised" from the value "with schwa not realised". A highly negative *c.e.f.* value indicates a strong preference for the variant with schwa. For instance, the Swiss informants provide a value of 6.67 for the item *bedaine* 'belly' for the variant with schwa realised, and a value of 1.42 for the one with schwa absent; therefore, the *c.e.f.* value amounts to *1.42 - 6.67 = -5.25*. A highly positive *c.e.f.*, on the other hand, indicates a strong preference for the variant with absent schwa. For instance, the item *chelem* 'slam' receives a *c.e.f.* value of *5.57 - 1.43 = 4.14*. A *c.e.f.* value approaching zero indicates that the two variants are equally preferred, e.g. *dessous* 'under' receives a *c.e.f.* value of *4.58 - 4.58 = 0.00*. The global results show that the structural environment – e.g. a strong preference for the realisation of schwa in a word-initial position preceded by two consonants – heavily influences the *c.e.f.* value, as predicted by the traditional analyses. As discussed in Chapter 3, the results obtained for schwa preceded by one single consonant in the word-initial syllable, e.g. *la semaine* 'the week', are central to our study. While the French more easily accept the variant with the schwa realised in this position, the Swiss more easily accept the variant with the schwa absent, thus, confirming the existence of diatopic variation claimed by Martinet (1971) and Walter (1982, 1990).[69]

2.6 Concluding remarks

This chapter has reviewed the literature examining the Swiss French varieties from a diversity of angles. If history has contributed to their linguistic identity, the sociolinguistic situation, and their general exposure to Hexagonal French seem to push the French-speaking Swiss in the direction of a standardised model. At present, however, at the level of prosodic and phonological organisation, recently collected data nevertheless show that Swiss French varieties continue to be distinct from FR through several features of variable strength. The literature also confirms the existence of inter-cantonal differences. As regards Nyon and Neuchâtel, two of the PFC survey points, we observe slightly less conservatism in Nyon, which, in part, could be explained by the district's proximity to Geneva in which a more standard variety is attested. Given the geographical situation of Nyon, Armstrong and Pooley (2010) find it surprising that such a large amount of regional variation – more or less stable, it is true – still persists in the Nyon variety. In this regard, we find it appropriate to remind ourselves of the comment made by Knecht in personal communication with Bayard and Jolivet (1984), whereby the Vaudois living in the more privileged Lac Léman area are prone to display a heightened sense of linguistic security, which again could potentially be reflected in their preservation of linguistic identity markers. We leave it to future sociolinguistic studies to confirm or reject this postulation.

[69] The same preferential pattern across varieties is observed for schwa in word-medial position preceded by one single consonant, e.g. *casserole*.

This chapter has provided a detailed introduction to the French variety spoken at our investigation point, and it thereby contributes to one of the empirical challenges in this thesis. The chapter has also highlighted aspects of the local variety that might have an influence on schwa categorisation and alternation, i.e. weakness of the Positional Law for mid front round vowels, locution speed, and optional non-final prominence.

The next chapter is focused around a major theoretical challenge, which is the distribution of schwa in target Swiss French.

3. Distribution of schwa

Ah oui, une fois il y a un rhinocéros qui est rentré dans la classe.
C'est vrai que c'était assez drôle. Parce qu'on avait …
on avait une école qui était … Il y avait le cirque qui [vn]ait.
Puis ils installaient toujours la ménagerie …
On était quasiment dans la ménagerie avec notre école.
Puis là il y avait le, l'enclos du rhinocéros.
Mais vraiment, euh, à côté de l'école.
Et puis un jour, je sais pas, il a réussi à grimper sur son truc
puis il avait passé la tête dans la [fn]être.
Ah oui sans compter que pour avoir congé,
on avait trouvé l'astuce pour éteindre le chauffage l'hiver.
Ça fait que, comme il [fz]ait dix [dgʁ]és, nous, on [dv]ait rentrer à la maison.

svaje1, 45-year-old man living in Gland (Nyon District)
semi-formal conversation on memories from his childhood

3.1 Introduction

The more restricted definition of schwa presented in Section 1.2.2 entails a reduced distribution of the vowel in comparison to what has traditionally been laid out in the literature, where both obligatorily present and obligatorily absent schwas have to be accounted for. In the present chapter, we aim to reveal the distribution of schwa, here defined as a segment that alternates, and, in light of its distribution, to narrow down the number of theoretically possible representations for schwa. In order to do so, we focus on adult French and – when data are available – more particularly on adult Swiss French. First, in Section 3.2, we discuss arguments put forth in the literature for analysing schwa as a separate abstract vowel category in the French system, before we introduce two hypothetical alternatives to the categorisation of schwa; as a variant of /œ/ or as an epenthetic vowel. Second, in Section 3.3, we present the distribution of schwa and test the above-mentioned hypotheses that claim schwa is not an autonomous part of the categorical inventory. In order to reveal the distribution of schwa against stable /œ/ and schwa against primary clusters, we proceed by examining the acceptability of schwa alternation in light of three variables: phonotactic structure, morphological structure, and lexical sub-grouping. The motivation for the fine-grained examination of the data is twofold: to understand what constitutes the input for the child, and, more specifically, to identify the level of ambiguity in the input. Third, in Section 3.4, after an examination of the data, we discuss previous approaches to the underlying representation of schwa, primarily focusing on the problems they encounter when the full range of data is taken into account. Finally, in Section 3.5, on the basis of the distribution observed, we put forward a hypothesis concerning schwa's underlying representation.

3.2 Alternative approaches to the categorisation of schwa

3.2.1 Introduction

As mentioned in Section 1.2.2, Schane (1968) and Dell (1985) – working within the SPE framework (Chomsky & Halle 1968) – treat schwa as a regular vowel, present in the underlying structure. In their view, the V ~ ∅ alternation is due to specific deletion rules, e.g. the Rule for truncation by Schane (1968:10), which states that "[a]t a boundary, [α cons, -α voc, -stress] segments are truncated before [α cons] segments". This rule deletes schwa and the liaison consonant in front of a vowel and a consonant, respectively, while Dell's rules VCE$_1$ (ə → ∅ / V#$_1$C__) and E-FIN (ə → ∅ / __C$_0$#) collectively derive *deux petites* /døz#pətit + ə + z#/ → [døptit] 'two small$_{\text{FEM-SG-PL}}$' (Dell 1985:187-188).[70] In post-SPE approaches, Anderson (1982), Durand (1986), and Tranel (1987a), to name but a few, focus to a greater extent on the representation of the vowel, arguing that the unique output behaviour of schwa is the mere reflection of its deviant nature, i.e. an underlying empty syllable node, a weak member of a sentence foot, or a floating segment, in the respective analyses. A theoretical turning point comes in 1993, when Prince and Smolensky introduce Optimality Theory (henceforth OT), in which output structures are derived via constraint interaction only, reducing to zero the power of the input form, cf. McCarthy (2002:70), who states that "[a]ll generalizations about the inventory of elements permitted in surface structure must be derived from markedness/faithfulness interaction, which controls the faithful and unfaithful mappings that preserve or merge the potential contrasts present in the rich base". Therefore, while Anderson, for example, treats schwa as a void syllable nucleus in the underlying structure, which is either deleted via autosegmental rules or spelled out via a later feature-filling rule, Tranel (2000) considers schwa alternation in OT to be the reflection of the unranked ordering of MAX[schwa] 'a schwa in the input must have an output correspondent' and SYLLABLE ECONOMY, the latter part of the *STRUCTURE constraint family (Prince & Smolensky 1993) and roughly defined by Tranel (2000:62) as "moins, c'est mieux".

We return to the proposed underlying representations of schwa in Section 3.4, confining ourselves at this point to underlining that the formal nature of schwa and the power attributed to its nature change according to the theoretical framework in which the scholar positions himself. Hence, the present literature includes a wide range of analyses with no consensus on fundamental issues like schwa's underlying representation, the modelling of alternation in grammar, and the evaluation of the vowel at the phonetics–phonology interface, cf. Section 1.2.2. One aspect, however, upon which most scholars agree, constitutes schwa's phonological autonomy in the vowel system (cf. illustration (a) in Figure 3.1, henceforth referred to as the *two-category approach*). Alternatives to the categorisation of schwa, however, do exist, at least in principle. Absent schwa could be interpreted as an output variant of the category /œ/ (cf. illustration (b) in Figure 3.1, henceforth referred to as the *one-category approach*), or alternatively, as an epenthetic vowel [œ], whose presence is conditioned by phonotactic requirements (cf. illustration (c) in Figure 3.1, henceforth referred to as the *epenthesis approach*). For the sake of clarity, we stress that the difference between the one-category approach and the epenthesis approach is not the number of vowel categories, but whether alternating [œ] is the output of underlying /œ/ or the result of an optionally inserted [œ], which is not present in the underlying structure of the word. We mention that a third alternative analysis constitutes a non-uniform treatment of schwa, whereby it would be the output of the

[70] A truncation rule accounts for the deletion of underlying /z/.

category /œ/ in some structurally defined environments, while being epenthetic in others (cf. Côté 2000, and Côté & Morrison 2007, discussed in more detail in Section 3.4.2.4).

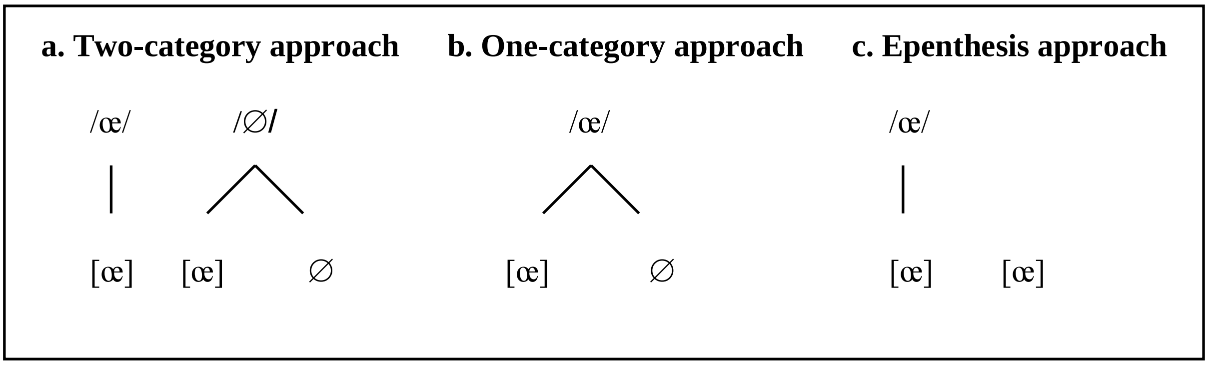

Figure 3.1: Hypothetical underlying representations of schwa[71]

The one-category approach and the epenthesis approach would *a priori* lead to a more economical phonological inventory with fewer categories; these approaches obviate the need for an autonomous category /∅/. Also, the two approaches provide a more transparent mapping between the phonology and the phonetics; without an autonomous category /∅/ there is no need for a phonetic neutralisation of categories /∅/ and /œ/. Thus, we already have two theoretically grounded reasons for revisiting the two alternative approaches. In addition, research suggests that abstract vowel categories with articulatory similarity are acquired quite late (cf. Caravolas & Bruck 2000, and references cited therein), an observation that cannot be neglected when the objective of this thesis is to study the acquisition of schwa (vs. stable [œ]). Thus, if categorical economy prevails in acquisition, the one-category and the epenthesis approaches – which can be analysed as less costly, representationally and phonetically – should be considered possible solutions in the child's grammar. In this regard, then, we aim at proceeding in a minimal fashion in the analysis of the vowel inventory, taking as a desideratum that the more categories we can collapse from the beginning, the better.[72]

Strong arguments are, nevertheless, put forth in the literature for the two-category approach and the treatment of schwa as an underlying, autonomous category. In the sub-sections to follow, we repeat these arguments and discuss whether they are sufficiently strong enough to reject the one-category approach and the epenthesis approach. Thereafter, in Section 3.3, we examine the data to determine the extent of counter-examples to the two approaches.

3.2.2 Revisiting the arguments for schwa as a formal category

Anderson (1982) constitutes one of the first formal analyses of schwa in a representation-oriented framework that authorises other options than insertion or deletion of a full vowel. He reaches the conclusion that schwa is a distinct phoneme, but different from the other vowels; schwa is underlyingly represented by a void syllable nucleus only. Even though there is an

[71] Henceforth, if no other definition is given, we interpret /∅/ as representing the autonomous schwa category, without taking a stand on its (lack of) featural composition, e.g. *cheval* 'horse' /ʃ∅val/. This is at present distinct from Anderson (1982), who reads /∅/ as the representation of an empty syllable node. The same symbol without slashes – ∅ – will solely be used in illustrations to indicate the absent vowel in the phonetic output.
[72] A complete understanding of the emergence of vowel categories requires an examination of the entire inventory, but this is beyond the scope of this thesis.

abundant literature raising the same fundamental questions as Anderson (cf. Côté 2007, for an overview), this particular paper fits nicely with the present discussion, on the one hand, because of its support for schwa's deviant underlying representation, and on the other hand, because of its categorical rejection of the one-category approach and the epenthesis approach. We nevertheless find Anderson's number of examples to be too scarce to serve as a testing ground for the two alternative approaches, and we therefore need a more extensive set of data in order to determine whether there is sufficient linguistic evidence for rejecting them. In what follows, we first review the arguments put forth against the one-category approach, and second, those put forth against the epenthesis approach.

3.2.2.1 The one-category approach: arguments and hypotheses

> [W]hen the phonetic identity of this vowel is investigated, it appears (at least for most speakers of the 'standard' dialect under consideration), that it is not distinct from the vowel /œ/. (Anderson 1982:537)

In his analysis of the normative *français de référence*, Anderson (1982) postulates two categories /∅/ and /œ/, the former alternating between [œ] and ∅, e.g. *demain* 'tomorrow' [dœmɛ̃] ~ [dmɛ̃], the latter invariably realised as [œ], e.g. *peureux* 'timid' [pœʁø] ~ *[pʁø].[73] His initial argument for splitting up the group of output [œ] into two categories /∅/ and /œ/ is their relative ability to be stressed. When it is realised, alternating [œ] (the output of /∅/, according to Anderson) does not bear stress, except for in the monosyllabic function words in given contexts, e.g. the emphatic stress assigned to [sœ] in *il lit CE livre* 'he is reading THIS book (and not the other one)' [i li ˈsœ livʁ]. Although alternating [œ] can be present in the final syllable of polysyllables, it never licences stress, e.g. *vitre* 'windowpane' [ˈvitʁ(œ)] vs. *[viˈtʁœ].[74] Non-alternating [œ] (the output of /œ/, according to Anderson), on the other hand, can be stressed in this position, e.g. *bonheur* 'happiness' [bɔˈnœʁ]. However, as Anderson points out, stress cannot be the crucial factor for the creation of two categories /∅/ and /œ/ because both alternating and non-alternating [œ] occur unstressed by default in the initial syllable of polysyllables[75], e.g. *genêt* 'broom' [ʒœˈnɛ] ~ [ʒnɛ] vs. *jeunet* 'youngish' [ʒœˈnɛ] ~ *[ʒnɛ] (example drawn from Anderson 1982:538). Without stating it explicitly, and without elaborating any further, this positional overlap of alternating and non-alternating [œ] leads Anderson to discard the one-category approach. We agree with him that, at first glance, this approach seems to render part of the system more complex in that [œ] in *genêt* would need to be lexically specified in some way as a target for alternation, or, alternatively, that [œ] in *jeunet* would need to be lexically specified in some way as a non-target for alternation. For lexical constraints indexed to exceptional forms, cf. Fukazawa (1999), Itô & Mester (1999), and Pater (2000, 2001, 2007).[76]

Our criticism against Anderson concerns the lack of documented empirical data backing up his argument against the one-category approach. We contend that if the language turns out to contain very few conflicting pairs of the type *genêt* vs. *jeunet*, the analysis with schwa as a

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[73] The quality of the stable vowel /œ/ alternates between [œ] and [ø]. We pick up this discussion in Section 5.3.1.
[74] Recall that we follow Côté (2000) and consider word-final optional [œ] to be epenthetic.
[75] In this regard, call to mind the optional non-final prominence associated with the penultimate syllable in Swiss French (cf. Section 2.5.2.2).
[76] Another theoretical option requiring a higher level of lexical storage consists of the creation of two input forms for the items subject to [œ]-alternation, one with and one without a vowel, e.g. *cheval* 'horse' /ʃœval/ and /ʃval/ (see Racine 2008 and Bürki et al. 2010, among others). We dot not pursue this option in this chapter.

variant of /œ/ should be revisited, including the lexical indexing it would potentially require. In order to check the extent of counter-evidence for this latter analysis, we first address the question of alternation admissibility in Section 3.3.2. In this regard, recall that the treatment of all graphic <e> as schwa often blurs the factual distribution of alternating and non-alternating [œ]. Even if one part of a seemingly conflicting pair contains <e>, it is essential to establish whether or not its phonological counterpart constitutes an alternating [œ] in the grammar under investigation. This issue has already been raised by Morin (1983), Walter (1990), Hansen (1994), Walker (1996), and Racine (2008), to name but a few. Second, we examine for each [œ] the phonotactic[77] environment of the vowel, the morphological structure of the item in which the vowel occurs, and the lexical sub-grouping of the item. Concerning the position of the vowel, we confine ourselves to focusing on the initial syllable of polysyllables. We do so for two reasons; first, the initial syllable of polysyllables is the sole position where there is a general consensus on the existence of an underlying counterpart to the output schwa[78], and second, it has been shown that monosyllabic, typically unstressed, function words are acquired later than lexical polysyllables, at least when it comes to the choice of items selected for production (Gerken et al. 1990, Kern 2003). Given these facts, we consider lexical schwa-items as better suited to serve as a testing ground for the hypotheses put forward throughout this chapter.

As already mentioned, first, we evaluate the admissibility of [œ]-alternation in light of its phonotactic environment. Previous descriptive studies such as Bazylko (1976), Hansen (1994), and Walker (1996) provide a rather thorough outline of the consonantal contexts in which [œ] alternates, while theoretical analyses – Dell (1985) and Côté (2000, 2009) being notable exceptions – in a remarkable way tone down the complexity of the relationship between schwa and consonantal combinations. In addition, no study has come to our attention that provides, in parallel, the phonotactic distribution of alternating and non-alternating [œ]. In fact, despite the theoretically important observation of both alternating and non-alternating [œ] in word-initial syllables, it has never been investigated to what extent they occur in similar phonotactic conditions. It follows that the main argument against the one-category approach remains questionable. In order to fill in this gap in the argument, we devote Section 3.3.2.2 to analysing the two hypotheses outlined in Examples (1) and (2).

(1) Hypothesis A1
There exists one category /œ/ in the inventory, with two output realisations [œ] and ∅. The loci of the [œ] ~ ∅ alternation stand in complementary distribution with the loci of non-alternating [œ]; [œ] alternates with ∅ in a naturally defined set of phonotactic environments, while the residual set of phonotactic environments licenses [œ], not ∅.

While Hypothesis A1 predicts that alternating and non-alternating [œ] never occur in the same phonotactic environment, Hypothesis A2 predicts that there are certain segmental contexts in which we find both types of [œ].

(2) Hypothesis A2
There exists one category /œ/ in the inventory, with two output realisations [œ] and ∅. The loci of the [œ] ~ ∅ alternation stand in overlapping distribution with the loci of non-

[77] Concerning the notion of *phonotactics*, we confine ourselves in this chapter to examining segmental combinations only, leaving the discussion on segmental combinations relative to the syllable structure for future research.
[78] Alternating [œ] in monosyllables has traditionally been analysed along the same lines as alternating [œ] in word-initial syllables. Recall that Côté and Morrison (2007) propose a different view, to which we briefly return in Section 3.4.2.4.

alternating [œ]; [œ] alternates with ∅ in a naturally defined set of phonotactic environments, but within this set, some phonotactic environments licence [œ], not ∅, in a defined group of words. The residual set of phonotactic environments licenses [œ], not ∅.

Second, we evaluate the admissibility of [œ]-alternation in light of the morphological structure of the item in which the vowel occurs. If the phonotactics receive the main focus of the schwa literature, morphology is, nevertheless, occasionally looked at in some analyses. For instance, Scheer (1999) stresses the importance of controlling for the morphological composition of the schwa-item when one searches for a phonotactically defined distribution of schwa. Scheer exemplifies this thing in the following:

> Dans des mots comme 'gouverne-ment, hurle-ment, ferme-té, gendarme-rie' et 'mal-mener', un complexe composé de deux sonantes le précède. Or, la pertinence phonologique de ce contexte est douteuse du fait de son inexistence dans les séquences morphologiquement simples. (Scheer 1999:89)

In addition to its impact on alternation acceptability in various phonotactic contexts, morphology often enters the discussion of what constitutes a true schwa. For instance, Côté (2000) defines schwa as "a vowel that alternates with ∅ in the same lexical or morphological context" (2000:80); the alternation *autrement* 'otherwise' [otʁ + œmɑ̃] vs. *doucement* 'gently' [dus + mɑ̃] illustrates alternation in the same morphological context.[79] In Section 3.3.2.3, after the examination of the phonotactic context surrounding [œ], alternation acceptability is looked at in light of the morphological structure of items with [œ] in the initial syllable. In fact, if we remove ourselves from the rather extensive discussion of the prefix <re> (cf. Malécot 1976, Walter 1982, Hansen 1994, Walker 1996), the morphological structure has not received much attention as a potential factor accounting for the distribution of alternating vs. non-alternating [œ] in word-initial syllables. Thus, we examine whether the morphological structure of the items with [œ], corresponding to orthographic <e> or <eu>, has an impact on the behaviour of the vowel, i.e. whether the position of [œ] relative to the morphological juncture determines whether vowel alternation is acceptable or not. Given that the literature on French phonology attests the fact that phonological forms are sensitive to and impacted by morphological boundaries[80], we test the hypotheses outlined in Examples (3) and (4) in Section 3.3.2.3. In parallel with the respective members of the set of hypotheses A1-A2 presented above, the respective members of the second set of hypotheses B1-B2 claim that the distribution of alternating vs. non-alternating [œ] is complementary vs. partly overlapping.

(3) Hypothesis B1
There exists one category /œ/ in the inventory, with two output realisations [œ] and ∅. The loci of the [œ] ~ ∅ alternation stand in complementary distribution with the loci of non-alternating [œ]; [œ] alternates with ∅ in a morphologically defined environment, while [œ], not ∅, is licensed elsewhere.

[79] Côté (2000) uses the morphological context to determine whether or not schwa is underlying. Schwas occurring at word-internal and word-final junctures are considered epenthetic, cf. *autrement* and *doucement*, and schwas present in a morpheme-internal position (= word-initial syllable) are considered underlying, e.g. *renard* 'fox' [ʁœnaʁ] ~ [ʁnaʁ].

[80] Dell (1985) shows an example that illustrates the sensitivity of phonological forms to morphological boundaries; optional vowel harmony is attested across morpheme boundaries in Standard French, e.g. *cédant* 'person giving up a right' /sed + ɑ̃/ → [sedɑ̃] or [sɛdɑ̃] (transcriptions taken from Dell 1985:215). Note that according to Métral (1977), vowel harmony does not apply in Swiss French.

While Hypothesis B1 predicts alternating and non-alternating [œ] do not occur in the same position with regard to the morphological juncture, Hypothesis B2 predicts there is a certain overlap in distribution.

(4) Hypothesis B2
There exists one category /œ/ in the inventory, with two output realisations [œ] and ∅. The loci of the [œ] ~ ∅ alternation stand in overlapping distribution with the loci of non-alternating [œ]; [œ] alternates with ∅ in a morphologically defined environment, but in this environment, [œ], not ∅, is licensed in a defined group of words. The residual set of morphologically defined environments license [œ], not ∅.

To sum up, Hypothesis A1 and Hypothesis B1 predict that alternating and non-alternating [œ] never occur in the same phonotactic and morphological environment. Hypothesis A2 and Hypothesis B2 predict that alternating and non-alternating [œ] both occur in some given phonotactic and morphological environment. Hypothesis A2 and Hypothesis B2 have in common that we do not expect alternating and non-alternating [œ] to overlap completely. Taken together, the four hypotheses present several plausible scenarios for the distribution of alternating and non-alternating [œ]. The distribution could hinge on phonotactic or morphological requirements, or alternatively, the distribution could be subject to both types of constraints. For instance, in the case of a phonotactically defined overlap, the distribution of alternating vs. non-alternating [œ] within the overlap could find its explanation in the morphological structure of the items involved. Vice versa, in the case of a morphologically defined overlap, the distribution of alternating vs. non-alternating [œ] within the overlap could find its explanation in the phonotactic structure of the items involved.

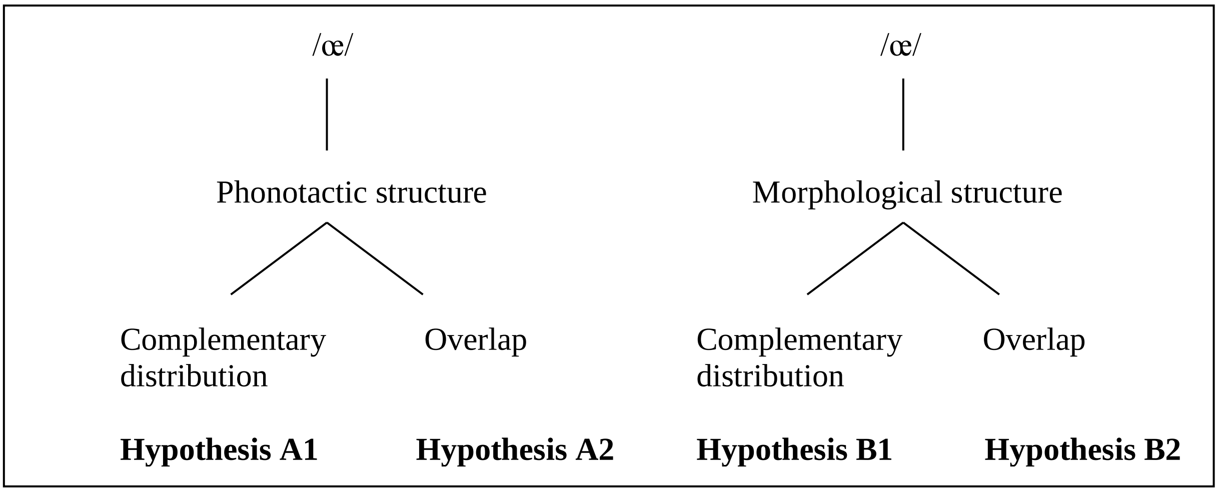

Figure 3.2: Hypotheses on the distribution of alternating vs. non-alternating [œ] in light of the phonotactic and morphological structure of the lexical item

To summarise, the segmental context of [œ] and the item's morphological constitution are two factors that have a potential impact on alternation acceptability. The third factor considered in this chapter is the lexical sub-group to which the item with [œ] belongs. As regards lexical information, the literature has already reported the non-uniform behaviour of schwa across the derivation.

> Nous avons dressé la liste exhaustive de tous les mots commençant par *#Cə-* contenus dans le *Petit Robert* et connus de nous, et nous les avons répartis entre deux colonnes, selon que

> dans notre parler ils peuvent ou non perdre leur schwa lorsque le mot précédent est terminé par une voyelle. […] Cette liste montre en tout cas que ce sont les mots, et non les morphèmes, qui doivent être marqués dans le lexique comme des exceptions à VCE$_1$. En effet, un même morphème peut être une exception dans un mot et pas dans un autre. Notre parler oppose par exemple *m(e)ner* et *meneur*, *s(e)mer* et *semailles*, *ch(e)min* et *cheminer*. En général ce sont les mots peu courants ou d'usage littéraire qui ont tendance à être des exceptions à VCE$_1$. (Dell 1985:229)

> La stabilisation ne correspond pas non plus à un changement des règles régissant la syncope des continuateurs de schwa ou de la structure syllabique de la langue. En effet, tel locuteur qui a une voyelle [œ] stable dans peler peut avoir une voyelle instable dans pelure et/ou pelouse. (Morin 1988:187)

> L'idée que certains morphèmes favoriseraient le maintien du E est évoquée puis rejetée par Dell et Morin. Si on prononce obligatoirement le E de *peler*, et qu'on peut l'omettre dans *pelouse*, celui de *meneur*, mais pas toujours celui de *mener*, de *cheminer* mais très rarement celui de *chemin* (Morin, 1988: 187; Dell, 1973: 230) , la structure morphologique n'entre apparemment pas en compte dans le jeu de la variation. (Hansen 1994:30)

Although Dell (1985:229) concludes that there is "aucune régularité simple qui permettrait de prédire à partir des consonnes qui l'entourent si un schwa en syllabe initiale de mot est ou non sujet à VCE$_1$", and in addition, that lexical morphemes do not behave identically across the derivation, we emphasise that he does observe a difference between *mener* 'lead$_{INF}$' and *meneur* 'agitator', whereby [œ]-alternation is attested in the verbal form only. Dell rightly observes that the morpheme <men> does not display a unique behaviour, but he neglects the possibility that the difference is due to the suffix attached to the root, i.e. infinitival <er> [e] and nominal <eur> [œʁ]. Our motivation for including lexical information in the range of potential factors that are decisive for [œ]-alternation comes from the theory of lexically specified constraints or constraint rankings, thought of as accounting for both morphologically conditioned phonology and lexical exceptions in grammar, among other things. In current OT, different approaches to the phenomenon have been taken. For instance, J. L. Smith (1997) observes that in many languages, nouns are subject to a higher level of faithfulness than other lexical categories, i.e. more contrasts are licensed in the output of the former. This observation is explained as a reflection of domain-specific faithfulness constraints (Beckman 1998), which only target domains that are "appropriately salient, in some phonological, phonetic, grammatical, or cognitive sense" (J. L. Smith 1997:2). Nouns are reported as being more prominent in a variety of studies (for references, cf. J. L. Smith 1997); the constraint ranking Noun Faithfulness >> Markedness >> Faithfulness protects the nouns from neutralising effects imposed by Markedness.[81] Concerning schwa, Côté (2009) indicates a difference in alternation acceptability between nouns and verbs, i.e. "[l]e schwa semble plus stable dans les noms que dans les verbes, du moins en FQ [français québécois]; ainsi, il est stable dans le nom *remorque*, mais variable dans le verbe *remorquer*" (2009:95). Although, to our knowledge, no statistically reliable study has been carried out that confirms this observation, we find Côté's remark useful as a starting point in our search for a lexical variable that affecs the behaviour of [œ]. Thus, accepting yet again the possibility that other forces than strictly phonological ones are at play in the [œ] ~ ∅ alternation, we put forward the hypotheses outlined in Examples (5) and (6), which we test in Section 3.3.2.4. In

[81] As mentioned, morphologically conditioned phonology and lexical exceptions have been approached from a variety of angles, e.g. domain-specific faithfulness (J. L. Smith 1997), lexically specified rankings or co-phonologies (Anttila 2002), and morpheme-specific, lexically indexed markedness and faithfulness constraints (Pater 2009). As the theoretical implications of each approach fall beyond the scope of this section, we abstain from discussing these any further.

parallel with the respective members of the sets of hypotheses A1-A2 and B1-B2 presented above, the respective members of the third set of hypotheses C1-C2 claim that the distribution of alternating vs. non-alternating [œ] is complementary vs. partly overlapping.

(5) Hypothesis C1
There exists one category /œ/ in the inventory, with two output realisations [œ] and ∅. The loci of the [œ] ~ ∅ alternation stand in complementary distribution with the loci of non-alternating [œ]; [œ] alternates with ∅ in a lexically defined set of words, while [œ], not ∅, is licensed elsewhere.

Whereas Hypothesis C1 predicts that the items subject to [œ]-alternation belong to the same lexical sub-group (e.g. verbs or nouns or nominal sub-groups), Hypothesis C2 predicts that not all members of the same lexical sub-group behave identically with regard to alternation acceptability.

(6) Hypothesis C2
There exists one category /œ/ in the inventory, with two output realisations [œ] and ∅. The loci of the [œ] ~ ∅ alternation stand in overlapping distribution with the loci of non-alternating [œ]; [œ] alternates with ∅ in a lexically defined set of words, but within this set, [œ], not ∅, is licensed in a defined group of words. The residual set of words licences [œ], not ∅.

To conclude our discussion on the one-category approach, we repeat that morphological and lexical constraints could, in principle, work alone or interact with phonotactic constraints, and, thereby, could reveal a distribution of alternating and non-alternating [œ] – output variants of the category /œ/ – that is grammatically predictable. As we discuss in Section 3.4.2.1, this scenario contrasts with Walker (1996) and Côté (2008), who propose that the deletability of the category /œ/ is fully encoded in the lexicon.

In the following section, we turn to arguments put forth against the claim that schwa is an epenthetic vowel.

3.2.2.2 The epenthesis approach: arguments and hypotheses

In Section 3.2.2.1, we reintroduce a frequently discarded alternative to the phonological autonomy of schwa. Instead of a vowel inventory containing a structurally deficient schwa category, here represented as /∅/, we put forth a hypothesis claiming alternating [œ] – alongside non-alternating [œ] – is an output realisation of the category /œ/. Yet another solution to avoid the postulation of a category /∅/ is to treat alternating [œ] as the output reflection of an optional epenthesis process. Recalling the pair of examples in Anderson (1982), i.e. *genêt* ‘broom’ vs. *jeunet* ‘youngish’, this latter hypothetical analysis predicts that the underlying structures are /ʒnɛ/ and /ʒœnɛ/, respectively; there is optional epenthesis in the former item resulting in [ʒœnɛ]. Whereas variants of this approach are proposed by Martinet (1972) and Hirst (1985)[82],

[82] In Martinet’s (1972) view, “epenthesised” schwa is a phonetic lubricant depending on the preceding consonant. For instance, the phoneme /m/ has two allophones [m] and [mœ], the latter is selected in a post-consonantal context, e.g. *une meringue* ‘a meringue’ [ynmœʁɛ̃g]. Hirst (1985), on the other hand, explains the different behaviour of *pelouse* (with optional epenthesis) and *place* (no epenthesis possible) as a difference in the underlying representation; whereas *pelouse* contains an underlying consonant sequence /pl/, *place* is analysed as having a

Anderson (1982), as one of many, rejects the schwa epenthesis analysis in word-initial syllables, primarily on the basis of cluster well-formedness in French. Consider the items *place* 'place' [plas] ~ *[pœlas] and *peluche* 'teddy bear' [plyʃ] ~ [pœlyʃ], where only in the latter case does the cluster [pl] optionally decompose through the realisation of an inter-consonantal [œ]. These examples clearly illustrate that an unrestricted authorisation of optional epenthesis in the phonotactic environment [pl] does not work. For instance, in OT, the postulation of a high-ranked phonotactic constraint that bans the cluster *[pl] in the output would wrongly favour the optional realisation of [œ] in *all* items with underlying initial /pl/, e.g. *[pœlas] and [pœlyʃ]. On the other hand, as we indicate in the presentation of the one-category approach, to maintain a vowel inventory without schwa, one could hypothesise that schwa epenthesis links directly to the lexical item in question, and that only a subset of items with initial [pl] optionally requires the presence of an inter-consonantal [œ]. In this case, a lexical constraint favouring epenthesis, indexed with *peluche*, among others, would explain the distribution of output structures [pœl] and [pl] from the input /pl/.

If lexical sensitivity is introduced into the grammar to account for the phonological behaviour of the schwa-items (i.e. the alternation /pl/ → [pœl] ~ [pl] in *peluche* 'teddy bear', *pelouse* 'lawn' etc., is not found in *place* 'place', *placard* 'cupboard' etc.), and if we want our grammar to be driven by economical principles, we expect the set of items subject to lexically specific variation to remain relatively restricted in order for this solution to be the most economical one.[83] In this regard, it is important to mention that Anderson (1982) rejects the epenthesis approach because "[a] wide range of forms show similar behavior" (1982:538) to *place* [plas] vs. *pelouse* [p(œ)luːz], making it "necessary to mark most clusters in most words for whether or not they were subject to epenthesis" (1982:538). Unfortunately, as is the case with the discussion of the one-category approach, the identity of the supposedly large amount of counter-evidence to the epenthesis approach remains unclear, and we therefore devote Section 3.3.3 to an examination of their authenticity. The main motivation for this examination is to determine whether the counter-evidence to the epenthesis approach is sufficiently important, and subsequently to decide whether the one-category approach or the two-category approach should be preferred to lexically defined constraints in the target grammar.

Before designing hypotheses about the relationship between schwa and word-initial clusters, we briefly refer to some general French phonotactics. In Dell's (1995) comprehensive analysis of clustering in French, phonotactic constraints that relate to syllable structure determine the asymmetry between clusters allowed on word edges and word-medially. The crucial assumption – which Dell attributes to Bouchard (1980) – is that the coda position in French can be filled with at most one consonant, e.g. *garde* 'guard' *[gaʁd] but [gaʁ.d∅].[84] The first argument in favour of the formal ban on bi-consonantal codas is that the relationship between initial and intervocalic clusters is straightforwardly accounted for.

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single underlying segment /p͡l/, whose "surface forms would be derived from the underlying segments […] by means of linearisation rules which factor out an underlying representation into a sequence of permissible surface forms" (Hirst 1985:91).

[83] According to the phonological lexicon-model proposed by Itô and Mester (1999), the interaction of markedness constraints and lexically defined faithfulness concludes in a higher degree of markedness violations in stratum Lex^1 (i.e. "exceptions") than in stratum Lex^0 (i.e. "native"). Whereas more marked output candidates in Lex^1 are protected from elimination because of higher ranked Faith, the domination of markedness over faithfulness to Lex^0 makes the more marked output candidates generated in this stratum lose to the less marked candidates. In our case, for a lexeme-based analysis to hold, this model should predict that the number of items with optional epenthesis vs. no epenthesis is in an identifiable asymmetric relation, where L^1 - L^0 defines the set of "exceptions" to a more general rule.

[84] The symbol ∅ refers in this example to the nucleus of a degenerate syllable, cf. Dell (1995:19).

> For any admissible medial sequence WXY(Z) [e.g. *o*[pstr]*uer*] there exists (i) an admissible word-initial sequence XY(Z) [e.g. [str]*ikt*] and (ii) an admissible medial sequence WX [e.g. *ca*[ps]*ule*]. (Dell 1995:16)[85]

More specifically, the coda constraint implies that the set of admissible onsets is identical in word-initial and word-medial positions. Second, if bi-consonantal codas were allowed, e.g. *[ʁt] in *porte* 'door', the grammar would need to distinguish between [ʁtʁ], attested word-medially in *portrait* 'portrait' [pɔʁtʁɛ], and unattested *[ʁtl]. Conversely, if the coda licenses one segment only, the remaining consonant(s) is/are necessarily licensed in the following onset position; therefore, [ʁ.tʁ] with a well-formed onset vs. *[ʁ.tl] with an ill-formed onset. Thus, by looking at phonotactic structures from the perspective of formal syllables, Dell accounts for gaps like *[ʁtl] in the list of attested word-medial consonant sequences. The coda constraint also implies that the word-initial position only licences a subset of the consonant sequences observed word-medially. Whereas [ʁtʁ] is authorised in the latter position, it is banned word-initially by the fact that $*_{\sigma1}$[ʁ.tʁ] cannot be licensed without resorting to operations such as resyllabification or degenerate syllable structures.[86] In fact, for the word-initial position, Dell (1995) reveals a relatively small number of well-formed, bi-consonantal onsets, cf. the shaded cluster cells checked with uppercase <X> in Table 3.1. The cluster cells indicated with lowercase <x> in Table 3.1 are judged as deviant onsets, more specifically "when it occurs in few morphemes, or when it occurs mostly in unfrequent words, in foreign-sounding words [this does not include all loanwords, cf. Dell (1995:11, Footnote 15)], or in specialized strata of the lexicon [sic]" (Dell 1995:11). As for the clusters indicated with lowercase <xx> in Table 3.1, Dell does not provide any evaluation regarding their well-formedness.[87] Before commenting on the observed clusters, note that Dell examines clusters present at "level L" in the phonology, which is anterior to the implementation of the rule VCE_1 optionally deleting schwa in a post-vocalic context (Dell 1995:8; see Dell, 1985:187). Cluster [mʁ], exemplified by the schwa-less variant of *meringue* 'meringue' [mʁɛ̃g], thus falls out of his survey.

[85] The examples inserted in the citation are taken from Dell (1995:16), with his transcription conventions.

[86] Theoretically, it is possible for a word-initial consonant to be relegated to the final position of the preceding word, or, alternatively, to fill the onset of an empty-headed syllable. These phenomena have already been proposed for the schwa-less variant of schwa-items, cf. Anderson (1982) for and example of the former analysis and Rialland (1986) and Charette (1991) for and example of the latter analysis.

[87] Dell bases his search for authorised word-initial clusters on the dictionaries written by Rey (1967) and Leclère (1984). Note that in this section, we confine ourselves to the study of bi-consonantal onsets, but for the sake of completion, we mention that Dell (1995) reports that the well-formed tri-consonantal onsets in French consist of five combinations of [s] + well-formed PloLiq-clusters, i.e. [spl, spʁ, stʁ, skl, skʁ]. There are additionally three deviant onsets [ʃpʁ, psk, zgʁ], attested in *schproum* 'to kick up a row', *pschent* (name of the Double Crown of Ancient Egypt) and *sgraffite* 'sgraffito' (Dell 1995:11).

1 \ 2	p	b	t	d	k	g	f	v	s	z	ʃ	ʒ	m	n	ɲ	ʁ	l
p			xx				x		xx					xx		X	X
b																X	X
t									x		x		x			X	x
d										x		x				X	
k			x					x	xx				x	x		X	X
g										xx				x		X	X
f			x													X	X
v																X	x
s	X		X		X		x	x					x	x			xx
z		x						x									x
ʃ								x						x		x	x
ʒ																	
m														x			
n																	
ɲ																	
ʁ																	
l																	

Table 3.1: Attested word-initial clusters in French, based on Dell (1995:10-11), where <X> is well-formed, <x> is deviant, and <xx> is not well-formed, not deviant

The well-formed consonant sequences allowed word-initially comprise the majority of possible ObsLiq-combinations (where the sibilants [s, z, ʃ, ʒ] are not Obs) and the three [s]+$\text{Plo}_{[\text{-vce}]}$ sequences. Extensively studied in the literature on cross-linguistic phonotactics, the two types of sequences are often analysed as being prosodified differently. Whereas ObsLiq-clusters are branching onsets, [s]+Plo-clusters are viewed as single onsets with a left-hand appendix attached to a higher node, cf. Rialland (1994) on French, and Goad and Rose (2004), and references cited therein, on West-Germanic languages.[88] The entire set of permissible clusters in French, i.e. even including the clusters not judged as well-formed (cf. <x> and <xx> in Table 3.1), do however lead Dell to acknowledge that cluster grammaticality is scalar: "[s]ome of [the rare clusters] seem more deviant than others" (Dell 1995:11). He explicitly avoids dealing with the question of scalar cluster admissibility and refers to the discussion in Algeo (1978) for this matter:

> When a cluster is in violation of a very general rule and is also of rare occurrence […], we may be tempted to condemn it to whatever outer darkness awaits those combinations that occur but that we have decided ought not to. To yield to that temptation, however, is to play the capricious deity in drawing artificial lines around the realities of phonology. […] Phonotactic rules cannot define what is English, but only what is systematic in English. (Algeo 1978:222)

In his elaborate survey of English phonotactics, Algeo (1978) underscores the importance of not confining oneself with approaching linguistic data by means of *yes/no* questions, which solely generate dichotomous distinctions like *permitted/not permitted* and *attested/not attested*. He proposes that one should rather search for the number of items in which the cluster occurs, the frequency of these items, stylistic conditions on their use, and "to what extent [the sequence can] be predicted by general rule" (Algeo 1978:222). Attention to the fine-grained nature of phonotactics has been revived in recent years, and in particular the invention of stochastic phonology has contributed to the understanding of gradient well-formedness, cf. J.

[88] As discussed in Section 7.4.1, ObsLiq and [s]+$\text{Plo}_{[\text{-vce}]}$ display different reduction patterns in acquisition.

Pierrehumbert (1994), Coleman and Pierrehumbert (1997), Hayes (2000), Treiman et al. (2000), Bailey and Hahn (2001), Boersma and Hayes (2001), Moreton (2002), Bod et al. (2003), Coetzee (2004), Frisch et al. (2004), Hammond (2004), Albright (2007), and Berent et al. (2007), among others (cf. also Cohn 2006, for a general discussion on gradient well-formedness). In regard to the study of schwa alternation, the debate on scalar phonotactics turns out to be highly important. Two years prior to Algeo's study, Bazylko (1976) examines the level of difficulty experienced by Parisian speakers during the production of various word-initial clusters. His experimental protocol is designed to elicit read speech production of cluster-initial words, e.g. *placard* 'cupboard' and *blanc* 'white', and polysyllables with "/ə/ instable" (1976:63) in the initial syllable, e.g. *pelouse* 'lawn' and *belon* 'Belon oyster'. For the latter type of words, Bazylko asks the informants to delete every vowel judged as prone to deletion in normal speech, in a post-consonantal (C#C<e>C) and in a post-vocalic (V#C<e>C) context. The experiment reveals four groups of syllables containing <e> (or <ai>, e.g. *faisable* 'doable'), which we review in light of our definition of schwa as a vowel [œ] that alternates with ∅. The first group of syllables shows a 100% presence of [œ] for all informants and comprises among others [bœd, pœz, kœʁ], which we find in *bedaine* 'belly', *pesée* 'weighing', and *querelle* 'quarrel'. In accordance with our definition of schwa, we consider the stable presence of [œ], orthographically <e>, across the derivation, in the morpheme-internal position V#C<e>C to be a reflection of the historical restructuring of /∅/ → /œ/, an opinion shared for instance with Morin (1977), Durand et al. (1987), Charette (1991), and Eychenne (2006). The second group of syllables shows a 100% absence of [œ], containing one single item, *chelem* 'slam (in chess)' [ʃlɛm]. Complete absence of [œ] in the morpheme-internal position V#C<e>C is analysed by some scholars to be the result of deletion of the underlying /∅/, cf. Walker (1996) and Côté (2009); our hypothesis also predicts this. Without phonetic evidence of its existence, we avoid postulating a vowel in the underlying representation of the lexical morpheme.

The third group of syllables proves more complex in that for a limited number of informants, the vowel alternates in some frequent words whose phonotactic structure in the majority of cases requires the presence of schwa (cf. Morin 1983, for a similar observation, and Angoujard 2006, whose theoretical model accounts for this type of phonological microvariation). For instance, while the syllable [kœn] in *quenotte* 'tooth (child language)' is produced with the vowel across informants, one informant does not produce a vowel between [k] and [n] in *quenelle* 'meatball', "affirmant que c'était sa prononciation habituelle, le mot étant très employé dans sa famille" (Bazylko 1976:68). Another informant produces the vowel in *quenette* and *quenelle* but selects the variant without vowel for *quenouille* 'bedpost (of a four-poster bed)'. This type of data constitutes a serious challenge to analyses that either search for a strict phonology-orthography correspondence, i.e. <e> = [œ] ~ ∅, or neglect the possibility that intra- and inter-speaker variation across items reflects different underlying representations, i.e. /œ/ vs. /∅/ vs. nothing.[89] The fourth group of syllables comprises syllables with schwa alternation, but importantly, the rate of alternation differs for the various types of consonantal combinations. In addition, token frequency reveals itself to be a relevant factor. For instance, frequently occurring *chemin* 'road' [ʃ(œ)mɛ̃] and less frequently occurring *chemisette* 'short-sleeved shirt' [ʃ(œ)mizɛt], both of which contain the syllable [ʃ(œ)m], are subject to schwa absence in 90% and 20% of the cases in a post-consonantal context, respectively. For the combination [t(œ)n], attested in *tenancier* 'manager (of hotel)', none of the items surpasses 10% of schwa absence in a post-consonantal context. In a post-vocalic context, on the other hand, the rate of schwa absence for the group of

[89] Recall the extensive fieldwork conducted by the PFC community in recent years, which has resulted in the publication of a considerable number of analyses of intra- and inter-speaker variation, cf. Durand and Eychenne (2004), who present the advantages of the PFC methodology for a cross-linguistic study of schwa.

[t(œ)n] items ranges from 0 to 100%, confirming the presence of alternating [œ], in at least some of the items with this segmental constitution. We conclude from these results that the latter two groups that are noted by Bazylko undoubtedly contain items with schwa, but at an unknown percentage. As regards the lexical morphemes that constitute the former two groups, more evidence from elsewhere in the derivation is required to support for the claim that schwa is present in their phonological representations.

Despite the fact that the results in Bazylko (1976) are nearly 40 years old and that his sampling strategy is problematic with respect to data reliability (one single production per item per informant), we find this paper relevant because, besides providing numbers that reflect the gradient well-formedness of the various clusters, it is to our knowledge the sole study that has hitherto examined the relationship between primary clusters (type *placard* ‘cupboard’) and secondary clusters[90] (type *pelouse* ‘lawn’) in production data (for perception data, cf. Spinelli and Gros-Balthazard 2007, discussed in Section 3.3.3.2). Bazylko hypothesises schwa absence is favoured when the resulting consonant sequence exists as a primary onset cluster in French, e.g. [bʁ] vs. *[ʁb]. His findings indicate rather the opposite in that the majority of potential secondary clusters are *not* attested as primary clusters. Bazylko counts 89 primary clusters and 66 potential secondary clusters; the overlap comprises the following 18 clusters: [pt, pn, kn, ɡn, pl, bl, dʁ, kʁ, sp, sk, sm, sn, ʃn, fl, vl, sl, ʃl, mn]. These results establish that the presence and strength of a primary cluster in the system does not affect the presence and strength of its secondary counterpart. For instance, the high frequency of primary [bl], e.g. *bleu* ‘blue’ [blø], does not trigger schwa absence in *belon* ‘Belon oyster’ *[blɔ̃], and conversely, the low frequency of primary [pt], e.g. *ptéryle* ‘pteryla’ [pteʁil], does not hinder the frequent schwa absence in *petit* ‘small’ [pti].[91] Bazylko’s careful analysis of the data further shows that 47 of the 66 potential secondary clusters authorise an alternating vowel (the above-mentioned fourth group). For a cluster to be analysed as a true secondary cluster, Bazylko requires that the vowel is absent in 50% of the cases in a post-vocalic context, and by more than 40% of the informants. 34 of the 47 potential secondary clusters fulfil this requirement. Further, Bazylko reveals six “groupes secondaires en puissance” (1976:74); in addition to being absent in the post-vocalic context (see above), these are produced without schwa in a post-consonantal context more than once, and by more than 40% of the informants. Table 3.2 classifies the 34 secondary clusters as overlapping or not with the primary clusters; the “strong” secondary clusters are emphasised in bold.

	Secondary clusters
Primary clusters	pt **pl** sp ʃn **sm** sl mn
Not primary clusters	db dd dg dv **ds** **dm** sg **ʃm** **sʁ** ʒl mz nv lk ʁp ʁb ʁt ʁd ʁg lv ls ʁf ʁv ʁʃ ʁʒ ʁm ʁn

Table 3.2: Secondary clusters in Parisian French and their overlap with primary clusters, based on Bazylko (1976)

[90] “En ce qui concerne les termes: primaire et secondaire, nous les avons adoptés pour désigner respectivement les groupes qui existent effectivement en français à l’initiale du mot et ceux qui se forment par suite de la chute de /ə/ instable” (Bazylko 1976:63). We adopt this terminology in the remainder of the thesis.

[91] Bazylko conducts a pilot study that confirms that primary ObsLiq-clusters cause no production difficulty among the subjects, and they are consequently excluded from the reading task. Thus, in the following examination of #CC and #C<e>C sequences, we use the data in Dell (1995) to identify the primary ObsLiq-clusters authorised in French.

The scarce overlap between primary and secondary clusters, at first glance, fits well with the epenthesis approach to schwa presented in this section. Table 3.2 shows that seven clusters [pt, pl, sp, ʃn, sm, sl, mn] are attested both as primary and as frequently occurring secondary clusters, reducing the number of environments in which a cluster (i.e. [CC]) and a cluster with optional epenthesis (i.e. [CC] ~ [CœC]) co-occur. The table further leads us to infer that of the above-mentioned overlap of 18 clusters, 11 contain an intervening stable/stabilising/alternating [œ], whose degree of alternation is expected to be highly item- and speaker-specific (cf. Bazylko's four groups): [pn, kn, ɡn, bl, dʁ, kʁ, sk, sn, fl, vl, ʃl]. At this point, it is important to mention that Bazylko implicitly proposes a strict correspondence between an orthographic <e> and an underlying schwa. This analytical decision gives rise to a complex system with item-specific phonotactic behaviour. The phonotactic unpredictability of the loci for schwa alternation leads Bazylko to examine the importance of extra-grammatical factors, such as the item and syllable frequencies, the formality of the situation in which the item is produced, and the stylistic value of both the text and the lexical item itself. He concludes by claiming that the rate of schwa presence decreases proportionally with usage frequency, while it increases proportionally with the level of formality. However, although frequency has proven decisive for schwa behaviour in a variety of ways (cf. Racine and Grosjean 2002), there is in fact little evidence that the presence of schwa increases proportionally with the level of formality of the conversational register. This is contrary to the general hypothesis that for a given phonological variable, one of the output variants is typically considered to be "more prestigious".[92] Rather, the tendency of a higher stability of schwa presence sometimes observed in conversation has hitherto been interpreted as a means used in more careful discourse planning (cf. Andreassen & Lyche 2009, Lyche & Østby 2009, Racine & Andreassen 2012), as an emphatic accent (cf. Lucci 1976) or as a phenomenon belonging to advanced age (cf. Malécot 1976, Racine & Andreassen 2012). Interestingly for our study, however, if it is true that a higher level of schwa presence is "en partie lié à la nécessité d'augmenter la redondance et l'intelligibilité dans la chaîne parlée" (Lucci 1976:96), we should also *a priori* expect this extra-linguistic factor to be present in the phonology of child-directed speech because the register is generally characterised as including the presence of redundant features (cf. Section 6.2). The importance of extra-grammatical factors operating on schwa in child-directed speech and in child language itself is partly beyond the scope of this thesis, but as we cannot rule out the influence that these factors may have on the grammar, we nevertheless briefly return to this subject in Chapters 6 and 7.[93]

Whereas Bazylko proposes a joint analysis of "stable" and "variable" schwa, which necessarily relegates much of the explanatory burden to extra-grammatical factors like register and token frequency, our definition of schwa only covers the "variable" type; the "stable" type is defined as non-alternating [œ], i.e. the output of /œ/ that is not subject to vowel ~ zero alternation anywhere in the derivation (cf. Section 3.3.2). This theoretical choice prompts us to first and foremost attempt an analysis of [CC] vs. [C(œ)C] in which the complexity of schwa alternation reflects its interaction with scalar phonotactics. Therefore, we revisit the nature of primary and secondary clusters in Section 3.3.3. The judgement data that form the primary empirical basis for our analysis are methodologically controlled (Racine 2008, cf. Section 2.5.4 for an introduction to her methodology), and thus, register should not influence the results. The importance of token frequency for alternation acceptability, on the other hand, has been established by Racine and Grosjean (2002) and might have an impact on the results in what

[92] However, cf. Lucci (1976), who – like Delattre (1955) for the liaison consonant – observes stylistic variation in the rate of schwa presence in speakers belonging to a privileged socio-economic class.
[93] Note that we only discuss rates of schwa presence in spontaneous speech. In a reading task, for instance, the presence of an orthographic <e> is prone to provoke a higher rate of schwa presence, cf. Geerts (2007) and the various contributions in Durand et al. (2009b).

follows. However, frequency will not receive any focus in the present chapter.[94] Rather, the main objective of the survey is to determine the distribution of primary [CC] vs. secondary [C(œ)C] and to subsequently analyse the results in light of Bazylko's claims. Note that the Parisian French distribution of "/ə/ instable" (1976:63) that Bazylko published more than 30 years ago does not necessarily correspond to the contemporary Swiss French system, and it follows that his data cannot automatically serve as a reliable reflection of the input we expect the Swiss French child to encounter during acquisition.

Bazylko does not at any point consider schwa to be epenthetic, but remember that the overlap he observes between primary and secondary clusters is scarce; in our view, such results encourage a search for a complementary distribution of [CC] vs. [C(œ)C]. As already mentioned, there exists a tacit assumption in the literature that the schwa epenthesis analysis is incorrect, but to our knowledge, no recent study examines the distribution of clusters that can and cannot be split by schwa. If conflicting pairs of the type *place* 'place' [plas] vs. *pelouse* 'lawn' [p(œ)luz] are limited in number and can possibly be accounted for theoretically, the need for alternating [œ] underlyingly is reduced. In addition, and more importantly, no one has hitherto looked at the interaction of schwa and (primary and secondary) clusters in child language, prior to the acquisition of literacy skills. Although primary cluster reduction has been attested as a far more frequent strategy than inter-consonantal vowel epenthesis, the latter strategy can be selected by the child during a short period in the acquisition of phonotactic patterns (Fikkert 1994, 2010). Accordingly, prior to the analysis of the child language data in Chapter 7, we identify the distributional relationship between [CC] and [C(œ)C] and, thereby, determine the viability of the approach that considers alternating [œ] in word-initial syllables to be epenthetic. Section 3.3.3 is, therefore, devoted to analysing the two hypotheses outlined in Examples (7) and (8), which are of a parallel form to the hypotheses presented for the one-category approach in Section 3.2.2.1.

(7) Hypothesis D1
Underlying word-initial /CC/ has two output realisations, [CC] and [CœC]. The loci of the [CC] ~ [CœC] alternation stand in complementary distribution with the loci of non-alternating [CC]; for a naturally defined set of phonotactic combinations, [CœC] alternates with [CC]. For the residual set of phonotactic combinations, [CC] is the only option.

Hypothesis D1 predicts that there is a complementary distribution of primary and secondary clusters; if schwa is attested in a lexical item with a given cluster, it is expected to occur in all lexical items containing this cluster. Conversely, if a lexical item with a given cluster never surfaces with optional schwa epenthesis, none of the lexical items containing this cluster should surface with schwa. Hypothesis D2 predicts primary and secondary clusters to fall into two separate groups, but for some consonantal combinations, the presence of an optional [œ] is phonotactically unpredictable.

(8) Hypothesis D2
Underlying word-initial /CC/ has two output realisations, [CC] and [CœC]. The loci of the [CC] ~ [CœC] alternation stand in overlapping distribution with the loci of non-alternating [CC]; [CC] alternates with [CœC] in a naturally defined set of phonotactic combinations, but within this set, some phonotactic combinations license [CC], not

[94] Note that both syllable frequency and token frequency might have an impact on acquisition (cf. Gierut et al. 1999, Fikkert & Levelt 2002, C. C. Levelt & van de Vijer 2004, Gierut & Dale 2007, Monnin et al. 2007, E. Lieven & Tomasello 2008). We leave these aspects for future research.

[CœC], in a defined group of words. The residual set of phonotactic combinations licenses [CC], not [CœC].

Thus, to summarise this section, we propose that if the data support Hypothesis D1, the epenthesis approach has to be revisited. If the data support Hypothesis D2, the model of [œ] ~ ∅ alternation must be more complex; it must allow for a distribution that is partly complementary, partly overlapping, which again leaves open the question about the phonological nature of alternating [œ].

3.2.3 Summary

In this section, we have revisited the arguments that the literature has put forth against two alternatives to the traditional two-category approach to schwa, which is defended, for instance, by Dell (1973/1985) and Anderson (1982). Core questions about the nature of alternating [œ] have been revisited, e.g. does the inventory contain two categories /œ/ and /∅/, one category /œ/, or are we dealing with epenthesis? Among these possible analyses, the latter two are not sufficiently investigated in the literature. Thus, in order to fill this gap, we have proposed a number of hypotheses that are tested on Swiss French judgement and production data in Section 3.3. First, in Section 3.3.2, we explore the hypotheses for the one-category approach (cf. hypotheses A-C), and second, in Section 3.3.3, we explore the hypotheses for the epenthesis approach (cf. hypotheses D).

3.3 The distribution of schwa: the system

3.3.1 Introduction

In Section 3.2, we present two alternative approaches to schwa in which the vowel does not form a separate category in the inventory, i.e. the one-category approach and the epenthesis approach, both of which are frequently discarded in the schwa literature. However, as shown in the same section, the arguments against these proposals are not based on a large-scale or fine-grained examination of the actual distribution of schwa, possibly because Anderson (1982) and his peers focus on the phonological representation of schwa and how the alternation could theoretically be accounted for. Thus, in this regard, we cannot criticise their empirical approach, which traditionally has been to discuss a limited set of data taken from the normative *français de référence*. As Morin (2000) points out, and as Anderson (1982) exemplifies, early generativists probably choose to focus on *français de référence* on purely practical grounds.

> [C]ette variété de français serait particulièrement bien décrite et assurerait une base empirique exceptionnelle pour la formulation de généralisations théoriques [… une] démarche […] légitime, si l'on comprend bien la limite de ces témoignages. (Morin 2000:104)

> [T]his study is confined to 'standard' French, represented by such conservative sources as Fouché 1956 and Grevisse 1959. While the description of this norm may (or may not) generalize easily to other dialects, this is not considered relevant to the present description. Similarly, many speakers who consider their language to be 'standard French' may well deviate from this norm in more or less significant ways. Such idiolectal variation is, again, treated as not directly relevant to the description of the particular form of speech discussed here. (Anderson 1982:534, Footnote *)

The empirical data set on which we base our analysis should allow for the examination of schwa in all of its inter- and intra-speaker variation[95] for two reasons. First, the very existence of *français de référence* is subject to debate because it does not refer to the variety of any particular speech community, and hence cannot provide authentic information regarding rates of schwa alternation. Second, the input to our Vaudois child subjects is not Hexagonal French. Even though the Swiss French varieties vary only slightly from the Northern French varieties (cf. Section 2.5.1), the observation of diatopic variation with regard to schwa alternation (cf. Martinet 1971, Walter 1982, 1990, Eychenne 2006, Pustka 2007, Racine 2008) strongly encourages a review of the system based on Swiss French alternation rates. Further, although the importance of the input during acquisition is highly debated (cf. Section 6.2), recall from Section 2.5.4 that the selection of the variant with schwa or the one without is seemingly influenced by the frequency of the two variants in the speaker's linguistic community (Racine 2008). Taking these factors into account, we limit our authentic data set to Swiss French data.

Although the starting point in our examination is the written French lexicon, the main empirical source in this chapter is Racine's (2008) presentation of the results of Neuchâtel judgement data, which consist of estimated usage frequencies of the two variants of schwa-items, with and without vowel.[96] However, there are two problems with using only these results as a basis for claims about the distribution of schwa. First, Racine's experiment protocol does not include an exhaustive list of schwa-items; she only examines nouns and certain nominalised elements. Second, judgement data cannot be interpreted as directly corresponding to production data, although they provide a good indication of what happens in the latter case (Penke & Rosenbach 2007). Therefore, in order to increase the reliability of the following analysis, we include production data from three PFC survey points, Geneva, Nyon, and Neuchâtel. Studies on schwa have already been carried out using parts of these data, e.g. Skauge's (2009) study on Geneva, Andreassen (2003) and Andreassen and Lyche (2009) on Nyon, and Racine and Andreassen (2012) on Neuchâtel. The low number of recurring items across the speakers examined in the various papers makes the individual Swiss French PFC surveys insufficiently detailed to serve as a target system in our study, and we have, therefore, collapsed all three of them into one data set.

Recall that the main objective of the present discussion is to provide a more accurate overview of the child's ambient language and in particular the environments in which he is faced with ambiguous input. The purpose is to establish clear cases of ambiguity where there are output candidates that cannot be rendered unambiguous on the basis of phonotactic, morphological, or lexical factors. To do this we must systematise the available data, check and cross-check complementary and overlapping distributions with regard to the above-mentioned factors (cf. hypotheses A-D). Before turning to the examination of the data, we re-emphasise that this section only focuses on the initial syllable of polysyllables.

[95] The construction of large digital corpora of naturalistic speech is important in this regard. One prime example is the PFC database (Durand et al. 2002, 2009a), cf. the project website for further information: www.projet-pfc.net.

[96] Note that we use the judgements from Neuchâtel speakers to indicate the Swiss French usage frequencies of the two variants of a schwa-item, all while acknowledging that this variety slightly differs, both phonologically and phonetically, from the Vaudois variety, cf. Section 2.5.3 and Racine and Andreassen (2012). Note however that no study to date has tested whether the two varieties differ with regard to rates of schwa alternation.

3.3.2 The one-category analysis: examination of the counter-evidence

In this section, we review the distribution of alternating and non-alternating [œ]. Alongside the presentation of the data, we will test hypotheses A through C, laid out in Section 3.2.2.1 and synthesised in Example (9).

(9) Hypothetically influencing factors on the realisation of category /œ/

• Hypotheses A1 and A2	Phonotactic environment
• Hypotheses B1 and B2	Morphological structure
• Hypotheses C1 and C2	Lexical subgroup affiliation

If the distribution of alternating and non-alternating [œ] can be accounted for by one or several of these factors, we propose a reconsideration of the one-category analysis, with a system containing a category /œ/ whose realisation (i.e. categorical or optional presence) in the output is conditioned by phonotactic, morphological, or lexical constraints.

3.3.2.1 Identification of the empirical material

According to Dell (1985, 1995), among others, the position of schwa is restricted to open syllables at an abstract level of analysis. The reference to the abstract level of analysis is important for cases like schwa in the initial open syllable in *redevenir* 'become again$_{\text{INF}}$' /ʁœ-dœ-vœ-niʁ/; it might surface in an open or closed syllable depending on the presence or absence of the word-medial schwas; [ʁœ-dœv-niʁ] or [ʁœd-vœ-niʁ]. Taking this restriction into account, items with [œ] in the word-initial open syllable are identified in a manual search on Lexique.org[97] (New et al. 2001) and in a subsequent consultation of Le Petit Robert (Rey-Debove & Rey 2004, henceforth LPR). All phonetic bi-consonantal combinations are checked, and every polysyllabic (non-compound) item with an initial orthographic sequence #C<e>C, #C<eu>C or #C<œu>C present in LPR is extracted for analysis.[98] Note that in conformity with the analysis in Dell (1985, 1995), we exclude items with [œ] followed by consonantal sequences other than ObsLiq-clusters, e.g. *meurtrier* 'murderer' [mœʁtʁije] and *röstis* (originally Swiss German potato dish) [ʁœʃti]. Also note that we include items with [œ] followed by a consonant + non-final <e>, e.g. *beuverie* 'booze-up' [bœvʁiː] and *seulement* 'only' [sœlmɑ̃]. This is also in line with the analysis in Dell (1985, 1995), who claims that word-medial schwas (orthographically <e>) are present at some abstract level of analysis. *A priori*, this is counter to our view that schwa is epenthetic at word-medial morpheme junctures (cf. also Côté 2000). However, as the combination #[CœC]+<e>C is found in less than ten items and does not have any consequence for the final results, we include them for the sake of completeness. In addition, a number of inflectional stems, not separate entries in the dictionary, have been added to the data set, e.g. <ser> (from *être* 'be$_{\text{INF}}$'), <fais> and <fer> (from *faire* 'do$_{\text{INF}}$'), <dev> and <devr> (from *devoir* 'must$_{\text{INF}}$'). Further, as it has been documented that the number of word-initial consonants influences the admissibility of alternating [œ] (cf. Grammont 1894, Delattre 1951, Anderson 1982, Dell 1985), we additionally extract all items containing an initial sequence #CC<e>C, #CC<eu>C, or #CC<œu>C – i.e. with a complex left edge – as well as #<e>C, #<(h)eu>C, #<œ>C, or #<œu>C – i.e. with a vowel-initial left edge. Note that all items with

[97] The results were downloaded from *Lemmes* (Lexique 2), www.lexique.org on September 22, 2008.
[98] In the orthographic code, 'C' refers to a single phonetic segment. For instance, *chemin* 'road', with word-initial orthographic <ch> = [ʃ], is coded #C<e>C (vs. *crever* 'die;inf', coded #CC<e>C).

initial #<re> entered in LPR, e.g. *renard* ‘fox’, *regarder* ‘look at$_{\text{INF}}$, watch again$_{\text{INF}}$’, and *recommencer* ‘start again$_{\text{INF}}$’, are included in the survey, irrespective of the morphological and semantic nature of <re> (cf. Jalenques 2002).[99] As regards schwa, <re> constitutes a potential challenge because when it takes on a prefixal nature it is prosodified differently from when it is part of the lexical morpheme, cf. Delais-Roussarie (1999) who considers affixes to be represented in the recursive structure of the phonological word in French. Although scholars occasionally remove <re>-items from their analyses because of their supposedly variable structure (cf. Côté 2009), Hansen (1994), in her study on Parisian French, claims that the morphological nature of <re> does not have an effect on alternation admissibility; rather she claims it is the frequency of the <re>-item that is crucial.[100] Taking this claim into account, in the remainder of the chapter we abstain from referring to the morphological nature of <re> and classify these with the group #C<e>C. Table 3.3 presents the numbers of items generated for each orthographic sequence.[101]

Orthography	**Number of items**	**Example**		
#CeC[102]	1118	*remorque*	ʀ(ə)mɔʀk[103]	‘trailer’
#CeuC	145	*veuvage*	vœvaʒ	‘widowhood’
#CœuC	1	*sœurette*	sœʀɛt	‘nickname’
#CCeC	81	*crevette*	kʀəvɛt	‘shrimp’
#CCeuC	75	*pleurer*	plœʀe	‘cry;inf’
#CCœuC	-	-		
#eC	-	-		
#euC	77	*européen*	øʀɔpeɛ̃	‘European’
#œC	8	*œdème*	edɛm; ødɛm	‘oedema’
#œuC	3	*œuvrer*	œvʀe	‘work;inf’

Table 3.3: [œ] in word-initial syllables in French, the written data set by count[104]

To sum up Table 3.3, the data set consists of 1264 items in which [œ] is preceded by one consonant; 156 items in which it is preceded by two consonants; and 88 items in which the vowel is word-initial. Thus, there are a total of 1508 items with [œ] in the word-initial syllable. In the three sub-sections to follow, we combine these data with the Swiss French judgement and production data, and examine the distribution of alternating vs. non-alternating [œ] in light of the phonotactic context, the morphological structure, and the lexical affiliation, respectively.

[99] As we see later in this section, the Swiss French production data contain verbs with <re> not present in LPR. Whereas these are good examples of the productivity of the prefix, they also show that our written data set given in Table 3.3 is not exhaustive.

[100] In this regard, see Walker (1996), who agrees with Hansen (1994) and considers schwa alternation in <re>-items to be “a phonological rather than a morphophonological phenomenon” (Walker 1996:217, Footnote 11).

[101] As regards the feminine variant of nouns and nominalised adjectives without a separate entry in LPR, we only include those present in the test material in Racine (2008), e.g. *redoublante* ‘person$_{\text{FEM}}$ staying in a class for a second year’ [ʁ(œ)dublɑ̃t]. The masculine-feminine pairs Racine tests (e.g. *redoublant/-e*) show near-identical behaviour with regard to vowel alternation admissibility, and we, therefore, believe that the exclusion of some feminine variants does not have any influence on the distribution of schwa discussed in the present section.

[102] <ai> and <on> pronounced [œ] are included in this group, e.g. *faisable* ‘doable’ and *monsieur* ‘mister’.

[103] The transcriptions are taken from LPR.

[104] A glide [j] is found in the stems <feuil> ‘leaf$_{\text{N}}$’ [fœj], <seuil> ‘threshold$_{\text{N}}$’ [sœj], <cueil> ‘gather$_{\text{V}}$’ [kœj], <deuil> ‘grief$_{\text{N}}$’ [dœj], and <œill> ‘eye$_{\text{N}}$’ [œj]. As the glide is considered to be the output of a vocalic segment, we exclude it from our data set (cf. Durand and Lyche 1999, and references cited therein). Note that [œ] in these stems is considered not to alternate.

3.3.2.2 Distribution of (non-) alternating [œ] according to the phonotactic context

In this section, we investigate the relationship between alternating and non-alternating [œ] and the consonants surrounding the vowel. For the sake of being systematic, we take the historical correspondences <e> as alternating [œ] and <eu> as non-alternating [œ] for our starting point, recognising and stressing the fact that the absence of a 1:1 mapping of orthography to phonology is well established (cf. Walker 1996, for a list of non-alternating <e>, and Walker 1993, Côté 2008, for a discussion on the unstable <eu> observed in a few common words, e.g. *peut-être* 'maybe' [p(œ)tɛːtʁ]).[105] In fact, we can immediately exclude two groups of <e>-items from our <e> as alternating [œ] set. First, Racine (2008:381) examines a number of #CC<e>C-items, out of which none is accepted without the vowel, and she, thus, confirms that alternation is blocked after a word-initial cluster (cf. Dell 1985, Scheer 2000). Vowel-initial words are not examined by Racine (2008), but the fact that there are no <e>-initial words in the lexicon indicates, if we follow the tendency of a correspondence between the orthographic and the phonological representation, that alternation is banned in the absence of a immediately preceding consonant. Note that although the ungrammaticality of word-initial schwa is a restriction that is undisputed in the literature (alongside the requirement that the schwa syllable must be open, cf. the previous section), variable schwa presence is nevertheless observed word-initially in Louisiana French, e.g. *d'êt' revenue* 'to be back' [dɛtərvəny] vs. [dɛtrəvəny] (Lyche 1995:371). According to Lyche (1995), however, both examples are instances of schwa epenthesis in the context C#<re>C, where schwa is inserted pre- or post-consonantally, i.e. [ər] or [rə], in order to save the word-initial degenerate and unparsable syllable /r/. Thus, there is no word-initial schwa in the phonological representation. In light of these results, we abstain from further commenting on words in which [œ], written <e/eu>, is preceded by a cluster or is word-initial; we instead only concentrate on those in which [œ] = <e/eu>[106] is preceded by a single onset consonant. Note that the one item with #C<œu>C, *sœurette* 'little sister' [sœʁɛt], is henceforth included in the #C<eu>C group.

The first step in the search for a phonotactically conditioned distribution of alternating and non-alternating [œ] is to determine in which consonantal contexts the two occur. Therefore, we present in Table 3.4 the consonantal combinations observed with an intervening <e> or <eu>.

[105] As Racine (2008) only focuses on the alternation admissibility of [œ] written <e> (and not [œ] written <eu>), we do not comment on the few items in which instability has been reported for the vowel [œ] written <eu>. Thus, unless called for in what follows, we consider [œ] written <eu> to be stable.
[106] A corresponding pair of the format [œ] = <e> is to be read as *phonetically realised [œ], written <e>*.

1 \ 2	p	b	t	d	k	g	f	v	s	z	ʃ	ʒ	m	n	ɲ	ʁ	l
p	eu		e/eu						eu	e	eu			e		eu	e
b				e		eu		eu		e				e		eu	e
t			eu											e			
d	e	e	eu	e	e	e		e	e	eu			e	e		e	e
k			eu							eu				e		e	
g										eu				e			eu
f			eu	eu						e			e	e		e	e/eu
v				e		eu		eu		e				e			e/eu
s	e		e	e	e	e		e	e				e	e		e/eu	e/eu
z										eu							
ʃ								e					e	e			e
ʒ			e	eu										e/eu			e
m		eu				eu			e	e				e/eu		e/eu	e/eu
n			eu					e/eu			eu			eu		eu	
ɲ																	
ʁ	e	e	e	e	e	e	e	e	e		e	e	e	e			e
l		e			e/eu			e	e/eu							eu	

Table 3.4: Phonotactic distribution of <e> and <eu> in the context #C_C, based on searches in Lexique and Le Petit Robert

Out of a total of 289 potential consonant combinations, 101 are combined with [œ] = <e> or <eu>. Among these 101 combinations, 12 overlap in creating the phonotactic environment for both <e> and <eu>, i.e. [pœt, fœl, vœl, sœʁ, sœl, ʒœn, mœn, mœʁ, mœl, nœv, lœk, lœs]. At first glance, this overlap seems to falsify Hypothesis A1, which states that alternating and non-alternating [œ] are in complementary distribution. However, since orthography has proven not to be transparent, we need to look into the <e/eu> cells in Table 3.4 and determine which of the <e> correspond to an alternating [œ]. To do so, we make use of the judgement results in Racine (2008:372-378), and classify the items with <e> observed in a [CœC] context according to their *c.e.f.* value. Recall that highly positive *c.e.f.* values indicate a strong preference for the vowel-less variant, whereas highly negative *c.e.f.* values indicate a strong preference for the variant with vowel. In order to isolate tendencies in the data, and in particular to identify the instances of #C<e>C with a non-alternating [œ] = <e>, we divide the data set into three groups according to their *c.e.f.* value: (i) items with a positive value, from 0.0 to 3.0, which are highly frequently alternating (label HFA), (ii) items with a negative value, from -3.0 to -0.01, which are alternating (label A), and (iii) items with a strongly negative value, from -6.0 to -3.01, which are highly infrequently alternating (label HIA). Note that *peloton* ‘ball of wool’, with a *c.e.f.* value of 3.08, is included in the HFA group.[107]

In order to determine which [œ] = <e> pattern with [œ] = <eu>, we draw a line between those of the above-presented categories considered to reflect an alternating [œ] and a non-alternating [œ], respectively. Racine and Grosjean (2005) define three evenly distributed intervals within the continuum, representing obligatory absence (*c.e.f.* values between 4.50 and 5.72), variable absence (*c.e.f.* values between -0.50 and 1.00), and forbidden absence (*c.e.f.* values between -5.50 and -4.00). In line with this partition, we consider the group of highly infrequently alternating items (*c.e.f.* values between -6.00 and -3.01) to contain a non-alternating [œ], and

[107] Regarding *chelem*, its elevated *c.e.f.* value of 4.14 patterns both with the high deletion rate obtained by Bazylko (1976) for his Parisian speakers, and with the LPR-transcription [ʃlɛm] (Rey-Debove & Rey 2004:415). The absence of a vowel both in production and in the transcription strongly indicates that the item does not contain a phonological vowel corresponding to <e>, and it is therefore excluded from the survey.

thus to pattern with [œ] = <eu>. Whereas this somewhat arbitrary division of the continuum seems counter to Algeo's (1978) argument concerning the gradience of phonotactics, the dichotomous division will nevertheless allow us to isolate the alternating [œ], which in turn might facilitate an understanding of the least frequent alternations (*c.e.f.* values between -6.00 and -3.01). Table 3.5 displays the various consonantal combinations attested in the three categories.

		Highly frequently alternating (HFA)	**Alternating (A)**	**Highly infrequently alternating (HIA)**
PloPlo	lab + cor	pt	pt	pt, bd
	cor + cor		dd	
	cor + dor		dg	
PloFri	lab + cor		pz, bz	pz, bz
	cor + lab	dv	dv	dv
	cor + cor	ds		
PloNas	lab + cor			bn
	cor + lab	dm	dm	dm
	cor + cor		tn	dn
	dor + cor			kn, gn
PloLiq	lab + cor	pl	pl	pl, bl
	dor + dor			kʁ
FriPlo	lab + cor			vd
	cor + cor	ʒt	ʒt	
	cor + dor	sk, sg	sk	sk
FriFri	lab + cor			fz
	cor + lab	ʃv	ʃv	ʃv, sv
FriNas	lab + lab		fm	
	lab + cor	fn	fn, vn	fn, vn
	cor + lab	sm, ʃm	sm	sm
	cor + cor	ʃn, ʒn		ʃn, ʒn
FriLiq	lab + cor		vl	fl, vl
	cor + cor	ʒl		
	cor + dor	sʁ	sʁ	sʁ
NasPlo				
NasFri	lab + cor	mz	ms	
	cor + lab	nv		
NasNas	lab + cor	mn	mn	mn
NasLiq	lab + cor		ml	
	lab + dor		mʁ	mʁ
LiqPlo	dor + lab	ʁp, ʁb	ʁp, ʁb	ʁb
	dor + cor	ʁt	ʁt, ʁd	ʁt, ʁd
	dor + dor	ʁk, ʁg	ʁk, ʁg	ʁk
LiqFri	cor + lab	lv	lv	lv
	cor + cor	ls		
	dor + lab	ʁv	ʁf, ʁv	ʁv
	dor + cor	ʁs, ʁʃ	ʁs, ʁʃ, ʁʒ	ʁs
LiqNas	dor + lab	ʁm	ʁm	
	dor + cor		ʁn	ʁn
LiqLiq	dor + cor	ʁl	ʁl	ʁl

Table 3.5: Degrees of alternation admissibility in word-initial [CœC], where [œ] = <e>, based on Racine (2008)

Recall from Table 3.4 the consonants that in the orthographic representation surround both <e> and <eu>: [pœt, fœl, vœl, sœʁ, sœl ʒœn, mœn, mœʁ, mœl, nœv, lœk, lœs]. If we examine these consonantal combinations in light of alternation admissibility, we can immediately discard [fœl] as being a counter-example to A1. It only occurs in *felouque* ‘felucca’ [fœluk] with a non-alternating [œ] = <e>, and it is accordingly classified in the same group as non-alternating *feuler* ‘snarl$_{\text{INF}}$’ [fœle] etc. with [œ] = <eu>. The remaining 11 combinations overlap in authorising both alternating and non-alternating [œ] and constitute genuine counter-examples to A1. Also, on the basis of the *c.e.f.* values we additionally isolate a number of consonant combinations with non-alternating [œ] = <e> that are not found with [œ] = <eu>: [bœd] (e.g. *bedaine* ‘belly’), [bœn] (e.g. *benêt* ‘silly’), [dœn] (e.g. *denier* ‘formerly a coin of small value’), [kœn] (e.g. *quenelle* ‘small seasoned ball of pouted fish or meat’), [gœn] (e.g. *guenon* ‘ugly woman’), [bœl] (e.g. *belette* ‘weasel’), [kœʁ] (e.g. *querelle* ‘quarrel’), [vœd] (e.g. *vedette* ‘theatrical star’), [fœz] (e.g. *faisan* ‘pheasant’), and [sœv] (e.g. *sevrage* ‘weaning’). Table 3.6 summarises the clusters that only authorise a non-alternating [œ] (= <e> or <eu>).

		Non-alternating (NA) [œ] = <e>	**Non-alternating (NA) [œ] = <eu>**
PloPlo	lab + lab		pp
	lab + cor	bd	
	lab + dor		bg
	cor + cor		tt, dt
	dor + cor		kt
PloFri	lab + lab		bv
	lab + cor		ps, pʃ
	cor + cor		dz
	dor + cor		kz, gz
PloNas	lab + cor	bn	
	cor + cor	dn	
	dor + cor	kn, gn	
PloLiq	lab + cor	bl	
	lab + dor		pʁ, bʁ
	dor + cor		gl
	dor + dor	kʁ	
FriPlo	lab + cor	vd	ft, fd
	lab + dor		vg
	cor + cor		ʒd
FriFri	lab + lab		vv
	lab + cor	fz	
	cor + lab	sv	
	cor + cor		zz
FriLiq	lab + cor	fl	
NasPlo	lab + lab		mb
	lab + dor		mg
	cor + cor		nt
NasFri	cor + cor		nʃ
NasNas	cor + cor		nn
NasLiq	cor + dor		nʁ
LiqLiq	dor + dor		lʁ

Table 3.6: Consonantal combinations authorising non-alternating [œ] only, based on Racine (2008)

While some consonantal combinations only authorise a non-alternating [œ], a number of clusters only combine with alternating [œ]. Table 3.7 lists the latter clusters according to their level of alternation admissibility, i.e. whether or not the items are subject to a highly frequent alternation.

		Highly frequently alternating [œ] = <e>	**Alternating [œ] = <e>**
PloPlo	cor + cor		dd
	cor + dor		dg
PloFri	cor + cor	ds	
PloNas	cor + lab		
	cor + cor		tn
FriPlo	cor + cor	ʒt	ʒt
	cor + dor	sg	
FriNas	lab + lab		fm
	cor + lab	ʃm	
FriLiq	cor + cor	ʒl	
NasFri	lab + cor	mz	ms
LiqPlo	dor + lab	ʁp	ʁp
	dor + dor	ʁg	ʁg
LiqFri	dor + lab		ʁf
	dor + cor	ʁʃ	ʁʃ, ʁʒ
LiqNas	dor + lab	ʁm	ʁm

Table 3.7: Consonantal combinations authorising alternating [œ] only, based on Racine (2008)

When the consonantal combinations that only authorise non-alternating [œ] (cf. Table 3.6) or alternating [œ] (cf. Table 3.7) are taken out, what remains are the true counter-examples to Hypothesis A1. These are presented in Table 3.8.[108]

[108] There are two combinations with an <e>/<eu> overlap that are not examined by Racine (2008) and that are not inserted in Table 3.8, i.e. [sœl] and [lœk]. With [œ] = <e>, the combinations are found in the following items; with [sœl] in *selon* ‘according to’, *celer* ‘to conceal’, *cela* ‘that’, and *celui* DEM$_{\text{MASC-SG}}$, and with [lœk] in *lequel* ‘which$_{\text{MASC}}$’. With [œ] = <eu>, the combinations are found in the following items; with [sœl] in *seulement* ‘only’ and *seulet* ‘all alone’; with [lœk] in the element *leuco-* ‘leuco-‘. As we do not have judgement data indicating the alternation admissibility of [œ] = <e>, we abstain from commenting on these clusters at this point, and we refer to the production data for further discussion.

		HFA [œ] = <e>	A [œ] = <e>	NA [œ] = <e>	NA [œ] = <eu>
PloPlo	lab + cor	pt	pt	pt	pt
PloFri	lab + cor		pz, bz	pz, bz	
	cor + lab	dv	dv	dv	
PloNas	cor + lab	dm	dm	dm	
PloLiq	lab + cor	pl	pl	pl	
FriPlo	cor + dor	sk	sk	sk	
FriFri	cor + lab	ʃv	ʃv	ʃv	
FriNas	lab + cor	fn	fn, vn	fn, vn	
	cor + lab	sm	sm	sm	
	cor + cor	ʃn, ʒn		ʃn, ʒn	ʒn
FriLiq	lab + cor		vl	vl	vl
	cor + cor				
	cor + dor	sʁ	sʁ	sʁ	sʁ
NasFri	cor + lab	nv			nv
NasNas	lab + cor	mn	mn	mn	mn
NasLiq	lab + cor		ml		ml
	lab + dor		mʁ	mʁ	mʁ
LiqPlo	cor + dor				
	dor + lab	ʁb	ʁb	ʁb	
	dor + cor	ʁt	ʁt, ʁd	ʁt, ʁd	
	dor + dor	ʁk	ʁk	ʁk	
LiqFri	cor + lab	lv	lv	lv	
	cor + cor	ls			ls
	dor + lab	ʁv	ʁv	ʁv	
	dor + cor	ʁs	ʁs	ʁs	
LiqNas	dor + cor		ʁn	ʁn	
LiqLiq	dor + dor	ʁl	ʁl	ʁl	

Table 3.8: Consonantal combinations authorising both types of [œ], based on Racine (2008)

One consequence of assuming highly infrequently alternating [œ] = <e> patterns with non-alternating [œ] = <eu> is that the number of phonotactic environments that authorise both alternating and non-alternating [œ] has increased from 11 to 31 combinations of various segments. First, looking at clusters with a plosive C_1 (Plo), they are attested in items that form counter-examples to Hypothesis A1; with a plosive C_2, we find highly frequently alternating (HFA) *petit* 'small' [p(œ)ti] and alternating (A) *petiot* 'tiny' [p(œ)tjo] that contrast with non-alternating (NA) *peton* 'small foot (nursery speech)' [pœtɔ̃] in a PloPlo context. One would expect that *petit* and *petiot* also contrast with *peut-être* 'maybe' [pœtɛtʁ], but the latter is one of the few items in which [œ] = <eu> is found to alternate; Tranel (1987b) provides an alternative transcription [ptɛt] for *peut-être.* With a fricative C_2 (PloFri), we observe for instance alternating (A) *pesée* 'action of pressing' [p(œ)zeː] contrasting with non-alternating (NA) *pesage* 'enclosure' [pœzɑːʒ]. With a nasal C_2 (PloNas), highly frequently alternating (HFA) *demi* 'half' [d(œ)mi] and alternating *demain* 'tomorrow' [d(œ)mɛ̃] contrast with non-alternating (NA) *demeure* 'domicile' [dœmœːʁ]. Finally, with a liquid C_2 (PloLiq), highly frequently alternating (HFA) *peluche* 'teddy bear' [p(œ)lyʃ] and alternating (A) *pelée* 'waste' [p(œ)leː] contrast with non-alternating (NA) *pelage* 'coat' [pœlaːʒ].[109]

Second, looking at clusters with a fricative C_1 (Fri), these are also attested with items forming counter-examples to Hypothesis A1; with a plosive C_1 (FriPlo), highly frequently alternating (HFA) *secours* 'help' [s(œ)kuːʁ] and alternating (A) *secret* 'secret' [s(œ)kʁɛ] contrast with non-

[109] Note that we provide one single example per combination of manners. For example, the combination PloFri is only illustrated by the combination of labial [p] and coronal [z], despite the fact that the combinations [bz] and [dv] also authorise both alternating and non-alternating [œ].

alternating (NA) *sequin* 'type of adornment' [sœkɛ̃]. With a fricative C_2 (FriFri), we find highly frequently alternating (HFA) *cheval* 'horse' [ʃ(œ)val] and alternating (A) *chevillard* 'wholesale butcher' [ʃ(œ)vijaːʁ] that contrast with non-alternating (NA) *chevreuil* 'roe deer' [ʃœvʁœj]. With a nasal C_2 (FriNas), highly frequently alternating (HFA) *fenêtre* 'window' [f(œ)nɛːtʁ] and alternating (A) *fenil* 'hayloft' [f(œ)nil] contrast with non-alternating (NA) *fenaison* 'haying' [fœnɛzɔ̃]. Finally, with a liquid C_2 (FriLiq), highly frequently alternating (HFA) *cerise* 'cherry' [s(œ)ʁiːz] and alternating (A) *seringa* 'seringa' [s(œ)ʁɛ̃ga] contrast with non-alternating (NA) *serein* 'calm$_{\text{MASC}}$' [sœʁɛ̃] and *sœurette* 'little sister' [sœʁɛt], the latter with [œ] = <œu>.

Third, looking at clusters with a nasal C_1 (Nas), there are additional items forming counter-examples to Hypothesis A1; with a plosive C_2 (NasPlo), no items with [œ] are attested. With a fricative C_2 (NasFri), we find highly frequently alternating (HFA) *neveu* 'nephew' [n(œ)vø] that contrasts with *neuvième* 'ninth' [nœvjɛm], where [œ] = <eu>. With a nasal C_2 (NasNas), highly frequently alternating (HFA) *menu* 'menu' [m(œ)ny] and alternating (A) *menace* 'threat' [m(œ)nas] contrast with non-alternating (NA) *menuet* 'minuet' [mœnɥe] and *meunier* 'millhand' [mœnje], the latter with [œ] = <eu>. Finally, with a liquid C_2 (NasLiq), we observe alternating (A) *meringue* 'meringue' [m(œ)ʁɛ̃g] contrasting with non-alternating (NA) *merisier* 'wild cherry tree' [mœʁizje] and *Meurette* 'type of red-wine sauce' [mœʁɛt], the latter with [œ] = <eu>.

Lastly, looking at clusters with a liquid C_1 (Liq), there are further items forming counter-examples to Hypothesis A1; with a plosive C_1 (LiqPlo), we observe for instance highly frequently alternating (HFA) *rebord* 'edge' [ʁ(œ)bɔːʁ] and alternating (A) *rebond* 'rebound' [ʁ(œ)bɔ̃] that contrast with non-alternating (NA) *rebelle* 'rebel' [ʁœbɛl]. With a fricative C_2 (LiqFri), highly frequently alternating (HFA) *levure* 'yeast' [l(œ)vyːʁ] and alternating (A) *levage* 'hoisting' [l(œ)vɑːʒ] contrast with non-alternating (NA) *levain* 'leaven' [lœvɛ̃]. Further, with a nasal C_2 (LiqNas), alternating (A) *renard* 'fox' [ʁ(œ)naʁ] contrasts with non-alternating (NA) *renom* 'fame' [ʁœnɔ̃]. Finally, with a liquid C_2 (LiqLiq), we find for instance highly frequently alternating (HFA) *relève* 'relief' [ʁ(œ)lɛv] and alternating (A) *relais* 'relay' [ʁ(œ)lɛ] that contrast with non-alternating (NA) *relique* 'relic' [ʁœlik].

To summarise, the examination of the alternation admissibility for the various consonantal combinations, first, confirms that the mapping between orthography and phonology is not transparent: some [œ] = <e> do not alternate. Second, we identify three groups of consonant combinations: one group that only authorises non-alternating [œ], one group that only authorises alternating [œ], and finally one group that authorises both alternating and non-alternating [œ], the latter amounting to 31 segmental configurations. At this point, it is appropriate to call attention to the fact that Racine (2008) only includes the nouns and nominalised elements present in the Brulex database (Content et al. 1990), which comprise 378 items with <e> in the word-initial syllable.[110] The data extracted from Lexique and LPR not only contain additional nouns and nominalised elements, but also other word classes with [œ] in the initial syllable of polysyllables, e.g. verbs and prepositions. The inclusion of additional data has at least two potential consequences for our study. When we compare the data from Lexique and LPR and the test material in Racine (2008), it turns out that her alternation admissibility results lack the following possible phonotactic contexts: [dœp] (*depuis* 'since'), [dœb] (*debout* 'standing'), [dœk] (*decauville* railway name), [pœn] (*penaud* 'dumbfounded' and *penon* (flag indicating the wind direction)), [dœʁ] (*derechef* 'yet another time'), [dœl] (*delà* 'further away'), [sœp]

[110] Note that the total number of 378 items also includes those not taken into account in the present study, i.e. compounds like *petit pois* 'pea', cf. Racine (2008:372-378).

(*cependant* 'yet'), [sœt] (*setier* (ancient measurement)), [sœd] (*sedan* (fabric made in Sudan)), [vœz] (*vesou* 'cane-juice'), [sœs] (*ceci* 'this'), [sœn] (*senau* (ancient type of boat)), [fœʁ] (<fer> 'do$_{\text{IMPERF/COND}}$'), [sœl] (e.g. *selon* 'according to'), [lœb] (*lebel* (type of French rifle)), and [lœk] (*lequel* 'which'). Taking this into account, the inclusion of new data firstly has the effect of enlarging the set of consonantal combinations with an intervening [œ]. Secondly, the enlargement of the data set might increase the number of counter-examples to Hypothesis A1, i.e. the number of phonotactic contexts that authorise both alternating and non-alternating [œ].

The additional data are drawn from the three Swiss French survey points currently present in the PFC database: Geneva (9 informants), Neuchâtel (13 informants), and Nyon (12 informants).[111] For each of the subjects, approximately ten minutes per conversation (semi-directed and informal) have been coded in accordance with the PFC protocol (Durand & Lyche 2003). As for the syllabic position of interest in this study, the Swiss French PFC corpus contains 1206 occurrences of <e> (and [œ] = <ai> or <on>) in a V#C<e>C context, e.g. *pas besoin* 'no need' [pab(œ)zwɛ̃], *on faisait* 'we did' [ɔ̃f(œ)zɛ], and *un monsieur* 'a mister' [œ̃m(œ)sjø]. These occurrences – taken from authentic and spontaneous production data – reveal at least four interesting points. First, we observe that all nouns and nominalised elements for which we have judgement data (464 occurrences) are analysed as containing an alternating vowel, i.e. with a *c.e.f.* value of -3.0 or higher. The sole exceptions are one occurrence of *demeuré* 'mentally retarded' (*c.e.f.* value of -3.58), one occurrence of *menuisier* 'carpenter' (*c.e.f.* value of -4.25), one occurrence of *vedette* '(theatrical) star' (*c.e.f.* value of -4.83), and two occurrences of *chevreuil* 'roe deer' (*c.e.f.* value of -5.5). Except for *demeuré*, realised as [dmœʁe], these items are produced with the vowel present. This observation is in line with the judgement data, and, thereby, strengthens the validity of the data for analysis. Also, the nouns and nominalised elements judged as subject to alternation in Racine (2008) strengthen the judgement data; these items are also attested with frequent schwa absence in production, cf. Table 3.9. For every item occurring five or more times in our corpus (highlighted in grey in Table 3.9), the rate of vowel absence surpasses 50%. The sole exception is the word *relation*, whose *c.e.f.* value is 0.00, but which is realised with a vowel in all six occurrences. Despite the preservation of [œ] in *relation*, the absence of the vowel in the single occurrences of *relève* (*c.e.f.* value of 1.25) and *relaxation* (*c.e.f.* value of -1.33) prevents us from removing [ʁœl] from the list of contexts authorising [œ]-alternation. As for the items occurring less than five times in the corpus, we find their frequency of occurrence to be insufficiently low to draw any conclusion about their alternation admissibility from the production data.

[111] The recordings in Geneva were carried out in 2003 by students attending a course held by Anne Catherine Simon at the University of Geneva (see Skauge 2009, for a presentation of the survey). The Neuchâtel corpus was constructed in 2009 by Isabelle Racine with the help of Helene N. Andreassen, Nathalie Bühler, and Jean-Paul Philippe, cf. Racine and Andreassen (2012) for a presentation of the survey. The Nyon data – the first PFC survey point in Switzerland – were gathered in 2002 by Helene N. Andreassen, and are presented in length in Andreassen (2003, 2004) and Andreassen and Lyche (2009). All data are available on the project website: www.projet-pfc.net.

CC context		Item	Absence of [œ]		
			Number	%	Rate expected
PloPlo	pt	petit	224/252	89	Highly frequent alternation
PloFri	dv	devoir	1/3	33	
	dv	devant	4/6	67	
	ds	dessus	2/4	50	
	ds	dessous	0/2	0	
PloNas	dm	demi	18/21	86	
	dm	demande	0/1	0	
FriPlo	sk	secretariat	0/1	0	
	sk	secrétaire	2/3	67	
	sg	seconde	3/4	75	
	sg	second	0/1	0	
FriFri	ʃv	cheville	1/1	100	
	ʃv	cheveux	2/2	100	
	ʃv	chevet	2/2	100	
	ʃv	cheval	4/4	100	
FriNas	sm	semaine	29/29	100	
	fn	fenêtre	2/2	100	
	ʃn	chenillette	3/3	100	
	ʃm	chemin	9/9	100	
NasFri	mz	mesure	1/2	50	
LiqPlo	ʁt	retour	4/5	80	
	ʁt	retard	7/7	100	
	ʁp	reproche	1/2	50	
	ʁp	représentant	1/2	50	
	ʁp	repos	0/2	0	
	ʁp	repassage	1/2	50	
	ʁp	repas	2/4	50	
	ʁg	regard	0/1	0	
LiqFri	ʁv	revanche	0/1	0	
	ʁʃ	recherche	0/2	0	
	ʁs	recette	0/2	0	
	ls	leçon	0/1	0	
LiqNas	ʁm	remarque	3/4	75	
LiqLiq	ʁl	relève	1/1	100	
	ʁl	relation	0/6	0	
PloPlo	dg	degré	2/3	67	Alternation
	dd	dedans	3/3	100	
PloFri	pz	pesée	0/1	0	
	bz	besoin	17/22	77	
PloNas	dm	demain	0/1	0	
FriNas	fm	femelle	1/1	100	
NasFri	ms	monsieur	5/8	63	
NasNas	mn	meneur	0/1	0	
LiqPlo	ʁt	retraité	0/3	0	
	ʁg	regret	0/3	0	
	ʁk	recul	0/1	0	
	ʁk	requin	1/4	25	
	ʁt	retraite	2/2	100	
	ʁk	recrue	2/2	100	
LiqFri	ʁʒ	registre	0/1	0	
	ʁv	revue	0/1	0	

	sk	secret	0/2	0	
	ʁf	reflet	1/2	50	
LiqNas	ʁm	remise	1/1	100	
LiqLiq	ʁl	reliure	0/1	0	
	ʁl	relieur	0/1	0	
	ʁl	relaxation	1/1	100	
PloNas	dm	demeuré	1/1	100	No alternation
FriPlo	vd	vedette	0/1	0	
FriFri	ʃv	chevreuil	0/2	0	
NasNas	mn	menuisier	0/1	0	

Table 3.9: <e> = [œ] in nouns and (nominalised) elements in context V#C<e>C, observed vs. expected rates of vowel absence[112], PFC spontaneous speech data, classification based on Racine (2008)

Second, as shown in Table 3.10, the inclusion of verbal forms has a consequence for the placement of the combination [fœz], which has previously been placed on the list of combinations that only authorise a non-alternating [œ], cf. Table 3.6. The imperfect and present participle form of ‘do’, <fais>, is realised without a vowel in 86 of 87 occurrences in a post-vocalic context, e.g. *tu faisais* ‘you did’ [tyfzɛ]. Additionally, <fais> is realised without schwa in five of the nine occurrences in a post-consonantal context. Therefore, we can undoubtedly relocate the FriFri-combination [fœz] to the list of phonotactic contexts that authorise both alternating and non-alternating [œ]. For the remainder of the verbs occurring five times or more in our production corpus (highlighted in grey in Table 3.10), they are all subject to [œ]-absence in at least 50% of the cases. Note, there are a few exceptions including the various inflected forms of *revenir* ‘come back$_{\mathrm{INF}}$’ (29% absence, 7/24 occurrences) and *refaire* ‘do again$_{\mathrm{INF}}$’ (33% absence, 2/6 occurrences). When we interpret these data in light of the *c.e.f.* values in Racine (2008), whereby a value around 0.0 indicates an equal, 50-50, acceptance of the two variants, we conclude that these verbs are subject to (highly frequent) alternation. It follows then that, other than the above-mentioned [fœz], the distribution of [œ] with respect to the segmental context for the nouns and nominalised elements remains unaltered.

[112] Nouns and adjectives attested in a V#C<e>C context in the Swiss PFC corpus but not present in Racine (2008) are the following: *chenit* ‘mess’ [ʃni] (1/1 occurrence of schwa absence), *menuiserie* ‘carpentry’ [mœnɥisʁiː] (0/1), *pesante* ‘heavy$_{\mathrm{FEM}}$’ [pœzɑ̃t] (0/1), *rechange* ‘replacement’ [ʁʃɑ̃ʒ] (1/1), *relecteur* ‘proofreader’ [ʁœlɛktœːʁ] (0/1), *représentative* ‘representative’ [ʁpʁezɑ̃tativ] (1/1), *revêtement* ‘coating’ [ʁœvɛtmɑ̃] (0/1), and *secondaire* ’secondary’ [sœgɔ̃dɛːʁ] (0/1).

CC context		**Item**	**Absence of [œ]**		
			Number	**%**	**Rates expected**
FriPlo	ʒt	jeter	1/1	100	Highly frequent alternation (HFA)
	sg	seconder	0/1	0	
FriLiq	ʒl	geler	1/1	100	
LiqPlo	ʁg	regarder	32/37	86	Highly frequent alternation (HFA) or Alternation (A)
	ʁg	regretter	1/4	25	
	ʁg	regrouper	0/1	0	
	ʁp	repartir	12/15	80	
	ʁp	repasser	2/2	100	
	ʁp	repentir	0/2	0	
	ʁp	repérer	2/3	67	
	ʁp	replier	0/1	0	
	ʁp	reposer	1/2	50	
	ʁp	repousser	1/1	100	
	ʁp	reprendre	15/24	62	
	ʁp	représenter	4/5	80	
	ʁp	reprocher	1/2	50	
LiqFri	ʁʃ	rechercher	1/2	50	
LiqNas	ʁm	remarquer	10/12	83	
	ʁm	remercier	0/1	0	
	ʁm	remettre	9/14	64	
	ʁm	remonter	7/8	88	
PloFri	dv	devenir	19/28	68	Highly frequent alternation (HFA) or Alternation (A) or No Alternation (NA)
	dv	devoir	25/48	52	
PloNas	dm	demander	33/38	87	
FriPlo	sk	secouer	1/1	100	
FriFri	ʃv	chevaucher	1/1	100	
FriLiq	sʁ	ser-	45/46	98	
NasNas	mn	menacer	0/1	0	
LiqPlo	ʁk	recommander	0/2	0	
	ʁk	recommencer	6/9	67	
	ʁk	reconnaître	5/10	50	
	ʁk	recroiser	1/2	50	
	ʁt	retéléphoner	1/1	100	
	ʁt	retenir	4/7	57	
	ʁt	retirer	0/1	0	
	ʁt	retordre	1/1	100	
	ʁt	retourner	5/7	71	
	ʁt	retransmettre	0/1	0	
	ʁt	retravailler	5/5	100	
	ʁt	retraverser	0/1	0	
	ʁt	retrouver	11/17	65	
LiqFri	lv	lever	1/1	100	
	ʁs	recevoir	12/17	71	
	ʁs	ressembler	2/3	67	
	ʁs	ressentir	1/1	100	
	ʁs	resserrer	1/2	50	
	ʁs	ressortir	5/5	100	
	ʁv	revendiquer	0/1	0	
	ʁv	revendre	0/1	0	
	ʁv	revenir	7/24	29	
	ʁv	revoir	6/12	50	

	ʁv	revoyager	0/1	0	
LiqLiq	ʁl	relever	0/2	0	
	ʁl	relire	0/3	0	
PloNas	tn	tenir	6/9	67	Alternation (A)
LiqFri	ʁʒ	rejoindre	0/1	0	
	ʁf	refaire	2/6	33	
	ʁf	refuser	4/4	100	
FriNas	vn	venir	57/64	89	Alternation (A) or No Alternation (NA)
LiqPlo	ʁd	redescendre	2/3	67	
LiqNas	ʁn	renouveler	0/1	0	
FriFri	fz	fais-	86/87	99	NA
FriLiq	fʁ	fer-	11/11	100	n/a

Table 3.10: <e> = [œ] in lemmatized verbs in context V#C<e>C, observed vs. expected rates of vowel absence, PFC spontaneous speech data, classification based on Racine (2008)[113]

Third, the production data contain proper nouns that are not attested in Lexique/LPR or in Racine (2008), e.g. the toponyms *Begnins* (0/4 occurrences of vowel absence), *Bevaix* (0/3), *Chevroux* (0/1), *Venise* (0/2), *Genève* (17/29) and its derivative *genevois* (7/12), and the personal name *Denis* (0/2 occurrences of vowel absence). Although Dell (1985:229) claims that "[l]a plupart des noms propres sont des exceptions à VCE$_1$", the elevated rate of schwa absence in *Genève* and *genevois* confirms that at least some proper nouns are subject to the same constraints as the rest of the lexicon when it comes to alternation admissibility. Fourth and finally, the production data add six empirically attested consonantal combinations to the data set. The PloPlo-combination [dœp] is attested without vowel in 6/23 occurrences of *depuis* 'since'. The PloNas-combination [bœɲ] is attested with vowel in the toponym *Begnins* (cf. above). The FriFri-combination [sœs] is attested with vowel in the single occurrence of *ceci* 'this'. The FriLiq-combination [fœʁ] is attested without vowel in all 11 occurrences of <fer> 'do$_{\text{FUT/COND}}$' (cf. Table 3.10). The FriLiq-combination [sœl] is attested without vowel in 1/3 occurrences of *cela* 'that' and with vowel in the two occurrences of *selon* 'according to'.[114] Finally, the LiqPlo-combination [lœk] is attested with vowel in the single occurrence of *lequel* 'which'. Whereas *Begnins* further strengthens the claim that a word-initial cluster containing [ɲ] is ungrammatical (cf. Walker 2001), the words *ceci, cela, selon,* and *lequel* do not provide any clear indication of the alternation admissibility in the contexts [sœs], [sœl], and [lœk]. Further, *depuis* merely indicates the authorisation of schwa absence and we may propose, with reservation, to put [dœp] in the set of contexts that allow [œ]-alternation. As regards [fœʁ], we can without hesitation add this combination to this set. The latter move is encouraged by the four instances of <fer> in a C#C<e>C context, where schwa absence is categorical.

Table 3.11 summarises the distribution of alternating and non-alternating [œ] as they are manifest in the Neuchâtel judgement data (Racine 2008) and in the Swiss French PFC data. A number of phonotactic contexts present in Lexique/LPR are not attested in our Swiss French data, and some of these will henceforth be removed from the discussion because of their low token frequency[115], i.e. [pœn] found in *penon* 'flag indicating the wind direction' and *penaud*

[113] All verbs attested in the PFC production data are present in LPR, except for *recroiser* 'cross again$_{\text{INF}}$' and *revoyager* 'travel again$_{\text{INF}}$'. Whereas the former appears in Lexique, the latter does not and thereby illustrates the productivity of the prefix <re> in French.
[114] We also attest vowel absence in 2/6 occurrences of *celui(-ci/là)* 'this$_{\text{MASC}}$ (here/there)'. We abstain from further commenting on this item in this chapter because of the liquid deletion in the reduced form: [sœlɥi] ~ [sɥi].
[115] The lemma frequency, not presented here, is calculated per million words in a corpus of film subtitles (New et al. 2007).

‘dumbfounded’, [dœk] found in *decauville* ‘railway name’ (not present in Lexique), [dœʁ] found in *derechef* ‘yet another time’, [vœz] found in *vesou* ‘cane-juice’ (not present in Lexique), [sœt] found in *setier* ‘ancient measurement’ (not present in Lexique), [sœd] found in *sedan* ‘fabric made in Sudan’, [sœn] found in *senau* ‘ancient type of boat’ (not present in Lexique), and [lœb] found in *lebel* ‘type of French rifle’. As for the remainder of the phonotactic contexts not attested in the Swiss French data, i.e. [dœb] in *debout* ‘standing’, [dœl] in *delà* ‘further away’, and [sœp] in *cependant* ‘however’, we do not exclude them from the survey because of their more elevated token frequency (New et al. 2007). However, the lack of data prevents us from commenting on the alternation acceptability of [œ] in these words (cf. cells checked with <?> in Table 3.11).

1 \ 2	p	b	t	d	k	g	f	v	s	z	ʃ	ʒ	m	n	ɲ	ʁ	l
p	na		n/a						na	n/a	na					na	n/a
b				na		na		na		n/a				na	na	na	na
t			na											a			
d	a	?	na	a		a		n/a	a	na			n/a	na			?
k			na							na				na		na	
g										na				na			na
f			na	na						n/a			a	n/a		a	na
v				na		na		na						n/a			n/a
s	?				n/a	a		na	?				n/a			n/a	?
z										na							
ʃ								n/a					a	n/a			
ʒ			a	na										n/a			a
m		na				na			a	a				n/a		n/a	n/a
n			na					n/a			na			na		na	
ɲ																	
ʁ	a	n/a	n/a	n/a	n/a	a	a	n/a	n/a		a	a	a	n/a			n/a
l					?			n/a	n/a							na	

Table 3.11: Phonotactic distribution of alternating and non-alternating [œ], based on PFC spontaneous speech data and Racine (2008)

In Section 3.2.2.1, we dicuss two hypotheses regarding the phonotactically driven distribution of alternating and non-alternating [œ]; they are repeated below:

(10) Hypothesis A1, repeated from Example (1)
There exists one category /œ/ in the inventory, with two output realisations [œ] and ∅. The loci of the [œ] ~ ∅ alternation stand in complementary distribution with the loci of non-alternating [œ]; [œ] alternates with ∅ in a naturally defined set of phonotactic environments, while the residual set of phonotactic environments licenses [œ], not ∅.

Hypothesis A2, repeated from Example (2)
There exists one category /œ/ in the inventory, with two output realisations [œ] and ∅. The loci of the [œ] ~ ∅ alternation stand in overlapping distribution with the loci of non-alternating [œ]; [œ] alternates with ∅ in a naturally defined set of phonotactic environments, but within this set, some phonotactic environments licence [œ], not ∅, in a defined group of words. The residual set of phonotactic environments licenses [œ], not ∅.

We reject Hypothesis A1 because the segmental combinations that authorise alternating and non-alternating [œ] do not stand in complementary distribution. At present, we cannot reject Hypothesis A2 because the distribution of alternating and non-alternating [œ] with respect to segmental context shows an overlap. However, it remains to be shown whether the set of phonotactic environments authorising [œ]-alternation can be naturally defined, and whether within this set of overlapping phonotactic environments there is a way to isolate the groups of words that allow alternating and non-alternating [œ], respectively. As regards the naturalness of the set of segmental contexts authorising the alternation, Table 3.11 does not immediately reveal any pattern. Nevertheless, there are some tendencies to be observed, cf. Example (11).[116]

(11) a. No alternation

$C_{x\ [+/-\ vce]}$ + $C_{x\ [+/-\ vce]}$	exception: [dœd]
$Plo_{[lab]\ or\ [vel]}$ + C	exceptions: [pœt], [pœz], [bœz], [pœl]
Nas + Plo	exceptionless
$Nas_{[cor]}$ + sonorant	exceptionless

b. Alternation possible

$Plo_{[cor]}$ + C	exceptions: [dœz], [dœn]
Fri + C	exceptions: $Fri_{[labden]}$ + Plo, [ʒœd], [sœv]
Nas + Fri	exception: [nœʃ]
$Nas_{[lab]}$ + sonorant	exceptionless
Liq + C	exception: [lœʁ]

First, note that [œ]-alternation is not authorised in the case of two consonants identical for place and manner. The only exception is *dedans* 'inside' [d(œ)dɑ̃], which is also found without a vowel in the complex adverb *là-dedans* 'inside there' (6/7 occurrences of vowel absence in the production data). The possibility of alternation after C_1 = [d] is further strengthened when we look at the totality of combinations with a plosive C_1. Although it is well established in the literature that plosives do not favour the absence of a following [œ] (Walker 1996, Côté 2009), the distribution in Table 3.11 reveals that this seems to be particular to non-coronal plosives. The coronal plosives, on the other hand, allow alternation across the board. Alternating [œ] is attested with a plosive C_2 in *degré* 'degree' [d(œ)gʁe], with a fricative C_2 in *devinette* 'riddle' [d(œ)vinɛt] (but note *devin* 'soothsayer' [dœvɛ̃]), with a nasal C_2 in *tenue* 'dress' [t(œ)nyː] and *demande* 'request' [d(œ)mɑ̃d] (but note *demeuré* 'stupid' [dœmœre]), and possibly with a liquid C_2 in the empirically unattested *delà* 'further away'. The only exception to alternation admissibility is when C_1 = [d] combines with C_2 = [z], e.g. *deuxième* 'second', which Walker (1996) analyses as a rightward segmental context that blocks alternation. In this context, however, the labials authorise alternation, at least in Swiss French, e.g. *pesée* 'action of pressing' [p(œ)zeː] (but note *pesage* 'enclosure' [pœzɑːʒ]) and *besoin* 'need' [b(œ)zwɛ̃] (but note *besogne* 'work' [bœzɔɲ]). Like the coronal C_1, the velar C_1 is attested with a non-alternating [œ] when C_2 = [z], e.g. *quesot* 'glass tube' [kœzo] and *gueuserie* 'beggary' [gœzʁi]. It is possible that the non-alternation attested with a C_2 = [z] can be explained on phonotactic grounds for C_1 = [d], i.e.

[116] The strength of the tendencies could possibly be intensified if token frequency was taken into account across the data set. For instance, for the combination [sœk], the sole item with a non-alternating [œ] is *sequin*, referring to a historical gold coin that was minted in the 13th century. The remaining group of items with [sœk] for which we have judgement data, all authorise an alternating [œ], e.g. *secours* 'aid', with a *c.e.f.* value of 0.83. The exclusion of *sequin* would entail a generalisation of an alternating [œ] in context [s] + $Plo_{[vel]}$. However, the decision not to include token frequency in the examination of the empirical data prevents us from obtaining such refined generalisations at this point. As shown in the production data, however, and further, as shown in Section 6.3 with child-directed speech, the phonotactic distribution the child is confronted with seems to diverge slightly from the one presented in Table 3.11.

*[dzj] for *deuxième*, and on the basis of token frequency for the velar C_1. While *queusot* is not found in Lexique, *gueuserie* is attested with a low token frequency. Finally, the voiceless labial is found with alternating [œ] in two other cases, i.e. [p(œ)t] in *petit* ‘small’ [p(œ)ti] (but see *peton* ‘tiny foot’ [pœtɔ̃]) and [p(œ)l] in *peluche* ‘teddy bear’ [p(œ)lyʃ] (but see *pelage* ‘fur-lined coat’ [pœlɑːʒ]). These are difficult to explain purely on phonotactic grounds, given the stability of the vowel in the phonotactically similar contexts, e.g. [bœd] in *bedaine* ‘belly’ [bœdɛn] and [bœl] in *belon* ‘Belon oyster’ [bœlɔ̃].

Another well attested environment that freely accepts alternation is a fricative C_1 (Walker 1996, Côté 2009). The only regular exception in our data is the combination of a non-sibilant, labiodental fricative and a plosive, e.g. *vedette* ‘(theatrical) star’ [vœdɛt]. If the perceptual salience of the consonant plays a role in alternation acceptability, as Côté (2000) shows is the case for schwa in a C#C<e>C context, then it is possible that the lower intensity that is inherently assigned to the non-sibilants disfavours their sequencing with a plosive C_2. For the salience of the internal cues in sibilants, see Wright (2004). As for the sibilant C_1 preceding a plosive C_2, i.e. [s] and [ʒ], when we take out *sequin* (type of adornment) [sœkɛ̃], they combine exclusively with alternating [œ], e.g. *secours* ‘help’ [s(œ)kuːʁ], *seconde* ‘second’ [s(œ)gɔ̃d], *jetée* ‘breakwater’ [ʒ(œ)teː], and possibly the unattested *cependant* ‘however’. The sole exception to this regularity is C_1 = [ʒ] in combination with C_2 = [d], attested in *jeudi* ‘Thursday’ [ʒœdi]. This example cannot be explained straightforwardly on phonotactic grounds given the fact that [œ] alternates in a similar context like [ʒœt], e.g. *jeton* ‘chip’ [ʒ(œ)tɔ̃]. When a fricative C_1 combines with a fricative, nasal, or a liquid C_2, on the other hand, alternating [œ] is attested across the board, although in competition with non-alternating [œ] in the majority of cases. We first look at the items with a fricative C_2. Alternation is blocked when [œ] precedes the cluster [vʁ], an observation Walker (1996) makes, e.g. *cheval* ‘horse’ [ʃ(œ)val] vs. *sevrage* ‘weaning’ [sœvʁɑːʒ] and *chevreuil* ‘roe deer’ [ʃœvʁœj]. The fact that the cluster [vʁ] acts as a blocker is seemingly context-sensitive, because although [vʁ] blocks alternation with a fricative C_1 (or a liquid C_1, cf. below), the coronal plosive C_1 in the verbal stem <devr> ‘should$_{\text{FUT/COND}}$’ [d(œ)vʁ] authorises vowel absence in 11/23 occurrences in our production data. The behaviour of [œ] with a fricative C_1 and C_2 = cluster [vʁ] may possibly be explained on phonotactic grounds. This does not seem to be the case with the FriFri-combination [fœz], which authorises [œ]-alternation in *faisait* ‘do$_{\text{3-SG-IMPERF}}$’ [f(œ)zɛ] (but see *faiseur* ‘bluffer’ [fœzœːʁ]). If we abstract away from *felouque* ‘felucca’ [fœluk], a fricative C_1 in combination with a sonorant C_2 allows [œ]-alternation, e.g. *femelle* ‘female’ [f(œ)mɛl], *fenêtre* ‘window’ [f(œ)nɛtʁ] (but note *fenaison* ‘haymaking’ [fœnɛzɔ̃]), *ferait* ‘do$_{\text{3-SG-COND}}$’ [f(œ)ʁɛ], *venue* ‘arrival’ [v(œ)nyː] (but note *venaison* ‘venison’ [vœnɛzɔ̃]), *velours* ‘velvet’ [v(œ)luːʁ] (but note *velouté* ‘velvetiness’ [vœlute]), *semaine* ‘week’ [s(œ)mɛn] (but note *semoir* ‘seed bag’ [sœmwɑːʁ]), *cerise* ‘cherry’ [s(œ)ʁiːz] (but note *serein* ‘calm’ [sœʁɛ̃]), possibly *cela* ‘that’, for which we have an occurrence of schwa absence in production, *chemin* ‘road’ [ʃ(œ)mɛ̃], *chenille* ‘caterpillar’ [ʃ(œ)nij] (but note *chenet* ‘andiron’ [ʃœnɛ]), *genou* ‘knee’ [ʒ(œ)nu] (but note *jeunet* ‘youngish’ [ʒœnɛ]), and *gelée* ‘frost’ [ʒ(œ)leː].

Turning to the combinations with a nasal C_1, alternation is banned with a plosive C_2, e.g. *meubler* ‘furnish$_{\text{INF}}$’ [mœble]. The plosive C_2 is in all cases part of an ObsLiq-cluster, e.g. *meugler* ‘moo$_{\text{INF}}$’ [mœgle] and *neutraliser* ‘neutralise$_{\text{INF}}$’ [nœtʁalize], which could explain the stability of [œ]. However, the fact that rightward ObsLiq-clusters do not obligatorily block alternation, e.g. *replâtrage* ‘replastering’ [ʁ(œ)platʁɑːʒ] and *degré* ‘degree’ [d(œ)gʁe], prevents us from further pursuing this idea, at least for the moment. When a nasal C_1 is combined with a fricative C_2, the vowel is subject to alternation, e.g. *monsieur* ‘mister’ [m(œ)sjø], *mesure* ‘measure’ [m(œ)zyːʁ], and *neveu* ‘nephew’ [n(œ)vø]; however, note *neuvième* ‘ninth’ [nœvjɛm], which is possibly stable because of a constraint *[nvj] that bans this particular cluster. The only context in which we find vowel stability is the combination of a nasal C_1 and a coronal fricative C_2 in [nœʃ], attested in a single example *Neufchâtel* 'name of a French cheese'. In cases of a sonorant C_2, only the labial nasal C_1 authorises [œ]-alternation, e.g. *menace* 'threat' [m(œ)nas] (but note *menuisier* 'carpenter' [mœnɥizje]), *meringue* 'meringue' [m(œ)ʁɛ̃g] (but note *merisier* 'wild cherry tree' [mœʁizje]) and *melon* 'melon' [m(œ)lɔ̃] (but note *meulage* 'grinding' [mœlɑːʒ]). Although the post-nasal glide in *menuisier* could explain the vowel stability (i.e. *[mnɥ]), an explanation on phonotactic grounds does not seem to be available for *merisier* or *meulage*. As regards the coronal nasal C_1, it only combines with a sonorant C_2 in *neuneu* 'a familiar term for a person characterised as slightly stupid, which is analysed as a doubling of *nœud* 'knot'' [nœnø], and the medical element *neuro-* and its derivatives (from Greek *neuron* 'nerve'), neither of which occurs with an alternating [œ]. It is possible that the particular etymology of these words has a synchronic effect on the alternation admissibility, but this variable is beyond the scope of our study.

Finally, the group of combinations with a liquid C_1 is the most straightforward in that alternating [œ] is authorised across the board, although frequently in competition with non-alternating [œ]. For instance, with a plosive C_2, we find *repère* 'marker' [ʁ(œ)pɛʁ], *rebord* 'edge' [ʁ(œ)bɔːʁ] (but note *rebelle* 'rebel' [ʁœbɛl]), *retard* 'delay' [ʁ(œ)tɑːʁ] (but note *retable* 'retable' [ʁœtabl]), *redresseur* 'rectifier (of current)' [ʁ(œ)dʁɛsœːʁ] (but note *redingote* 'riding coat [ʁœdɛ̃gɔt]), *requin* 'shark' [ʁ(œ)kɛ̃] (but note *requis* 'required' [ʁœki]), *regard* 'look' [ʁ(œ)gɑːʁ], and possibly *lequel* 'which' [l(œ)kɛl], which is attested with a vowel in the one occurrence found in the production data. These examples of an overlap cannot be explained on the basis of the consonants flanking [œ]. With a fricative C_2, we find *reflet* 'reflection' [ʁ(œ)flɛ], *revanche* 'revenge' [ʁ(œ)vɑ̃ʃ] (but note *revalorisation* 'reassessment' [ʁœvalɔʁizasjɔ̃]), *reçu* 'receipt' [ʁ(œ)sy] (but note *ressac* 'surf' [ʁœsak]), *recharge* 'refill' [ʁ(œ)ʃaʁʒ], *rejet* 'rejection' [ʁ(œ)ʒɛ], *levée* 'raising' [l(œ)veː] (but note *levraut* 'small hare' [lœvʁo]), and *leçon* 'lesson' [l(œ)sɔ̃] (but note the medical term *leucémie* 'leukaemia' [lœsemi]). Again, except for the rightward cluster [vʁ] observed in *levraut*, nothing in the immediate context of [œ] explains the overlap in distribution. The same is true for combinations with a sonorant C_2, e.g. *remorque* 'trailer' [ʁ(œ)mɔʁk], *renard* 'fox' [ʁ(œ)nɑʁ] (but note *renardeau* 'fox cub' [ʁœnaʁdo]), and *relève* 'relief' [ʁ(œ)lɛv] (but note *relique* 'relic' [ʁœlik]). The only exception to the overlap in distribution with a liquid C_1 is the combination of [l] and [ʁ], found solely with non-alternating [œ] in *leurrer* 'deceive$_{\text{INF}}$' [lœʁe].

We end this section with a note on [œ]-alternation and the Sonority Sequencing Principle (SSP), which traditionally requires segments belonging to a given syllable to rise in sonority from the edges to the peak (cf. Côté 2000, for a reformulation of SSP whereby syllabic constituents are removed from the definition). Acknowledging that a variety of versions of the sonority hierarchy appears in the literature, we follow Côté (2000) and adopt Clements' (1990) version: vowels (most sonorous) > glides > liquids > nasals > obstruents (least sonorous). Evaluating [œ]-alternation in light of SSP, the realisation of [œ] should be favoured in order to avoid the creation of an onset cluster of decreasing sonority, e.g. [ʁœg] > [ʁg]. Also, under this assumption the rate of vowel absence should decrease proportionally to the sonority profile of the cluster, reflecting the gradient acceptability of phonotactic structures in grammar, e.g. [pl] > [pœl] but [ʁœg] > [ʁg].[117] Table 3.12 presents the nouns and nominalised elements attested in our production data with [œ] judged as either alternating or highly frequently alternating (cf.

[117] Cf. Clements (2009) for a recent discussion of the definition of sonority.

Table 3.9), and all the verbal forms (cf. Table 3.10), sorted according to the manner of C_1 and C_2, and the sonority profile of their combination.

Raising sonority			**Sonority plateau**			**Falling sonority**		
Type	**Occ.**	**%**	**Type**	**Occ.**	**%**	**Type**	**Occ.**	**%**
ObsNas	158/178	89	ObsObs	400/481	83	NasObs	6/10	60
ObsLiq	57/58	98	NasNas	0/2	0	LiqObs	176/299	59
NasLiq	-	-	LiqLiq	2/15	13	LiqNas	30/41	73
Total	215/236	91	Total	402/498	81	Total	212/350	61

Table 3.12: Rates of schwa absence according to the sonority profile of C_1C_2, occurrences and percentages[118], based on PFC spontaneous speech data and Racine (2008)

Table 3.12 repeats the results presented throughout this section, whereby [œ] is subject to alternation regardless of the sonority profile of the cluster. Despite the low number of occurrences for some of the combinations, the global results show that schwa alternation is generally more frequent when the resulting cluster is in conformity with the SSP. This is in line with the results in Côté (2009), who observes three groups of clusters with regard to rates of alternation admissibility. Côté bases her study on Quebec French judgement data and a Quebec French corpus of folkloric tales, and she performs a three-way classification of schwa, i.e. absent, variable, and stable, which depends on the rate of absence vs. presence.[119] First, Côté identifies a group comprising sequences of an obstruent C_1 and a liquid C_2, in which there is a very strong preference for schwa absence, e.g. *velours* ‘velvet’, *cerise* ‘cherry’, *gelée* ‘frost’, and *pelouse* ‘lawn’; in 91% of the cases, the vowel is never present at the surface, which patterns well with the Swiss French PFC data that show 98% absence of schwa in the context of ObsLiq. Second, Côté identifies a group comprising sequences where C_2 is lower on the sonority scale than C_1, which includes the FriPlo-sequences (cf. Footnote 118), and in which complete schwa absence is far less frequent, e.g. *levée* ‘lifting’, *lever* ‘lift;inf’, *mesure* ‘measurement’, *secours* ‘aid’, and *jetée* ‘pier’; variably or categorically present, schwa hinders the production of phonotactically less optimal clusters like [lv] and [mz]. Again, Swiss French seems to pattern with Quebec French in that various clusters with falling sonority are attested with a rate of alternation ranging from 59% (LiqObs) to 73% (LiqNas), which is substantially lower than the rate observed for the ObsLiq-clusters.[120] Third, Côté identifies a group comprising the ObsObs-sequences, FriFri, PloFri, and PloPlo, e.g. *cheville* ‘ankel’, *dessous* ‘under’, *dedans* ‘in there’, and ObsNas-sequences, FriNas and PloNas, e.g. *fenêtre* ‘window’, *demander* ‘ask’. For this group, the nature of the initial segment turns out to be important. The fricative C_1 favours total absence of schwa, e.g. *venir* ‘come$_{\text{INF}}$’ [vniʁ], and the plosive C_1 favours a variable schwa, e.g. *tenir* ‘hold$_{\text{INF}}$’ [t(œ)niʁ]. As shown in Table 3.13, Swiss French seems to behave in a similar fashion to Quebec French with regard to the rate of schwa alternation. While the rate of schwa absence is elevated in the PloPlo-context, which is to be

[118] As we see in what follows, Côté (2009) splits the ObsObs-sequences into two groups. For the FriPlo-sequences, our data reveal a 58% absence of schwa (7/12 occurrences), and for the PloFri-sequences, they reveal a 60% vowel absence (68/114). For the sake of completeness, we mention that the vowel absence in PloPlo- and FriFri-sequences amounts to 89% (229/258) and 99% (96/97), respectively.

[119] Côté (2009:100) establishes a number of criteria for classifying a schwa as absent, variable, or stable. Schwa is classified as *absent* if the word is unanimously pronounced without vowel, and if the word occurs in a post-consonantal context at least once. Schwa is classified as *variable* if the word is sometimes pronounced with the vowel and sometimes without. Finally, schwa is classified as *stable* if the word is pronounced with the vowel across the board, and this at least once in a post-vocalic context. Recall that the Swiss data considered here are all drawn from the post-vocalic context.

[120] Note that Côté excludes items with initial <re> from her analysis.

expected because of the near-obligatory vowel absence in frequently occurring *petit* – left out from the analysis by Côté – the fricative C_1 is slightly more favourable toward vowel absence than the plosive C_1. Note that Côté excludes the verbal stem <fais> 'do;imperf' and the item *faisable* 'doable' from her analysis, but the fact that these items are highly frequently subject to alternation in our corpus does nothing but strengthen her analysis.

C_1 ↓	**C_2 →**	**Plosive**	**Fricative**	**Nasal**
Plosive		89% (229/258)	60% (68/114)	81% (57/70)
Fricative			99% (96/97)	94% (101/108)

Table 3.13: Rate of schwa absence in obstruent-initial words, by percentage and count, PFC spontaneous speech data

We conclude this section with a summary of our findings. In Section 3.2.2.1, we have presented three variables that potentially account for the distribution of alternating and non-alternating [œ]. In this section, we have tested the first variable, which is the segmental environment of the vowel, by making use of Swiss French judgement data and production data. Hypothesis A1, which claims there is a phonotactically defined complementary distribution, is not supported by the data. Hypothesis A2, which claims there is a phonotactically defined overlapping distribution, proves more successful. There are however a large number of overlaps that cannot be accounted for on phonotactic grounds, which implies that for a complete understanding of the distribution of alternating and non-alternating [œ], the identification of the other forces at work in the grammar is required. Therefore, we turn our attention to the second variable presented in Section 3.2.2.1, i.e. the items' morphological structure and its potential influence on the distribution of alternating and non-alternating [œ].

3.3.2.3 Distribution of (non-) alternating [œ] according to the morphological structure

In this section, we investigate the relation between the alternation admissibility of [œ] and the morphological structure of the lexical item, but first recall from the previous section that we reconfirm the absence of a 1:1 mapping between orthography and phonology. In other words, several <e> = [œ] are phonologically non-alternating and hence fall out of our definition of schwa. As regards the morphological structure of the lexical item with [œ], focus in the literature has hitherto centred on [œ] = <e> that occurs at morphological junctures word-medially – e.g. *nettement* 'distinctly' [nɛtmɑ̃] vs. *appartement* 'apartment' [apaʁt(œ)mɑ̃] vs. *autrement* 'otherwise' [otʁœmɑ̃] – or in morpheme-final and word-final syllables – e.g. *nette* 'distinct$_{\text{FEM}}$' [nɛt] vs. *apporte* 'bring$_{\text{3-SG-PRE}}$' [apɔʁt(œ)] vs. *autre* 'other' [otʁ(œ)]. While an [œ] may also be produced word-medially in *nettement* in a highly controlled register, like reading, a word-medial [œ] preceded by a cluster is variably or obligatorily realised depending on the nature of the latter, LiqObs in *appartement* 'apartment' vs. ObsLiq in *autrement* 'otherwise'. Word-finally, e.g. in *nette* 'distinct$_{\text{FEM}}$', [œ] is never obligatorily present, except when it is called for by metrical requirements in songs or in the recitation of classical poetry (Morin 2003). Even if [œ] at morphological junctures is interesting from a phonotactic point of view (i.e. the types of segments requiring [œ]-presence), it is generally considered epenthetic, or non-anchored in a multi-linear approach, and, therefore, different in nature from morpheme-internal [œ] = <e> that occurs in word-initial syllables, cf. Tranel (1981), Lyche and Durand (1996), Côté (2000), and

Côté and Morrison (2007).[121] For this reason, we exclude word-medial and word-final [œ] = <e> from the remainder of the section.

One morphologically defined operation that affects schwa is the alternation between [œ] or ∅ and [ɛ] observed in a limited set of verbs, for instance *geler* 'freeze' and *lever* 'rise'; these verbs are found with [œ] or ∅ in the infinitive *geler/lever* and the past participle *gelé/levé*, i.e. [ʒ(œ)le] and [l(œ)ve], and with [ɛ] in the third person present *gèle/lève*, i.e. [ʒɛl] and [lɛv], and in the third person future *gèlera*/*lèvera*, i.e. [ʒɛlʁa] and [lɛvʁa].[122] Several generative scholars attempt a phonological analysis of the [œ] ~ ∅ vs. [ɛ] alternation, cf. Selkirk (1972), Anderson (1982), Tranel (1984), and Dell (1985); however, Morin (1988) considers these alternations to be an example of allomorphy, whereby each lexical verb has two stems containing different underlying vowels, surfacing as [œ] ~ ∅ and [ɛ], respectively. In what follows, we adopt Morin's point of view and do not consider [ɛ] in *gèle* and *lève* to be an allophone of /œ/. Important for our analysis, however, is that we identify a morphologically defined set of words that contains schwa; the allomorph with /œ/, as opposed to the allomorph with [ɛ], can optionally be realised as ∅. In his study of schwa, couched in the CVCV framework of Government Phonology, Scheer (1999) focuses on a morphologically homogeneous data set, well aware of the possibility that "nombre de généralisations qui ont des chances d'être pertinentes pour le fonctionnement phonologique de schwa sont démenties par les seuls objets morphologiquement complexes" (1999:89). Scheer examines words in which [œ] = <e> and the surrounding consonants belong to the same morpheme, but he does not discuss the syllabic count of the morpheme and the position of [œ] = <e>, e.g. *degré* 'degree' [d(œ)gʁe], *bretelle* 'strap' [bʁœtɛl], *vendredi* 'Friday' [vɑ̃dʁœdi]. This thesis has a different focus that targets the vowel [œ], irrespective of its orthographic correspondant, <e> or <eu>, when it is positioned in the word-initial syllable with a simplex onset. Also, we include morphological boundaries into the discussion in order to see whether these have any affect on [œ]-alternation.[123] Accordingly, in what follows, we aim to separate our database into two groups defined by morphological structure. The first group [CœC(C)+] represents [œ], orthographically <e> or <eu>, that is present in a word-initial monosyllabic morpheme. The second group [CœC(C)V…] represents [œ] = <e> or <eu> present in a word-initial polysyllabic morpheme. The notation […] indicates

[121] The definition of a morpheme is debated, but as morphology proper is not the main subject of the thesis, we abstain from engaging in the debate and merely adopt Aronoff's (1976:15) conception of a morpheme as "a phonetic string which can be connected to a linguistic entity outside that string." By taking this stand, we do not exclude complex items whose sub-components do not have a unique and stable semantic meaning (cf. Corbin 1987, for an opposing view).

[122] Note that this vowel alternation is also found in items with CC<e>C, for instance *crever* 'die', where [œ]-absence is ungrammatical; [œ] is found in the infinitive *crever* and the past participle *crevé*, i.e. [kʁœve]/*[kʁve], and [ɛ] is found in the third person present *crève* [kʁɛv] and in the third person future *crèvera* [kʁɛvʁa]. We do not further comment on these forms. Nor do we comment on verbs where the alternation is located in a non-initial syllable, for instance *appeler* 'call'; [œ] or ∅ is found in the infinitive *appeler* and in the past participle *appelé*, i.e. [ap(œ)le], and [ɛ] is found in the third person present *appelle* [apɛl] and in the third person future *appellera* [apɛlʁa]. Finally, note that although Morin (1988) additionally discusses non-deverbal derivations, e.g. *lunettes* 'glasses' [lynɛt] vs. *lunetier* 'optician' [lyntje] vs. *lunetté* 'bespectacled' [lynɛte], we find this to be beyond the scope of this thesis.

[123] Remember that, given the main goal of the chapter, elucidating the structural properties of <e> and <eu>, we transcribe the phonological correspondent of <eu>, present in word-initial syllables, as [œ] across the board. It is quite possible that <eu>, at least for some speakers in an unidentified group of words, is pronounced [ø] (cf. Martin 1998, on the vowel qualities of <e> and <eu> in Quebec French). Well aware of this possibility, we refer to the data examination in Section 5.3.1, which might indicate whether schwa and the stable vowel can additionally be predicted on the basis of their acoustic properties.

that the number of syllables following the initial syllable with [œ] can be one, two, or several.[124]

(12) [CœC(C)+] [œ] present in a word-initial monosyllabic morpheme, preceded by one consonant and followed by one (or two) consonant(s)
e.g.: *gel+er* ‘freeze$_{\text{INF}}$’, *meubl+er* ‘furnish$_{\text{INF}}$’

[CœC(C)V…] [œ] present in a word-initial polysyllabic morpheme, preceded by one consonant and followed by one (or two) consonant(s)
e.g.: *cheval+ier* ‘knight’, *jeudi* ‘Thursday’

First, the majority of items with non-alternating [œ] = <eu> fall into the group [CœC(C)+]. Exceptions are the items listed in Example (13), which mainly consist of infrequent loanwords, proper names, and unproductive stems. The location of stable [œ] in the position [CœC(C)+] is noted by Morin (1977:10), who argues that the merger of /œ/ and schwa is facilitated by their limited ability to contrast (cf. Section 3.4.2.2 for a detailed presentation of the analysis). The above-mentioned exceptions aside, the morphological structural environment for non-alternating [œ] = <eu> can be defined as [CœC(C)+], e.g. *peupl+ade* ‘small tribe$_{\text{N}}$’ [pœplad], *feul+ement* ‘snarl$_{\text{N}}$’ [fœlmɑ̃], *meubl+é* ‘furnish$_{\text{PAST-PART}}$’ [mœble], and *jeûn+er* ‘fast$_{\text{INF}}$’ [ʒœne].

(13) [œ] = <eu> in items with the morphological structure [CœC(C)V…]

a. Loanwords
deutér(o)- [dœteʁ(o)] an element from Greek *deuteros* ‘second’, also found in the compounds *deutérium*, *deutéron* (or *deuton*), and *deutérocanonique*; *neurone* [nœʁɔn] from Greek *neuron* ‘nerve’, also found in *neuronal* [nœʁɔnal]; *neutron* [nœtʁɔ̃] borrowed from English, also found in *neutronique* and *neutrographie*; *neutrino* [nœtʁino] type of elementary particle, borrowed from Italian; *peuchère* [pœʃɛːʁ] a regional interjection expressing an ironic or affectionate commiseration, Frenchified form of the Occitan *pécaïre* ‘fisherman’; *teuton* and *teutonique* [tœtɔ̃/-ik] ‘Teutonic’ an ancient Germanic people; *veuglaire* [vœglɛːʁ] ‘veuglaire gun’ from Dutch

b. Proper names and technical terms
Neufchâtel [nœʃatel] a cheese made in Normandie; *peucédan* [pœsedɑ̃] ‘peucedanum’; *zeuzère* [zœzɛːʁ] ‘Zeuzera’

c. Unproductive stems
beuverie [bœvʁiː] ‘booze-up’ an unproductive stem variant of *boire* [bwɑːʁ] ‘drink$_{\text{INF}}$’; *meurette* [mœʁɛt] a red-wine sauce, from Old French *muire* ‘salted water’; *feudataire* [fœdatɛːʁ] ‘vassal’ and the related term *feudiste* [fœdist] ‘specialist in feudal laws’ from Medieval Latin *feudum* ‘fief’

d. Other
neutraliser [nœtʁalize] from Latin *neutralis*, also found in *neutralisant, neutralisation, neutralisme, neutraliste,* and *neutralité*; *jeudi* [ʒœdi] ‘Thursday’; *neuneu* [nœnø] a familiar term for a person characterised as slightly stupid,

[124] See also Andreassen (2011) for a first version of this analysis.

analysed as a doubling of *nœud* ‘knot’; *deuzio* [dœzjo] ‘secondly’ familiar expression

Second, the examination of the written database reveals that all items with the structure [CœC(C)+] and with [œ] = <e> are verbal roots in which allomorphy or suppletion takes place in inflection, and which participate in word-formation by combining with a variety of derivational suffixes, e.g. the nominal <ade> and <age>. The sole exception is nominal <chevr>, e.g. *chevreau* ‘baby goat’ [ʃœvʁo] vs. *chèvre* ‘goat’ [ʃɛvʁ].[125] Three groups of verbal roots can be identified; the first group consists of the above-mentioned verbs subject to the allomorphic alternation [œ] ~ ∅ vs. [ɛ], e.g. <cel> ‘conceal’ /sœl/, <jet> ‘throw’ /ʒœt/, <gel> ‘freeze’ /ʒœl/, <lev> ‘rise’ /lœv/, <men> ‘lead’ /mœn/, <pel> ‘peel’ /pœl/, <pes> ‘weigh’ /pœz/, and <sem> ‘sow’ /sœm/. The second group consists of the two verbs *tenir* ‘hold$_{\text{INF}}$’ and *venir* ‘come$_{\text{INF}}$’, which are subject to a morphologically defined alternation whereby [œ] ~ ∅ is found in the infinitive, the present participle, the imperfect, and the past participle, e.g. *tenir* ‘hold;inf’ [t(œ)niːʁ]; [jɛ̃] is found in the singular present and the future, e.g. *tient* ‘hold;3-sg-pr’ [tjɛ̃]; [jɛn] is found in the third person plural present and in the singular and third person plural present subjunctive, e.g. *tiennes* ‘hold;2-sg-pr-sub’ [tjɛn]. The third group consists of the two verbs *être* ‘be$_{\text{INF}}$’ and *faire* ‘do$_{\text{INF}}$’, which in the conditional and future tenses select the suppletive stems /sœʁ-/ and /fœʁ-/, respectively, and are subject to [œ]-alternation, e.g. *serait* [s(œ)ʁɛ] (3-SG-COND) and *fera* [f(œ)ʁa] (3-SG-FUT). As regards *faire*, it additionally has an imperfect suppletive stem /fœz-/, which is also subject to alternation, e.g. *faisaient* [f(œ)zɛ] (3-PL-IMPERF).

The remainder of the items with [œ] = <e> have a structure [CœC(C)V…], ranging in length from two syllables, e.g. *reprise* ‘rerun’ [ʁ(œ)pʁiːz], to seven, e.g. *représentativité* ‘representativity’ [ʁ(œ)pʁezɑ̃tativite].

Recall the alternation acceptability observed for the various [œ] = <e>. First, as regards <e> in the context [CœC(C)+], and as already indicated in Section 3.3.2.2, [œ]-alternation does not take place in <sevr> ‘wean$_{\text{V}}$’ /sœvʁ/ most likely because of the combination of C_1 = [s] and C_2 = cluster [vʁ] (cf. *chevreau* ‘baby goat’ *[ʃvʁo]). The judgement data also show further inconsistency in alternation admissibility in this morphologically defined context as, for instance, [œ] alternates in *pes+ée* ‘weighing’ and *lev+age* ‘lifting’, but not in *pes+age* ‘weighing’. The behaviour of <e> is seemingly also inconsistent in the context [CœC(C)V…] because, according to the judgement data in Racine (2008), [œ]-alternation is blocked in a phonotactically and lexically heterogeneous group of items, exhaustively listed in (14).

(14) Non-alternating [œ] = <e> in context [CœC(C)V…], *c.e.f.* values between -6.00 and -3.01, based on Racine (2008)

a. Disyllables
belote ‘name of a card game’, *besogne* ‘(piece of) work’, *demeure* ‘habitation’, *guenille* ‘old rag’, *querelle* ‘quarrel’, *levrette* ‘greyhound bitch’, *merise* ‘wild cherry’, *rebelle* ‘rebel’, *relique* ‘relic’, *semonce* ‘reprimand’, *vedette* ‘(theatrical) star’, *bedaine* ‘belly’, *bedeau* ‘verger’, *bedon* ‘belly’, *belette* ‘weasel’, *belon* ‘Belon oyster’, *benêt* ‘silly’, *besace* ‘pilgrim’s scrip’, *devin* ‘soothsayer’, *felouque* ‘felucca’, *faisan(e)* ‘pheasant’, *quenelle* ‘meatball’, *quenouille* ‘distaff’, *levraut* ‘leveret’, *peton* ‘tiny foot’, *rebut* ‘rubbish’, *relent* ‘musty smell’, *renom*

[125] Note that we here present the items with [œ] = <e> without taking into account the alternation acceptability of the vowel outlined in Section 3.3.2.2.

‘renown’, *recel* ‘harbouring (of criminal)’, *ressac* ‘surf’, *retable, sequin* ‘type of adornment’, *chevreuil* ‘roe deer’, *chenal* ‘entrance fairway’, *chenet* ‘andiron’, *serein* ‘serene’, *serin* ‘canary’, *chevron* ‘chevron’, *venin* ‘poison’, *genèse* ‘genesis’, *genêt* ‘broom’, *levain* ‘leaven’, *reclus(e)* ‘reclusive’, *requis* ‘required’, *guenon* ‘ugly woman’

b. Trisyllables[126]
reliquaire ‘reliquary’, *demeuré(e)* ‘stupid’, *velouté* ‘velvetiness’, *renardeau* ‘fox cub’, *levantin(e)* ‘Levantine’, *menuet* ‘minuet’, *redingote* ‘frock coat’, *renégat(e)* ‘renegade’, *renoncule* ‘buttercup’, *venaison* ‘venison’, *genièvre* ‘gin’, *fenaison* ‘haymaking’

c. Tetrasyllables +[127]
recréation ‘recreation’, *menuisier* ‘woodworker’, *merisier* ‘wild cherry tree’, *ressortissante* ‘under the jurisdiction of (fem.)’, *revalorisation* ‘reassessment’, *religiosité* ‘piousness’, *genévrier* ‘juniper (tree)’

We organise the results of alternating and non-alternating [œ] according to the morphological structure of the lexical items, and we obtain the distribution presented in Table 3.14.

Morph. structure	**HFA [œ] = <e>**	**A [œ] = <e>**	**NA [œ] = <e>**	**NA [œ] = <eu>**
CœC(C)+	√ *levure* [l(œ)vyːʁ] (allomorphy or suppletion)	√ *levage* [l(œ)vaːʒ] *semeur* [s(œ)mœːʁ] (allomorphy)	√ *semoir* [sœmwaːʁ] (allomorphy)	√ *meulage* [mœlaʒ]
CœC(C)V…	√ *demi* [d(œ)mi]	√ *demain* [d(œ)mɛ̃]	√ *demeure* [dœmœːʁ]	(√) *jeudi* [ʒœdi]

Table 3.14: Morphological contexts authorising both types of [œ], based on Racine (2008) and Lexique/LPR

To summarise, the examination of the alternation admissibility for the two morphological contexts reveals that alternation is authorised in both contexts. However, in the context [CœC(C)+], alternation is restricted to a set of verbal stems which is subject to allomorphic variation, e.g. [œ] ~ ∅ vs. [ɛ], or suppletion (<ser> from *être* ‘be$_{\text{FUT/COND}}$’) in certain verbal tenses. As regards the context [CœC(C)V…], the large majority of items authorise alternation, but the data also contain a certain amount of items with a non-alternating [œ] = <e/eu>. Recall that these results are only based on nouns and nominalised elements found in the Brulex database (Content et al. 1990), cf. Racine’s (2008) methodology. To check whether the Swiss French PFC production data can shed further light on the hypothetical morphologically driven distribution, we include the nouns and nominalised elements for which we have judgement data, and all the verbal forms attested (cf. Table 3.9 and 3.10 for a detailed presentation). As regards [CœC(C)+], the inclusion of the verbal stems subject to allomorphy or suppletion does nothing but strengthen our claim about alternation admissibility in this context, see Table 3.15. The inclusion of verbs further increases the viability of the nominal judgement data; in verbs with a [CœC(C)V...] structure, [œ]-absence is tolerated in more than half of the cases.

[126] *Menuet* ‘minuet’ [mœnyɛ] and *genièvre* ‘juniper’ [ʒœniɛvʁ] are trisyllabic if diaeresis is applied.
[127] *Menuisier* ‘carpenter’ [mœnyizie] and *merisier* ‘wild cherry tree’ [mœʁizie] are tetrasyllabic (or more) if diaeresis is applied.

	CœC(C)+		CœC(C)V…	
	Occurrences	**%**	**Occurrences**	**%**
Nouns/elements$_N$	1/5	20	367/459	78
Verbs	233/268	87	233/357	65

Table 3.15: Rate of [œ] = <e> absence in the context V#C<e>C, distributed according to morphological structure, PFC spontaneous speech data, by count and percentage

In Section 3.2.2.1, we present two hypotheses regarding the morphologically driven distribution of alternating and non-alternating [œ], repeated below:

(15) Hypothesis B1, repeated from Example (3)
There exists one category /œ/ in the inventory, with two output realisations [œ] and ∅. The loci of the [œ] ~ ∅ alternation stand in complementary distribution with the loci of non-alternating [œ]; [œ] alternates with ∅ in a morphologically defined environment, while [œ], not ∅, is licensed elsewhere.

Hypothesis B2, repeated from Example (4)
There exists one category /œ/ in the inventory, with two output realisations [œ] and ∅. The loci of the [œ] ~ ∅ alternation stand in overlapping distribution with the loci of non-alternating [œ]; [œ] alternates with ∅ in a morphologically defined environment, but in this environment, [œ], not ∅, is licensed in a defined group of words. The residual set of morphologically defined environments license [œ], not ∅.

Although the distribution of non-alternating [œ] is, to a large extent, limited to the context [CœC(C)+] in forms not subject to allomorphy or suppletion, e.g. *peur+eux* 'timid' [pœʁø], it is also attested in a hitherto undefined group of words with a morphological structure [CœC(C)V…], thereby falsifying Hypothesis B1, which claims that alternating and non-alternating [œ] are in complementary distribution. In the case of an overlap, here restricted to the context [CœC(C)V…], Hypothesis B2 claims that the presence of non-alternating [œ] should be limited to a defined group. Therefore, we now look at the items listed in (14) to check whether the occasional stability of [œ] can be explained on the basis of phonotactic constraints, and thereby reveal an even stronger interaction of morphology and phonology regarding [œ]-alternation. This hypothesis is immediately falsified. Although the group with non-alternating [œ] in the context [CœC(C)V…] contains items with consonant sequences proven to block [œ]-alternation, e.g. [bœl] ~ *[bl] in *belote*, [lœvʁ] ~ *[lvʁ] in *levraut*, and [mœnɥ] ~ *[mnɥ] in *menuisier*, it also contains items whose initial segmental constitution is subject to variation, e.g. [sœm] ~ *[sm] in *semonce* vs. [sœm] ~ [sm] in *semaine* 'week', [ʒœn] ~ *[ʒn] in *genèse* vs. [ʒœn] ~ [ʒn] in *genou* 'knee', and [sœʁ] ~ *[sʁ] in *serein* vs. [sœʁ] ~ [sʁ] in *seringue* 'syringe'. For these latter items, then, neither morphologically defined constraints nor phonotactic ones are sufficient to account for the attested alternation frequencies. If lexical sub-class, which is examined in the following section, does not contribute to explain these data, it seems plausible that an extra-grammatical factor such as token frequency might play a role here, e.g. infrequently occurring *semonce* vs. frequently occurring *semaine*, cf. New et al. (2007). However, as already mentioned, this option is set aside in this chapter.

We conclude this section by a summary of our main findings. In Section 3.2.2.1, we have presented three variables that potentially account for the distribution of alternating and non-alternating [œ]. In this section, we have tested the second variable, which is the morphological structure of the item in which [œ] occurs. On the basis of Swiss French judgement and production data and the results on alternation admissibility, discussed in Section 3.3.2.2, we have established that Hypothesis B1, which claims there is a morphologically defined complementary distribution, is not supported by the data. Hypothesis B2, which claims there is a morphologically defined overlapping distribution, has proven more successful; a large number of the occurrences of alternating and non-alternating [œ] occur in the contexts [CœC(C)V…] and [CœC(C)+], respectively. As regards the context [CœC(C)+], we have additionally identified a group with <e> in the monosyllabic word-initial morpheme, which solely consists of verbal roots subject to allomorphy or suppletion. Counter to Hypothesis B1, also this group of items is variably subject to alternation, e.g. *pesée* with alternation vs. *pesage* without. In the following section, these particular forms will receive our attention when we turn to the importance of lexical subgroup affiliation and check whether the suffix adjoined to the stem with /œ/ has an influence on the alternation acceptability of the vowel.

3.3.2.4 Distribution of (non-) alternating [œ] according to the lexical subgroup affiliation

In this section, we examine the influence that a suffix potentially exerts on [œ]-alternation. We previously determine that [œ] = <eu> and [œ] = <e> occur, to a large extent, in different morphological configurations, i.e. monosyllabic vs. polysyllabic morphemes, but it is still far from clear at which rate a given stem-vowel <e> alternates between [œ] and ∅ for the various suffixes that combine with it. Bearing in mind the work on lexical sensitivity in constraint-based grammar (cf. Beckman 1998, Itô & Mester 2001, Anttila 2002, 2008, Pater 2009) and in particular the work on noun faithfulness (J. L. Smith 1997), we examine in what follows the alternation admissibility of [œ] in light of the various suffixes that attach to [CœC(C)+] and [CœC(C)V…], with the aim to corroborate or discard Hypothesis B2; we also aim to check the validity of Hypothesis C1 and C2, outlined in Section 3.2.2.1. First, however, recall from the previous section that if alternating [œ] = <e> is restricted to initial syllables of polysyllabic morphemes, [CœC(C)V…], and if non-alternating [œ] = <eu> is restricted to monosyllabic morphemes, [CœC(C)+], then Hypothesis B1 predicts that [œ] = <e> in monosyllabic morphemes does not alternate. However, the group of items with [œ] = <e> in a monosyllabic morpheme is subject to allomorphy or suppletion, e.g. [œ] ~ ∅ in *jeter/jeté* 'throw$_{\text{INF/PAST-PART}}$' [ʒ(œ)te] vs. [ɛ] in *jette/jettera* 'throw$_{\text{3-SG.PRE/FUT}}$' [ʒɛt]/[ʒɛtʁa]. These items constitute counter-evidence to Hypothesis B1 because they occasionally alternate. The fact that these items take part in an identifiable morphologically conditioned alternation could serve as a lexical group indicator. What remains to be accounted for is the occasional [œ]-stability observed within this group, e.g. *pes+age* 'weighing' [pœzaːʒ] ~ *[pzaːʒ]. If the various suffixes attached to the stem trigger some regularity regarding alternation admissibility, then this fact corroborates Hypothesis B2, which claims that there is a morphologically defined, overlapping distribution, as well as corroborates Hypothesis C1 or Hypothesis C2, which claim that there is a lexically defined, complementary and overlapping distribution. Second, recall from the previous section that counter to the predictions of Hypothesis B1, [œ]-alternation is blocked for a number of items with the structure [CœC(C)V…]. Although phonotactic constraints are identified as blockers for some of the items, e.g. *[ʃvʁ] in *chevreuil* 'roe deer', the large majority of this group remains unexplained, both in terms of the phonotactics and the morpho-phonology. What remains to be examined is the nature of the item itself and the nature of the suffix, if there is a suffix attached.

Thus, as an initial step in our search for a lexically driven [œ]-alternation, we list in Table 3.16 the suffixes that are attested to attach to stems with alternating and non-alternating [œ]. As previously outlined, the alternation acceptability of [œ] = <e> is defined on the basis of the *c.e.f.* values in Racine (2008). For the sake of readability, the stems are additionally classified according to their morphological structure, i.e. [CœC(C)+] and [CœC(C)V…].[128]

[128] Note that the suffix <ique>, only found for [œ] = <eu> in a context [CœC(C)V …], is not included in Table 3.16.

Suffix	[CœC(C)+]			[CœC(C)V…]		
	Alternating <e>	**Non-alternating <e>**	**Non-alternating <eu>**	**Alternating <e>**	**Non-alternating <e>**	**Non-alternating <eu>**
–ade$_N$		pelade	peuplade	reculade		
–age$_N$	levage	pelage, pesage, sevrage	feutrage, meulage, veuvage	pelotage, recopiage, recyclage, remariage, remontage, remorquage, repassage, repêchage, repérage, repiquage, replâtrage, reportage		
–(er)aie$_N$			peupleraie			
–aille$_N$	tenaille					
–(at)aire$_N$				retardataire	reliquaire	feudataire
–ance$_N$				reconnaissance, redondance, remontrance, renaissance, ressemblance		
–ant$_N$ –ante$_N$	levant, tenant		beuglant, beuglante meublant, gueulante	reconstituant, redoublant(e), remontant, représentant, ressortissant	ressortissante	neutralisant
–ard$_N$ –arde$_N$			gueulard	chevillard, revanchard(e)		
–(ari)at$_N$				secrétariat		
–(isa)tion$_N$ –(t)ion$_N$				recommandation, reconduction, reconstitution, reconstruction, reconversion, redistribution, relation, relaxation, relégation, remilitarisation, renonciation, représentation, reproduction, retransmission, revendication	recréation, revalorisation	neutralisation
–é$_{A/N}$ –ée$_{A/N}$	jeté, levé, pelé		beurré, feutré, meublé, peuplé	refoulé(e), retraité(e)	demeuré(e), velouté	
–eau$_N$				chemineau	renardeau, chevreau	
–ée$_N$	gelée, jetée, levée, pelée, pesée		beurrée	cheminée, chevauchée, remontée, renommée, retombée		
–ence$_N$	semence			recrudescence		
–er$_N$	lever					
–er, –ère$_N$				reporter		
–erie$_N$			beurrerie, gueuserie, meunerie, veulerie			beuverie

Suffix	[CœC(C)+]			[CœC(C)V…]		
	Alternating <e>	**Non-alternating <e>**	**Non-alternating <eu>**	**Alternating <e>**	**Non-alternating <e>**	**Non-alternating <eu>**
–esse$_{N}$			jeunesse	petitesse		
–et$_{N}$ –ette$_{N}$		chevrette	jeunet, seulet, sœurette	chevalet, devinette, chemisette, chenillette		
–eur$_{N}$ –euse$_{N}$	meneur/-euse, semeur/-euse, teneur	faiseur/-euse pesanteur	jeûneur, meuleuse	demandeur, peloteur/-euse, recruteur, redresseur, relieur/-euse, remorqueur, retoucheur/-euse, revendeur/-euse, repasseuse		
–eux$_{N}$ –euse$_{N}$			peureux	rebouteux/-euse		
–ier$_{N}$ –ière$_{N}$	levier	chevrier/-ière	beurrier, meunier, meulière, peuplier	cerisier, chemisier, chevalier, chevalière, devancier/-ière, genouillère	genévrier, menuisier, merisier	
–if$_{N}$ –ive$_{N}$				relatif/-ive		
–in$_{N}$ –ine$_{N}$					chevrotine, levantin/-ine	
–ir$_{N}$				repentir		
–is, –isse$_{N}$	semis					
–isme$_{N}$			jeunisme			neutralisme
–iste$_{N}$				secouriste		feudiste, neutraliste
–ement$_{ADV}$			jeunement, seulement			
–ement$_{N}$ –iment$_{N}$			beuglement, feulement, gueulement, meuglement, peuplement	ressentiment		
–ité$_{N}$				relativité, représentativité	religiosité	neutralité
–oir$_{N}$	devoir	semoir		remontoir, reposoir, repoussoir		
–(t)on$_{N}$	jeton		gueuleton	peloton		
–ot$_{N}$			jeunot, queusot	cheminot, petiot(e)		
–u$_{N/A}$ –ue$_{N/A}$	venu					
–ue$_{N}$	tenue, venue					
–ure	levure, pelure			devanture, relecture, reliure		

Suffix	[CœC(C)+]	[CœC(C)V…]				
	Alternating <e>	**Non-alternating <e>**	**Non-alternating <eu>**	**Alternating <e>**	**Non-alternating <e>**	**Non-alternating <eu>**
No suffix	dedans, dessous, dessus			besoin, cerise, chemin, chemise, chenapan, chenil, chenille, cheval, chevet, cheveu, cheville, degré, demain, demande, demi(e), demoiselle, devant, devis, devise, femelle, fenaison, fenêtre, fenil, fenouil, genou, leçon, melon, menace, menotte, menu, meringue, mesure, monsieur, neveu, pelote, pelouse, peluche, petit(e), rebond, rebord, rebuffade, recette, recharge, recherche, rechute, recoin, reconquête, record, recours, recrue, reçu, recueil, recul, redescente, reflet, reflux, refonte, refrain, refuge, refus, regain, regard, registre, regret, rejet, relâche, relais, relance, relève, relief, religieux/-euse, religion, remarque, remède, remise, remords, remorque, remous, renard(e), renouveau, repaire, repas, repère, repli, report, repos, reprise, reproche, requête, requin, ressort, ressource, retape, retard, retouche, retour, retrait, retraite, revanche, revers, revue, second, seconde, secours, secousse, secret/-ète, secrétaire, semaine, semelle, semestre, semoule, seringa, seringue, tenancier/-ière, velours	bedaine, bedeau, bedon, belette, belon, belote, benêt, besace, besogne, chenal, chenet, chevreuil, chevron, demeure, denier, devin, faisan/-e, felouque, genèse, genêt, genièvre, guenille, guenon, levain, levraut, levrette, menuet, merise, quenelle, quenouille, querelle, pelisse, peton, rebelle, rebut, recel, reclus/-e, redingote, relent, relique, renégat/-e, renom, renoncule, requis, ressac, retable, semonce, sequin, serein, serin, vedette. venaison, venin	deutér(o)-, deuzio, jeudi, meurette, Neuchâtel, neuneu, neuron +, neutron+, neutrino, peucédan, peuchère, teuton+, veuglaire, zeuzère

Table 3.16: Distribution of alternating and non-alternating [œ] in light of the suffix, based on Lexique/LPR and Racine (2008)

As regards the monosyllabic morphemes, nine nominal suffixes attach to stems with either [œ] = <eu> or [œ] = <e>; <age>, <ade>, <ant/ante>, <é/ée>, <ée>, <et/ette>, <eur/euse>, <ier/ière>, and <(t)on>. Recall that for Hypothesis B1 to hold, which claims there is a complementary distribution with regard to morphological structure, [œ] = <e> in monosyllabic morphemes should pattern with [œ] = <eu> in the same position and not alternate when combined with these suffixes. The one item combining with the suffix <ade>, i.e. *pelade* 'alopecia' [pœlad], conforms to this prediction as its *c.e.f.* value of -5.33 indicates a non-alternating [œ], thus patterning with *peuplade* 'small tribe' [pœplad]. The same is true for the suffix <age> in that, for instance, *pelage* 'fur (of animal)' [pœlɑːʒ] patterns with *meulage* 'grinding' [mœlɑːʒ] in that both have a non-alternating [œ]. These examples also fit with Hypothesis C1, which states that members of the same lexical sub-class should exhibit the same behaviour with regard to [œ]-alternation. The sole counter-example that needs to be accounted for in a morphologically or a lexically driven analysis is alternating [œ] in *levage* 'lifting' [l(œ)vɑːʒ]. In this case, an explanation based on phonotactic constraints does not hold because, in general, the cluster [pl], as in non-alternating *pelage*, is considered to be a more optimal onset than the cluster [lv], as in alternating *levage*. Regarding <ant/ante>, the judgement data contain two items with <e> = [œ] in the desired environment, i.e. *levant* 'orient' [l(œ)vɑ̃] and *tenant* 'supporter (of shield)' [t(œ)nɑ̃]. As both are judged to have an alternating [œ] and thus stand in opposition to non-alternating [œ] in *beuglant* 'café with live music' [bœglɑ̃], they constitute counter-examples to a one-category analysis that hinges on morphological structure or lexical sub-class affiliation.

The next combination to be scrutinised is the group of stems attested with the suffix pair <é/ée>. The *c.e.f.* values indicate that all attested stems in the data set, when combined with <é/ée>, are subject to alternation, e.g. *jeté* 'action of throwing' [ʒ(œ)te] with a *c.e.f.* value of -0,33 and *pelé* 'bald' [p(œ)le] with a *c.e.f.* value of -1,17. These instances of [œ]-alternation contrast with *beurré* 'buttered' [bœʁe], among others, and are counter to our hypothesis of uniform behaviour of the stems when they are combined with the same suffix. The suffix <ée> is like <é/ée>, in that each item with [œ] = <e> is authorised to alternate, e.g. *gelée* 'frost' [ʒ(œ)leː] with a *c.e.f.* value of 1.83 and *pesée* 'weighing' [p(œ)zeː] with a *c.e.f.* value of -2.67, which contrast with *beurrée* [bœʁeː] 'bread with butter'. The items with <e> = [œ] combined with <é/ée> and <ée> all form counter-examples to Hypothesis B1 and Hypothesis C1, who claim there is a complementary distribution with regard to morphological structure or lexical sub-group, respectively. As regards the suffix pair <et/ette>, at first glance, it triggers the same vowel behaviour as <ade> in that it does not authorise alternation, and it thereby patterns with, for instance, *sœurette* 'litte sister'. However, this is a premature conclusion because the sole item with [œ] = <e> that occurs in this morpho-lexical context is *chevrette* 'female roe deer' [ʃœvʁɛt], whose non-alternation could be explained on phonotactic grounds, i.e. a constraint banning the creation of the consonant sequence *[ʃvʁ]. The suffix pair <eur/euse> is problematic for our morphologically and lexically driven hypotheses because [œ] = <e> in the various stems to which the suffixes attach, alternates to variable degrees. It ranges from relatively frequent alternation in *semeur* 'person sowing' [s(œ)mœːʁ] with a *c.e.f.* value of -0.67, to slightly less frequent alternation in *meneur* 'agitator' [m(œ)nœːʁ] with a *c.e.f.* value of -2.17, and to highly infrequent alternation, or stable vowel, in *faiseur* 'maker' [fœzœːʁ] with a *c.e.f.* value of -4.08[129]; the latter item patterns with *jeûneur* 'faster (pers.)' [ʒœnœːʁ]. Turning to <ier/ière>, *chevrier* 'goatherd' [ʃœvʁije] with a *c.e.f.* value of -5.70 and its feminine variant *chevrière* pattern with *meunier* 'miller' [mœnje] because they have a non-alternating [œ]. *Levier* 'lever' [l(œ)vje], on the other hand, has a *c.e.f.* value of -2.25, which is more problematic because it

[129] The feminine variants *semeuse*, *meneuse*, and *faiseuse* behave in a similar fashion to the masculine variants.

indicates the possibility that [œ] could be absent.[130] When we take into account the phonotactic structure of non-alternating *chevrier* and the previously attested non-alternation in *chevrette*, we cannot exclude the possibility that [œ] = <e> in the context of <ier/ière> is subject to alternation across the board, except for cases in which phonotactic constraints, like *[ʃvʁ], take precedence over morpho-lexical constraints. As regards the suffix <(t)on>, it constitutes another counter-example to B1 and C1 in that [œ] alternates in *jeton* 'chip' [ʒ(œ)tɔ̃] whereas it is stable in *gueuleton* 'feast' [gœltɔ̃]. The surface syllabification of the respective items could possibly be an explanation for the variable behaviour of [œ]; in the latter item, [œ] is positioned in a syllable closed by [l], which blocks it from deletion.

The nominal suffix <oir> is solely attested in two items with <e> = [œ]. First, *semoir* 'seed bag' [sœmwɑːʁ] constitutes no challenge to B1 because it is judged without alternation. It is however a counter-example to C1 if we expect alternation to be authorised in stems subject to allomorphy. In addition, <oir> also occurs in the deverbal noun *devoir* 'duty' [d(œ)vwɑːʁ] in which [œ] is subject to alternation. A possible analysis of this difference in behaviour between *semoir* and *devoir* is that the alternation admissibility in the verbal form is transmitted to its deverbal counterpart (*devoir*), but as morphological effects of this nature are beyond the scope of our thesis, we do not pursue this hypothesis any further. Finally, some suffixes that attach to monosyllabic morphemes are only attested in the judgement data in cases where they combine with morphemes with alternating [œ] = <e> or with morphemes with non-alternating [œ] = <eu>; we need to wait for the results of polysyllabic morphemes to determine whether this dichotomous distribution is morphologically driven, lexically driven, or merely accidental. The group of suffixes only observed with monosyllabic morphemes containing [œ] = <e> comprises <aille> e.g. *tenaille* 'tongs' [t(œ)naj], <ence> e.g. *semence* 'seed' [s(œ)mɑ̃s], deverbal <er> e.g. *lever* 'rising' [l(œ)ve], <is> e.g. *semis* 'seed bag' [s(œ)mi], <u> e.g. *venu* 'arrived' [v(œ)ny], <ue> e.g. *tenue* 'dress' [t(œ)nyː], and <ure> e.g. *pelure* 'coat' [p(œ)lyːʁ]. The group of suffixes that are only observed with monosyllabic morphemes containing [œ] = <eu> comprises <(er)aie> e.g. *peupleraie* 'poplar plantation' [pœplœʁɛ], <ard> e.g. *gueulard* 'loudmouth' [gœlɑːʁ], <erie> e.g. *veulerie* 'listlessness' [vœlʁiː], <esse> e.g. *jeunesse* 'youth' [ʒœnɛs], <eux> e.g. *peureux* 'timid' [pœʁø], <isme> e.g. *jeunisme* 'discrimination against the youth' [ʒœnism], adverbial and nominal <ement> e.g. *seulement* 'only' [sœlmɑ̃] and *beuglement* 'bawling (of pers.)' [bœglœmɑ̃]), and <ot> e.g. *jeunot* 'youngster' [ʒœnɔ].

We now turn our attention to the polysyllabic morphemes with [œ] = <e>, listed in the right-hand column in Table 3.16. When these results are compared to the results from the monosyllabic morphemes discussed in detail above, slightly different alternation rates emerge, which potentially depend on a combination of the type of suffix involved and the non-final position of the syllable within the morpheme. First, polysyllabic stems in combination with the suffixes <ade> and <age> have an increased rate of alternation acceptability compared with monosyllabic stems with the same suffixes, e.g. non-alternating *pelade* with a *c.e.f.* value of -5.33 vs. alternating *reculade* 'retreat' [ʁ(œ)kylad] with a *c.e.f.* value of -0.25 and non-alternating *pesage* with a *c.e.f.* value of -4.0 vs. alternating *pelotage* 'petting' [p(œ)lɔtɑːʒ] with a *c.e.f.* value of 0.58. This is in accordance with the findings by Léon (1966), who observes that schwa is more frequently absent the further it is to the left of the word-final prominent syllable. As regards the suffix pair <ant/ante>, the results of polysyllabic morphemes merely strengthen the earlier observation of alternation acceptability in monosyllabic stems. Whereas

[130] Interestingly, the judgement data in Racine (2008) indicate that the reluctance toward the creation of word-initial CC+Glide-sequences is stronger in Hexagonal French (Nantes) than in Swiss French (Neuchâtel). The *c.e.f.* value of *levier* 'lever' for the Nantes speakers amounts to -4.75, i.e. the vowel is stable according to our classification. Note that *chevrier* 'goatherd' is judged as stable in both varieties.

ressortissante ‘under the jurisdiction of (fem.)’ [ʁœsɔʁtisɑ̃t] has a *c.e.f.* value of -3.08 and is treated as non-alternating according to our classification, and thus, patterns with *neutralisant* ‘neutralising’ [nœtʁalizɑ̃], all other items are subject to alternation, e.g. *remontant* ‘stimulant’ [ʁ(œ)mɔ̃tɑ̃] with a *c.e.f.* value of 2.08, *redoublant* ‘student repeating a year’ [ʁ(œ)dublɑ̃] with a *c.e.f.* value of -0.45, and *ressortissant* ‘under the jurisdiction of (masc.)’ [ʁ(œ)sɔʁtisɑ̃] with a *c.e.f.* value of -2.67. Turning to <é/ée>, we observe examples of non-alternation, which are hitherto unattested in this morpho-lexical context, e.g. alternating *refoulé(e)* ‘inhibited’ [ʁ(œ)fule] with a *c.e.f.* value of -0.25 vs. non-alternating *demeuré(e)* ‘half-wit’ [dœmœʁe] with a *c.e.f.* value of -3.58[131], and *velouté* ‘velvetiness’ [vœlute] with a *c.e.f.* value of -4.17. The alternation in monosyllabic stems and non-alternation in polysyllabic stems attested for <é/ée> is the opposite of the observation made for <ade> and <age>, in which alternation is attested with polysyllabic stems only; in light of these observations, it seems difficult to defend an account of the distribution of alternating [œ] purely based on its distance from the stressed, word-final suffix. Conversely, concerning the suffix <ée>, there are no items that weaken the previously attested alternation admissibility in stems that it attaches to, e.g. *cheminée* ‘chimney’ [ʃ(œ)mineː] with a *c.e.f.* value of 2.08 and *renommée* ‘good name’ [ʁ(œ)nɔmeː] with a *c.e.f.* value of -1.42.

As regards the suffix pair <et/ette>, for which the sole attested example with [œ] = <e> in monosyllabic morphemes is non-alternating *chevrette*, the inclusion of polysyllabic morphemes rejects the idea that this suffix pair is able to block [œ]-alternation in the stem. In fact, all polysyllabic morphemes attested in combination with <et/ette> are subject to alternation, e.g. *chevalet* ‘stand, support’ [ʃ(œ)valɛ] with a *c.e.f.* value of 0.83 and *devinette* ‘riddle’ [d(œ)vinɛt] with a *c.e.f.* value of 0.50. A somewhat similar observation is made for the suffix pair <eur/euse>; whereas the group of monosyllabic morphemes contain both alternating and non-alternating [œ], e.g. *semeur* vs. *faiseur*, the polysyllabic morphemes that combine with this suffix pair are all subject to alternation, e.g. *demandeur* ‘requestor’ [d(œ)mɑ̃dœːʁ] with a *c.e.f.* value of -0.17, *peloteur* ‘ball winder’ [p(œ)lɔtœːʁ] with a *c.e.f.* value of 1.0, and *revendeur* ‘retailer’ [ʁ(œ)vɑ̃dœːʁ] with a *c.e.f.* value of 0.67. Turning to <ier/ière>, the polysyllabic morphemes do not add any further clarity to the question whether this suffix pair enables or hinders alternation. While the majority of items are judged as more or less frequently alternating, e.g. *cerisier* ‘cherry tree’ [s(œ)ʁizje] with a *c.e.f.* value of 1.75 and *devancier* ‘precursor’ [d(œ)vɑ̃sje] with a *c.e.f.* value of -2.42, other items are found with a non-alternating [œ], e.g. *genévrier* ‘juniper (tree)’ [ʒœnevʁije] with a *c.e.f.* value of -4.17 and *menuisier* ‘joiner’ [mœnɥizije] with a *c.e.f.* value of -4.25. Finally, as regards the morpheme <(t)on>, which is the last of the nine suffixes that attach to monosyllabic stems with <e> and <eu>, the one example of a polysyllabic morpheme that combines with this suffix is *peloton* ‘ball of wool’ [p(œ)lɔtɔ̃]. With a *c.e.f.* value of 3.08, this polysyllabic morpheme patters with the single monosyllabic morpheme attested in combination with <(t)on>, i.e. *jeton*. Moving on to <oir>, only attested with [œ] = <e> in monosyllabic stems, our previous hypothesis that the alternation in *devoir* is a reflection of the original verbal nature of this form is contested by the fact that all polysyllabic morphemes subject to the judgement test are considered alternating, e.g. *remontoir* ‘winder’ [ʁ(œ)mɔ̃twɑːʁ] with a *c.e.f.* value of -1.42 and *repoussoir* ‘burin’ [ʁ(œ)puswɑːʁ] with a *c.e.f.* value of -1.08. In these cases, <oir> does not constitute an infinitival ending.

Next, we concentrate on the suffixes only attested with alternating [œ] = <e> in monosyllabic stems. First, the alternation acceptability in combination with <ence> e.g. *recrudescence*

[131] Recall that *demeuré* is attested with schwa absence in the one occurrence of the item retrieved from the production data. This finding illustrates the fact that the *c.e.f.* value of -3.58 is near the arbitrary threshold established in this thesis between alternating and non-alternating [œ] = <e>.

'recrudescence' [ʁ(œ)kʁydɛsɑ̃s] with a *c.e.f.* value of -2.67, and <ure> e.g. *devanture* 'façade' [d(œ)vɑ̃tyːʁ] with a *c.e.f.* value of -1.17, is further confirmed. Second, as regards the remaining group of suffixes, i.e. <aille>, <is>, <u>, <ue>, and deverbal <er>, production data are needed in order to determine their ability to trigger alternation in polysyllabic morphemes. Next, we turn our attention to the suffixes only attested with [œ] = <eu> in monosyllabic stems. First, we observe alternation, for instance, in *chevillard* 'wholesale butcher' [ʃ(œ)vijɑːʁ], *petitesse* 'meanness' [p(œ)titɛs], *rebouteux* 'bonesetter' [ʁ(œ)butø], *ressentiment* 'resentment' [ʁ(œ)sɑ̃timɑ̃], and *cheminot* 'railroader' [ʃ(œ)minɔ], which illustrates that the suffixes <ard>, <esse>, <eux>, <iment>, and <ot> do not function as blockers of [œ]-alternation, at least not in polysyllabic morphemes. Second, as regards the remaining group of suffixes, i.e. <eraie>, <erie>, and <isme>, once again, production data are needed to check whether they trigger alternation in polysyllabic morphemes, or whether non-alternating [œ] is selected in polysyllabic morphemes, as well.

The final suffixes to be examined in this section are those only observed in combination with polysyllabic morphemes. The majority are found with both alternating and non-alternating [œ], thereby constituting additional counter-examples to Hypothesis C1, which claims there is a complementary distribution with regard to lexical sub-class. First, the stems that attach to <(at)aire> do not behave identically in that alternation is attested in *retardataire* 'latecomer' [ʁ(œ)taʁdatɛːʁ] with a *c.e.f.* value of -0.92 but not in *reliquaire* [ʁœlikɛʁ] with a *c.e.f.* value of -3.42. The phonotactic distribution presented in Section 3.3.2.2 illustrates that [ʁt] and [ʁl] both combine with alternating and non-alternating [œ], thus other factors must be at work here. Second, as regards the stems combining with <ion> or one of its variants, the majority are subject to alternation, e.g. *relaxation* 'relaxation' [ʁ(œ)laksasjɔ̃] with a *c.e.f.* value of -1.33. The only examples attested without alternation in the judgement data are *recréation* 'recreation' [ʁœkʁeasjɔ̃] with a *c.e.f.* value of -3.73 and *revalorisation* 'giving a new value to' [ʁœvalɔʁizasjɔ̃] with a *c.e.f.* value of -3.75; these thereby pattern with *neutralisation* 'neutralisation' [nœtʁalizasjɔ̃]. The same ambiguous behaviour is found for <eau>, which combines with alternating [œ] in *chemineau* 'tramp' [ʃ(œ)mino] with a *c.e.f.* value of 1.17, and with non-alternation in, for instance, *renardeau* 'fox cub' [ʁœnaʁdo] with a *c.e.f.* value of -3.25. The only examples attested with <iste> in the data contrast as well; whereas [œ] in *neutraliste* does not alternate, the opposite is true in *secouriste* 'first-aid worker' [s(œ)kuʁist]. The last suffix to be examined is <ité>, which is found with alternating [œ] = <e> in *relativité* 'relativity' [ʁ(œ)lativite] with a *c.e.f.* value of -2.83, with non-alternating [œ] = <e> in *religiosité* 'piousness' [ʁœliʒiɔzite] with a *c.e.f.* value of -3.50, and with non-alternating [œ] = <eu> in *neutralité* 'neutrality' [nœtʁalite]. Finally, some suffixes combine with either alternating [œ] = <e> or with non-alternating [œ] = <e>, and in the absence of counter-examples, we cannot exclude the possibility that the various suffixes have an influence on the stem. The group of suffixes that attach to stems with alternating [œ] = <e> comprises <ance>, e.g. *ressemblance* 'resemblance' [ʁ(œ)sɑ̃blɑ̃s] with a *c.e.f.* value of -0.08, <ariat>, e.g. *secrétariat* 'secretariat' [s(œ)kʁetaʁia] with a *c.e.f.* value of 0.83, <er/ère>, e.g. *reporter* 'reporter' [ʁ(œ)pɔʁe] with a *c.e.f.* value of 0.83, <if/ive>, e.g. *relatif* 'relative' [ʁ(œ)latif] with a *c.e.f.* value of 0.42, and deverbal <ir> e.g. *repentir* 'remorse' [ʁ(œ)pɑ̃tiːʁ] with a *c.e.f.* value of -2.25. The group of suffixes that attach to stems with non-alternating [œ] = <e> only contains <in/ine>, e.g. *chevrotine* 'buckshot' [ʃœvʁɔtin] with a *c.e.f.* value of -5.58 and *levantin* 'Levantine' [lœvɑ̃tɛ̃] with a *c.e.f.* value of -4.73.

To summarise, the examination of the alternation admissibility of [œ] in light of the word-final suffix first establishes that both alternating [œ] = <e> and non-alternating [œ] = <e/eu> are found with the majority of suffixes. At this point, we remind ourselves of the fact that [œ] = <e>

in the morphological context [CœC(C)+] is only found in verbal stems that are subject to allomorphy or suppletion. If we acknowledge that these form an identifiable morphologically defined group and that they, therefore, are prone to behave differently from the items with [œ] = <eu> in the same context, that is are not subject to allomorphy, what remains to be accounted for are similarities and dissimilarities between these monosyllabic morphemes with [œ] = <e> and the polysyllabic morphemes with [œ] = <e> – the latter not being subject to allomorphy or suppletion. Table 3.17 summarises the relevant findings; the suffixes that combine with both alternating and non-alternating [œ] (in one or across the two morphological contexts) are shaded in grey.

Items with [œ] = <e>	**ade**	**age**	**aille**	**(at) aire**	**ance**	**ant**	**ard**	**ariat**	**sion**	**é ée**	**eau**
CœC(C)+	na	n/a	a	---	---	a	---	---	---	a	---
CœC(C)V…	a	a	---	n/a	a	n/a	a	a	n/a	n/a	n/a

Items with [œ] = <e>	**ée**	**ence**	**er**	**er ère**	**esse**	**et ette**	**eur**	**eux**	**ier ière**	**if ve**	**in ine**
CœC(C)+	a	a	a	---	---	na	n/a	---	n/a	---	---
CœC(C)V…	a	a	---	a	a	a	a	a	n/a	a	na

Items with [œ] = <e>	**ir**	**is**	**iste**	**ment**	**ité**	**oir**	**on**	**ot**	**u**	**ue**	**ure**
CœC(C)+	---	a	---	---	---	n/a	a	---	a	a	a
CœC(C)V…	a	---	a	a	n/a	a	a	a	---	---	a

Table 3.17: Distribution of (non-) alternating [œ] = <e> in light of morpho-lexical structure – <a> = alternation, <na> = non-alternation, <n/a> = alternation and non-alternation, <---> = not attested, based on Lexique/LPR and Racine (2008)

At this point it is necessary to recall that these results are based only on the nouns and nominalised elements present in the test material in Racine (2008). Therefore, in order to check the reliability of these data for production and to expand the data set to include other lexical classes – necessary in order to validate or discard the set of hypotheses C – we turn to other available Swiss French data.

The Swiss French PFC corpus contains 464 occurrences of nouns and nominalised elements in a V#C<e>C context that are also included in the test material in Racine (2008). Only a scarce 27 of these occurrences contain a suffix; the remaining nouns are monomorphemic, e.g. *cheval*. Five of the 27 occurrences are of a structure [CœC(C)+]; one instance of *pesée* 'weighing' with a *c.e.f.* value of -2.67 and with schwa presence in production, one instance of *meneur* 'agitator' with a *c.e.f.* value -2.17 and with schwa presence in production, and three instances of *devoir* 'homework' with a *c.e.f.* value of 0.08 and with one schwa absence and two instances of schwa presence in production. It follows from these low numbers that no further conclusion regarding the importance of the suffix for the alternation admissibility of [œ] can be established on the basis of the production data. Information about additional forms with the structure [CœC(C)+], however, are available. To supplement the judgement data in Racine (2008), we make use of her methodology and test the judgement of one PFC informant (svaje1) for 16 items with [œ] = <e> in monosyllabic morphemes, which are not present in Racine's (2008) test material. Presented with the two variants of the items, the informant svaje1 evaluates their estimated frequency in his own speech. When we combine the values per variant per item, we obtain the results presented in Table 3.18.[132]

Suffix	Alternating		Non-alternating	
	Racine (2008)	**Svaje1**	**Racine (2008)**	**Svaje1**
–ant	levant, tenant	venant		pesant
–é	jeté, levé, pelé	gelé, mené, pesé, semé		sevré
–ée	gelée, jetée, levée, pelée, pesée	*(menée)*		
–ette			chevrette	pesette
–eur	meneur, semeur, teneur	jeteur, leveur, veneur	faiseur, pesanteur	peseur
–u	venu	tenu		
–ure	levure, pelure	gelure		*(tenure)*

Table 3.18: [œ]-alternation in stems subject to allomorphy or suppletion in light of the suffix, based on judgement data from Racine (2008) and from PFC informant svaje1

The additional judgement data greatly strengthen the previous observation of alternation acceptability in the majority of monosyllabic morphemes with [œ] = <e>. However, there are two remarks to be made. First, *sevré* 'deprived' [sœvʁe] is judged by svaje1 as non-alternating and patterns thereby with *sevrage*. This judgement, thus, constitutes yet another example of the obligatory vowel presence in the phonotactic context Sib+[vʁ] that we observe throughout this section, e.g. *chevrette* *[ʃvʁ]. Second, svaje1 consistently judges [œ] as non-alternating in the verbal stem <pes> 'weight', except when the stem combines with the past participle suffix <é>. In Racine's judgement data, [œ] in <pes> only alternates when it occurs in combination with <ée>, a nominal suffix that is identical to the feminine variant <ée> of the past participle suffix <é>. The close relationship between <é/ée> and <ée>, both semantically and phonetically, allows for the possibility to treat <é/ée> and <ée> as a single group that triggers schwa alternation. As regards the other suffixes in Table 3.18, we cannot exclude the possibility that they too trigger schwa alternation, however, that phonotactic constraints operate more heavily on the stems that they combine with. For instance, as regards the suffix <eur>, alternation is blocked in *faiseur*, which indicates that the creation of *[fz] is blocked. However, the opposite is true in verbal contexts because the production data reveal a near 100% schwa absence in the imperfect stem <fais>. Again, then, there seems to be an interaction at work between phonotactic and lexical constraints.

Recall from Section 3.2.2.1 that Côté (2009) observes a higher alternation rate in nouns than in verbs in Quebec French, which fits nicely with the set of hypotheses C, which claims that the distribution of alternating [œ] is lexically driven. However, when we examine our Swiss French production data, the global results do not reveal any clear difference between the schwa-items belonging to a noun class vs. a verbal class. Whereas the verbs in context V#C<e>C are produced without a vowel in 74.5% (466/625) of the cases, the nouns and nominalised elements that are also found in the test material in Racine (2008) are subject to vowel absence in 78.5%

132 As the additional items were presented to one single subject, the results presented in Table 3.18 must be treated with caution. Note however that in order to improve their reliability for analysis, we presented the list of items to the subject twice, with a one-year span. The two items receiving a different *c.e.f.* value the second time were *menée* (highly alternating → alternating) and *tenure* (alternating → non-alternating). These are therefore put in italics and in parentheses in Table 3.18 and will not receive any further attention.

(364/464) of the cases. This latter figure remains elevated even when *petit* is removed from the calculation – that is without *petit* 66% (140/212) occurrences are produced without [œ].[133] Despite the fact that no comparison between nouns and verbs can be made on the basis of production data, the latter nevertheless show the elevated alternation rate that is found with those verbs that are subject to allomorphy or suppletion (cf. Table 3.10 for details on the various verbs). When we combine the results of the verbal stems <jet> 'throw', <gel> 'freeze', <dev> 'must', <ser> 'be$_{\mathrm{COND/FUT}}$', <lev> 'rise', <ten> 'hold', <ven> 'come', <fais> 'do$_{\mathrm{IMPERF}}$', and <fer> 'do$_{\mathrm{COND/FUT}}$' the rate of schwa absence amounts to 87% (233/268), which is slightly higher than the global result. This seems to confirm that at least the verbs that are subject to allomorphy or suppletion are prone to highly frequent schwa absence in Swiss French.

In Section 3.2.2.1, we present two hypotheses regarding the lexically driven distribution of alternating and non-alternating [œ], repeated below:

(16) Hypothesis C1, repeated from Example (5)
There exists one category /œ/ in the inventory, with two output realisations [œ] and ∅. The loci of the [œ] ~ ∅ alternation stand in complementary distribution with the loci of non-alternating [œ]; [œ] alternates with ∅ in a lexically defined set of words, while [œ], not ∅, is licensed elsewhere.

Hypothesis C2, repeated from Example (6)
There exists one category /œ/ in the inventory, with two output realisations [œ] and ∅. The loci of the [œ] ~ ∅ alternation stand in overlapping distribution with the loci of non-alternating [œ]; [œ] alternates with ∅ in a lexically defined set of words, but within this set, [œ], not ∅, is licensed in a defined group of words. The residual set of words licences [œ], not ∅.

The data examined in this section reveal that the suffix alone does not suffice to account for the distribution of alternating and non-alternating [œ]; thereby, we reject Hypothesis C1, which claims that there is a lexically defined complementary distribution. However, the monosyllabic morphemes do, generally, support Hypothesis C2, which claims there is a lexically defined overlapping distribution. The monosyllabic morphemes comprise two sub-groups, one that is subject to allomorphy or suppletion, e.g. <pes>, and one that is not, e.g. <feutr>. As already mentioned, [œ]-alternation is restricted to the former sub-group. If we consider this former sub-group to be the lexically defined set of words referred to in Hypothesis C2, then we also have to define on independent grounds using natural criteria the set of words in which [œ]-absence is *blocked*. In Table 3.16, we reveal no suffix, except <age>, that favours [œ]-presence in monosyllabic morphemes. As regards the stems in which [œ] is non-alternating across the board, e.g. <sevr> in *sevrage* *[svʁ] and <chevr> *[ʃvʁ] in *chevrier*, these exceptions to [œ]-alternation in the context [CœC(C)+] can be explained as a reflection of phonotactically defined constraints that take precedence in the grammar over the morpho-lexically defined constraints under discussion. As regards the polysyllabic morphemes, we establish that the majority of those attested with non-alternating [œ] do not combine with a suffix, e.g. *besogne* 'job' (cf. Table 3.16). Further, the nominal elements in the judgement data, e.g. *chevalet* 'easel', and the verbal elements in the production data, e.g. *demander* 'ask', show that the majority of those that do combine with a suffix are subject to alternation. It is, nevertheless, false to conclude that only the presence of a suffix triggers alternation in polysyllabic stems. An extensive number of

[133] For the sake of completion, we note that *petit(es)* is produced without a vowel in 89% (224/252) of the occurrences.

polysyllabic morphemes without a suffix are also subject to alternation, e.g. *besoin* ‘need’ (cf. Table 3.16). The tendencies are summarised in Example (17).

(17) a. Lexical sub-groups where alternation is attested as possible

Nominal [CœC(C)+] with allomorphy or suppletion	Exceptions: <chevr> and <fais> combined with <eur>; <pel> combined with <ade> and <age>: <pes> combined with <age>, <ant>, <ette>, and <eur>; <sem> combined with <oir>; <sevr>
Verbal [CœC(C)+] with allomorphy or suppletion	Exception: <sevr>
Nominal [CœC(C)V…] with suffix	Exceptions: <chevr->, <neutr-> and ~ 15 items whose phonotactic structure authorises alternation elsewhere in the lexicon
Nominal [CœC(C)V …] without suffix	Exceptions: <bed->, <bel->, <ben->, <chevr->, <den->, <deut->, <deuz->, <fais->, <fel->, <guen->, <jeud->, <levr->, <menu->, <neuch->, <neun->, <neur->, <neutr->, <peuc->, <peuch->, <quen->, <quer->, <teut->, <ved->, <veug->, <zeuz-> and ~ 30 items whose phonotactic structure authorises alternation elsewhere in the lexicon
Nominal complex prepositions [CœC(C)V…]	No exceptions

b. Lexical sub-groups where alternation is not attested as possible

Nominal [CœC(C)+] without allomorphy or suppletion	No exceptions
Verbal [CœC(C)+] without allomorphy or suppletion	No exceptions

We conclude this section with a summary of our main findings. In Section 3.2.2.1, we have presented three variables that potentially account for the distribution of alternating and non-alternating [œ]. In this section, we have tested the third variable, which is the lexical subclass to which the item belongs. On the basis of Swiss French judgement and production data and the results on alternation admissibility, discussed in Sections 3.3.2.2 and 3.3.2.3, we have established that Hypothesis C1, which claims there is a lexically defined complementary distribution, is not supported by the data; neither the presence vs. absence of a suffix, suffix sets – nouns vs. verbs –, nor individual suffixes, e.g. <age>, account for the totality of the observed [œ]-alternation. Hypothesis C2, which claims there is a lexically defined, overlapping distribution, has proven to be more successful; monosyllabic morphemes subject to allomorphy or suppletion are, to a large extent, subject to [œ]-absence. To validate this hypothesis, however, both morphological and phonotactic conditions need to be included in the overall analysis in order to account for the exceptional forms.

In the following interim discussion, we briefly discuss the theoretical and empirical implications of this modular interplay for the acquisition process.

3.3.2.5 Interim discussion

In the preceding sections, we have argued for the one-category approach based on an analysis of the importance of phonotactic, morphological, and lexical factors in [œ]-alternation. The most salient distribution emerges in the morphology, indicating a *morphology first – phonotactics second* scenario.[134] In monosyllabic morphemes, non-alternating [œ] prevails, e.g. *meuler* 'grind;inf' [mœl + e]; while alternating [œ] in this position occurs only in verbal stems that are subject to allomorphy or suppletion, e.g. *lever* 'rise;inf' [l(œ)v + e]. For this latter group, the alternation rate of [œ] is partly lexically defined, e.g. some suffixes trigger a frequent alternation, for instance nominal <é/ée>, while others ban alternation altogether, for instance nominal <ade>, and partly constrained by phonotactic requirements. In polysyllabic morphemes – with [œ] in the initial syllable – the vowel generally alternates. There are exceptions like loanwords, which can be explained as such, e.g. *teutonique* 'Teutonic' [tœtɔnik], while others, with [œ] = <e>, cannot be explained on the basis of syllable count or the attached suffix, thus relegating part of the responsibility to phonotactics or perhaps token frequency. Lexical factors, at first glance, seem to be related to the position of the vowel in the prosodic word. A comparison of [œ] in monosyllabic and polysyllabic morphemes with the same suffix attached indicates a discrepancy in alternation rate that is related to position. Distance from the morpheme boundary cannot be the decisive factor, however, because the change in alternation frequency goes in both directions, increases or decreases, depending on the suffix. Figure 3.3 depicts the main findings in this chapter.

[134] *Morphology first – phonology second* is the opposite of what Anttila (2002) proposes in his account of stem-final vowel alternations in Finnish.

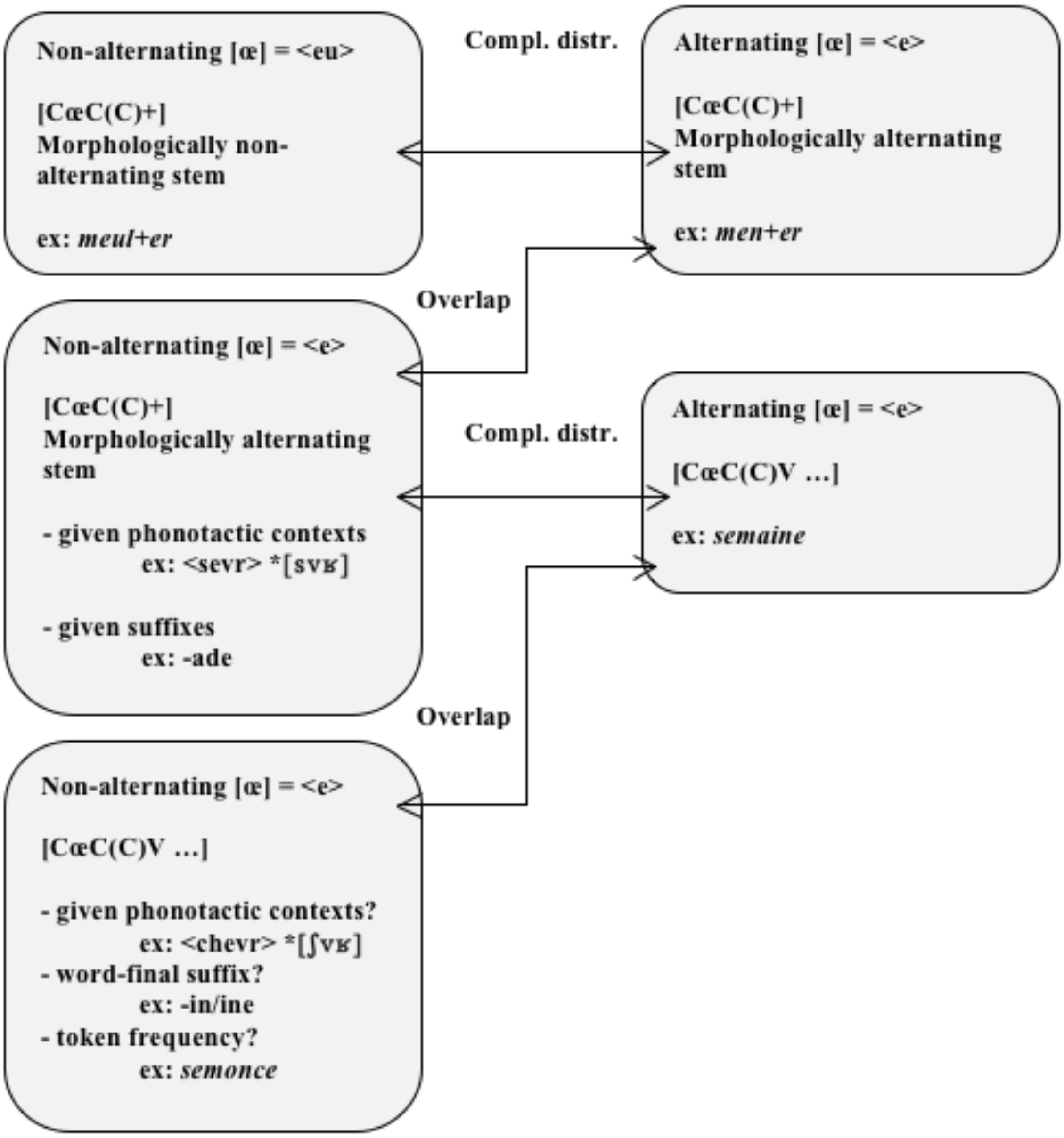

Figure 3.3: Distribution of alternating and non-alternating [œ] in light of phonotactic, morphological, and lexical factors[135]

Although strong tendencies in the distribution of alternating [œ] in the target language Swiss French can be revealed on the basis of phonotactic, morphological, and lexical factors, it is important for the present study to keep in mind that a hypothesis based on any of these three types of factors requires that the child has access to the phonotactic, morphological and lexical information, respectively. For instance, the group of items with a structure [CœC(C)V …] with a non-alternating [œ] = <e> would, *a priori*, cause problems for a speaker who, first and foremost, bases his distributional hypothesis on the morphological structure of items with [œ]. However, as shown in Chapter 7, the child language data indicate that neither derivational nor inflectional morphology is fully acquired by many of the subjects, and therefore, it is premature to conclude at this point that this group of items would cause any particular problem for a young

[135] The few items with [œ] = <eu> in context [CœC(C)V…] are not included in Figure 3.3.

child. Also, as regards the two subgroups with a structure [CœC(C)+], the sole information beyond a morphological juncture separating the two is the morphologically conditioned vowel alternation [œ] ~ ∅ vs. [ɛ], which targets only one sub-group. In this regard, note that Clark (1985) claims that children acquiring Romance languages start forming new words early on. She does not provide any further details with regard to age or developmental stage, but, referring to Grégoire (1947) and Aimard (1975), she does provide, for instance, the following examples of noun innovations by French-speaking children: agent noun: *le crêmeur* from *crême* 'cream', for 'eater of cream' (3;08), instrument noun: *une troueuse* from *trou* 'hole', for *un perforateur* 'drill' (4;00), object intrinsic to a certain activity: *un rouleau* from *rouler* 'to roll', for *une balle* 'ball' (3;00), and act of doing something: *une parlette* from *parler* 'to talk', for *une causette* 'a chat' (3;05).[136] The rather late acquisition of morphology, taken together with the observation reported by Walker (1993:58) that the child can replace [ɛ] with [œ], e.g. [lœv] and not [lɛv] for *lève* 'rise;3p', indicate that the morphological juncture and the allomorphic vowel alternation is not fully in place at an early stage; these are thus unavailable as a cue for identifying the monosyllabic morphemes that are subject to alternation. Therefore, we propose that for the youngest children in this study phonological constraints are likely to take precedence over morpho-lexical ones when it comes to constructing hypotheses about [œ]-alternation.

3.3.3 The epenthesis analysis: examination of the counterevidence

In Section 3.3.1, we reproduce from the literature a number of distributional arguments favouring the existence of a formal schwa category. Two alternative and frequently discarded analyses of schwa are reintroduced into the discussion, i.e. the one-category approach and the epenthesis approach. Whereas the previous section is devoted to testing the one-category approach, we turn our attention in the present section to the epenthesis approach, whereby schwa is considered an optionally inserted vowel instead of the traditionally assumed abstract category /∅/. Our main objective is to examine the distribution of non-alternating consonant sequences [CC], e.g. [pl] in *place* 'place' [plas], and consonant sequences optionally split by an intervening [œ], e.g. [p(œ)l] in *pelouse* 'lawn' [p(œ)luːz], and in so doing test the two hypotheses that state that [CC] and [C(œ)C] stand in complementary vs. overlapping distribution, respectively (cf. Section 3.2.2.2). If the distribution of [CC] and [C(œ)C] is complementary, or only partly overlapping, the epenthesis approach with an optionally present [œ], whose realisation is conditioned by phonotactic constraints, is a viable and a representationally more economic alternative than the abstract sequence /C∅C/.

3.3.3.1 Identification of the empirical material

The empirical material used to test the epenthesis approach is obtained in a relatively similar fashion to the material presented in Section 3.3.2, i.e. we first perform a manual search for items with word-initial orthographic #CC(C) on Lexique.org (New et al. 2001)[137], before consulting Le Petit Robert (Rey-Debove & Rey 2004).[138] All bi-consonantal combinations are checked, and every item with the initial graphic sequence #CC(C) present both in Lexique and LPR is

[136] Clark and Berman (2000) report that children start analysing the internal structure of words between three to four years of age.
[137] The results were downloaded on October 1st, 2011.
[138] Recall that [C] represents a single phonological segment, e.g. [ʃ] written <ch>.

extracted for analysis.[139] Note that monosyllabic items with #CC(C) are included, as they are potentially subject to [œ]-insertion, e.g. *clé* ‘key’ [kle] vs. the hitherto unattested and thereby hypothetical form [k(œ)le]. We also find it important to underline that “true” tri-consonantal clusters #CCC of the type [s]+ObsLiq are more closely looked at in the current survey, e.g. *scrutin* ‘poll’ [skʁytɛ̃]. These clusters are shown to be prone to optional vowel presence in the position between C_1 and C_2, e.g. *secret* ‘secret’ [sœkʁɛ] ~ [skʁɛ], but not between C_2 and C_3, e.g. *squelette* ‘skeleton’ [skœlɛt] ~ *[sklɛt].

The search generates 4539 lemmas with orthographic #CC(C), and in addition – as the variety in focus is Swiss French – we extract 11 Germanisms[140] from the Dictionnaire suisse romand (Knecht & Thibault 2004, henceforth DSR), i.e. with initial [kn], e.g. *knöpfli* ‘type of small dumplings’ [knøpfli], with initial [ʃ]+Plo, e.g. *spätzli* ‘small strips made of flour’ [ʃpɛtsli], *stamm* ‘village hall’ [ʃtam], *staufifre* ‘nickname given to Swiss German speakers’ [ʃto(:)fifʀ], *stempf* ‘stamp’ [ʃtɛmpf], and *stöck* ‘expression in the *jass* card game’ [ʃtœk(x)], with initial [ʃ]+Fri, e.g. *schwyzerdütsch* ‘Swiss German variety’ [ʃvitsəʀdytʃ], with initial [ʃ]+Nas, e.g. *chneuquer* ‘search for (with insistence or indiscretion, without authorisation)’ [ʃnøːke][141], *faire schmolitz* ‘start$_{\text{INF}}$ being on familiar terms with someone’ [ʃmɔlits], and with initial [ʃ]+Liq, e.g. *chlapper* ‘drink covetously’ [ʃlape] and *schlouc* ‘small quantity’ [ʃluk].[142]

In the section to follow, we examine the #CC(C)-clusters in light of the distribution of alternating [œ] in the context #C<e>C(C), the latter is discussed in detail in Section 3.3.2. Note that neither [œ] = <eu> nor stable [œ] = <e> are included in the present survey, since the objective is to test the hypothesis about the optional presence of [œ]. Table 3.4 gives the numbers of items generated for each orthographic sequence that is subject to testing. In contrast to the preceding section, we organise the items with #C<e>C into two groups, characterised by the number of consonants following schwa.

Orthography	**Number of items**
#CC	4445
#CCC	105
#CeC	225
#CeCC	26

Table 3.4: CC(C) in Lexique/LPR vs. alternating C<e>C(C) in Racine (2008) and Swiss French PFC production data, the data set by count

3.3.3.2 Distribution of [CC(C)] and [C(œ)C(C)] according to the segmental nature

In Section 3.2.2.2, we outline the phonotactic restrictions on the complexity of the word-initial syllable in French, which is already presented in detail in Bazylko (1976) and Dell (1995). While the group of frequently occurring clusters is observed to be homogeneous in nature, e.g. ObsLiq and [s]+Obs, and in part analysed as more optimal from a sonority-based point of view, the group of rare clusters is identified as more heterogeneous, e.g. PloPlo, PloFri, and FriNas,

[139] As in Section 3.3.2, we exclude glides from our survey; they are often analysed as being derived from underlying vocalic elements, e.g. *pied* ‘foot’ /pie/ → [pje] (Durand & Lyche 1999:57).
[140] Cf. Section 2.5.1 for additional examples and an explanation of the term *Germanism*.
[141] *Chneuquer* is according to Knecht and Thibault (2004) a dialecticism which at an earlier stage was borrowed from Alemannic. The same is true for *chlapper*, cf. below.
[142] All transcriptions are taken from Knecht and Thibault (2004).

less optimal, and considered by Dell (1995:11) to function as more or less "deviant" onsets. The relation between primary, well-formed, clusters and secondary clusters – i.e. the consonant sequences optionally decomposed via the presence of schwa – has received renewed attention in a more recent study by Spinelli and Gros-Balthazard (2007). They reveal that among 895 polysyllabic words containing schwa in the second segment position, schwa absence yields an onset cluster that is also found as a primary cluster in a scarce 14.2% of the cases.[143] By this finding we expect the nature of the secondary clusters observed in Swiss French to pattern with the "deviant" onsets rather than with the well-formed ones. Before we lay out our data, note that Bürki et al. (2009) discuss whether primary and secondary clusters that are identical with regard to segmental content are articulated differently. In contrast to Lebel (1968) and Rialland (1986), Bürki et al. (2009), first, show that schwa absence does not entail compensatory lengthening in the secondary cluster. Second, they observe that the other acoustic cues separating the two types of clusters are few and unsystematic.

Table 3.19 presents the well-formed and deviant C_1/C_2 combinations retrieved from Lexique/LPR/DSR in the cells checked with <c>. The deviant cluster cells are shaded in grey. Additionally, the secondary clusters identified in Section 3.3.2.2 are shown in the cells checked with <a>.[144] Regarding cells checked with <?>, see Footnote 145. For the sake of clarity, recall that we have identified the secondary clusters on the basis of Neuchâtel judgement data with *c.e.f.* values of -3 or higher and production data from three PFC survey points, i.e. Geneva, Neuchâtel, and Nyon, cf. www.projet-pfc.net.

1 \ 2	p	b	t	d	k	g	f	v	s	z	ʃ	ʒ	m	n	ɲ	ʁ	l
p			c/a				c		c	a	c			c		c	c/a
b										a						c	c
t									c	c	c			a		c	
d	a	?		a		a		a	a			c	a			c	?
k			c						c				c	c		c	c
g										c				c		c	c
f			c							a			a	a		c/a	c
v														a		c	c/a
s	c/?	c	c		c/a	a	c	c	?				c/a	c		a	c/?
z																	c
ʃ	c		c					c/a					c/a	c/a		c	c
ʒ			a											a			a
m									a	a				c/a		a	a
n								a									
ɲ																	
ʁ	a	a	a	a	a	a	a	a	a		a	a	a	a			a
l					?			a	a								

Table 3.19: Distribution of [CC] vs. [C(œ)C], based on Lexique/LPR/DSR and Racine (2008)[145]

[143] Their data are drawn from the Brulex database, cf. Content et al. (1990).

[144] Both bi-consonantal and tri-consonantal consonant sequences are included in Table 3.19, but as we are mainly interested in establishing which C_1 and C_2 combine with or without an optionally intervening [œ], the potential third segment (C_3) is not explicitely shown in the table. For instance, the cell [st] refers both to [st] found in *stage* 'training course' and [stʁ] found in *strict* 'strict'.

[145] Dell (1995:11) transcribes *sbire* 'henchman' and *zingaro* 'Italian bohemian' with [zb] and [dz], respectively, whereas Lexique provides a transcription with [sb] and [tz], which accounts for the mismatch of the cells defined as [z,b] and [d,z] in Table 3.1 and the cells defined as [s,b] and [t,z] in Table 3.19. As regards [tl, tm, kv, zg, zv], no examples are found in both Lexique and LPR (compare with *thlaspi* 'type of herb', *tmèse* 'tmesis', *kvass* 'type of fermented beverage', *sgraffite* 'sgraffito', and *zwinglien* 'partisan of Zwingli' in Dell 1995:11). Finally,

Recall from Section 3.2.2.2 that Bazylko (1976) initially observes an overlap of primary [CC] and secondary clusters [C<e>C], amounting to 18 CC-sequences. As only seven of these are found to be true secondary clusters, i.e. [pt, pl, sp, ʃn, sm, sl, mn], we infer that the remaining 11, i.e. [pn, kn, gn, bl, dʁ, kʁ, sk, sn, fl, vl, ʃl], contain an intervening stable or stabilising [œ] and are subject to an item- and speaker-specific degree of alternation. While Table 3.19 confirms the secondary nature of the first seven clusters, the survey in Section 3.3.2.2 reveals that among the 11 latter clusters, only [sk, vl] are prone to schwa alternation. The other nine contain stable vowels, e.g. *querelle* 'quarrel' [kœʁɛl] with a *c.e.f.* value of -6.00. Having eliminated those clusters whose intervening <e> corresponds to a stable [œ], we next test the two hypotheses presented in Section 3.2.2.2 and repeated below in Example (18). They both claim that there is a phonotactically driven distribution of [CC] vs. [C(œ)C], and that the two surface structures are the output of an underlying /CC/:

(18) Hypothesis D1, repeated from Example (5)
Underlying word-initial /CC/ has two output realisations, [CC] and [CœC]. The loci of the [CC] ~ [CœC] alternation stand in complementary distribution with the loci of non-alternating [CC]; for a naturally defined set of phonotactic combinations, [CœC] alternates with [CC]. For the residual set of phonotactic combinations, [CC] is the only option.

Hypothesis D2, repeated from Example (6)
Underlying word-initial /CC/ has two output realisations, [CC] and [CœC]. The loci of the [CC] ~ [CœC] alternation stand in overlapping distribution with the loci of non-alternating [CC]; [CC] alternates with [CœC] in a naturally defined set of phonotactic combinations, but within this set, some phonotactic combinations license [CC], not [CœC], in a defined group of words. The residual set of phonotactic combinations licenses [CC], not [CœC].

Table 3.19 reveals four groups that are identifiable on the basis of the presence or absence of alternating [œ] and the segmental nature of the stem. The first identifiable group consists of consonant sequences with an obstruent C_1 and a liquid C_2. These are not attested with an optional [œ], with the exceptions of [pl, dl, fʁ]. Among these three exceptions, [dl] is the only cluster that can be explained on the basis of a well-established and cross-linguistically attested phonotactic constraint, $*\text{Plo}_{[\text{cor}]}$ + [l]; this constraint may possibly trigger optional [œ] in *delà* 'further away' [d(œ)la]. However, as we do not possess any Swiss French judgement or production data for *delà*, we cannot confirm this claim. As regards the cluster [fʁ], it has traditionally only been attested with optional [œ] in the verbal stem <fer> '$\text{do}_{\text{FUT/COND}}$' [f(œ)ʁ].[146] At this point we bring attention to the results from the PFC conversational data. No [œ] is present in any of the 11 occurrences of <fer> in a V#C<e>C context. The fact that the stem is also produced without [œ] in the four occurrences observed in a C#C<e>C context – a context traditionally analysed as favouring the presence of [œ] in word-initial syllables (Dell 1985) –

Lexique/LRP and DSR report two clusters not found in Dell (1995), i.e. [ʃt, ʃm], observed, for instance, in *stöck* and *smolitz*. Also, note that Bazylko (1976) reveals a rate of schwa absence in contexts [d(œ)b, s(œ)p, s(œ)l, l(œ)k] that is sufficiently high enough to classify [sb, sp, sl, lk] as secondary clusters. Due to a lack of judgement data, we have hitherto questioned the alternation admissibility in these phonotactic contexts. The results in Bazylko (1976), however, despite being obtained from Parisian, and not Swiss French, data, make our choice of including these secondary clusters in Table 3.19 (cells checked with <?>) more reliable.

[146] The fact that <fer> is obligatorily realised with [œ] in *feriez* '$\text{do}_{\text{2-PL-COND}}$' [fœʁje] not only illustrates that vowel presence is observed elsewhere in the inflectional paradigm, but also that it is preferred to a theoretically viable, but, as far as we know, unattested diaeresis solution *[fʁije].

indicates that <fer> behaves in a similar fashion to the items with orthographic word-initial <fr> or <phr>, e.g. *frais* 'fresh' [fʁɛ] and *phrase* 'sentence' [fʁaːz]; the cluster is well-formed and does not trigger vowel insertion. As for the well-formed [pl], it is attested with optional [œ] in a variety of items, which have *c.e.f.* values ranging from -1.17 in *pelée* 'waste' to 3.08 in *peloton* 'ball of wool' (Racine 2008); thus, it constitutes a true counter-example to Hypothesis D1, which claims there is a complementary distribution of [CC] and [C(œ)C].

The second identifiable group consists of consonant sequences in which a nasal or a liquid sonorant occupies the C_1 position. Setting aside the deviant [mn] cluster that is observed without intervening [œ] in only three items, *mnésique* 'mnestic', *mnémonique* 'mnemonic', and *mnémotecnique* 'mnemonic', all CC(C)-sequences with a sonorant C_1 are subject to optional [œ]-presence, e.g. [mz] in *mesure* 'measure' [m(œ)zyːʁ], [nv] in *neveu* 'nephew' [n(œ)vø], [ʁg] in *regard* 'look' [ʁ(œ)gaːʁ], and [ls] in *leçon* 'lesson' [l(œ)sɔ̃]. This group, thus, fits nicely with the idea of a phonotactically defined distribution of schwa. Sequences that have a sonorant C_1 and an obstruent or a nasal C_2, counter to the Sonority Sequencing Principle, are separated by an optional [œ] as a way to avoid the production of these less optimal consonant sequences.

The third identifiable group consists of consonant sequences with a sibilant C1. Whereas ObsLiq-sequences are well-formed clusters and are not subject to schwa presence, and sequences with a sonorant C_1 are variably licit as they are subject to schwa presence across the board, sequences with a sibilant C_1 are far more challenging to account for in a phonotactically driven analysis. First, regarding the well-formed [sp, st, sk] (cf. Dell 1995), the three different clusters do not display the same behaviour with regard to schwa. As regards [sk], our data show that items containing this initial sequence are split into two groups: those that are always realised with [sk], e.g. *script* 'script' [skʁipt], and those that are realised with optional schwa, e.g. *secret* 'secret' [s(œ)kʁɛ]. Regarding [sp] and the sole item transcribed with schwa in LPR, *cependant* 'however' [s(œ)pɑ̃dɑ̃], neither judgement nor production data are available to determine whether it can be realised with schwa in Swiss French. The transcription in Lexique, however, with [sp] and no schwa, seems to indicate that this item is preferably, or perhaps obligatorily, realised without a vowel in *français de référence*, hence patterning with the items that are orthographically presented with a word-initial <sp>, e.g. *sparadrap* '(adhesive) plaster' [spaʁadʁa]. Finally, no item with [st] is attested with an alternative output [sœt].

To summarise what we have hitherto established regarding [s]+Plo clusters, optional [œ] is not attested except for in some items with [sk]. When we additionally include [sg], which is attested with schwa across the board and is the only frequent cluster with a voiced plosive in the C_2 position, e.g. *secondaire* 'secondary' [s(œ)gɔ̃dɛːʁ], we conclude that in the group of [s]+Plo-clusters, only the combination [s]+$\text{Plo}_{[\text{vel}]}$ forms a counter-example to Hypothesis D1. However, the items with a velar plosive C_2 that are optionally attested with schwa in a post-vocalic context are occasionally produced without schwa in the post-consonantal context. This observation strengthens the well-formedness of [s]+$\text{Plo}_{[\text{vel}]}$. For instance, in the production data *secrétaire* 'secretary' is realised without schwa in 2/3 occurrences in a V#C<e>C context, and in 1/2 occurrences in a C#C<e>C context, i.e. *comme secrétaire* 'like secretary' [kɔmskʁetɛːʁ], from svarb2 in free conversation. An example with [sg] is *secondaire*, which is found without schwa in 5/8 occurrences in a C#C<e>C context, e.g. *école secondaire* 'secondary school' [ekɔlzgɔ̃dɛːʁ], from svaab1 in semi-formal conversation and subject to regressive assimilation [zg]. The literature indicates that schwa is sporadically prone to absence in a post-consonantal context where the immediate left-hand consonant is a continuant (Dell 1985), or more specifically a (sibilant) fricative (Côté 2000, 2008, 2009). If we add to this observation that the nature of the preceding word-final sonorant consonant, i.e. [m] in *comme* and [l] in *école* in our examples, also seems to trigger vowel absence[147], the apparent redundancy for schwa in this environment can be explained by the segmental nature of the consonants preceding schwa.

The fourth and final identifiable group extracted from Table 3.19 consists of consonant sequences with a voiceless sibilant C_1 and a nasal C_2. Whereas [sm, sn, ʃn] are classified by Dell (1995) as more or less deviant, Bazylko (1976:65) considers them to be "représentés dans un grand nombre de mots et ayant une fréquence très élevée dans les textes". Note that neither Dell nor Bazylko provides examples with deviant [ʃm]. Despite the low frequency in *français de référence* of primary SibNas-clusters, like [sm] in *S.M.I.C.* for *Salaire minimum interprofessionnel de croissance* 'minimum wage', and [sn] in *snob*, Walker (2001) characterises them as well-formed alongside the more frequent ObsLiq- and SibObs-clusters. In an epenthesis approach, the well-formedness of the $Sib_{[-vce]}$+Nas-clusters is put into question by the optional schwa presence attested in items like *semaine* 'week' [s(œ)mɛn], *chemin* 'road' [ʃ(œ)mɛ̃], and *chenille* 'caterpillar' [ʃ(œ)nij]. However, the majority of these "native" items are subject to highly frequent schwa absence[148], an observation that fits nicely with the unmarkedness analysis of [sm] and [sn] by Walker (2001). Thus, the obvious factors that differentiate *semaine* from *S.M.I.C.* or *snob* are the presence of orthographic <e> and the occasional presence of [œ] in the former type of items. Given that the comparison is between a native word, *semaine*, on the one side and an acronym, *S.M.I.C.*, and a foreign word, *snob*, on the other side, it is possible that the latter two items are not subject to the same phonological constraints as *semaine*, explaining why they are not observed with optional [œ]-presence.

Itô and Mester (1999) propose for Japanese a theory of lexical strata in the phonological lexicon that could turn out helpful in an account of the relatively extensive list of rare clusters in French, those grey-shaded cells checked with <c> in Table 3.19. Itô and Mester split the lexicon into native Yamato, technical and learned Sino-Japanese, foreign, and onomatopoetic strata. These divisions account for the gradually more marked structures one observes as one moves toward the periphery of the lexicon (toward the onomatopoetic stratum in Japanese). In their theory, each stratum has a set of faithfulness constraints, and the position of a given set relative to various markedness constraints determines the output structures found for each stratum. To take an example from Table 3.19, the cluster [ʃv] is subject to more or less frequent [œ]-alternation, which indicates that [ʃv] is not a completely well-formed cluster in Swiss French. The Germanism *schwyzerdütsch* is also included in this variety's lexicon. In DSR, it is transcribed [ʃvitsəʀdytʃ], without any alternative transcription with schwa. In line with the theory proposed by Itô and Mester (1999), we could interpret this distributional overlap as a reflection of *schwyzerdütsch* not being fully integrated into the native Swiss French vocabulary, and

[147] This observation does not go unnoticed in previous works. Delattre (1966), Dell (1985), and Tranel (2000) all observe that a word-final [ʁ] is more likely to trigger schwa absence. Tranel (2000) explicitly explains this as a reflection of constraints imposed by the Sonority Sequencing Principle, e.g. [ʁ] is more sonorous than [d] and can, therefore, form a well-formed complex coda in *sûr de personne* 'certain of no one' [syʁdpɛʁsɔn]. A word-final [k], however, is part of the least sonorous group of segments, and cannot form a complex coda with [l] in *avec le panneau* 'with the sign' *[avɛklpano] without violating sonority constraints (Tranel 2000:65). We refer to Côté (2000, 2008) for an opposing view.

[148] The Swiss French production data confirm the highly frequent absence of schwa in this context. For instance, in a post-vocalic context, *semaine* is produced without schwa in 29/29 occurrences. The admissibility of [sm] is further confirmed in a post-consonantal context, where schwa is absent in 13/31 of the cases. The fact that in 3/13 cases of absence, the word-final consonant is [t], shows that absence is not limited to cases in which the preceding word ends in a sonorant. Another example of a well-formed cluster formation is the production of *chenillettes* 'tracked vehicles': In a post-vocalic context, it is produced without schwa in 3/3 occurrences. The grammaticality of schwa absence in this segmental environment is further confirmed when we look at the sole example observed in a post-consonantal context: *des petites chenillettes* 'small tracked vehicles' is pronounced [deptitʃnijɛt] by sgads1 in a free conversation.

therefore, subject to a set of faithfulness constraints that dominate phonotactic requirements of the type *[ʃv]. The discussion of lexical strata in French is beyond the scope of the thesis, but is an area for future research, especially considering the French varieties in Switzerland are in close contact with no less than three other languages, German, Italian, and Romansh.

Thus, we conclude this examination of Table 3.19 by checking the validity of Hypothesis D1 and Hypothesis D2, outlined in Section 3.2.2.2 and repeated above in (18). First, it emerges from Table 3.19 that the predictions of Hypothesis D1 are not supported by the data. The absence of a strict complementary distribution has already been exemplified by well-formed [pl] vs. [p(œ)l], e.g. *plier* ‘fold$_{\text{INF}}$’ [plie] vs. *peluche* ‘teddy bear’ [p(œ)lyʃ], and well-formed [sk] vs. [s(œ)k], e.g. *ski* ‘ski’ [ski] vs. *secours* ‘help’ [s(œ)kuːʁ]. Hypothesis D2, on the other hand, predicts overlap in the distribution, but in addition, that there should also be some phonotactically defined regularity to the distribution of [C(œ)C]. If we abstract away from clusters with a sonorant C_1, which are subject to optional schwa insertion across the board, Table 3.19 reveals that there is more regularity in the contexts in which the optional vowel does *not* occur, i.e. in well-formed ObsLiq-clusters and well-formed [s]+Plo$_{\text{[-vce, lab/cor]}}$-clusters. Before we summarise the observed tendencies, one factor that still has to be taken into account is the length of the cluster, i.e. whether there are any further restrictions on cluster complexity in the cases when the cluster contains three segments. As can be inferred from the previous discussion, the sole Sib+CC-cluster found with optional [œ]-insertion is [s(œ)kʁ], e.g. *secrétaire* ‘secretary’ [s(œ)kʁetɛːʁ] with a *c.e.f.* value of 0.83. While [stʁ] and [spʁ] are seemingly produced without difficulty without a vowel, for instance in *strict* ‘strict’ [stʁikt] and in more foreign-sounding *sprint* ‘sprint’ [spʁint], other types of tri-consonantal clusters are subject to optional [œ]-presence. The *c.e.f.* values obtained by Racine (2008) show, however, the relative ease with which the vowel-free variant is selected, e.g. [ʁpʁ] in *reproche* ‘reproach’ [ʁ(œ)pʁɔʃ] with a *c.e.f.* value of 0.33, [ʁtʁ] in *retraite* ‘retirement’ [ʁ(œ)tʁɛt] with a *c.e.f.* value of -0.17, and [ʁkʁ] in *recrue* ‘recruit’ [ʁ(œ)kʁy] with a *c.e.f.* value of -1.33.[149] Also, the Swiss French production data confirm the alternation acceptability in items with a tri-consonantal cluster; schwa is absent in 58% (44/76) of the occurrences of a sequence [ʁ]<e>Plo[ʁ] in a post-vocalic context, e.g. *ton de reproche* ‘reproachful tone’ [tɔ̃dœʁpʁɔʃ] pronounced by scajd1 in a semi-formal setting. Example (19) summarises the tendencies observed throughout this section.

[149] Interestingly, and contrary to Delattre (1966) who claims that “[l]e nombre de consonnes qui *suit* l’*ə* est donc sans effet” (1966:17), there seems to be diatopic variation regarding schwa alternation in tri-consonantal clusters. For instance, whereas the Swiss French informants in Racine (2008) judge *degré* ‘degree’ [d(œ)gʁe] with a *c.e.f.* value of -1.83 and *recrue* ‘recruit’ [ʁ(œ)kʁy] with a *c.e.f.*-value of -1.33, the Nantais informants consider them stable, with *c.e.f.* values of -5.67 and -4.08, respectively (2008:373-375). A diatopic difference is found for all tri-consonantal clusters present in Racine’s material, with a consistently higher rate of schwa absence in the Swiss French data. A preference for schwa presence in the context #C<e>CC is also observed by Charette (1991:31), who claims that “a pronunciation without schwa is rejected by the majority of Quebec French speakers” (1991, Endnote 9, p. 214). As inter-variety variation is beyond the scope of the thesis, we do not pursue these observations.

(19)

No optional [œ]-insertion	Obs + Liq	Exceptions: well-formed [p(œ)l] and [f(œ)ʁ] attested with overlap; deviant [v(œ)l] attested with overlap
Optional [œ]-insertion	Son + C	Exception: deviant [m(œ)n] attested with overlap
	Non-sibilant Obs + $C_{[\text{-liq}]}$	Exception: deviant clusters (no insertion)
	CCC	Exception: well-formed [s(œ)kʁ] attested with overlap
Overlap: [CC] and [C(œ)C]	Sib + C	Exceptions: [ʒ] + C attested exclusively with insertion, [ʃ] + Plo/Liq attested exclusively without insertion

Re-examining Table 3.19, we observe that numerous clusters with an obstruent C_1, there is no overlap with items subject to [œ]-insertion; either the cluster is judged to be rare by Dell (1995) and not reported with optional [œ] – i.e. grey-shaded cells checked with <c>, e.g. [ps] – or [œ]-insertion is authorised – i.e. cells checked with <a>, e.g. [pz]. Bazylko (1976) emphasises that “bien que certains groupes initiaux causent des difficultés de réalisation aux informateurs, aucun d’entre eux n’a été tenté d’y intercaler un /ə/ d’allégement” (1976:67). This is seemingly contested by Hume and Bromberg (2005), who mention that “[i]n French, a non-lexical vowel is inserted in a range of contexts including between consonants, e.g. [gø̲dɑ̃sk] ‘Gdansk’ [, illustrating] epenthesis in loanword adaption” (2005:9). In line with Algeo (1978), who encourages the search for an understanding of marginal clusters, an epenthesis approach to schwa would not only need to determine to what extent vowel insertion occurs in loanwords, but also to explain, if it is the case, why optional vowel insertion more regularly targets [pz] than [ps] – neither of which are well-formed or frequent onset clusters in French.[150]

We conclude this section with a summary of our main findings. In Section 3.2.2.2, we have presented the approach whereby schwa is an optionally inserted vowel whose presence is triggered by phonotactic requirements. On the basis of Swiss French judgement and production data and the results on alternation admissibility, discussed in Section 3.3.2, we have established that Hypothesis D1, which claims that there is a complementary distribution of [CC] and [C(œ)C], is not supported by the data. Hypothesis D2, which claims that there is an overlapping distribution, has proven to be more successful; the distribution of [CC] and [C(œ)C] is near-complementary. Further, Hypothesis D2 claims that the nature of [C(œ)C] should be identifiable on the basis of its segmental structure. The data have revealed that optional [œ]-insertion is required for “native” items whose initial consonant sequence is not optimal in a sonority-driven analysis, i.e. ObsLiq. As regards the “non-native” items with a less optimal consonant sequence, we have suggested the possibility that they are not fully integrated into the vocabulary, and are, hence, protected from markedness constraints that ban the clusters in question (see Itô and Mester 1999). The data have also revealed a certain amount of overlap in Sib+C-clusters, which must be explained in order for the epenthesis approach to hold.

[150] Foreign-sounding words that have entered the language and contain an initial C_1/C_2-combination that generally authorises [œ]-insertion, e.g. [dv] found in *devinette* ‘riddle’ [d(œ)vinɛt], would contribute to an understanding of this asymmetry.

3.3.4 Summary and discussion: examination of the counter-evidence

At the outset of this chapter, we reintroduce the debate on the underlying representation of schwa. The majority of the previous works on schwa in French consider it to be an autonomous, representationally deviant, vowel category. Representationally and phonetically more economic alternatives such as the one-category approach and the epenthesis approach, in which schwa is a variant of /œ/ or is an optionally inserted [œ], respectively, have often been mentioned but ultimately rejected. Also, at the outset of this chapter, we present the twofold objective of this chapter, which comprise understanding what constitutes the input to the child, and, more specifically, identifying the level of categorical ambiguity in the input. A first step toward achieving this objective has been to re-examine the distribution of schwa and to identify the amount of counter-evidence to the one-category and epenthesis approaches, i.e. the cases in which the output schwa must be analysed as a separate phonological category. Therefore, in Sections 3.3.2 and 3.3.3, we have looked at Swiss French judgement and production data and have investigated the distribution of non-alternating [œ] vs. alternating [œ], and the distribution of non-alternating [CC] vs. alternating [C(œ)C]. First, the examination of alternating vs. non-alternating [œ] has revealed an absence of a completely complementary distribution, both with regard to phonotactics, morphological structure, and lexical sub-class affiliation. Although we have rejected the hypotheses that claim a complementary distribution account, hypotheses A1, B1, and C1, a number of regularities within these domains have been shown to jointly account for a large part of the data set, which at least partly confirms the hypotheses on a constrained, partial overlap, hypotheses A2, B2, and C2. Our preliminary conclusion, thus, states that the one-category approach is a viable alternative analysis of schwa alternation. The examination of non-alternating [CC] vs. alternating [C(œ)C] has also revealed the absence of a complementary distribution, which has led us to reject Hypothesis D1. Even though the observed overlapping distribution contains no identifiable pattern, the distribution *outside* the overlap contains a number of regularities, allowing us to partially confirm Hypothesis D2. Therefore, our preliminary conclusion states that the epenthesis approach is, alongside the one-category approach, a viable alternative analysis to schwa alternation. The reintroduction of the one-category approach and the epenthesis approach goes against previous works that reject the two approaches primarily on the basis of a vast amount of counter-evidence in the data. Although the ultimate analysis might reveal that the two-category approach is, in fact, best suited, we find the distributional tendencies observed in this section to be sufficiently important to consider all three possible analyses when we turn to our child language data in Chapter 7.

There are some challenges that still require a solution if we adhere to the epenthesis approach. First, the group of verbal stems subject to allomorphy shows variable requirements with regard to [œ]. For instance, while <lev> 'rise' authorises [œ]-alternation across the derivation, <pes> 'weigh' and <sem> 'sow' do not. Whereas *pesé* 'weighted' [p(œ)ze] and *semé* 'strewn' [s(œ)me] contain schwa in Swiss French, *pesant* 'heavy' [pœzɑ̃] and *semoir* 'seed bag' [sœmwaːʁ] are judged to contain a stable [œ]. To capture the distribution of [œ] in the latter stems, the insertion would need to be obligatory in *pesant* and *semoir*, while being optional in *pesé* and *semé*. Alternatively, the model should authorise two underlying representations for the given stems: one with an underlying /œ/, i.e. /pœz/ and /sœm/, and one without a vowel, i.e. /pz/ and /sm/, and the selection of one over the other would have to be dependent on the suffix.

The psycholinguistic study by Spinelli and Gros-Balthazard (2007) reveals a second challenge for an epenthesis approach to schwa. In their study they set out to compare schwa-items with secondary clusters that are not observed as primary clusters, e.g. [ʁn] in *renard* 'fox' [ʁ(œ)naʁ], with words with secondary clusters that are observed as primary clusters, e.g. [pl] in *pelouse* 'lawn' [p(œ)luːz] in a lexical decision task. They observed a more important processing cost for visual targets primed with an auditorily reduced form, i.e. without schwa, than for targets primed with an auditorily full form, i.e. with schwa. Importantly, the higher processing cost was only observed for schwa-items with clusters observed as both primary and secondary, e.g. [pl] attested as primary in *place* 'place' and as secondary in *pelouse* 'lawn'. For schwa-items with secondary clusters not attested as primary clusters, the processing cost was the same, whether the target was primed with the full or the reduced variant of the word, e.g. *renard* 'fox' [ʁœnaʁ] or [ʁnaʁ]. Spinelli and Gros-Balthazard interpret this result as a reflection of a more rapid lexical restoration of words whose word-initial sequence cannot be an underlying cluster in the language, e.g. [ʁn]. As for *pelouse*, the word-initial sequence [pl] in the reduced prime is analysed as entering into a lexical competition with all other words beginning with [pl], e.g. *place* [plas], thereby increasing the reaction time. In their view, then, schwa is a psychologically and phonemically real entity that is restored when interpreting the reduced form of schwa-items. The variable illicitness of a cluster, determined by phonotactic rules, functions as an aid to restore the underlying representation more quickly. If schwa is an inserted element, as hypothesised in the previous section, it remains to be seen how one could account for the results of this psycholinguistic study. If *renard* and *pelouse* are phonologically represented by word-initial /ʁn/ and /pl/, respectively, how can the processing cost of [pluːz] be greater than for [pœluːz] when it would be the latter item that contained an altered form, with [œ]-insertion? It might very well be the case that lexical competition is still a decisive factor in that /pl/ would be far more frequent – found both in items authorising [œ]-insertion and in items not authorising it – compared to /ʁn/ – found in a more reduced lexical set that is entirely subject to optional [œ]-insertion. At this point, such an alternative proposal remains mere speculation and will not be commented upon until Section 7.4, where we use child language data to propose whether the one-category, the epenthesis approach, or the traditional two-category approach best captures the data.

In the next section, we leave the discussion of word-initial syllables in order to provide a brief survey of schwa behaviour in monosyllables. The goal of this survey is similar to the one in the present section, to determine the distribution of schwa in adult Swiss French.

3.3.5 Distribution of schwa in monosyllables

In the preceding sections, we examine the distribution of schwa in word-initial syllables, with a particular focus on phonotactic structure, morphological structure, and lexical sub-class. The word-initial syllable is, however, just one of two positions in which schwa alternation is traditionally assumed to occur; thus, in order to get the full picture of the distribution of the vowel, we provide a brief examination of the monosyllables occurring in the PFC production data in this section. Note that schwa in monosyllables does not receive any particular attention in the remainder of the thesis, but the data to be presented are interesting in that they serve as a point of reference for future studies on schwa in child language.

While lexical class seems to play a role for the distribution of [œ]-alternation in polysyllables, its importance is far more preponderant and straightforward when it comes to monosyllables. While an output [œ] is obligatorily realised in monosyllabic nouns, e.g. *feu* 'flame' [fø], adjectives, e.g. *bleu* 'blue' [blø], verbal forms, e.g. *meurt* 'die$_{\text{2-SG-PRE}}$' [mœːʁ], and adverbs, e.g. *mieux* 'good$_{\text{COMP}}$' [mjø], it is subject to alternation in a closed set of open monosyllabic function words consisting of *de* [d(œ)] preposition meaning 'of, by, with etc.' or plural partitive article, *que* [k(œ)] with a exclamative, interrogative, relative, or conjunctive function, *ne* [n(œ)] the negation particle, the pronominal clitics *je* [ʒ(œ)] 1SG-SUBJ, *me* [m(œ)] 1SG-OBJ, *te* [t(œ)] 2SG-OBJ, *le* [l(œ)] 3SG-MASC-DIR.OBJ, *ce* [s(œ)] 3SG-DEM, *se* [s(œ)] 3SG-REFL, and the singular determiners *le* [l(œ)] 3SG-MASC-DEF and *ce* [s(œ)] 3SG-MASC-DEM. In sum, [œ]-alternation in monosyllables is restricted to grammatical function words. It is well known that both the position of the monosyllable in the prosodic structure and the nature of the final segment in the preceding word have an impact on the alternation rate. A phrase-internal monosyllable, preceded by a word ending in a vowel, is most prone to schwa absence (cf. Delattre 1966, Dell 1985, to name but a few). This is shown in the results from the Swiss French conversational data presented in Table 3.20.[151]

Position	**% absence**	**Occurrences**
##Cœ#C	43	203/471
C#Cœ#C	27	203/750
V#Cœ#C	70	1193/1701

Table 3.20: Rates of schwa absence in monosyllables in Swiss French, PFC spontaneous speech data, by percentage and count

Thus, schwa absence is as expected more frequent in a post-vocalic environment. When we look at the different monosyllables individually in Table 3.21, there are at least two observations to be made. First, regarding the highly frequently omitted negation particle *ne*, when it is not omitted, it is produced with schwa in 11/23 occurrences in the post-vocalic context. This is a rather significant number, compared to the rate of schwa presence in the other monosyllables. Although *ne* is almost completely absent from oral French, Fonseca-Greber (2007) observes that *ne* is taking on a new, pragmatically conditioned, emphatic function in Swiss French. If it is true that *ne* serves an emphatic function in these varieties, the presence of the optional vowel alongside the [n] does nothing but underline its emphasis. Second, in a post-pausal or a post-consonantal position, schwa is more likely to be absent when immediately preceded by a sibilant. As already mentioned, Côté (2009) explains vowel absence in this segmental context as a consequence of the sibilant's inherent perceptual salience; it is more tolerant to stand next to a pause or a consonant than other, less perceptually salient segments, e.g. [d] in *de*, subject to absence in 6% of post-pausal contexts and 19% of post-consonantal contexts.

[151] The results in Table 3.20 are retrieved from the PFC database (cf. www.projet-pfc.net). According to the PFC protocol, three minutes per conversation per speaker are coded for schwa (Durand & Lyche 2003). The Nyon informants stand out in that ten minutes of the semi-formal conversation are coded (cf. Andreassen 2003). As the aim of this section is not to perform an inter-variety comparison, the difference in length of coding does not have any impact on the results presented here.

Mono-syllable	##CœC#		C#CœC#		V#CœC#	
	%	Occ.	%	Occ.	%	Occ.
que	18	2/40	17	28/167	62	120/194
te	0	0/1	31	4/17	84	26/31
de	6	5/82	19	52/268	69	343/495
me	50	1/2	16	7/43	69	69/100
ne	0	0/1	17	1/6	52	12/23
le	8	5/66	22	24/108	66	225/339
ce	85	28/33	69	25/36	89	104/117
se	50	2/4	27	3/14	79	55/70
je	65	155/237	65	59/91	72	239/332

Table 3.21: Rates of schwa absence in different monosyllables, PFC spontaneous speech data, by percentage and count

Schwas in monosyllables are, according to Côté and Morrison (2007), epenthetic and pattern with schwas at morpheme junctures, word-medially and word-finally, and we return to this in more detail in Section 3.4.2.4. In their view, the resemblance of schwas in monosyllables to schwas in word-initial syllables is not due to their underlying status, but rather to their prosodic position inside a prosodic word – as opposed to word-final schwas that occur at the boundary of the prosodic word. As indicated at the outset of this chapter, nothing prevents us from postulating different statuses for schwas in different positions, but we need to be aware of the implications that such claims have for acquisition. If schwa in word-initial syllables is underlyingly /∅/ or /œ/, and patterns, both prosodically and phonotactically, with epenthetic schwa in monosyllables, the child faces several challenges. First, he must acquire the use of function words – shown to emerge later than lexical words (Gerken et al. 1990, Kern 2003), see also Bassano and Maillochon (2008) – including their phonetic content, their function, and their segmentation within the prosodic word or phrase.[152] Second, the child must somehow optionally license both an underlying segment, /∅/ or /œ/, and an inserted segment, a monosyllabic schwa, in the prosodic word-internal position, in addition to the phonotactic or other structural requirements that determine their relative presence or absence in the output. Thus, it will be interesting to determine in future studies whether schwa in monosyllables, when they start emerging in child speech, are subject to the same constraints as schwa in word-initial syllables, or whether they behave differently.

As is presented in Section 6.2, the work initiated by Liégeois and his colleagues on schwa in monosyllables is promising and constitutes, alongside the present work, the first studies on schwa production in child language.[153] Complementary with regard to types of schwa-items subject to analysis, a future comparison of our results will most likely provide information about the relationship in child language between schwas occurring in monosyllables vs. polysyllables in child language. At this point, however, we continue the discussion of the distribution and theoretical definition of schwa. In order to do so, we present in what follows various approaches to the underlying status of schwa, discussing them in light of the distribution of the vowel, presented throughout this chapter. As the one-category approach has proven to be less problematic than the epenthesis approach (cf. Section 3.3.4), we focus on the former and contrast it with the traditional two-category approach.

[152] This latter challenge is obviously also present if all target schwas are underlying or epenthetic, but in these cases, every alternating vowel would have the same phonological status.
[153] See Liégeois et al. (2012).

3.4 The underlying representation of schwa in the literature: review and discussion

3.4.1 Introduction

In Sections 3.2 and 3.3, we raise some core questions with regard to schwa's underlying status and focus on getting a clearer picture of schwa's distribution in Swiss French. In the present section, we review several approaches to the underlying representation of schwa. For each analysis that is presented, we go through the arguments and highlight the potential problems it encounters when the full range of data – outlined in Section 3.3 – is taken into account. For each given underlying representation, we present what is gained and what is lost at the level of phonological generalisation. We focus explicitly on acquisition by directly inquiring what the various theoretical definitions of schwa imply for the learnability question, i.e. within each approach, we discuss what is schwa and what has to be acquired in order to master it. We find these to be important questions, as we need a theoretical starting point that indicates what exactly should be acquired before looking at the child language data in Chapter 7. Note that while Chapter 7 reconciles schwa theory and acquisition theory, this section is primarily devoted to schwa theory and is construed as follows. We contrast two main opinions, i.e. the literature that considers schwa to be a full-fledged segment, the segmental approach, and the literature that considers schwa to be a deviant element, the structural approach.[154] Both phonological evidence, i.e. distribution, and phonetic evidence, i.e. vowel quality, are referred to in the various approaches, but, as is shown, the two types of evidence receive different degrees of focus depending on the level of abstraction in the analysis. In addition to focusing on the underlying status of schwa, i.e. insertion or deletion of segmental or structural content, we discuss the representation of schwa and related learnability issues.

3.4.2 The segmental approach

3.4.2.1 Schwa as an underlying segment: full identity with /œ/

Two papers approach schwa from a strict surface-true perspective. Walker (1993) initiates the discussion, rephrasing on Page 45 a principle from Natural Generative Phonology (cf. Vennemann 1972, 1974, Hooper 1976): "segments which are phonetically identical or which are in obvious complementary distribution or free variation must be treated as phonologically identical." Thus, schwa is no longer an autonomous segment; a category /œ/ realised as [œ] or ∅ is all there is, and its output realisation is relative to the morpho-lexical class to which the item belongs. Walker's main arguments for treating schwa as /œ/ are well-known: phonetic identity, interchanges between the class of alternating and non-alternating [œ], e.g. stabilising in *velouté* 'velvetiness' [vœlute], destabilising in *déjeuner* 'have lunch$_{\mathrm{INF}}$' [deʒ(œ)ne], and potential lexicalisation entailing distinctiveness of stress, e.g. initial stress in *sable* 'sand' [ˈsablœ] vs. final stress in *sableux* 'sandy' [saˈblø]. Walker recognises that the postulation of one single category /œ/ makes the vowel distribution very complex, and necessitates a large amount of morphological and lexical conditioning. However, we interpret the main goal of his paper to be a testing of an alternative to the traditional two-category approach, and in doing so, to reveal the

[154] As already mentioned, note that the full-fledged epenthesis analysis, assuming there is no phonemic schwa in the inventory, is not a part of the following discussion. Also, note that we do not discuss usage-based models (cf. Bybee 2001, for an introduction to the model and Eychenne & Pustka 2007, for an application of the model on French data).

complexity of the system when taking into account morphological and lexical information. Côté (2008) adheres to a perceptual account of schwa, showing that alternation rates can be explained as a reflection of the salience of surrounding consonants in a given segmental context. Like Walker (1993), she rejects the necessity of a separate schwa category in the inventory, arguing that redundancy of syllable well-formedness constraints in a perceptibility-driven analysis reduces the power of the empty-element approach (cf. Anderson 1982, Charette 1991). Côté further rejects the notion of schwa as an underspecified vowel, since schwa's realisation equals [œ], which is traditionally analysed as a marked vowel. Thus, taking into account that alternating and non-alternating [œ] are phonetically identical – in addition to the interchanges between the alternating and the non-alternating classes already revealed by Walker (1993) – she concludes that they have a common featural specification, and the only thing separating them is a lexically encoded *index of relative deletability*, given below.

> The main problem I see with the empty V approach is that it establishes between deletable and non-deletable [œ]'s a radical distinction which does not reflect the continuity observed between the two types of vowels. The contrast between stable and unstable [œ] is not as clear-cut and well-defined as usually assumed. There is rather a continuum from vowels that are almost always omitted to vowels that are always maintained. Unstable vowels vary widely, depending on the lexical item, in their propensity to be pronounced or omitted in a given segmental and prosodic context […]. The border between stable and unstable [œ] is also easily crossed. […] These facts suggest that there is no fundamental difference in nature between two kinds of [œ]. There is rather one vowel, associated with a certain propensity for deletion (at least in contexts where deletion is possible, notably in initial syllables after a single consonant). This index of relative deletability, which ranges from almost 0% to almost 100%, needs to be encoded in the lexicon, no matter how unstable vowels are represented. The use of empty vowels establishes a distinction that may be considered artificial and partly misleading. It is also unnecessary to the extent that the instability of the vowel is already expressed in the "deletability index". It seems reasonable, then, to use /œ/ for all stable and unstable [œ]'s. (Côté 2008:80)

The examination in Section 3.3.2 of alternating [œ] in word-initial syllables fits well with the view advocated by Walker (1993) and Côté (2008).[155] If a large portion of the distribution of alternating and non-alternating [œ] – output of one single category /œ/ – is predictable on the basis of a combination of phonotactic, morphological, and lexical conditions, it is possible to gain inventory economy, which we hypothesise to be one of the driving forces during the acquisition of vowel systems. Where our view diverges from Côté (2008) is regarding the level at which the rate of [œ]-alternation is modelled. In her view, everything is lexically encoded, i.e. the relative index given to an item is – as far as we understand her proposal – represented in the grammar and interacts with regular faithfulness and markedness constraints. She does not ever explicitly consider factors other than segmental ones, and as such misses the phonological regularity seemingly imposed by morphological junctures and word-final suffixes. Work on phonological variation and its acquisition provide alternative models in which overlapping regular constraints account for variability at all points in acquisition (cf. Boersma and Hayes 2001). We propose to explore these options to see whether they fare better than lexical constraints indexed with frequency. Côte's (2008) view of a deletability index has implications for the acquisition process; if schwa is underlyingly represented by /œ/, which is cognitively less challenging than having to contrast /∅/ and /œ/, the child not only has to acquire phonotactic

[155] Note that Walker (1993) and Côté (2008) have separate hypotheses regarding the nature of schwas that occur in positions other than the initial syllable of polysyllables. Walker considers everything is derived from an underlying /œ/, Côté considers that the junctural [œ] is epenthetic – even in monosyllables. We return to the analysis of epenthetic schwas in monosyllables in Section 3.4.2.4.

generalisations, morphological structure, and lexical functions, but in addition, and independently of gradually fixing grammatical modules, he has to extract and index alternation frequencies from the input for every word containing an [œ], irrespective of the word's phonotactic, morphological, and lexical composition.[156] If the child takes in alternation frequencies early on, we should be able to observe a differential behaviour in the production of non-alternating [œ] and alternating [œ]. If alternation frequencies are less important than structural constraints, this should also be reflected in the child language data and alternating and non-alternating [œ] should develop in a similar fashion.

Finally, note that other developmental scenarios are possible. First, it is possible that the child stores a single category /œ/ and that the lexical schwa-item is represented by two competing underlying variants, i.e. one variant with a vowel and another without (cf. Racine 2008, Bürki et al. 2010); these may be subject to either conditioned variation or free variation. Once the lexicon is sufficiently large and the phonotactic grammar is sufficiently developed, the two underlying forms are subject to lexical economisation and one of the forms is suppressed.[157] Second, it is also possible that the child initially identifies two categories, which in the target grammar surface as alternating and non-alternating [œ], and that they are collapsed at a later point in development. If economy prevails in the development of categories, the latter alternative is less likely to occur.

3.4.2.2 Schwa as an underlying segment: partial identity with /œ/

The analysis by Morin (1977, 1978) is couched within Natural Generative Phonology, where his theoretical representation of schwa reflects the history of the language. To provide some background, Morin explains that historical, reduced schwa evolved from an [e]-like pronunciation to [y] in front of labial consonants in the 12th century, as in *femier* > *fumier* 'manure', whereas other words underwent rounding to [œ] around the 15th century. Yet another group of words maintained its original [e]-quality, particularly words in which schwa preceded another vowel, as in *séance* 'session'. However, the present-day [œ]-reflex of schwa stands out as the only vowel that is subject to alternation, and Morin provides the following analysis. What differentiates the historical developments of schwa into [y] or [e] vs. [œ] is that [ø] but not [œ] existed in the language at the point when schwa developed into [œ], and thus no conflict between alternating and non-alternating [œ] was created. On the other hand, [e] existed when schwa evolved into [e], which caused the schwa [e]-reflex to merge with the existing, stable [e]. In the 17th century, when the existing, stable [ø] developed into two categories, realised [ø] and [œ], the language came to contain two [œ]; one alternating [œ], which was the historical [œ]-reflex of schwa, and one non-alternating, which was the output of the newly developed category /œ/. Historical sources indicate that the two types of [œ] were not phonologically merged (for details, cf. Morin 1978). On the basis of these historical facts, Morin postulates the existence of the categories /œ̇/ and /œ/, which refer to the [œ]-reflex of schwa and the stable [œ], respectively. The [œ]-reflex of schwa, i.e. /œ̇/, is diacritically marked and thus visible to a deletion rule. Thus, when the [œ]-reflex of schwa changes in character and develops into a stable [œ] or disappears completely from the surface, the word undergoes restructuring, e.g. *belote* 'French card game' /bœ̇lɔt/ is restructured as /bœlɔt/ and *peluche* 'teddy bear' /pœ̇lyʃ/ is

[156] In fact, this goes for every vowel subject to alternation in the French grammar, e.g. the [y] in *tu* 'you' /ty/ reduced to [t] in front of a vowel *tu as vu* 'you have seen' [tavy].

[157] Note that Fikkert et al. (2005) propose that children generalise over their own lexicon and not over the target lexicon present in the overall input.

restructured as /plyʃ/.[158] Morin's surface-based view without an abstract schwa – inspired by Vennemann (1974) – is clearly opposed to Schane (1968) and Dell (1985), who postulate the existence of abstract schwas word-medially and word-finally even for speakers who never produce schwa in these positions. Morin postulates schwa only when alternation is attested, i.e. in word-initial syllables (underlying), at specific morphological junctures (underlying status not specified), and in a number of verbal inflections (underlying, in alternation with [ɛ]).[159]

Morin's theoretical proposition is similar to Walker (1993) and Côté (2008) in that he claims that there is no abstract schwa category. His postulation of a "hybrid" category /œ/, i.e. one vowel quality [œ] representing /œ/ or its diacritically marked variant /œ̇/, does not encounter any particular problems when we take the full range of data into account; there is one underlying /œ/ that is subject to lexical marking, which leads to alternation in those given items. Thus, schwa is autonomous and the transparency problem, i.e. the phonetic merger of abstract /∅/ and /œ/, no longer exists. However, this claim imposes some demands on the learner. The major learnability challenge consists of the creation of two featurally identical, yet somehow distinct, /œ/; the only difference between the two is that one of them is subject to alternation. For a given word with [œ] in the input, the learner has to correctly categorise it as simultaneously identical to yet different from /œ/, i.e. determine its underlying status on the basis of its potential participation in (morpho-) phonological alternations. Subsequently, in order to avoid over- and undergeneralisation of the alternation, the learner must continuously evaluate the items with [œ] in his intake, build up a number of lexical constraints indexed with the items containing /œ̇/, and throughout remain sensitive to the alternation frequency in the various items. For phonological theory, Morin's underlying representations cause another difficulty, discussed in Anderson (1982) with reference to Kiparsky (1973):

> If the difference between /ə/ and /œ/ is limited to the difference between 'stable' and 'unstable' instances of the same vowel, then the use of two distinct symbols is purely diacritic; and most phonologists would probably agree that such positing of absolute neutralization (cf. Kiparsky 1973a) is illicit in the absence of further arguments. (Anderson 1982:538)

Thus, for the phonological constraints to operate successfully, schwa and /œ/ must either be underlyingly identical, i.e. /œ/, or they must be formally distinct, a position to which we turn in the following section.

3.4.2.3 Schwa as an underlying segment: unknown featural specification

Tranel (1999) defines schwa as a floating vowel, i.e. a structurally defective vowel without an inherent anchor in the structure.[160] By positing this defective structure, he explicitly defends the ranking of MAX[schwa] within the MAX[V] family:

> MAX(schwa) self-ranks below MAX(V) because the lack of realization of a structurally defective vowel automatically constitutes less of a MAX violation than the lack of realization of a "full" vowel. (Tranel 1999:272-273)

[158] Examples taken from Morin (1978:105-106).
[159] In this paper, Morin does not address the underlying status of schwa in the word-final position or in clitics.
[160] This view is initially presented by Tranel (1987a).

By *self-ranking*, Tranel suggests that it is less of a faithfulness violation to delete melodic content, e.g. a violation of MAX[melody], than to delete both the melodic content and its structural anchor, e.g. an additional violation of MAX[anchor]. Although he does not explicitly reject it, Tranel abandons the analysis of schwa as a floating vowel[161] in a paper published a year later in 2000. Tranel (2000) is the first elaborate discussion of schwa within OT. Like Dell (1985), he assumes schwa in word-initial syllables constitutes an autonomous underlying segment, but we find his treatment inadequate and partially contradictory. Tranel begins by renouncing any attempt to identify schwa's underlying structure; he merely assumes that its formal nature accounts for its "weakness", which means in the output schwa is the first vowel to be deleted and is the default vowel to be inserted. While accepting that schwa has a certain formal structure, Tranel does not posit any grammatical constraint that punishes this particular weakness. In fact, in his view, schwa deletion results from the interaction of MAX[schwa], the lowest-ranked member of the MAX[V]-family, phonotactic constraints on syllable structure, and the floating structure-avoiding constraint SYLLABLE ECONOMY (Prince & Smolensky 1993, henceforth SE). Nothing in the partial grammar that Tranel proposes overtly indicates that schwa is any different underlyingly from any other vowel, i.e. the low position of MAX[SCHWA] and its interaction with SE do not necessitate a deviant underlying representation, *per se*.[162] Of course, by not treating schwa as fundamentally different, but merely as a visible subject to SE, Tranel is able to explain schwa alternation as an effect of a constraint that plays a role cross-linguistically (cf. Page 62 for examples and references).[163] Like Côté (2000, 2008), Tranel adheres to the idea that not every output schwa has the same underlying representation – i.e. in his view, monosyllables contain an underlying schwa, contra Côté (2008) – while word-final schwas are epenthetic. He does not provide any examples of underlying representations for word-medial syllables, but for word-initial syllables, he gives the input form /pəti/ for *petit* 'small' in his discussion on liaison, thus indicating the traditional common treatment of monosyllables and word-initial syllables.

Tranel does not specify schwa underlyingly, but characterises it as a "weak vowel" compared to the other vowels, which can first be dispensed with in order to reduce structure. By letting phonotactic constraints and the MAX-family interact with SE, Tranel nicely captures why schwa is subject to gradient alternation, and why all other vowels, like /œ/, are protected. However, his analysis does not account for the variability in rates of schwa alternation in any given phonotactic context, e.g. [s(œ)m] is subject to more or less frequent alternation (cf. Section 3.3.2.2). Nor does his analysis provide an explanation of the fact that the phonetic nature of schwa is identical to the nature of the "strong vowel" [œ]. Finally, his analysis also fails to link alternating and non-alternating [œ]: in what way does stabilisation (or destabilisation) occur in an ObsLiq-environment, e.g. [pl] in *pelage* 'fur-lined coat', when the constraints interacting, *CC[ons], *CC[coda] and SE, should *a priori* first penalise the less optimal consonant sequences, e.g. [ʁp] in *repère* 'marker'? While the main purpose of Tranel's paper is to test mechanisms in OT and apply them to well-known French phenomena, the reluctance to

[161] Positing floating segments in French is more common in analyses of liaison (cf. Wauquier-Gravelines 2003, Miller and Fagyal 2005, and Scheer and Encrevé 2005), and in analyses of the *h-aspiré* phenomenon (cf. Pagliano 2003).
[162] If the phonological status of schwa is deviant, this should be reflected somewhere in the grammar. A shift of focus from the structure-preserving MAX[schwa] to a structure-avoiding constraint – one banning particular featural combinations – could serve better in the analysis. However, this would require independent evidence in order to be phonologically justified.
[163] See Gouskova (2003) who argues against economy constraints in grammar, proposing that economy effects are derived from the interaction of independently motivated constraints only.

acknowledge the exceptional nature of schwa renders his analysis of the dynamics of schwa alternation impossible to carry out.

Tranel avoids discussing learnability issues in this paper, but we consider one major task for the child to be the categorical identification of the various [œ] in the input. Since alternating [œ] and non-alternating [œ] are identifiable by different MAX[V]-constraints, i.e. MAX[V moyennes] ≫ MAX[schwa] (Page 61), they must be acquired as featurally or structurally distinct underlyingly, and one of them must be characterised as "weak". The learner must infer which [œ] represent schwa on the basis of the faithfulness constraints MAX(schwa) and DEP(schwa) and their interaction with SE, which itself is blind to the featural make-up of the syllable nucleus. The learner must additionally acquire floating constraints, i.e. that not all constraints are ordered in the final state, and one should expect – before the range of the floating constraint is fixed – either an under- or overapplication of vowel deletion.

3.4.2.4 Schwa as a non-uniform segment: deletion vs. insertion

We share with Côté and Morrison (2007) the definition that schwa is a vowel that alternates; however they do not specify its internal structure. What singles out Côté and Morrison from the approaches reviewed above is that they analyse schwa in monosyllables as being epenthetic. As previously mentioned, schwas in monosyllables and polysyllables are traditionally considered to be subject to the same constraints, an analysis mainly based on their phonotactically similar distribution. According to Côté and Morrison, and as already mentioned, this similarity is not an output effect of the interaction of phonotactic constraints and faithfulness constraints that evaluate the output correspondent of an underlying schwa, but rather it is the effect of the prosodic position of schwa. There is a preference for schwa to be realised in a prosodic word-internal position as opposed to word-final schwas which sporadically surface on the edge of prosodic words. They also reject other arguments put forth in the literature for the underlying status of a clitic schwa. First, they show that schwa in monosyllables is not lexically contrastive, e.g. *te* 'you' [tœ] vs. *[t]; second, they observe that residual lip rounding in cases of schwa absence is seemingly *not* the result of schwa deletion – contrary to the view in Fougeron and Steriade (1997) – and instead, show that it is more probably the effect of neighbouring consonants. Thus, Côté and Morrison argue for a differentiated analysis of schwa's underlying status; a view that cannot be rejected without evidence to the contrary. When it comes to learnability, however, several faithfulness constraints must be activated in order to properly account for both inserted and deleted schwa, e.g. DEP[schwa] must operate against insertion in monosyllables and MAX[schwa] must operate against deletion in word-initial syllables. Implied in their analysis is the claim that schwa is structurally or featurally different from /œ/ – a view that Côté (2008) later abandons. Thus, in order to correctly categorise the vowels in monosyllables and word-initial syllables, the learner must first deduce, from the input, a category split between /∅/ and /œ/ for [œ] in word-initial syllables, for which the data provide scarce evidence. Second, in order to project a vocalic node in monosyllables he must acquire constraints on word minimality as well as constraints on prosodic positions. Prosodically, the word-internal position is stronger than the edge of a prosodic word; when in conflict, monosyllabic and internal schwas take precedence over final schwas.

Recall, however, that function words emerge later in production than lexical words (cf. Gerken et al. 1990, Kern 2003). If acquisition is surface-based and economically driven, one could hypothesise that, prior to building the target prosodic structure, all attempted output [œ] represent /œ/. Later, when target monosyllables with schwa start emerging, underlying /œ/

continues to surface as [œ] or ∅ in lexical items. In addition, one should expect the established category /œ/ to feed the learner with a vowel quality that he selects when schwa insertion is triggered in the output.[164]

In this section, we have reviewed several approaches to the underlying status of schwa that consider the vowel to be more or less featurally specified. They range from full identity of schwa with /œ/ via diacritic marking of /œ/ to claiming a separation from /œ/ – the latter type of analysis often involves undefined featural content. In the next section, we turn to the second main approach, which is to claim that schwa is represented by a structural, and featurally empty, element.

3.4.3 The structural approach

3.4.3.1 Schwa as a structural element: underlying syllable nucleus

Schwa, more than any other vowel in French, has a unique behaviour, and the vowel ~ zero alternation observed in the output has led scholars to treat it as a defective, structural element. Recall that in SPE (Chomsky & Halle 1968), the syllable is not recognised in phonological rules, but with the introduction of Autosegmental Phonology the syllable as a formal unit gained more importance. Thus, as mentioned in Section 3.2.2, Anderson (1982) is among the first to refer to the abstract syllable structure in the analysis of schwa. Like those treating schwa as a vowel with featural content, Anderson (1982), too, recognises the analytical problem related to the phonetic identity of schwa and underlying /œ/. [œ] is only one out of three possible surface variants of schwa, the other two being [ɛ] or zero, and Anderson selects the one that does not independently exist elsewhere in the system, i.e. zero, to represent schwa underlyingly. In his view, in the abstract syllable structure, schwa constitutes a bare syllable nucleus, the *zero allophone*, and just like segments, the syllable structure can undergo change via the implementation of phonological rules. Anderson proposes a rule for French that requires that the material in an onset followed by an empty nucleus be reassociated with the preceding syllable, as long as the coda position of the latter is unfilled. Subsequently, the remnants of the schwa-syllable, which now contains a bare nucleus only, are deleted. If the resyllabification of the onset material does not take place, e.g. if the coda position in the preceding syllable is already filled, the empty nucleus must be associated with phonological features via the rule *schwa-spelling*.

Evaluated against the distribution of alternating and non-alternating [œ] in Swiss French, the empty nucleus approach seems to fare better than a two-category approach in which schwa is underlyingly specified. The deletion cost is lower if only a structural node is deleted, and not both a structural node and vocalic features. Given that the majority of schwa-items in our production data are subject to frequent or highly frequent schwa absence, we suggest that it is more economic to internalise a rarely spelled out node than to delete a rarely realised underlying full vowel.

As regards learnability issues, first, note that Anderson follows the system laid out by Dell (1985) and assumes the presence of empty nuclei in monosyllables and in word-initial, word-medial, and word-final syllables; this position is also shared by the adherents of the CVCV-

[164] The selection of [œ] in the case of epenthesis goes counter to the idea that epenthetic vowels should be among the least marked in the language. Hume and Bromberg (2005) show however that [œ] is the vowel with the lowest amount of content information in French, and therefore, is apt to be selected for epenthesis.

framework (cf. Section 3.4.3.3). This assumption entails a number of challenges for the language learner. First, he must simultaneously build empty structures and correctly categorise the various [œ] as either empty /∅/ or /œ/. A prerequisite in this case is that he must generalise over the whole vowel system in order to view the necessity of empty nuclei, and recall that we do not want to categorise more then necessary. Second, in addition to creating abstract empty nuclei for which there is no phonetic evidence in the input, he must also develop his grammar in a way such that it authorises a lower degree of absence in word-initial syllables than in word-final syllables. Finally, he must acquire the late fill-in rule that appropriately assigns phonetic features to the nucleus.

3.4.3.2 Schwa as a structural element: empty vocalic node in Optimality Theory

Eychenne (2006) examines the phonology of word-medial and word-final schwa in Midi French varieties, using the Connection Theory (van Oostendorp 1995) and the Turbidity Theory (Goldrick 2001), two constraint-based approaches that propose a directional relationship between the infra-segmental and the supra-segmental levels, and between the phonology and the phonetics.[165] One of the main claims in Eychenne's thesis is that schwa is represented as an empty vocalic node, which, as a consequence of being deprived of place features, has no access to strong prosodic positions like the head of a binary foot. As regards the alternation admissibility of schwa in conservative vs. innovative Midi varieties, the interaction of the constraints VOC-V, defined as "a Vocalic node dominates melodic content" and MAX-VOC, defined as "do not delete a Vocalic node", is decisive for the realisation or deletion of the vowel. If VOC-V dominates MAX-VOC, schwa is deleted; if MAX-VOC dominates VOC-V, the vocalic node is realised. In the latter case, for speakers who spell out schwa other than default [ə], place features are projected onto the empty vocalic node, which causes a violation of DEP-F, dominated by VOC-V. As regards schwa in word-initial syllables, e.g. *cheval* 'horse' [ʃ(œ)val] and *c<u>e</u>rise* 'cherry' [s(œ)ʁiz], subject to alternation in Northern varieties, they do not alternate in the Midi varieties. Given that there is no motivation for postulating an underlying schwa in these words, /œ/ is thus selected. Eychenne does not extend his analysis to Northern varieties, and we can only assume that alternating [œ] in word-initial syllables in Northern varieties would receive the same phonological status as the word-medial and word-final schwas in Southern French.

Like Anderson (1982), Eychenne suggests that the node deletes when it is not spelled out, leaving no traces of its presence in the lexical representation. Different from Anderson, however, the analysis by Eychenne explicitly allows for qualitative variation in the spell-out of the vowel, which he claims is frequently attested in the word-final position: "dans tous les cas où il y a clairement un schwa, la voyelle peut prendre tout une palette de timbre (p. ex. ə, e, ɒ, œ, ø) en finale, et elle se réalise le plus souvent [ø] en position interne de mot (Rochet 1980 : 92)" (Eychenne 2006:234-235). When we take into account the variable quality of schwa attested in word-initial syllables in Louisiana French (Blainey 2009), we acknowledge the importance of allowing for a variety of vocalic features to attach to the vocalic schwa node. This finding is an argument in favour of the two-category approach and is an argument against the one-category approach proposed in this thesis because the one-category approach claims schwa is an output variant of /œ/. The analysis of the child language data in Chapter 7 is decisive for the selection of one approach over the other; a qualitative difference between schwa and target non-

[165] As the Connection Theory and the Turbidity Theory do not receive any further attention in the remainder of the thesis, we refer to Eychenne (2006) for details on the application of these theories on Midi French data.

alternating [œ] in word-initial syllables in the data, which cannot be accounted for by C_1 or C_2, seems to attribute more explanatory power to the approach Eychenne advocates.

In the last two decades, the empty-vowel approach to schwa has gained substantial support outside of the traditional generative analyses, and to conclude this section, we briefly present some important contributions to the study of schwa in Government Phonology.

3.4.3.3 Schwa as a structural element: undeletable nucleus in Government Phonology

Charette (1991) agrees with Anderson's (1982) treatment of schwa as an empty nucleus, but she aims at accounting for the facts Anderson cannot explain, e.g. schwa absence in post-pausal word-initial syllables. Within the framework of Government Phonology, schwa is underlyingly present as an empty nucleus, which is never deleted from the structure. What separates a present vs. an absent schwa in the output is whether or not the nucleus is filled with content. Kaye et al. (1985, 1989, 1990) propose that a vowel is composed of a set of elements, these latter representing a matrix of phonetically interpretable features out of which one specification is labelled as marked, or *hot* (cf. Harris 1990). Among the elements combined in a segment, one is the *head* and one (or several) is the *operator*. Since the feature specifications within the head and the operator(s) can conflict, the segment eventually comes to contain all the feature specifications of its head in addition to the *hot* feature of the operator. One of the elements contains no marked features and is labelled the *cold* element, phonetically interpreted as [ɨ]. In French, for the cold element to be interpreted, the grammar adds the element A^+ as the operator in the segmental representation, which is phonetically interpreted as [ə].

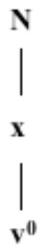

Figure 3.5: Formal representation of schwa, where v^0 = head (Charette 1991:75)

Common for cold elements cross-linguistically is their ability to be realised as zero, i.e. represented with *x* only, if they are properly governed, cf. the definition in Example (20) taken from Charette (1991:83):

(20) Proper government
A nucleus α properly governs a nucleus β iff
(i) α governs β
(ii) α is not itself governed (it has phonetic content)

Like Dell (1985), Charette posits schwa in word-initial, word-medial, and word-final syllables. The stability of schwa when it is preceded by two consonants, e.g. word-initially as in *brebis* 'ewe' [bʁœbi] and *cette semaine* 'this week' [sɛtsœmɛn], is never a question of restructuring the underlying structure. The various government relations are complex and are beyond the scope of this thesis, but in short, schwa stability is merely the result of the empty nucleus functioning as the *government-licencer* for the preceding consonant. This relationship is defined as “[a] non-nuclear head may govern a complement iff it is government-licensed, i.e. governed by a non-properly governed nucleus” (Charette 1991:104).

Scheer (1999, 2000, 2005) rejects Charette’s (1991) analysis by falsifying her theory’s prediction that no schwa with two preceding consonants can be phonetically absent. In fact, within the range of potential clusters preceding schwa, only those with increasing sonority, i.e. ObsLiq-clusters, require a phonetic schwa, whereas, for other clusters, there is inter-speaker variation. He argues for a strict CVCV-structure (Lowenstamm 1996), where one important principle is at work, i.e. *The Empty Category Principle*, which is given as “[a] position may be uninterpreted phonetically if it is properly governed” (Kaye et al. 1990:219). Whereas the phonological rules postulated for schwa in French, in general, have been language-specific, Scheer sees a pattern in schwa alternation that is similar to the vowel ~ zero alternation in a range of other languages[166], rendering it part of a more general phenomenon, as Tranel (2000) proposes to capture in his OT analysis. To provide an example, in Figure 3.6 below, [ə] is not realised in the structure because of the *infrasegmental government* relation (Scheer 1999) between its neighbouring consonants, i.e. the liquid is authorised by [i] to govern [ɡ]. The empty category N☺ in this structure is properly governed by [i], and need not be spelled out.

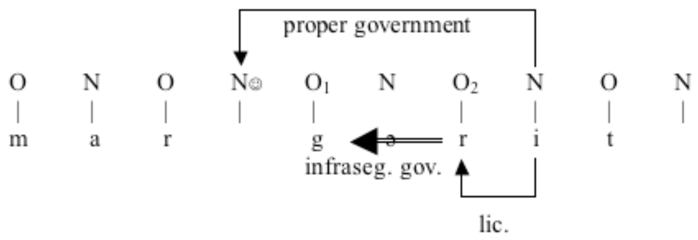

Figure 3.6: Formal representation of *marguerite* ‘daisy’ [maʁɡ(œ)ʁit] with absent schwa, adapted from Scheer (1999:103)

This approach is at the extreme opposite of the one-category approach in that it not only postulates the separation of schwa and /œ/, but it also assumes that the schwa position never deletes. From a learnability perspective this is interesting because it entails a strict division between the phonological and the phonetic structure. A schwa might be phonetically absent but still present phonologically. *A priori*, a strict CVCV-approach also opens for the possibility of vowel insertion in empty V-positions, thereby allowing for the realisation of vocalic content that is not present underlyingly.[167]

The CVCV-approach to schwa concludes our review of the various phonological statuses assigned to schwa in the literature. While the segmental approaches are shown to favour the one-category approach, the structural approaches raise some challenges for it. The latter do, however, reveal some analytical opportunities hitherto not considered, like variable schwa quality and the undeletability of schwa position. Only an analysis of the child language data will determine whether or not these analytical tools can be incorporated into the one-category analysis or not.

[166] See Scheer (1999) for examples and references.
[167] In a traditional approach, this is analysed as epenthesis.

3.5 The underlying status of schwa: summary and hypothesis

In this chapter, the aim has been to reveal the distribution of schwa and to evaluate the theoretically possible underlying representations of the vowel. Three theories are under discussion. The first theory is the traditional two-category approach in which schwa is taken to be a separate vowel category. The second theory is the one-category approach in which schwa is taken to be an output variant of /œ/. The third theory is the epenthesis approach in which schwa is taken to be an optionally inserted [œ]. The one-category approach and the epenthesis approach are frequently rejected in the literature, and the argument for reintroducing these two in this thesis has been centred on a principle of economy. The two alternatives are less costly representationally and phonetically because they both imply fewer vowel categories, i.e. there is no need for an autonomous category /∅/, and they claim a more transparent mapping between the phonology and the phonetics, i.e. there is no need for a phonetic neutralisation of categories /∅/ and /œ/. In this chapter, we have tested the two approaches to Swiss French judgement and production data, and we have established that phonotactic, morphological, and lexical factors collectively account for a large part of the data; however, these factors do not establish whether we can eliminate the two-category approach. However, despite the fact that the epenthesis approach has proven most successful when it comes to the distribution of schwa, there are challenges from elsewhere in the literature that make this approach less convincing, e.g. the variability in [œ]-behaviour across the derivation in verbal stems like <pel> ‘peel$_{\text{INF}}$’, and the psychological reality of the vowel indicated in the psycholinguistic experiment conducted by Spinelli and Gros-Balthazard (2007). A challenge for the one-category approach, on the other hand, is the phonetic variability attested for schwa in other French varieties, e.g. Louisiana French. Both the mental reality of schwa and its variable quality could be accounted for in a structural approach in which schwa is void of vocalic features, but, yet again, the existence of empty elements implies a level of abstractness that some scholars believe is unnecessarily high.

At this point, we bring child-directed speech into the discussion. According to the literature (cf. Ferguson 1977), child-directed speech is prone to contain a high level of redundant elements. On the basis of this observation, we first suggest that a caregiver’s input to the French-learning child contains a lower rate of schwa absence than what is observed in inter-adult speech. As regards the development of the vowel inventory, an input-driven approach implies a reluctance toward categorically distinguishing schwa and /œ/ before there is sufficient evidence in the input that requires this move. Following this line of reasoning, we suggest that the child moves from the concrete to the abstract, and initially creates one category /œ/, which is realised in the output as a vowel or zero. In gradually building up his lexicon to contain more items with alternating and non-alternating [œ], and in being gradually more exposed to schwa alternation in the child-directed speech, the child may inevitably make a categorical split whereby schwa becomes an autonomous element. In the remainder of the thesis we refer to this scenario as the *delayed-split hypothesis*.

Our hypotheses on the behaviour of schwa in child-directed speech and on the phonological representation of schwa in children concludes the present chapter. In what follows, we turn to a discussion of our sampling methods. We show that the construction of a data set that targets a phonological variable poses both practical and theoretical challenges.

4. Methods

Vaudois speaker	Elle est où, la fenasse?
Valentine	À gauche. (directs her speech to the researcher) Il fait ça très bien. Il fait ça très bien par ça. Ça fait pas monotone, ou je sais pas comment dire. L'intonation, la voix et tout et… Ça fait naturel, quoi. Comme si les enfants étaient là. Ça va très bien.

Valentine, the mother of Adèle, is subjected to the PowerPoint test with the male Vaudois speaker in July 2006. While playing, she makes a spontaneous comment on the naturalness in the Vaudois speaker's voice.

4.1 Introduction

Since the emergence of language acquisition studies, we observe the development of various methodological approaches to constructing data sets, each of which is either abandoned or refined in the course of the history of linguistic research. Three main phases can be distinguished in this methodological development (Ingram 1989): the period of diary studies (1876-1926), the period of large sample studies (1926-1957), and the period of longitudinal language sampling (1957-present). Descriptive diary studies[168] generally come in the form of parental reports on the (often more general) linguistic development of the child. This approach is indisputably advantageous because the caregiver, often a trained linguist, knows the child better than an outside researcher does. Its major potential drawback, however, concerns the type of information reported by the caregiver. She is susceptible to reporting solely what she considers to be important, which does not necessarily include the linguistic phenomena of interest to an outside researcher. Ingram (1989) nevertheless points out that many parental diaries are so comprehensive that they may serve as databases from which contemporary, more theoretically oriented linguists can extract valuable data. See for instance the following remark by Grégoire (1947) that indicates that the acquisition of schwa alternation is subject to individual variation, and further, that children use repair strategies to avoid the creation of secondary consonant clusters.

> *Place de l'e caduc.* – On connaît les difficultés qu'occasionne aux étrangers la voyelle *e* (*e* caduc) figurant dans une syllabe initiale. Elle ne semble pas avoir fort embarrassé l'aîné [Charles], dans la mesure où il l'a rencontrée. Son frère [Edmond] lui a consacré plus de temps. Au début de la quatrième année […], il se sent gêné par les groupements cependant faciles, tels que « les r[e]mettre », « ils (i) r[e]gardent ». Dans les deux verbes, il opère la métathèse de l'*e* […]. Il dit : les (lè-z-e-rmette, i-z-e-*rgartent*. Les deux exemples ne manquent pas d'intérêt, si l'on tient compte de la liaison en *z* dans chaque cas. L'enfant considère donc les mots comme étant *ermettre, *ergarder, ce qui provoque la liaison entre eux et les pronoms pluriels, d'une part, « les » (lèz, de l'autre « ils » (iz-). Le fait est

[168] Cf. Leopold's (1939-49) study of the English-German bilingual child Hildegard and Grégoire's (1937, 1947) study of the two brothers Charles and Edmond, raised in a Belgian French linguistic community.

> confirmé par le traitement du verbe « remuer » dans la phrase : est-ce qu'elle *ermu:w* pas ? (« ne remue pas ? » […]). (Grégoire 1947:270-271)

The period after World War I marks the rise of behaviourism. Researchers from this period are interested in establishing a theory of learning wherein a child's development can be explained through observable conditions in his immediate environment. Whereas the parental diaries report individual behaviour, the behaviourists aim to report observations of what they believe to be "normal" behaviour, which they believe is possible to identify solely on the basis of a systematic observation of a large number of carefully selected children with identical environmental influences and stimuli.[169] Although the behaviourists introduce one important component into the field of language acquisition, i.e. the quantitative analysis of the collected data[170], Ingram (1989) highlights at least three problems with these kinds of studies. First, many of the researchers lack linguistic experience and their analyses consequently are often superficial. Second, in focusing on collective data instead of individual patterns, the researchers are unable to devote attention to the idiosyncrasies of individual grammars, which have the potential to yield enlightening information about the developing rule system that guides production. Third, the transcriptions are carried out without recording equipment and are consequently unreliable. Even if the diarists – familiar to their child subjects – experience the same problem, they are, as already mentioned, often trained linguists. The quantitative studies can nonetheless function as a normative reference, e.g. in the case where a researcher wants to determine where in the broader picture of development a specific child is and whether he is typical or unusual.

The period of longitudinal language sampling emerges in the late 1950s. The new methodology requires the sampling of several children, who are selected on the basis of predetermined criteria and are recorded at regular intervals for a certain period of time in order to provide representative data. The emergence of longitudinal language studies also happens to coincide with a theoretical turning point inspired by the publication *Syntactic Structures* by Chomsky (1957). Focus shifts from pure linguistic description to an explanation of language competence, and child language researchers begin to focus on analyses of the acquisition of the grammatical rules that guide production; however, Chomsky (1964) is quite pessimistic toward using longitudinal language sampling as a means to discover a child's competence:

> [I]f anything far-reaching and real is to be discovered about the actual grammar of the child, then rather devious kinds of observations of his performance, his abilities, and his comprehension in many different kinds of circumstance will have to be obtained, so that a variety of evidence may be brought to bear on the attempt to determine what is in fact his underlying linguistic competence at each stage of development. Direct description of the child's actual verbal output is no more likely to provide an account of the real underlying competence in the case of child language than in the case of adult language […]. Not that one shouldn't start here, perhaps, but surely one shouldn't end here […]. (Chomsky 1964:36)

Chomsky points to two potential problems, i.e. first, that the sampling method is not focused enough and does not provide the necessary (and unambiguous) data needed in order to answer research questions about particular aspects of linguistic competence, and second, that there may be too large a gap between child language performance and competence. Ingram (1989) addresses these methodological problems by proposing to reconcile into one discipline the objectives of two separate approaches in the field; one, the *Child Language* approach, where

[169] Cf. D. McCarthy (1930) and Templin (1957), cited by Ingram (1989:14).

[170] Their quantitative results are generally presented as strict proportions and percentages. The statistical analyses used today are still under development at the time (Ingram 1989).

researchers primarily focus on data, stages, and performance factors, and two, the *Language Acquisition* approach, where researchers primarily focus on developing a theory of grammar. The unified field of *Child Language Acquisition* has a twofold goal, "to provide a testing ground for current theories of grammar [… and] to develop a theory of acquisition" (Ingram 1989:60), which would require three properties; the study of child language, the use of theories of grammar to examine child language data, and the use of methods that establish when a given linguistic behaviour is rule-based (Ingram 1989:60). While the adherents of the Language Acquisition approach, at least historically, concentrate on the theory of language or grammar, the adherents of the Child Language approach, again, at least historically, concentrate on the theory of acquisition. Ingram discusses the two different theories and emphasises the fact that the theory of acquisition must culminate in a learnable grammar as well as account for the different stages children go through prior to the final stage. Additionally, the theory of acquisition must strive to identify both competence factors, i.e. the principles that guide the construction of the grammar, and performance factors, i.e. the psychological processes that affect language learning. Ingram's (1985) Lexical Principle "learn individual paradigmatic alternations as separate lexical items" is an example of a compentence principle; Slobin's (1973) Principle A "pay attention to the ends of words" is an example of a performance principle.

Previous analyses of schwa alternation in adult French indicate the importance of both competence and performance factors. For instance, if we assume that the phonotactic rules on segmental sequences are a part of a speaker's linguistic competence, it follows that the general requirement to realise schwa when it is preceded by two consonants should be analysed as reflecting some aspect of the phonological grammar. Further, even though schwa alternation that is related to the gradient nature of phonotactic rules remains unexplained in the performance-competence debate, other scalar characteristics of schwa alternation are defined as performance factors within generative analyses of the phenomenon; this is particularly the case with type frequency and situationally conditioned speech style (cf. Section 3.2.2.2).[171] While type frequency and speech style are not subject to extensive analysis in this thesis, the gradient nature of phonotactic rules, presented in Section 3.3, proves to be substantial in target Swiss French and, thereby, forms one of the major learnability tasks facing the young child. At this point, we underline that it is well established that performance factors affect child language more than adult language, and that schwa in the child language output may turn out to be particularly vulnerable to performance constraints. First, schwa occurs in a non-prominent, non-final position – a string position potentially neglected by the child (cf. Slobin 1973, Ingram 1989). Second, recall that output schwa comes in two forms in adult French, as [œ] or ∅, neither of which are ungrammatical in a V#C<e>C context. At some point in development the child has access to both phonological variants of the word, i.e. with and without schwa, but this does not automatically entail an immediate target-like selection between the two. Rather, if one of the variants of schwa, for some reason, turns out to be too difficult for the child, it may be the case that he greatly prefers the complementary variant because it is the one that he can more easily produce.[172]

To summarise, first, the very nature of schwa alternation makes it particularly apt for the discussion of the mismatch between competence and performance in child language. However,

[171] See van Bergem (1994) for a discussion on schwa in Dutch and the competence – performance debate. However, also see Moisik (2009) who proposes a usage-based model whereby frequency has explanatory power in phonological theory.
[172] For reasons of consistency, throughout the thesis we refer to the generic *child* using the masculine pronouns *he/him*, keeping in mind that there are also female subjects in our corpus. Further, we refer to the generic *caregiver* using the feminine pronouns *she/her*.

as the in-depth discussion on where to draw the theoretical line between performance and competence is beyond the scope of this thesis, we do not pursue any elaborate discussion on the subject. Second, schwa alternation raises a series of methodological questions concerning the data set to be used in the theoretical analysis, and therefore, we devote the following two sections to various aspects of the collection of the corpus of Swiss French child language data; in Section 4.2 we present the practical and technical construction of the corpus as well as details on the selected types of data. In Section 4.3 we first present the tools used for the transcription and organisation of the data, and second, the coding system established for facilitating the extraction of the relevant data for the analysis. In Section 4.4 we present the final corpus used in this thesis.

4.2 Data collection

4.2.1 Introduction

Chapter 3 shows that schwa can be approached from a multitude of perspectives, e.g. schwa can be analysed through its rate of alternation in the various segmental contexts, through its assumed phonetic identity with stable [œ], through its relationship with orthographic <e>, or through its stylistic conditioning. As presented in Section 1.2.4, the main descriptive objective of this work is to study the behaviour of target schwa and its consonantal environment in the initial syllable of polysyllables in child language. To provide an answer to this research objective, various selection criteria based on previous acquisition studies need to be established prior to the selection of child subjects, to which we will return in Section 4.2.2. Further, like any other corpus-based study of language, an analysis of child language hinges on a reliable data set. As regards obtaining sufficient data reliability, Bennett-Kastor (1988) stresses several aspects that should be considered at the various phases of data collection, cf. Example (1).

(1) Factors to ensure data reliability (adapted from Bennett-Kastor 1988:100)

1. as many data as possible which have been subject to control of setting and other aspects of collection;
2. as many subjects as feasible, or alternatively as many instances of the features in question as possible;
3. a combination of recording techniques which complement each other such that where one is defective the other is superior (e.g., videotape is non-selective; human note-taking observers are highly selective);
4. multiple observers and/or analyzers to maximize attempts at objectivity;
5. clearly and formally articulated procedures for recording;
6. consistent, well-defined coding categories;
7. reliability measures;
8. an open mind.

Although we take into account the majority of these factors in our data collection when possible, some deviations from this protocol occur due to unforeseen practical and technical difficulties. We return to this discussion when relevant throughout the chapter.

4.2.2 Selection of informants

We mention in Section 4.1 that longitudinal language sampling methodology requires a selection of children based on predetermined criteria. As schwa has never been investigated in the production of children[173], we carried out a small pilot study in order to obtain some indication of which age group(s) to focus on in the main study. We recorded half an hour of the spontaneous speech of one boy aged 4;04.06 while interacting with his mother and one hour of two girls aged 5;07.11 and 5;10.27 playing together. Everyone in the pilot study resides in the vicinity of Nyon in the canton of Vaud. The recordings contain a total of 146 occurrences of schwa-items, 102 produced by the children and 44 by the mother. An examination of the data does not reveal any particular divergence from the adult system. In the V#C<e>C context, 65% (39/60) of the occurrences of schwa are absent from the children's productions; in the case of absence, there are no particular modifications of the consonantal sequence that are not also found in target Swiss French, e.g. [nmi] for *demi* 'half' [d(œ)mi] and [ti] for *petit* 'small' [p(œ)ti]. The sole indication of a child-specific distribution of schwa is the verbal stem <fais> 'do$_{\text{IMPERF}}$' [f(œ)z], for which we observe a weaker absence of schwa in the children's productions, i.e. 2/6 absent schwas in the V#C<e>C context and 0/4 absent ones in the C#C<e>C context. Whereas token count is low and does not authorise even preliminary conclusions, these results are interesting given the fact that in the Swiss French PFC corpus <fais> is realised without a vowel in 86/87 occurrences in the V#C<e>C context, i.e. there is a near-obligatory vowel absence, and in 5/9 occurrences in the C#<e>C context. Other schwa-items frequently subject to alternation in Swiss French behave in a target-like manner in the pilot data. In the V#C<e>C context, schwa in *demi* 'half' is absent in 100% (4/4) of the cases, compared to 86% absence in the PFC data, and schwa in *venir* 'come$_{\text{INF}}$' and its various inflected forms is absent in 100% (8/8 cases), compared to 89% absence in the PFC data. Further, as regards *petit*, which is also subject to a highly frequent alternation in Swiss French, i.e. 89% schwa absence in the V#C<e>C context in the PFC data, schwa is realised in only 25% (5/20) of the cases cases in the V#C<e>C context by the pilot study children. Despite the fact that a study of older (pre-) school children is necessary for a more complete understanding of the acquisition of schwa, and particularly with regard to the influence of orthography (cf. Goudaillier 1985, Racine 2007, Racine et al. (accepted for publication), discussed in Section 6.4), the conclusion of the pilot study is that we direct our attention to younger children in the main study. The primary reason for this choice is that the findings reported in the acquisition literature indicate that children need time before mastering complex consonant sequences and the phonological processes affecting unstressed syllables, problems not observed in our pilot subjects.

We employ four subject selection criteria for subjects on the basis of preceding works on schwa in French and on phonological acquisition. The first criterion is related to the quality of schwa vs. stable [œ] and concerns the unfolding of the vowel system and the vowels attempted in the child's production. In her study on the acquisition of place in Dutch, C. C. Levelt (1994) observes that the mid-open front unrounded /ɛ/ is the last target vowel to be attempted by children, despite its high frequency in the target language. Words containing this frequent but problematic – for the children – vowel, are, thus, to a large extent avoided in production. Further, when children select such words, they display a very high error rate. Within the group of mid vowels, yet another problem is the rounding of the front vowels, i.e. target [ø, œ], already described in Jakobson (1968); this is particularly interesting when we take into account the assumption that target schwa is identical to [œ] in most varieties. In an economy-driven construction of the vowel system, if it is true that schwa is an autonomous vowel, it would not be categorised prior to /œ/. Rather, we expect productions of schwa to be attempted simultaneous to or after /œ/. This hypothesis not only predicts that words with schwa should be

[173] At this point it is appropriate to recall the recent study by Liégeois et al. (2012) that examines the rate of schwa presence vs. absence in the production of two children and their caregivers. Their study focuses on monosyllables from a sociolinguistic angle, which thereby renders our two approaches complementary on several levels. We return to this study in Section 6.2.

avoided alongside those with /œ/, but also that words with schwa attempted in production should come with a high error rate. Another, more traditional analysis of the categorisation of schwa is one in which the vowel is not specified for place. Under this analysis, attempts to produce schwa and the success of schwa production are not related to the frequency and success rate of productions of [œ] derived from /œ/. In order to test our hypotheses regarding the distribution of schwa vs. stable [œ], we have selected subjects whose vowel system contains three degrees of aperture, i.e. those who already attempt vowels in the mid zone, but who do not necessarily have the front rounding in place. By this consideration, we aim at investigating the vowel system in which schwa and stable [œ] emerge or are present in production in a way that is more or less faithful to the target featural composition. According to C. C. Levelt (1994), words containing vowels with the third degree of aperture are attempted somewhere between 1;06 and 2;01.

The second selection criterion is related to the prosodic weakness of the target schwa syllable, i.e. its susceptibility of being absent in the context V#C<e>C, and concerns the (non-) faithfulness to non-prominent vs. prominent syllables in early child language. A variety of acquisition studies claim polysyllables pass through a stage in which non-prominent syllables are deleted (cf. Fikkert 1994, Rose 2000, Goad & Buckley 2006), whereas others provide experimental evidence indicating the deletion of the phonetic content only and not the prosodic position (cf. A. K. Carter & Gerken 2003, A. Carter & Gerken 2004). The latter finding is particularly interesting when we take into account the literature that claims that schwa deletion in adult French is gradient (Bürki et al. 2011) or leaves traces on the surrounding consonants (Rialland 1986, Fougeron & Steriade 1997). One hypothetical strategy that children who have not mastered syllable deletion could employ is to delete the phonetic schwa vowel but to retain the syllable structure of the polysyllable. As one of schwa's grammatical output variants is phonetic absence, e.g. *fenêtre* 'window' [fœnɛtʁ] ~ [fnɛtʁ], the as yet unattested strategy of syllable faithfulness combined with non-faithfulness to the featural specification of schwa could be a way to preserve the structure of the word while partly conforming to the adult production by removing the melodic content. Further, we expect this strategy to be used for schwa longer than for the other vowels that are not subject to alternation with zero in the target language. In order to isolate the potentially particular faithfulness to the schwa syllable, i.e. preservation of the syllable, but absence of the melodic content, we have selected subjects who already produce target non-prominent syllables with some melodic content, e.g. [pu] in *poupée* 'doll' [pupe]. According to the literature, e.g. Fikkert (1994), Rose (2000), and Goad and Buckley (2006), disyllables are attempted and faithfully produced around the end of the second year.

The third selection criterion is related to the creation of secondary consonant clusters in the case of schwa absence and concerns the acquisition of phonotactic complexity. It is well established in the literature that children pass through various stages before mastering onset complexity. Not only do children make use of strategies like reduction, substitution, and epenthesis (Fikkert 1994), but they also display faithfulness that is differentiated between non-prominent and prominent syllables in that onset complexity is first mastered in the non-prominent syllables (Rose 2000). As regards secondary clusters, e.g. [dg] in *degré* 'degree' [d(œ)gʁe], we see in Chapter 3.3.3 that they are generally segmentally different than primary clusters, not authorised elsewhere in the system.[174] For this reason, we hypothesise that secondary clusters are acquired only once the primary, well-formed clusters are in place. In order to test whether the relative

[174] However, recall that a few consonant sequences are found both as primary and secondary clusters, e.g. [pl] and [fʁ] are found as a primary clusters in *place* 'place' [plas] and *fraise* 'strawberry' [fʁɛz], and as secondary clusters in *peluche* 'teddy bear' [p(œ)lyʃ] and *fera* 'do$_{3\text{-SG-FUT}}$' [f(œ)ʁa]. We refer to Chapter 3.3.3 for a detailed discussion on the extension of the overlap between primary and secondary clusters.

mastery of consonantal sequences has an effect on the admissibility of schwa alternation, we have selected children who have not acquired complex onsets and children who already have these structures in place. If we follow the indications in the literature, target-like (primary) consonant sequences begin to be produced during the third year (cf. Fikkert 1994, Rose 2000).

The fourth and final selection criterion is related to the importance of the prosodic context for schwa alternation and concerns the production of multi-word utterances. As summarised in Singleton and Ryan (2004), there is relatively strong evidence "for a stable sequence of acquisitional stages associated with fairly well defined age-ranges […], in respect of the early emergence of syntactic structures" (2004:24). They compare the syntactic stages revealed by Crystal et al. (1976) and Wells (1985), and show that the postulated average age for two-element sentences, e.g. SV "daddy gone" or VO "kick ball", is found to be 1;06-2;00 in the former study and 2;00 in the latter study. As regards three-element phrases, e.g. SVO "daddy kick ball"[175], the postulated average age is found to be 2;00-2;06 and 2;03 in the two studies, respectively. Although schwa is prone to occasional absence in the ##C<e>C and C#C<e>C contexts, the V#C<e>C context is by far the one in which schwa is most often absent.[176] During the second year, children already start to realise pre-nominal material of the type "/a/ main", produced by Emilie 1;00.17 acquiring French (Boysson-Bardies 2005:236), but according to Boysson-Bardies (2005), gender and number marking on the filler syllable do not start emerging before the age of 1;08-2;00. As illustrated in the PFC database by both inter-adult conversation data and the read speech data, schwa in the ##C<e>C context is less likely to be absent than schwa contained within larger domains. In order to reduce the risk of collecting a large number of post-pausal, or isolated, schwa-items, e.g. the single-word phrase *cheval* 'horse' [ʃ(œ)val], we target children who have reached the stage at which the polysyllabic schwa-item is potentially preceded by material, e.g. a subject preceding the verb in target *ça ressemble* 'it resembles' [saʁ(œ)sɑ̃bl], and a verb preceding the noun in target *aller demain* 'go tomorrow' [aled(œ)mɛ̃]. Further, we also include children who have acquired the monosyllabic function words in order to test the behaviour of target schwa contained within them, e.g. *je le vois* 'I see it' [ʒ(œ)l(œ)vwa], and also to examine schwa in the word-initial position following such words, e.g. *le chemin* 'the road' [l(œ)ʃ(œ)mɛ̃]. First, as regards the determiners, e.g. the masculine third person singular definite determinant *le*, Bassano et al. (2008) in their cross-sectional study of noun grammaticalisation in French show that children at 1;08 use fillers or determiners in around 40% of the obligatory contexts, whereas children at 2;06 increase their use of determiners or fillers to more than 75% of the obligatory contexts, and they use determiners more frequently. At 3;03, very few fillers are used and determiners are used in about 95% of the obligatory contexts. Second, concerning clitic pronouns, several studies show that object clitics, e.g. the second person singular *me*, are mastered not only later than subject clitics, e.g. the first person singular *je*, but also later than reflexive pronouns, e.g. the third person singular *se* in French (cf. Prévost 2009, Zesiger et al. 2010, and references therein). Note that the earlier acquisition of subject clitics is confirmed in a previous Swiss French case study carried out by Hamann et al. (1995):

[175] All examples are taken from Singleton and Ryan (2004:25).

[176] The following results can be extracted from the Swiss PFC corpus. In a post-pausal context, ##C<e>C, and in a post-consonantal context, C#C<e>C, schwa is absent in 11% (7/64) of the cases, and in 29% (73/248) of the cases, respectively. In a post-vocalic, V#C<e>C, context, the rate of schwa absence increases to 72% (872/1206). Despite the variability in the total numbers across the three contexts, and despite the fact that these numbers also include some rare stable vowels, e.g. *chevreuil* 'roe deer' [ʃœvʁœj], we find the differences salient enough to conclude that they conform to distributional observations in the schwa literature.

> There is a clear difference in the appearance of subject and object clitics in the A corpus. Different kinds of subject clitics already occur at the age of 2;0 […], while the first genuine object clitic occurs at the age of 2.2.13 in the form of an enclitic: *ateins-le (éteins-le*). In fact, this is the only occurrence of an object clitic in the first seven files (2;0;2 – 2;4;22). In the same period, 74 occurrences of subject clitics have been recorded. It is only after the age 2;6 that we find a substantive number of object clitics. In the same period, the number of subject clitics increases dramatically. (Hamann et al. 1995:92)

To summarise, without speculating about the behaviour of target schwa during the one-element and two-element utterance periods, we focus on three groups of children in our main study, children who are 2;00, 2;06, and 3;00 at the outset of the recording period. The fieldwork spans a period of six months (winter and spring 2006), thus covering development from 2;00 to 3;06 years, approximately. We combine longitudinal and cross-sectional observation (cf. Fikkert 1994, C. C. Levelt 1994, who both selected this sampling strategy); thus, while the longitudinal aspect allows for a more detailed characterisation of the idiosyncratic systems, the cross-sectional aspect potentially allows for an approximation regarding points in time when different stages occur.

In order to construct our corpus, we contacted several kindergartens in the vicinity of Nyon, in the canton of Vaud, and those willing to engage in the project distributed an invitation letter to families with children in the kindergarten (cf. Appendix I-1). The caretakers who authorised the participation of their child had two options, i.e. to allow weekly recordings, preferably at home, or to allow more infrequent recordings in the kindergarten. We opted for a corpus containing six children to be followed weekly comprising two per age group, in addition to six children followed monthly comprising two per age group. The first obstacle to our search for informants was related to the high number of non-francophone residents in the canton of Vaud.[177] Among the many positive responses to the invitation there were several children with one or two non-francophone parent(s). In order to rule out the influence of a second home language, we exclude these children from the corpus under construction.[178] The second obstacle to our corpus construction relates to the fact that most kindergartens receive children from 2;06 and older, while younger children normally spend their days in *crèches* (nurseries), with a nanny, or at home with a caretaker. There were significantly fewer nurseries than kindergartens in Nyon and its vicinity, and those nurseries that wanted to participate were not successful in recruiting caretakers. In sum, the reduced number of potentially participating day-care centres, the seemingly stronger reluctance among the caretakers to let an outside person record their young child, in combination with the restricted amount of time set aside for the field work, consequently forced us to abandon the study of two-year olds.

As regards the construction of the corpus, we first underline that the aim was to cover a large time span in order to determine whether, and how, the quality and alternation rate of schwa develops over time, and not to examine lexical frequencies or the absolute frequency of present vs. absent schwa. Since the acquisitional aspects of schwa have not been previously covered in the literature, we find it more important to examine several children, with a more limited sampling density, than to follow one or two children several hours per week. Nevertheless, we do not opt for a large N study either. Like in target French, we assume that schwa alternation in

[177] As mentioned in Section 2.3, the group of non-francophone residents in Vaud amounted to 18.2% in 2000 (Lüdi & Werlen 2005).

[178] It is worth mentioning that although no formally bilingual kindergartens were contacted, several of the participating kindergartens received English-speaking children. As a consequence, the native nursery school teachers sometimes found it inevitable to use English and, in this way, exposed the French monolingual children to a second language.

child language may interact with a number of factors, e.g. prosodic, phonological, phonetic, and lexical factors, and that the complex, potentially idiosyncratic, interaction must be studied at the individual level, not across a large scale during these initial phases of research (cf. Bennett-Kastor 1988, for a discussion on the pros and cons of large vs. small N studies). Thus, among the children available for recording, we have recruited thirteen children to the study. All participants live in municipalities in the district of Nyon and attend various kindergartens in three villages neighbouring the town. No problems are reported concerning their hearing acuity, and all participants appear to have normal cognitive and motor development.

We have recorded a set of eight children on a weekly basis: Fabienne, Henri, Lucas, Adèle, Janice, Armand, Tom, and Guy. Fabienne and Henri are ages 2;02.15 and 2;04.01, respectively, at the outset of the recording period. We were not authorised to record Fabienne and Henri at home, and when our search for two-year olds to record at home still had not succeeded by the end of March, we decided to record these two children on a weekly basis on the kindergarten premises, for a period of around six weeks at the end of the time set aside for the fieldwork, May-July. Lucas and Adèle are ages 2;07.01 and 2;07.08, respectively, at the outset of the recording period, and we have recorded them at home on a weekly basis in the period late March-early July. Janice is age 2;07.27 at the outset of the recording period. We have recorded her at home on a weekly basis in the period February-June. Armand, Tom, and Guy are ages 2;11.13, 3;01.17, and 3;02.14, respectively, at the outset of the recording period, and we have recorded them at home on a weekly basis in the period February-early July. We have recorded a set of 13 children on a monthly basis. We have recorded five children in addition to the eight children presented above: Kim, Théa, Lambert, Eric, and Albert. Kim and Théa are ages 2;08.29 and 2;09.29, respectively, and Lambert, Eric, and Albert are ages 2;11.13, 2;11.16, and 3;01.00, respectively, at the outset of the recording period. We have recorded the 13 children on the kindergarten premises on a monthly basis in the period February-June. The children can be divided into three separate age groups, 1, 2, and 3 (see Table 4.1). However, as shown in Chapter 7, and as is well-known in the child language literature, although children are recorded at the same age, this does not imply that they are all at the same level of linguistic development.

Table 4.1 displays further information about the children, including the number of recordings and Phon records obtained during the recording period.[179] The table also contains information about the caretakers who participated in the recordings at home. For the consent form signed by the latter, cf. Appendix I-2, and for the biographical questionnaires, cf. Appendix I-3.[180]

[179] As shown in Section 4.3.1, the sound file is segmented into Phon records. The number of Phon records encompasses all verbal productions by the child during the recording. Note, however, that the Phon record, presented in detail in Section 4.3.1, does not in all cases correspond to a full utterance. The reason behind the mismatch is that long utterances are in some cases split into two Phon records to ease the transcription work.

[180] The children and caretakers are given fictional names in accordance with the consent form, cf. Appendix I-2. Also note that whenever the mother or the child talks about a person in the dense network, the name is not transcribed in order to assure full anonymity.

Age group	Name	Sex	Domicile	Family			Age		Type of session			
				Sibling position	Mother	Number of utterances	First session	Last session	Spontaneous	Number of utterances	Test	Number of utterances
1	Fabienne	f	Tartegnin	-			2;02.15	2;05.21	6	403	5	414
1	Henri	m	Duillier	-			2;04.01	2;07.08	7	936	5	458
2	Lucas	m	Vich	2	Véréna	844	2;07.01	2;10.25	16	3122	5	605
2	Adèle	f	Gland	2	Valentine	1794	2;07.08	2;10.13	12	2500	5	717
2	Janice	f	Crans	4	Nina	757	2;07.27	3;00.14	15	2204	6	650
2	Kim	m	Tartegnin	-			2;08.29	3;00.05			5	487
2	Théa	f	Begnins	-			2;09.29	3;01.12			5	583
3	Armand	m	Bursins	3	Karoline	2468	2;11.13	3;04.03	17	3212	6	511
3	Lambert	m	Begnins	-			2;11.13	3;03.02			5	424
3	Eric	m	Gland	-			2;11.16	3;02.15			5*	435
3	Albert	m	Bassins	-			3;01.00	3;04.03			5*	338
3	Tom	m	Gland	2	Blanche	2352	3;01.17	3;06.05	19	3934	6	795
3	Guy	m	Gland	1	Alice	2778	3;02.14	3;07.06	16	3698	6	1056

Table 4.1: Summary of corpus of children and mothers in the present study, given according to the child's age[181]

* For Eric and Albert, the interval between the test sessions varied due to unforeseen incidents.
[181] The cells marked with <-> indicate that the information could not be retrieved.

Before we outline our sampling strategy, we briefly provide further information on the individual children. It is well known that working with children adds a challenge to the fieldwork in that their linguistic performance can be influenced by their degree of attention, tiredness, and their general day-to-day condition. Many of the children selected for our study have particular rhythms and different habits that need to be taken into account in order to obtain useful data. First, Armand, Lucas, and Tom are not amenable to being recorded in the afternoons; at this point of day, Armand and Lucas refuse to participate and Tom is extremely agitated and often shouts in a high-pitch voice. Second, during the kindergarten sessions Armand and Albert often want to be accompanied by a friend.[182] In order to make the children comfortable, we let the second child fully participate, although, for legal reasons some of these data could not be used in the study. We find it important to mention the presence of a second child because, in her study on the acquisition of sociolinguistic variables in French, Nardy (2008) observes that children who interact frequently with one another display a more similar usage of optional liaisons than those who interact with one another less frequently.[183] Although the distribution of schwa among children and their peers is beyond the scope of the thesis, we cannot exclude the possibility that the presence of a second child during the test could have had an impact on the final results.

Further, the test easily tired some of the children. In particular Eric starts to play with other games when he finds the task boring or difficult. As for the youngest children, Fabienne and Henri, they become rapidly impatient and require a frequent change in activity. In addition, Henri often whispers rather than speaking to us in a normal audible voice. Finally, we mention that the frequent presence of a younger sibling in Tom's recording sessions influences his performance and renders Tom's speech phonetically more "child-like"; Tom's speech style used at home in the presence of the baby brother is seemingly highly conditioned by the relative attention paid by the mother to the baby because once Tom focuses less on the people present and more on the toys, he switches back to a more target-like production, which is also the style regularly used in the semi-controlled setting in the kindergarten.

4.2.3 Sampling strategy

In order to test our hypotheses on the interaction between schwa, stable [œ], phonotactic constraints, and syllable structure (cf. Sections 1.2.4 and 7.4) the final data set needs to contain a sufficient number of target schwas, target stable [œ], target primary clusters, and target secondary clusters distributed across all three age groups. In particular, for the words with target schwa, we need to have several occurrences in order to analyse and make claims about intra-speaker variation. Although a broader selection of schwa-items can be retrieved during spontaneous speech, it is the more controlled setting that ensures access to multiple tokens of the same word across all informants. In spite of the analytical problems related to naturalistic observation, e.g. the incomparability of subjects or the difficulty of controlling what the child utters, it is still a frequently used sampling method for child language research, and it has proven successful in combination with controlled experiments when the goal is to find converging evidence of a particular phenomenon. True naturalistic sampling does, nonetheless, raise the

[182] Armand is accompanied by Lambert during the first two test sessions, and Albert does the test together with a friend the first, fourth, and fifth time. For the sake of completion, note that we let a friend stay with Tom during the first test session.
[183] Note that the significant difference observed by Nardy (2008) at Time 1, average age 4;07, has disappeared at Time 2, average age 5;07, which the author explains is a result of the establishment of more diffuse social relations.

issue of how many data are needed for a theoretical analysis to be valid. Tomasello and Stahl (2004) put forth two factors that any researcher must have in mind when preparing for a fieldwork period; “the frequency with which a phenomenon occurs in the real world, and […] the temporal density with which a researcher samples the child’s speech” (2004:104). Assuming that a child is awake around ten hours per day, 70 hours per week, they calculate the number of targets captured for various combinations of actual frequency rate and sampling density, assuming independence and randomness for the various occurrences. For instance, if a phenomenon occurs 70 times per week and the sampling density is set to one hour per week, the researcher can expect to capture one single target in a weekly recording session, which is equivalent to 1.4%, 1/70th, of all estimated targets produced during that week. Given that the researcher can only easily control sampling density, if the sampling density is set to 0.5 hours/week, the possibility to capture one single occurrence of the phenomenon is obviously reduced.

As regards schwa, recall that the pilot study – with a duration of 90 minutes – provides a total of 102 occurrences of present or absent schwa produced by the three children recorded. Although this number may seem quite high, it is important to underline that these occurrences are unevenly spread across 27 schwa-items with various consonantal combinations, e.g. 11 occurrences of the verb *regarder* ‘look$_{\text{INF}}$’ and only one occurrence of the verbal stem <ser> ‘be$_{\text{FUT/COND}}$’. To our knowledge, no existing study provides the types of schwa-items and their frequency in French child language, and it may very well turn out that schwa-items are produced infrequently during the early stages of acquisition (cf. C. C. Levelt 1994, on the avoidance of words with problematic vowels). Nevertheless, at least we know that even though schwa is present in most lexical classes, the developing lexicon does not build up the various lexical classes simultaneously nor at an even pace. The presence of schwa in child language is thus constrained *a priori* by the very composition of the idiosyncratic lexicon. Bassano et al. (2005) study the lexical development in French by analysing naturalistic data from three age groups, 1;08, 2;06, and 3;03 years. They identify the following three steps in the development of the lexicon. In a first step, the prominent classes are nouns, particularly animate nouns, interjections, and fillers, which illustrates a “referential, expressive and pre-grammatical stage” (2005:82). In a second step, the three early classes are subject to a relative decrease in use, while verbs, pronouns, determiners, and auxiliaries show a relative increase in use, which illustrates the development of a combinatorial system. In a third step, conjunctions show a significant increase in use and allow for the emergence of complex sentences. Under this model the children selected for this study are at the second step or later, and thus produce a relatively high rate of nouns, verbs, and function words, although, with a higher presence of nouns compared to the other classes. The potential dominance of nouns may have an effect on our data in that they are thought of as being cognitively more salient than verbs (cf. Section 3.2.2.1). Recall that this salience, reported to be present in a variety of languages, is manifested by a higher level of phonological faithfulness in nouns compared to other lexical classes. This claim is important to our research questions because the salience of nouns could result in an asymmetrical number of nouns vs. verbs in the final data set as well as a greater presence of schwa in the former lexical class.

On the basis of the tool *Inventaire Français du Développement Communicatif*[184], or IFDC, Kern (2003) obtains parental reports for 663 children, ages 16-30 months. She analyses lexical development as it relates to a number of variables. While, for all children, the number of words

[184] *Inventaire Français du Développement Communicatif* is the French-adapted version (Kern 1999a, 1999b) of the MacArthur-Bates Communication Development Inventory (Fenson et al. 1993), a tool designed for measuring a child’s language abilities.

produced increases proportionally with age, an important inter-individual variation emerges from 24 months and onwards. Although Kern's results provide information on the development of the lexicon in French, they are of limited use phonologically because they do not include the entirety of the schwa-items that are potentially present in child production, cf. Table 4.2 for an exhaustive list of the schwa-items present in the IFDC. Kern also observes that a child's gender has an impact in that girls generally produce more words than boys. Also, firstborns produce more words and use more nouns and predicates than children who are born second or later in the sibling order. Finally, the education level of the mother has no impact on the child's lexical development, except for the development of a slightly larger lexicon by children whose mothers have completed four years of higher education after the baccalaureate, compared with children whose mothers have no diploma.

Schwa-item	**Gloss**	**Schwa-item**	**Gloss**
au dessus de	above	*monsieur*	mister
au revoir	bye bye	*par dessus*	over
avoir besoin de	need;inf	*petit déjeuner*	breakfast
chemise	shirt	*petite bête*	insect
cheval	horse	*petits gateaux*	cookies
cheveux	hair;pl	*petits pois*	peas
cheville	ankle	*petits pots*	baby food jars
dehors	outside	*recevoir*	receive;inf
demain	tomorrow	*regarder*	look;inf
devoir faire	must do; inf	*secouer*	shake;inf
être debout	be standing;inf	*tenir*	hold;inf
fenêtre	window	*le*	det. (masc sg def)
genou	knee	*le même*	same (masc sg def)
jeter	throw; inf	*de la*	det. (fem sg part)
melon	melon	*je*	subject pro 1sg

Table 4.2: Schwa-items present in the IFDC (Kern 1999b)

At this point, we underline that no extra-linguistic variable functions as a criterion for our selection of informants, and differences in gender, sibling position, or socio-economic conditions are, therefore, only referred to when called for.

In the following two sections, we provide more information on the two recording situations.

4.2.3.1 Naturalistic observation

As shown in Table 4.1, we have conducted weekly recordings of approximately 30 minutes at home. Carrying out the data collection in a strictly naturalistic setting does, however, pose a risk in that the number of schwa occurrences and the type of schwa-items are highly unpredictable in this setting. On the other hand, results of reading tasks carried out with adult informants provide evidence that, in general, schwa in the initial syllable of polysyllables is present far more often in a controlled setting where schwa-items are not uttered spontaneously (cf. the various studies in Durand et al. 2009b). This finding shows that data from picture-naming tasks cannot serve as a reliable source of data, at least not alone. The problem, as stated above, thus remains: how much sampling of naturalistic data is needed in order to make valid inferences about the developing grammar, and, more specifically, about the mechanisms behind schwa alternation?

Previous studies on adult Swiss French reveal that micro-variation across speakers and varieties does occur (cf. Racine 2008, Andreassen & Lyche 2009, Racine & Andreassen 2012), which indicates that an analysis that covers all nuances of schwa alternation requires a sampling density that exceeds every methodological approach to schwa used in this study. Thus, in order to ensure the production of at least some schwa-items in each recording session, we opt for semi-structured elicitation and employ games and books that encourage the child to produce schwa-items; the benefit of this set-up is that it directs production toward some items without creating an unnatural experimental setting. For instance, we provide the child with a puzzle picturing three horses, which potentially triggers the production of *cheval* 'horse' [ʃ(œ)val]. Also, we provide books from the series *L'imagerie des tout-petits* (Beaumont et al. 1998), which contain illustrations of objects and actions that a child would be familiar with, e.g. there are illustrations of a house, which potentially triggers the production of *fenêtre* 'window' [f(œ)nɛtʁ], *chemin* 'path' [ʃ(œ)mɛ̃], and *pelouse* 'lawn'[p(œ)luz], and a picture of a mother combing her daughter's hair, which potentially triggers the production of *cheveux* 'hair;pl'. Even though we record at the homes of people not within our social network, we have tried to make the setting as natural as possible – thereby maximally reducing the effect of our presence (cf. the problem of the Observer's paradox presented by Labov 1972). As the mother participates in most of the recording sessions[185], the two of us often have coffee and occasionally discuss adult issues while the child is playing next to us. All participating mothers showed an immense hospitality and the weekly sessions soon seemed to constitute an integrated part of the child's weekly life. Naturally, as Wells (1979) points out, the recording situation will never be fully spontaneous in that the mother, probably more conscious about the purpose of the recording, is prone to alter her linguistic behaviour, e.g. by expanding and interpreting the child's utterances to a larger extent than usual (cf. Wells 1982, and Section 6.3.3.3). Although the child in most cases seems relaxed, is spontaneous in his choice of activities, and quite freely interacts with both his mother and ourselves, the mother's occasional urge to make the child speak in some cases has the opposite effect in that he does not want to participate in any verbal activity after such prompting.

Three factors are decisive for the inclusion of the mothers in the recording sessions. First, we want to record the child in a familiar setting – both with regard to place and his interlocutor – where he feels less intimidated by the recording situation. Second, none of the mothers work full-time and consequently, she spends a large portion of the day with her child. Thus, we expect the mother's verbal activity during the recording session, i.e. reactions and repetitions, to be valuable support in interpretation of the child's utterances during the transcription of the data.[186] The mothers are of significant help, but in this regard we mention a potential detrimental scenario that Brown (1973) discusses; if the caretaker attributes the correct meaning to an incomplete phrase uttered by the child, the child may feel no pressure to produce a more complex and adult-like structure, even though he is capable of doing so.[187] Thus, the mapping of meaning and structure in child language is far from straightforward and should be presented with caution. Third, we want to record the mothers in order to obtain some indications about the parental input to the child. While child-directed speech (henceforth CDS) diverges from inter-adult speech, an issue to which we return in Chapter 6, it is also subject to inter-cultural

[185] Note that Véréna, the mother of Lucas, and Nina, the mother of Janice, were frequently prevented from fully participating in the recording sessions.

[186] Note that it is possible that the mother's interpretation of the child's utterance in the recording situation may be incorrect. Analysis of the recordings during the subsequent transcription work reveals several instances where the mother misunderstands what the child intends.

[187] Brown (1973) also proposes that one should pay more attention to the child's language when he is in a more unfamiliar setting, i.e. away from home or with strangers. We return to this in Section 7.3.3, where we analyse the data from the test sessions.

variation. For instance, according to Boysson-Bardies (2005), French mothers differ from American mothers; in the initial stage of lexical development, the American mothers are preoccupied by the child's ability to name things, whereas the French mothers focus more on the child's general well-being, i.e. "qu'il 'a bien le temps d'apprendre'. Elles ne recherchent pas de performances linguistiques mais estiment plutôt que l'enfant doit être heureux, gentil et qu'il doit beaucoup jouer" (Boysson-Bardies 2005:212). This difference further translates into a difference in conversational style where the French mothers do not necessarily encourage the child to repeat them, but rather, they attempt a dialogue with the child by providing further information about the object in question, see Example (2), adapted from Boysson-Bardies (2005:214-215).[188]

(2) CDS in American English vs. Hexagonal French

Mary: Look at the cat, it's a cat, look at the cat, cat.
Sue: a.
Mary: Good girl, you say cat, a cat, good girl.

Marie: Regarde le chat, Léo, il est noir avec une petite langue rose, c'est un gentil chat, tu vois le chat?
Léo: a.
Marie: Oui, c'est un chat, il boit du lait et fait miaou.

If it is true that French mothers tend to avoid pure repetition, it follows that French-learning children are less likely to be exposed to words repeated in their isolated form. Further, when we link this observation to what we know about schwa in adult language, i.e. the tendency to realise schwa in isolated words, we put forth the hypothesis that French-learning children are not repetitively exposed to the isolated variant with schwa when they interact with their mother. To our knowledge, no study examines the CDS of Romand mothers, and we find it relevant to underline the importance of not associating this group of mothers with Hexagonal French mothers before there is evidence of similar patterns between the two groups. Even though they speak varieties of the same language, the cultural differences that potentially affect linguistic communication are yet to be determined and subsequently accounted for. However, CDS is phonologically characterised by a tendency to produce words with the syllable structure CVCV (cf. Ferguson 1978). As discussed in more detail in Chapter 6, there also seems to be a consensus that mothers more often accentuate non-prominent syllables of the word when they address their child. In French, this strategy has two potential consequences. First, it may cause schwa to be realised, even in non-isolated cases and in positions where schwa is generally not produced, e.g. *doucement!* 'take it easy!/be careful! [dusmɑ̃] vs. [dusœmɑ̃] with schwa realised in a word-medial position. Second, this strategy of producing CVCV-structures reduces the amount of secondary consonant clusters in the input, e.g. *la cheminée* 'the chimney' [laʃœmine] vs. [laʃmine]. Alongside the identification of the presence or absence of schwa in CDS, recording naturalistic data allows for an examination of the child's immediate and general reaction to the degree of schwa alternation in his mother's speech. If the child is sensitive to schwa alternation in the ambient language, he may display a certain degree of imitation of his mother's production pattern. In this section, we do not further elaborate on the behaviour of schwa in the parental input, but refer to Chapter 6 for a detailed discussion.[189]

[188] The examples are extracts from corpora established for a cross-linguistic study on American, Swedish, French, and Japanese children; see Boysson-Bardies (2005:214, Footnote 5) for further details regarding the contributors.

[189] Note that in order to obtain further information about the schwa quality in the mothers' production and perception, we have the mothers participate in two production tasks and in one perception task, in which we focus on the assumed phonetic identity between schwa and stable [œ] (cf. Chapter 5.3 for results and discussion).

4.2.3.2 Semi-controlled observation

In Section 4.2.3.1, we mention that an experiment that intends to elicit schwa-items could be problematic in that the vowel tends to be realised in controlled speech (cf. Durand et al. 2009b). On the other hand, with regard to naturalistic data collected in the presence of a caregiver, we highlight the issue of obtaining data that display the full range of the child's linguistic competence. Recall from Section 3.3 that the distribution of schwa and the degrees of alternation are put to test in a grammaticality judgement experiment by Racine (2008). Although Racine's data pattern well with the degrees of schwa alternation in the Swiss French inter-adult production data, several problems are associated with the former type of data in the literature. First, even though grammaticality judgements provide important indications about the system, Crain and Wexler (1999) insist that such data must be treated with caution because it has not been established which behavioural or cognitive processes underlie the judgements. Lust et al. (1999) share their view and claim more explicitly that grammaticality judgements reflect a certain type of performance that is subject to variation and which cannot be considered a direct measure of the speaker's linguistic competence. In addition, in particular when it comes to testing structures with two output variants in the ambient language, one cannot interpret the absence of one of the variants in the child production data as a direct reflection of the ungrammaticality of this variant in the child's grammar; see Crain and Wexler (1999) for their discussion on the use of the truth-value judgement task and the elicitation of non-preferred structures:

> Suppose that a child knows that the sentence is ambiguous, that is, the child can analyze the sentence both ways. But suppose also that the child has a preferred analysis. This preference may be based on a large number of different factors, for example, processing considerations, strategies, situational preferences, or syntactic or semantic complexity of particular readings. It is well known that even adults have such preferences. (Crain & Wexler 1999:419)

Concerning schwa in adult Swiss French, the global results in Racine (2008) show that for a large number of schwa-items, one of the variants is strongly preferred – e.g. with *cheval* 'horse' there is a preference for the schwa-less form [ʃval] and with *chevalier* 'knight' there is a preference for the form with schwa [ʃœvalje] – and despite this preference the second, non-preferred variant is still authorised.[190] Thus, even if the child shows a frequent selection of one variant, this may indicate a mere preferential strategy and not a grammatical prohibition of the second variant. Aware of the challenge of distinguishing between potential non-preferred and unauthorised structures, the design of an elicitation test should at least allow for the production of non-preferred but available forms.

Prior to the fieldwork, we have designed a test to be carried out during the sessions that are recorded on the kindergarten's premises. The empirical goal is twofold; to assure the production of items with target schwa alternation (and secondary clusters) and to assure the production of recurrent and comparative structures across individuals. We underline that the dynamic design of the test, the eagerness of the child, or the lack thereof, and the presence of other children in the kindergarten entails that the conditions are not identical for each child across the different test sessions.

[190] The *c.e.f.* values given to *cheval* and *chevalier* by the Neuchâtel speakers are 1.58 and -1.92, respectively (Racine 2008:372).

The test consists of a series of animations and still pictures integrated into a PowerPoint presentation, illustrating objects with target schwa or target stable [œ] or [ø]. The test contains 36 slides, including six filler slides. All test slides targeting schwa or stable [œ] or [ø] are linked to pre-recorded sound files featuring an adult male Vaudois speaker who leads the dialogue with the child.[191] A first objective of this test is to check the child's reaction to illustrations of objects whose phonologicals correspondents contain schwa. The test includes pictures that encourage the production of two nonce words with schwa in the initial syllable in addition to the production of familiar schwa-items. In exposing these pictures to the child, we aim to examine the child's spontaneous linguistic reactions as well as the child's linguistic and extra-linguistic reactions to the schwa-variant produced by the Vaudois speaker. In order to generate recurrent and comparable occurrences of true and nonce words, we focus on a very restricted number of schwa-items, i.e. *cheval* 'horse' [ʃ(œ)val], *fenêtre* 'window' [f(œ)nɛtʁ], and *petit* 'small' [p(œ)ti]. As mentioned, we have invented two words, i.e. *chevir* [ʃ(œ)viʁ] and *fenasse* [f(œ)nas], which we assign to two different fictional animals. The segmental make-up of the nonce words allows for a comparison with the true words used in the test; *cheval* and *chevir* contain the secondary cluster [ʃv] and *fenêtre* and *fenasse* contain the secondary cluster [fn]. A second objective of the test is related to the potential schwa alternation produced by the child; we want to know if schwa is absent whether the child produces the target secondary cluster, or whether the child reduces or modifies the target secondary cluster because of constraints on consonantal sequencing. Note that for every illustration of a schwa-item, we encourage responses where the schwa-syllable is preceded by phonological material, e.g. picture of one or two windows potentially generates the answers *une fenêtre* 'a window' [ynfœnɛːtʁ] and *deux fenêtres* 'two windows' [døf(œ)nɛːtʁ]. A third objective of the test concerns the quality of the mid front rounded vowels [œ] and [ø], which are phonetically merged with schwa in target French. By including items containing [œ] or [ø][192], we aim at determining whether or not schwa collapses with one of these vowels in child language as well. All of these data are necessary to answer our theoretical research question relating to the underlying status of schwa; recall that there are many alternatives, e.g. /C∅C/ where /∅/ represents schwa, /CœC/ where schwa is a variant of /œ/, and /CC/ where schwa is epenthetic (cf. Chapter 3). However, if the child exhibits schwa alternation it turns out to be crucial not to automatically assume that schwa alternation is a part of the child's phonological competence. Before any conclusion can be drawn, we must determine whether a part of the child's answers are imitative and not a reflex of their preferential grammar. The fourth and final objective of the test is not directly related to the underlying status of schwa, but rather relates to the potential influence exerted by the phrase-final prominent syllable. In target French, the further away schwa is located from the stressed syllable, the more prone it is to be absent in the output (Léon 1966). In order to test whether schwa behaviour in child language is also conditioned by its distance from the phrasally prominent syllable, we included pictures that allow for the schwa-item to be followed by other target prominent material.[193]

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[191] We use pre-recorded stimuli for two reasons. First, all children are exposed to the same stimuli, and second, the stimuli are provided by a native Vaudois. In the construction of the test, we gave the adult Vaudois speaker the pictures and the phrases to read. The target schwas are indicated as <e> (present) or <'> (absent). Besides the presence or absence of the vowel, we did not give the Vaudois speaker any specific instructions regarding intonation or stress. However, when recording the sound files, we did ask him to act as if he were talking to a child; one of the mothers, Valentine, comments on the naturalness in his voice when we test the PowerPoint presentation with the mothers at the end of the recording period, cf. excerpt in the beginning of this chapter.

[192] Items with [œ] or [ø] include *pleure* 'cry$_{\text{PRE-3SG}}$' [plœʁ], *bleu* 'blue' [blø], *fleur* 'flower' [flœʁ], *deux* 'two' [dø], and *grenouille* 'frog' [gʁœnuj].

[193] Examples of complex phrases with the schwa-item in a non-final position include *cheval noir/blanc* 'black/white horse' [ʃ(œ)val nwɑʁ/blɑ̃], *fenasse noire/blanche* 'black/white fenasse (nonce word)' [f(œ)nas nwɑʁ/blɑ̃ʃ], *petite maison* 'small house' [p(œ)tit mɛzɔ̃].

The test is run as follows. Each slide is introduced by a question asked by the Vaudois speaker, e.g. *Là aussi il y a deux animaux. Tu peux me raconter ce que c'est?* 'Here as well there are two animals. Can you tell me what it is?' (cf. Figure 4.1). The sound file is activated by a cursor click, which allows us to carefully monitor the situation. In most cases, the child replies to the question without hesitation. Thereafter, the Vaudois speaker replies to the child. For each reply containing a schwa-item, we have two pre-recorded variants, one with the schwa realised, e.g. *Oui, c'est un cheval* 'Yes, it's a horse' (cf. Figure 4.1) and one with absent schwa, e.g. *Oui, c'est un ch'val* (cf. Figure 4.1). In each case, we determine on the spot whether the following adult stimulus should contain a schwa or not depending on the child's spontaneous linguistic reaction.

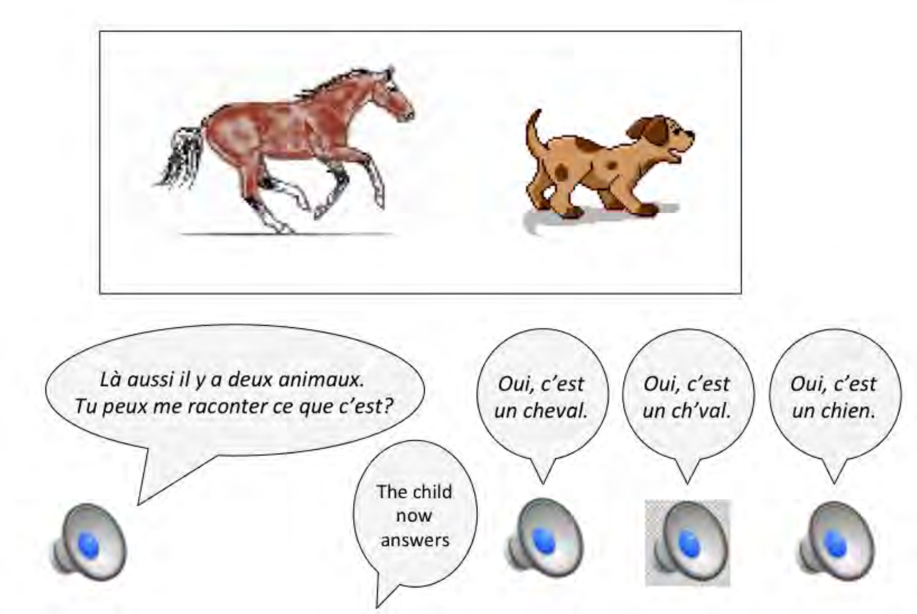

Figure 4.1: Illustration of the PowerPoint test[194]

To summarise, we not only want to examine how the child spontaneously reacts to the illustrations, but we also want to determine how the child reacts to input data with schwa alternation. Thus, in varying between the two pre-recorded options, we could control which stimulus to present to the child, the variant with schwa or the variant without; also, we could check the degree to which the child imitates the Vaudois speaker regarding selection of variant. We generally followed the routine outlined in Example (3).

(3) Routine in picture-task

We select a sound file where the Vaudois speaker asks the child a question related to the picture illustrating a given schwa-item. The child answers by producing variant A, e.g. with schwa, of the schwa-item. In the illustrations that follow of the given schwa-item, we select the sound file with variant B, e.g. without schwa, until the child produces variant B. In the illustrations that follow of the given schwa-item, we select the sound file with variant A.

Slide 1	child: with schwa	pre-recorded option to follow: without schwa
Slide 2	child: with schwa	pre-recorded option to follow: without schwa

[194] Animations downloaded from http://www.netanimations.net (horse) and www.animationlibrary.com (dog) on August 29th, 2006.

Slide 3	child: without schwa	pre-recorded option to follow: with schwa
Slide 4	child: with schwa	pre-recorded option to follow: without schwa

We imagine two potential outcomes. Either the child is influenced by the immediately preceding input and selects the alternative variant, or the child is not influenced by the input and continues to use his preferred variant. In both cases, and as noted above with reference to Crain and Wexler (1999), we cannot exclude the possibility that the child controls both variants, but simply has a preference for one of them. For the second outcome, i.e. non-imitation of the adult input, we further hypothesise that the child has not mastered both variants and consequently selects the one that is in conformity with his grammar under development. When examining the results of this task, we also bear in mind the eventual importance of emphatic stress on the initial syllable, which normally causes schwa to be realised (Lucci 1976).

Inspired by the work of Berko (1958), have we created two invented words with schwa, as mentioned earlier, *chevir* [ʃ(œ)viːʁ] and *fenasse* [f(œ)nas]; the former is depicted in Figure 4.2.[195] The procedure and objective are almost the same as for the familiar words. The invented words are initially presented by the Vaudois speaker with the schwa present; then, we ask the child to repeat the word in order to potentially ease the acceptability and the (temporary) lexical storage of the word. The child's initial linguistic reaction to the invented words is always followed by a confirmation from the Vaudois speaker, and additionally, the second time the schwa is also present in his speech.[196]

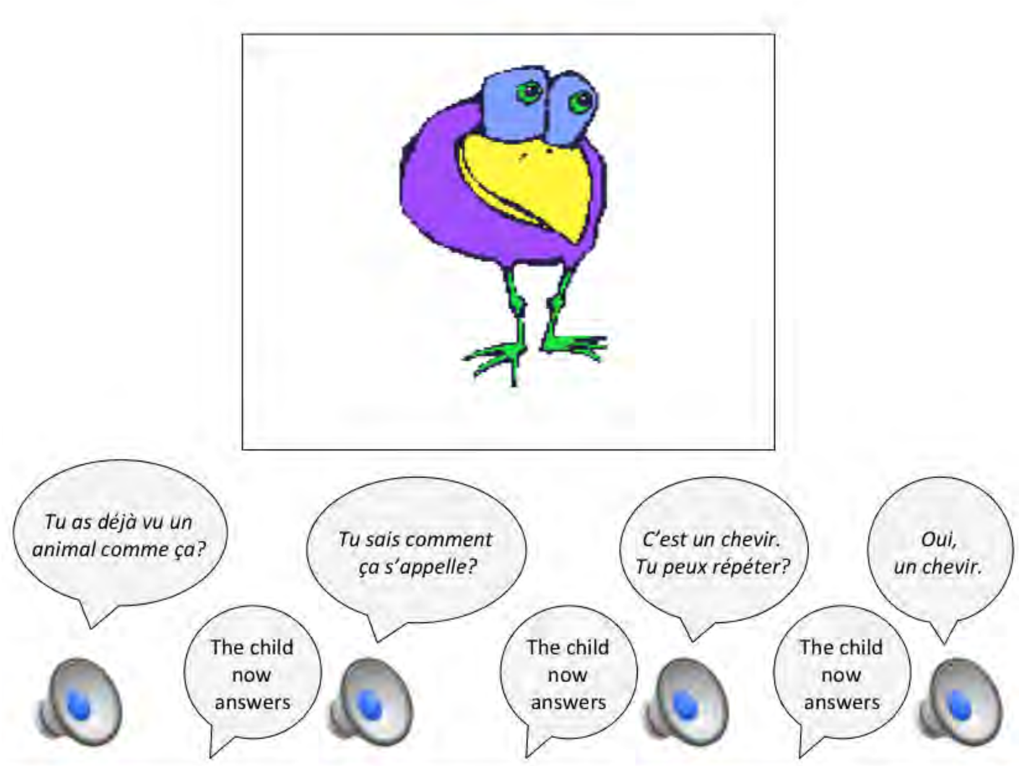

Figure 4.2: Illustration of the invented word *chevir* [ʃ(œ)viːʁ] used in the PowerPoint test[197]

[195] The series of pictures is presented in its full length in Appendix I-4.
[196] When first confronted with the invented words, the children occasionally refuse to repeat or by curiosity prefer asking questions about the fictive animal. In these cases, we talk about the animal and repeat the schwa-item ourselves, with the vowel present.
[197] Animation downloaded from www.animationlibrary.com on August 29th, 2006.

At this point, we underline the fact that reactions to invented words are not necessarily consistent with reactions to familiar words. For instance, D. Barton (1976, 1978) uses a picture selection task to test the differentiation of minimal pairs in children ages 2;03-2;11, and he observes that newly taught words have a far poorer success rate than familiar words, i.e. a 42.3% vs. 10.8% error rate (these results are drawn from the first five presentations of each pair, from D. Barton 1976:63). D. Barton does not propose that this differentiation is a result of poor discrimination, but rather is a result of the unfamiliarity of the newly taught test items.

We choose the more or less identical presentation of familiar and invented words in order to provide insight into the child's ability to process familiar vs. new words with schwa – without having to take into account the input frequency of the two variants of the schwa-item. Recall Racine's (2008) study of adult Swiss French in which it is shown that the frequency of variants in the input has an effect on the frequency of variants in the output. While we cannot exclude the possibility that input frequencies have an influence on the usage of the two variants in early child language, we can be sure that the child has no input frequency for the variants in the case of the invented words. This absence of input and ability to rely on extant variant frequencies could make the child use a default strategy, which would provide information about how children store and process schwa-items.

The test is carried out on a monthly basis. Additionally, we have created two versions of the PowerPoint test, one with *chevir* and one with *fenasse*, while keeping the other pictures the same. The reasons for alternating between two versions of the test are to avoid losing the child's interest and to reduce the possible effects of habituation on the results. In order to make the test even less predictable, and therefore more reusable, the pictures are presented in different orders between the *chevir*-version and the *fenasse*-version. One advantage of reusing the same test is to monitor any developments in schwa behaviour in both familiar and invented words, the latter initially unknown to the child. On the other hand, one drawback is that we never get to test other, familiar and invented, schwa-items. In addition, despite the switch in order of the pictures, the children become rapidly familiar with the test and occasionally want to speed up the PowerPoint presentation in order to do the "fun" parts right away. However, in order to obtain a sufficient amount of data, the picture series is rather comprehensive, and because not all of the children have the patience to finish the task, we often have to stop in the middle of the task and carry out a second task before returning to the pictures.[198] Some children, when they do not want to continue simply leave the computer and do not return. As previously mentioned, this is particularly a problem with the youngest children. In these cases, however, the reuse of pictures and the change in the order of appearance prove to be useful; within two test sessions, after one

[198] We have also designed a second task with the intent to elicit the production of monosyllabic function words with schwa, i.e. *je, me,te, de, le, se,* and *ce*. Although the acquisition of monosyllabic function words is beyond the primary scope of the thesis, we include a small test that allows us to study this second position in which schwa alternates, and thereby complement our data on the initial syllable of polysyllables. The procedure of the monosyllable test is as follows. We have constructed a series of six illustrations where the final four illustrations constitute a continuous story – all six are presented in colour on paper. We supplement the story with three stuffed animals: Titi, a yellow bird, and his two friends, two horses. We present the three animals to the child, and explain that Titi does not understand adults. We tell the child that we want to tell Titi a story, and ask him to help us out by repeating what we say to Titi. The phrases to be reproduced by the child are related to the pictures and include several occurrences of the various monosyllables, each of which occurs in a variety of segmental and prosodic contexts. Even if several children imitate the prompt willingly, one factor that may have burdened them in the task is the important use of function words. The use of personal pronouns may have been particularly difficult because it requires not only pronominal grounding, but also the correct retrieval of the pronominal substitute corresponding to the referent. This task proves challenging on several levels, and the inconclusive results demand a refinement of the method, which will be the focus of future research.

testing of the *chevir*-version and one testing of the *fenasse*-version, we manage to record on tape at least one production of each test item per child. We face two other complications during the testing. First, some children select other words than the ones we intend. For instance, some children use *coco* 'horse (children's speech)' instead of target *cheval* 'horse' and occasionally use *volet* 'shutter' or *carré* 'square' instead of *fenêtre* 'window'. When presented with a picture of two horses some children avoid the plural form and produce *(un) cheval, (un) cheval* '(one) horse, (one) horse' while pointing, instead of *deux chevaux* 'two horses'. In addition, not all children produce the intended complex nominal phrases. For instance, when presented with the picture of the black and the white horse with the Vaudois speaker asking *C'est deux chevaux rouges?* 'Is it two red horses?', some children react by pointing at the screen and uttering *Noir…blanc* 'black…white', while others merely say *Non* 'no'. Lastly, the children display various reactions to the invented words. Some refer to both pictures associated with these words as *animal* 'animal', while the pictures of the *chevir* and the *fenasse* are frequently associated with *hibou* 'owl' or *oiseau* 'bird' and *mammouth* 'mammoth' or *éléphant* 'elephant', respectively. Some children rapidly abandon the familiar word and accept the invented one, while others repeat after the Vaudois speaker but go back to selecting the familiar item further on in the test. Other children again repeat after the Vaudois speaker, but when exposed to a new picture of the invented animal, they refuse to answer. At this point, it is important to mention that the test is designed such that the child is never forced to reproduce the phrase uttered by the male speaker. In fact, as previously mentioned, the only time we ask the child to repeat anything during the PowerPoint test is after the first presentation of the two invented animals.

To conclude this section on the semi-controlled recording setting, we underline that, despite the methodological challenges encountered in the test situation, the data obtained during the kindergarten sessions, nevertheless, provide some initial indications about what to focus on in future experiments on the production of schwa-items in child language. Further, it is worth mentioning that this type of data may also provide information about the acquisition of stylistic levels in French. Regarding the literature on the acquisition of stylistically conditioned phonological variables, J. Smith et al. (2007, 2009), in a series of studies on the acquisition of Scottish English, first observe that not every phonological variable is subject to stylistic variation, neither in CDS nor in child language. Second, they observe that stylistically conditioned variation depends on the situational context; for example, the selection of the non-standard variant is significantly greater in the *play* context than in the *teaching* context. Third, they observe that stylistically conditioned variation, at least in some cases, is rapidly acquired when the child has acquired the two variants.[199] Returning to our PowerPoint test, it is possible that the situational context, i.e. answering questions, may have led the child to take on a "*teaching* style", whereby he more frequently selects the variant he considers "standard". Thus, the children who produce schwa alternation during the test may have segmentally altered their spontaneous production patterns in order to adapt to the situation, e.g. as they also do in the production of songs and nursery rhymes. See the discussion on ornamental schwa by Morin (2003):

> [L]es chvas ornementaux dans les comptines et les chansons enfantines ne peuvent être à la source d'une transmission orale de chvas posttoniques étymologiques qui agirait *avant* l'apprentissage de l'orthographe. Les enfants savent manipuler le chva ornemental très tôt; ils le font sans souci de l'étymologie et conservent cet usage à l'école élémentaire, pendant même qu'ils acquièrent le code orthographique du français. (Morin 2003:482)

[199] We return to the studies by J. Smith et al. (2007, 2009) in Sections 6.3.3.1 and 7.2.1.

In the following section, we present the recording facilities and the technical equipment that we use throughout the fieldwork.

4.2.3.3 Recording facilities and technical equipment

For the sessions recorded on the premises of the kindergarten, we attempt to familiarise with the children and thereby reduce the level of formality of the situation; staying with the entire group of children attending the kindergarten during the morning or afternoon welcoming sessions and joining them in songs and games, we soon achieve a certain rapport of trust and confidence with them. The recordings take place in a corner of the main activity room or in the adjacent locker room because all of the kindergartens are of a limited size and have no spare rooms. These locations have two separate challenges. First, when recording in the main activity room, all children have free access to the recording space and, driven by natural curiosity, they frequently approach us, wanting to participate. Second, when recording in the locker room, there is a risk that caregivers and children would arrive in the middle of the recording, where they would talk or make other noise before leaving the room again. As regards the subject, he is placed on a little chair or on a cushion in front of the computer, and he is free to leave whenever he wants to. We use a stationary directional microphone[200] and record monophonic sound. During the recordings at home, we add a wireless microphone[201] and record stereophonic sound. We place the wireless body pack transmitter[202] inside a cotton bag inside a little Winnie-the-Pooh knapsack so that it is cushioned for protection. The microphone itself is run through a hole in the knapsack, and is attached with Velcro® to the front. The wireless microphone is sensitive and records a substantial amount of noise whenever the child touches the Velcro®. The advantage to this system, however, is that the child becomes rapidly familiar with the knapsack, and does not pay attention to it when we carry it around the house. The microphones are plugged into a Marantz® Professional PMD660 Portable Solid State Recorder. The signal is digitised and recorded using a 32-bit sample size at 44 kHz sampling rate, in a .wav file format on a TwinMOS® CFC 1GB Compact Flash Card or on a Kingston Technology 1GB CompactFlash Elite Pro card. In some cases, the home recordings suffer from an echo because we let the mother decide where to stay during the recording in order to reduce the unnaturalness of the situation – opting for a room where the family generally spends time together over an acoustically better, but less commonly used room. Some mothers prefer to stay in the living room or in the kitchen, while others prefer to stay in the child's bedroom; the latter in general yields a better result as the floor is carpeted.

After the recording, the sound file is copied to the computer for further treatment in Phon (Rose & Hedlund 2006-2013) and Praat (Boersma & Weenink 1992-2013).

4.3 Transcription and organisation of the data

In this section, we outline the procedures selected for organising our raw data and preparing them for analysis. We will first present the Phon software, before turning to the transcription conventions and the coding system considered suitable for our main research questions.

[200] AKG D 1200 E.
[201] Mipro ACT-707SE Single Channel Wireless Receiver – Automatic Channel Targeting Wireless System.
[202] UHF ACT-707TE with a Lavaliere Microphone with XLR Connector.

4.3.1 Phon

Phon is a software program developed by Yvan Rose and Greg Hedlund (2006-2013), and it is designed to facilitate the treatment of data used in phonological analyses – in particular in first and second language acquisition and phonological disorders. Some of its many functions include linkage of video and sound files, automatic IPA transcription, word segmentation and alignment, comparison of target and produced phonological form, and automatic syllabification. The segmented records can be exported in .wav-format, which is compatible with Praat (Boersma & Weenink 1992-2013). For the treatment of the child data, we use Phon version 1.3r475.[203] In the Phon workspace we created a project file *Acquisition of schwa*, which comprises all of the recording sessions. Within the project file, the recording sessions per child, whether they took place in a naturalistic or in a semi-controlled setting, are grouped together into separate corpora. In a given child's corpus, each session entry consists of a session window and the appropriate sound file. The treatment of the sound file passes through three main stages, segmentation, transcription, and syllabification; we present each in detail in what follows.

The first stage in data treatment consists of segmentation. In the session window, we segment each production by the child and each production by the mother classified as child-directed speech into separate Phon records. The exhaustive segmentation of the sound file facilitates future database searches on other aspects of child language.[204]

The second stage in data treatment consists of transcription, and we enter information into five different tiers: Orthography, Target Orthography, IPA Target, IPA Actual, and Notes. All tiers but Target Orthography are pre-specified in the software. In the Orthography tier, we manually enter the orthography of the actual utterance, and these entries fully respects French orthographic conventions in that all graphic <e> are written, even when there is no phonological counterpart. In the Target Orthography tier, we manually enter the orthography of the target utterance in the case of a syntactic or morphological discrepancy between the actual and the target utterance. For instance, if the child omits the definite determiner, uses an infinitival verbal form instead of present tense, or produces an unbound subject pronoun instead of a bound one, the actual morphological and syntactic forms he uses are entered in the Orthography tier, while the target construction is entered in the Target Orthography tier. With this separation we can compare the developing morphological and syntactic structure with the target structure at any point. In the IPA Target tier, the phonetic representation of the target utterance is automatically entered; all phonetic transcriptions are written using the font Doulos SIL, IPA Unicode. On this tier, schwa is consistently transcribed in the initial syllable of polysyllables and in monosyllables. Schwa is also transcribed in verbs that are subject to allomorphy or suppletion, e.g. *enlever* 'remove;inf' [ɑ̃ləve] vs. *enlève* 'remove;pre-sg' [ɑ̃lɛv].[205] In the IPA Actual tier, we enter the phonetic representation of the utterance as it is actually produced. The mothers' speech is transcribed automatically using the Toogle transcription lookup function; however, the transcription is manually modified in the case of schwa absence and other relevant vowel or consonant modifications. The automatic transcription function uses the symbol [ə] for schwa. We have maintained this symbol in the mothers' productions, since the objective of the study

[203] For the analysis of child-directed speech in light of situational context (cf. Section 6.3.3), we use the version 1.4a716.
[204] Note that the preceding or following context for any given Phon record can be consulted in Phon's Media Player.
[205] All obligatory liaison consonants (Delattre 1966), which are not automatically generated by the program, are inserted manually in Word 2, e.g. *les yeux* 'the eyes' [le **z**jø]. Optional liaison consonants that are present in the IPA Actual tier, are also inserted in IPA Target tier.

with respect to the mothers' production in spontaneous speech is to analyse the presence or absence of schwa and not its actual quality.[206] As regards the transcription of the children's speech, we return to this issue in Section 4.3.2. Note that the IPA Target and IPA Actual tiers are linked to the Orthography tier; automatic phonetic transcription in the two former tiers is based on the orthography entered into the latter tier. Thus, we have an additional practical reason for separating Orthography and Target Orthography; given that we are interested in comparing the target and actual phonetic structures, whatever the morphological and syntactic structure of the latter may be, we have established a link between all three tiers, Orthography, IPA Target, and IPA Actual. Finally, in the Notes tier, when relevant for the data treatment, we enter comments of linguistic nature, e.g. cases where the child produces prosodic prominence on the schwa syllable, comments of communicative nature, e.g. cases where the mother first produces the schwa-item without schwa and then repeats the schwa-item with schwa to emphasise her message, comments of situational nature, e.g. cases where the child recites a nursery rhyme, and comments of contextual nature, e.g. cases where the child eats while talking.

The third step in data treatment is syllabification. On the basis of the phonetic transcriptions in the IPA Target and IPA Actual tiers, syllabic structures are automatically generated in the Target Syllabification and Actual Syllabification tiers. Also, the two syllable structures are automatically aligned in the Alignment tier. Figure 4.3, which illustrates a production from Adèle (2;08.22), shows that in the case of schwa absence, the input schwa in Target Syllabification is aligned with a blank spot.

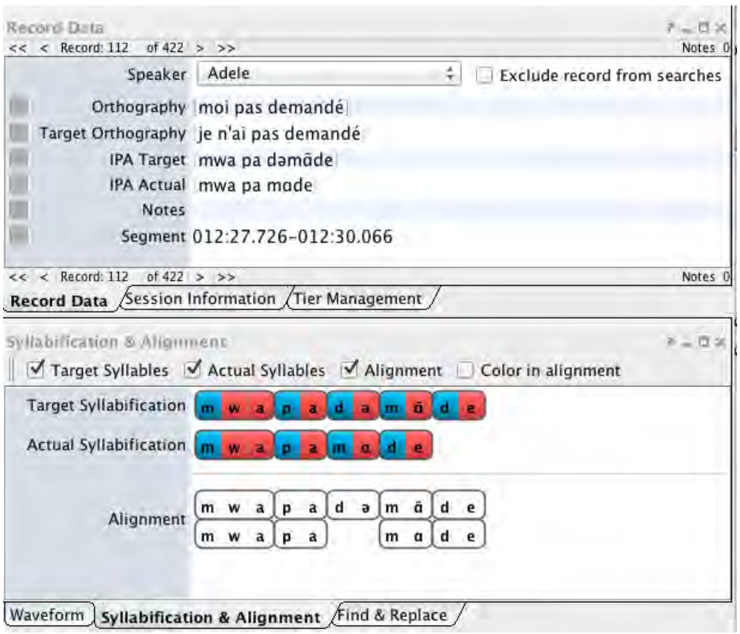

Figure 4.3: Extract of a Phon session window and schwa absence in the initial syllable of a polysyllable (blue box: onset, red box: nucleus, green box: coda), production from Adèle (2;08.22)[207]

In order to facilitate the search for correspondences between the IPA Target and IPA Actual tiers, in the case of schwa absence, or absence of another vowel, we respect the autonomy of the

[206] Recall that Section 5.3.1 presents an acoustic analysis of schwa produced by the mothers during a reading test.
[207] The screenshots in Figures 4.3 to 4.5 are taken from Phon, version 1.5.2.

lexical or functional items, when this is retrievable, cf. Figure 4.4 which illustrates a production from Guy (3;06.13).

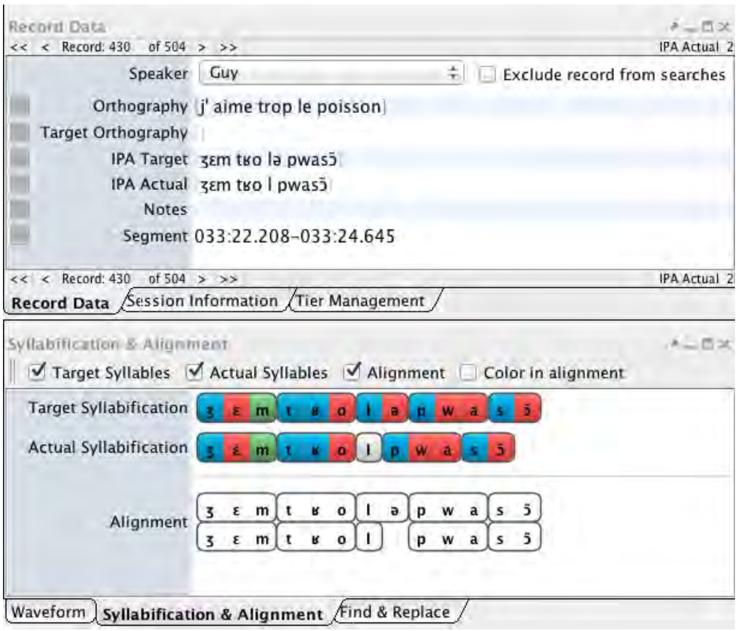

Figure 4.4: Extract of a Phon session window and schwa absence in a monosyllable, production from Guy (3;06.13)

The Alignment tier also serves to identify other types of reductions or modifications present in the child language data; see for example the production by Adèle (2;08.05) in which we find a reduction of the target cluster [gʁ] → [g] and a reduction and modification of the sequence [lɥ] → [w] (cf. Figure 4.5).

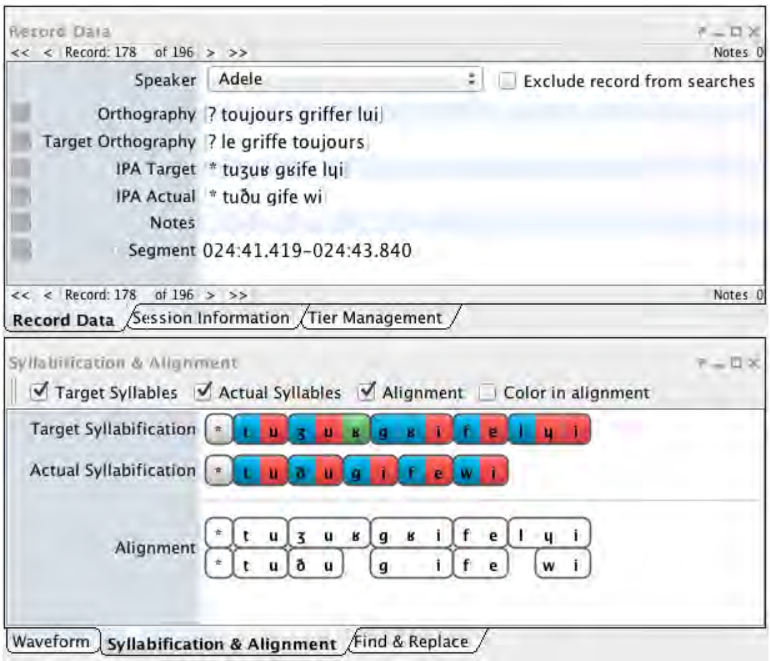

Figure 4.5: Extract of a Phon session window and consonant reduction and modification, production from Adèle (2;08.05)

To facilitate the isolation and treatment of the various participants in the session, each is given a separate code: subjects are coded using fictive names, mothers are coded using fictive names, any other secondary child present is coded using alphanumerics like E1[208], the native Vaudois speaker recorded for the PowerPoint presentation is coded using ‘Machine’, and we are coded using ‘Researcher’. The various participants are transcribed depending on their role and the items they produce. In what follows we present the set of conventions established for the orthographic and phonetic transcriptions.

4.3.2 Transcription

Three native speakers of French, two students in linguistics and one trained phonetician, all participated in the process of transcribing the speech of the youngest children, Fabienne, Henri, Lucas, Adèle, Kim, and Théa.[209] All transcriptions have been cross-checked several times by us and have been sent back to the assistants with comments. Besides Eric, who is transcribed by one of the assistants, we transcribe the data from the older children ourselves and thereafter cross-check all transcriptions at least twice. All relevant portions of the data are transcribed with the aid of visualised acoustic properties in Praat and an auditory comparison with the vowel samples in Ladefoged’s 5th edition of A Course in Phonetics (Ladefoged 2005).[210] As for the adult productions, we do the transcription ourselves. As in the case of the child data, the adult data have been re-examined at least twice after the initial transcription.

The choice of segments to transcribe phonetically is in part based on our decision to use the system outlined in Dell (1985) as a starting point, i.e. we consider every orthographic <e> not pronounced [e] or [ɛ] to correspond to a potential schwa.[211] On this basis, we transcribe every Phon record containing any of the following target structures: (i) polysyllables with a target schwa or a target [œ] = <e> in the initial syllable, e.g. *un petit peu* ‘a little bit’ [œ̃ p(œ)ti pø] and *une brebis* ‘an ewe’ [yn bʁœ̲bi], (ii) monosyllabic function words attempted by the children, e.g. *Henri se lave* ‘Henry is washing himself’ [ɑ̃ri s(œ) lav], (iii) polysyllables that are subject to stylistically conditioned schwa insertion in the medial syllable in target French – in order to check for cluster simplification in the expected case of schwa absence – e.g. *maintenant* ‘now’ [mɛ̃t(_)nɑ̃], and polysyllables with stable presence of [œ] word-medially; *garderie* ‘kindergarten’ [gaʁdœ̲ri], (iv) words subject to schwa insertion after a word-final consonant, e.g. *table* [tabl(_)] and *tête* ‘head’ [tɛt(_)] – the latter less likely to occur in the target language – and (v) verbs subject to allomorphy or suppletion, e.g. *jeter* ‘throw;inf’ [ʒ(œ)te] vs. *jette* ‘throw$_{\text{3-SG-PRE}}$’ [ʒɛt]. We additionally transcribe two target contexts that do not contain a graphic <e>: (vi) items with a target final consonant in order to check for the potential realisation of an inserted schwa without an <e>-correspondent, e.g. *sac* ‘bag’ [sak(_)], and (vii) items with a word-initial primary cluster, e.g. *clef* ‘key’ [kle]. In order to situate the qualitative development of target schwa more generally, we further decided to transcribe items containing one of the mid front rounded vowels [ø, œ] – the latter is assumed to share most, if not all, of target schwa’s phonetic features.

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[208] In the absence of an obligatory consent form, we do not transcribe the utterances of E1. However, as already mentioned, in order to check for a potential imitation strategy, we do segment the production of these children when they answer using a schwa-item.
[209] Hereafter, “we” or “us” refer to the author.
[210] http://www.phonetics.ucla.edu.
[211] Recall from Section 3.3.2 that some orthographic <e> in word-initial syllables correspond to a stable vowel, e.g. *grenouille* ’frog’ [gʁœnuj].

Records that do not contain any of the above-mentioned structures were not focused on, but when intelligible, they are orthographically transcribed in order to obtain a more accurate picture of the child's global production.

Although C. Levelt (2008:1344) notes that "[a]coustic data […] contain valuable information on phonological development that is often too subtle to be transcribed", we transcribe the data as phonetically narrowly as possible for the three vowels, schwa, [ø], and [œ], and the target primary and secondary clusters. In order to do so, we use certain symbols that are a part of the Extended IPA Chart, developed by the International Clinical Phonetics and Linguistics Association (1994) for the purpose of transcribing pathological speech, e.g. the diacritic sign for velo-pharyngeal friction [s͋]. We also transcribe false starts and repetitions that ultimately may provide information about the child's deep grammar. The reason behind our decision to do selectively narrow transcription is twofold. First, concerning the target secondary clusters, a narrow transcription, including non-standard symbols, makes it possible to detect in the corpus subtle articulatory strategies the child selects in order to avoid the production of consonantal sequences that he has possibly not yet mastered. Second, concerning the hypothetical preservation of the phonological syllable in the case of schwa absence, the transcription of segmental lengthening, inter-consonantal vocalic portions, and inter-consonantal silences makes it possible to identify alternative, or empty, material that phonetically represents the schwa syllable nucleus. Concerning prosodic features, neither vocalic length nor supra-segmental prominences are transcribed in the spontaneous speech sessions. As regards all schwa-items from the kindergarten sessions as well as spontaneous speech whose transcriptions are challenging, we extract these items from Phon and acoustically analyse them in more detail in Praat, with attention paid to Formants 1-3, pitch, amplitude, and length.

As previously mentioned, lexical autonomy is preserved in the IPA Target and IPA Actual tiers. However, word segmentation is only carried out once the Orthography tier has been properly transcribed. Sometimes, it is, nonetheless, impossible to segment the child's utterance without running the risk of over-interpreting the underlying structure of the utterance, and in such cases, no word segmentation is carried out and the utterance is merely indicated as non-segmented in the Notes tier. Further, note that there is important literature on the *filler strategy* selected by many children, i.e. the usage of non-adult-like monosyllabic elements that are gradually replaced by the target function word (cf. Peters & Menn 1993, Veneziano & Sinclair 2000, Peters 2001, Veneziano 2001, Vihman & Velleman 2001, Kehoe & Lléo 2003, Demuth & McCullough 2009a, Taelman et al. 2009, to name but a few). In our corpus, we observe pre-nominal syllabic elements whose underlying form, in many cases, remains undetermined, e.g. *X poupée* 'X doll' [a pupe]. This element, here exemplified by [a], may have a grammatical status or it may constitute a pure structural form in the child's grammar. We remain neutral with regard to their interpretation and transcribe them as 'ART' in the Orthography tier, with no correspondence besides [*] in the IPA Target tier, because these elements are not important for our research questions.

4.3.3 Coding

The search for and extraction of occurrences of present or absent schwa in the corpus is performed in two steps. First, in order to isolate the occurrences of schwa in the input, the mother's utterances in the individual sessions are extracted and saved as separate Phon sessions. In these newly created sessions that only contain the mother's utterances, two phone alignment searches are performed, i.e. "Search <IPA Target {Schwa}> aligned with <IPA Actual

{Schwa}>”, and “Search <IPA Target {Schwa}> aligned with <IPA Actual {_}>”, where <_> equals “nothing”.[212] The results of these searches are subsequently fed into Excel for quantitative analysis (cf. Section 6.3). Second, regarding the child data, the steps to isolate the occurrences of target present or absent schwa are performed in a similar way to the steps taken for the adult data. However, for the child language data in which the actual quality of the output schwa is phonetically transcribed, three alignment searches are conducted: “Search <IPA Target {Schwa}> aligned with <IPA Actual {Vowel}>”, “Search <IPA Target {Schwa}> aligned with <IPA Actual {Consonant}>”, and “Search <IPA Target {Schwa}> aligned with <IPA Actual {_}>”. The first search serves to extract the target schwas produced as a vowel, whatever its quality. The second search serves to include in our results the occurrences of a consonant that potentially realises the schwa syllable, e.g. *Regarde!* ‘Look!’ [n̩gaj], from Lukas (2;09.03), produced with a syllabic nasal consonant representing the schwa syllable. As with the adult data, the third search serves to extract absent schwas. We also want to retrieve the occurrences of vowel insertion either inside a target cluster or word-finally; the search “Search <IPA Target {_}> aligned with <IPA Actual {Vowel}>” enables the retrieval of these occurrences. Finally, in order to examine the realisation of target word-initial clusters, we additionally performs the search “Search <IPA Target {Consonant} {Consonant}> aligned with <IPA Actual {}{}>”, where {} equals “anything”, i.e. both a segment and nothing. This search provides a list of all target consonant sequences, within or across words, from which we isolate the productions of target word-initial clusters. Additionally, we have developed inductive codes during and after the transcription work, which we present in detail in Section 7.3, alongside the presentation of the child language data.

Recall from Section 1.2.2 that the likelihood of schwa absence is increased in a post-vocalic context in target French, when compared to post-pausal and post-consonantal contexts (Dell 1985). In order to determine whether these positional differences are also present in child language, all occurrences of target schwa in the child language data are coded with regard to the preceding material, i.e. post-pausal ##C<e>C, post-consonantal C#C<e>C, and post-vocalic V#C<e>C. Note that we classify the schwa occurrences according to the child’s segmental output and not according to the target form. For instance, a non-target deletion of word-final [ʁ] preceding the schwa-item, e.g. deletion of [ʁ] in *sur* that precedes the schwa-item *le* in the hypothetical example *sur le vélo* ‘on the bike’, entails the classification of *le* in the V#C<e>C context, as opposed to the C#C<e>C context in a target-like, non-reduced production of *sur*. Schwa-items following an absent monosyllable are also coded as being in a post-vocalic context, e.g. *monsieur* in the target sentence *voir le monsieur* ‘see the mister’ and produced as *voir monsieur* [vaœsjɛ] by Fabienne (2;04.03). As illustrated by Fabienne’s production of *monsieur*, the classification of schwa-items according to preceding context does not identify the presence vs. absence of the consonant that immediately precedes schwa in the target form, in this example, [m]. The (non-) faithfulness to surrounding consonants, however, is taken into account in the analyses in Chapter 7. Also indicated by this example from Fabienne, monosyllables that are phonetically absent from the child’s output are not coded as a trigger for the presence or absence of a following schwa, nor are they transcribed in the IPA Target and IPA Actual tiers. However, the absent monosyllables are indicated in the Target Orthography tier and are commented upon in the Notes tier; they are potentially important for an analysis of a target schwa that in the child’s production is phonetically absent but phonologically present in the child’s production (cf. A. Carter & Gerken 2004, and Chapter 7 where we address this issue with regard to schwa in the initial syllable of polysyllables). As a phonetically absent but

[212] Recall that the phonetic quality of schwa in the mothers’ production is not transcribed, and that we use the traditional schwa symbol [ə] across the board in these transcriptions.

phonologically present monosyllable is, at present, a purely theoretical construct, we exclude it from our bottom-up, output-based classification of schwa occurrences. Finally, as regards schwa in a post-segmental context, V#C<e>C and C#C<e>C, we do not separate cases in which the schwa-item immediately follows the preceding material from cases in which there is a slight silence between the two items. It is well known that children produce language at a slower pace than adults (cf. Green & Nip 2010, and references cited therein), which, thereby, increases the possibility for a schwa-item to be preceded by a short silence that is void of pragmatic content, e.g. in phrases like *C'est un* (short silence) *cheval* 'It is a horse'. Aware of the possibility that the presence of a silence may have an influence on the presence vs. absence of schwa, we do not measure the distance between the schwa-item and the preceding item in this study, and instead concentrate on the segments that are contained in the schwa-item and its preceding context, i.e. a vowel, a consonant or a phrase-initial pause.

4.4 The corpus

The final corpus that serves as the empirical basis of the remainder of this thesis consists of three main sub-corpora. The first sub-corpus is the target reference corpus that consists of the spontaneous speech, both semi-formal and informal conversation, of the 34 Swiss French speakers currently present in the PFC database (PFC). The second sub-corpus contains the child-directed speech of the six mothers recorded at home with their child during the fieldwork period (CDS). The third and most important sub-corpus contains the child language data from both a naturalistic setting (CNS), in most cases at home, and a semi-controlled setting, in most cases on the premises of the kindergarten (CSC). Table 4.3 illustrates the number and variability of schwa-items across the three different corpora. Note that a fourth sub-corpus that consists of semi-experimental adult data, obtained by means of a production test and a perception test, is consulted in Section 5.3.1. Under the Category section of Table 4.3 unique types of the various syntactic categories are enumerated.

		Corpus						
		Adult language				**Child language**		
		PFC		**CDS**		**CNS[213]**		**CSC**
Hours, total recording		~ 14		~ 38		~ 46		
Occurrences, total recording		1549		1939		2487		1571
Occurrences/hour, total recording		111		51		54		
Category		Type	%	Type	%	Type	%	
	Nouns/pronouns	94	45%	32	54%	28	65%	
	Verbs	68	47%	49	38%	39	29%	
	Other	15	8%	7	8%	7	6%	

Table 4.3: Number and variability of polysyllabic items with schwa in the initial syllable across three sub-corpora

The spontaneous child language (CNS) data show that the number of schwa-items uttered per hour adds up to only half of what is observed in the inter-adult PFC corpus: 54 vs. 111. This finding has two potential explanations: first, the recordings of the child contain a high number of intervals in which the child does not talk, and second, as the Type columns under the Category

[213] As mentioned in Section 7.3.2, there are some instances of schwa-items that are uttered spontaneously during the test sessions. These are not included in Table 4.3.

section indicate, the child uses fewer different schwa-items than the adults do. The low number of schwa-items in the CDS corpus is explained by the fact that the mother produces far fewer utterances than the child during the recordings, perhaps as an automatic consideration of the fact that the primary goal of the session is to record the child's productions. Another finding from Table 4.3 is that while the number of verbal forms is lower than the number of nominal forms in the child language corpus, the former group comprises a greater number of different types of schwa-items than the latter group, i.e. 39 vs. 28 schwa-items across the recording period. This indicates that while nouns are more frequently used some of these items are highly recurrent in the child's speech. The low number of various schwa-items represents a possible methodological shortcoming in that we run the risk of not being able to draw any conclusion about schwa in general, i.e. across various schwa-items and across various phonotactic, morphological, and lexical contexts. The recurrence of certain schwa-items, however, is also an advantage in that we may be able to observe inter- and intra-speaker variation.

4.5 Concluding remarks

This chapter presents the methods selected for the collection and treatment of the child language data. While the ultimate goal of a study on the acquisition of schwa is to provide a complete theoretical analysis of the gradual emergence of schwa alternation, this study, which, to the best of our knowledge, constitutes the very first phonologically oriented study of schwa in French child language, uses methods that yield information about schwa-items as they occur in two settings: in a naturalistic setting at home with a caregiver, and in a semi-controlled setting that encourages intra-speaker phonological variation as well as data that are comparable across informants. As stated by Eisenbeiss (2010), the use of semi-controlled production is favourable when it comes to the production of low-frequency structures. As we have seen, the number of schwa-items that is obtained in the naturalistic setting is scarce when compared to inter-adult speech, which, again, leads us to assume that schwa alternation, if it is available in the child's grammar, is not easily captured during 30 minute long recording sessions. A PowerPoint test where the child converses with a native Vaudois speaker is used to obtain information regarding the availability of the two variants of the schwa-item. The idea behind examining the usage of the two variants has the one major drawback that it relies on the selection of only a few recurring schwa-items that necessarily limits the study of schwa in the broad range of possible phonotactic, morphological, and lexical contexts.

One advantage of recording children in a naturalistic setting is that we are able to simultaneously collect adult input data. In Part II of the thesis, which follows this chapter, we focus on schwa in the mothers' speech; in Chapter 6, we concentrate on the child-directed speech data, with the aim of obtaining information about the degree and type of schwa alternation to which the child is exposed. Prior to this examination, however, in Chapter 5 we return to the question of phonetic similarity between schwa and non-alternating [œ], presented in Section 3.2.2.1. An analysis of the data obtained by means of a production test and a perception test is needed to indicate whether the one-category approach in the child's grammar is theoretically viable on phonetic grounds, or whether the schwa vowel is phonetically unique.

PART II

SCHWA IN THE INPUT

5. Quality of schwa in the input

Guy	Madame Crêpe!
Alice	Madame Tarte aux pommes!
Guy	Madame Crêpe!
Alice	Oh, c'est Madame Crêpe. Madame Crêpe au chocolat?
Guy	Madame Crêpe … au Nutella!
Alice	Ah, au Nutella …
Guy	Madame euh … [ʒœ].
Alice	[ʒœ]?
Guy	Ça c'est joli Madame [ʒœ]. Madame Caca!
Alice	[ʒœ] comment? Comme un *jeu* pour jouer ou [ʒœ] comme … *Je* suis malade?
Guy	Oui.
Alice	Un [ʒœ] comment?
Guy	Un [ʒœ] comme … Guy.
Alice	Ah …

Guy (3:03;13) and his mother Alice inventing funny names, inspired by the children's book series *Monsieur Madame*.[214]

5.1 Introduction

In Section 3.3, the examination of the Swiss French lexicon in light of adult judgement and production data reveal that in these varieties alternating and non-alternating [œ] rarely occur in the same structural environment. Recall that, prior to the examination, we hypothesise that an important distributional overlap in the input would necessitate a categorical split between schwa and /œ/ in the child's inventory at an early stage, while a more subtle overlap would make it possible for the existence of a developmental stage at which the child interprets all [œ] in the input, alternating and non-alternating, to be the output of one single category /œ/, referred to in Section 1.2.4 as the *delayed-split hypothesis*. Albeit scarce, the existence of an overlap on the phonotactic, morphological, and lexical level of analysis, prevents us from fully rejecting the two-category hypothesis, whereby schwa constitutes a separate category. Nevertheless, despite the possibility that the adult data could be best accounted for by an inventory with both schwa and /œ/, the relative distribution of alternating and non-alternating [œ] in adult speech indicates that the child does not need to split the input [œ] into two categories before acquiring a considerable number of phonotactic, morphological, and lexical properties.

Confirmation of the delayed-split hypothesis depends on phonetic evidence from adult speech. Recall that according to the common view, French schwa, when it is realised, does not have a unique phonetic quality; this situation implies that the language learner must perform a categorical split purely on phonological grounds, i.e. on the basis of the distribution of alternating [œ] and non-alternating [œ], which represent schwa and /œ/ in the input, respectively.

[214] *Monsieur Madame* is the French translation of the series *Mr Men and Little Miss*, written by Roger Hargreaves, cf. http://www.mrmen.com/fr.

A number of studies that all obtain results that show the phonetic autonomy of schwa question the reality of the merger of schwa and /œ/. In this regard, we mention that there are potential consequences if it holds true that schwa is phonetically distinct from non-alternating [œ]: first, the strength of the one-category approach, in which schwa and non-alternating [œ] both represent underlying /œ/, would be consequently weakened and second, both phonetic and distributional cues would be available to the child and thus could speed up the categorisation process.

The literature on the Swiss French vowel system, reviewed in Section 2.5.3, shows that the realisations of stable, mid front rounded vowels are considerably dispersed across the vowel space, and range from an extremely open [œ̞] to an extremely closed [ø̝]. Note that a large amount of inter-speaker phonetic variation is attested. In Section 5.3.1, we examine the spectral properties of schwa with two objectives: one, to determine its position relative to non-alternating [œ] and [ø] and two, to further test our hypotheses regarding the number of vowel categories in the system. As our six informants have unique ways of mapping /œ/ to a phonetic production, it is important to compare the distribution of schwa and /œ/ at the intra-speaker level. In focusing on the individual systems of these informants, who are also the primary caregivers to some of the children examined in Chapter 7, we further aim to obtain an accurate picture of the input to which these children are exposed. In Section 5.3.2, we question the phonetic autonomy of schwa from a perceptual perspective. Supposing that the production data reveal that schwa is acoustically unique, then only a perception test can uncover whether the acoustic cues separating schwa from /œ/ are sufficiently salient to affect vowel categorisation.

5.2 Theoretical preliminaries

It is typically claimed in the literature that the phonetic realisation of schwa is not qualitatively distinguishable from non-alternating [œ] (cf. Fouché 1959, Haden 1965, Morin 1974, Dell 1985). However, the variable behaviour of output [œ], i.e. the alternation in *mener* ‘lead$_{\text{INF}}$’ [mœne] ~ [mne] and the absence of alternation in *meunier* ‘millhand’ [mœnje] ~ *[mnje], constitutes a major argument in favour of the claim that there are two abstract categories, schwa and /œ/. Surprisingly, in sharp contrast to the considerable number of analyses that focus on the mechanisms in grammar that generate schwa alternation, astonishingly few discuss the assumed phonetic neutralisation of the two categories.[215] Even fewer analyses attempt a theoretical account of the merger. However, Anderson (1982) and Eychenne (2006) do consider rule-based and constraint-based analyses, respectively.

There are several phonetic analyses in the literature that focus on the physical properties of schwa and which raise the question of whether schwa in a given grammar is phonetically identical to [œ] or whether fine acoustic properties separate the two. In a speech technology manual, centred on the acoustic and auditory properties of language, Tubach (1989) excludes schwa from the phonetic vowel inventory altogether, and he assumes that it is realised [œ] or [ø]. No data are presented to support his conclusion. Conversely, Pleasants (1956) argues for schwa’s unique quality in a fine-grained phonetic analysis. She examines the controlled speech[216] of eight Parisian speakers and obtains acoustic, auditory, and articulatory information

[215] See Walker (1993, 1996) for a discussion on the theoretical challenges raised by the phonetic merger.
[216] Her protocol includes isolated vowels – schwa, [œ], [ø] –, monosyllables – e.g. *que* COMP, *cueille* ‘pluck$_{\text{PRE-3SG}}$, and *queue* ‘tail’ –, phrases – e.g. *tandis **que*** ‘whereas’, *parce **que** tu penses* ‘because you think’, and ***que** penses-tu* ‘what do you think’ –, and short texts.

that authorise a narrow phonetic comparison of schwa with neighbouring [œ] and [ø]. She finds that schwa acoustically has a lower F1 value than [œ], but a similar F1 to [ø], and a lower F2 value than both [œ] and [ø]. Further, she finds that schwa auditorily is less sonorous and shorter. Finally, she finds that schwa articulatorily is posterior to both [œ] and [ø], the tongue is positioned lower than in [œ] and [ø], and the jaw is more closed than in [œ] and sometimes even more closed than in [ø]. In addition, schwa is frequently realised with the lips in a neutral position, which is never the case for [œ] or [ø].[217] Finally, the mechanical properties of schwa, i.e. duration, intensity, and pitch, are subject the same variation as the other, stable vowels. Pleasants (1956) indicates a partial articulatory confusion of schwa and [ø], but not of schwa and [œ], as is traditionally assumed by later studies. However, the validity of her data is subject to debate. Several researchers strongly criticise her results. For instance, Fischer (1980) claims that not only are the vowels produced in isolation, making them susceptible of being different from the same vowels produced within larger prosodic contexts, but also that her instrumental measures of length, intensity, and intonation in unstressed syllables are inconsistent and of insufficient importance.

Malécot and Chollet (1977) confirm that the degree of uniqueness for schwa is lower than for other vowels. They compare more than 3,000 samples of schwa with 350 samples of /ø/[218] and 300 samples of /œ/ that are extracted from the spontaneous speech of 32 informants using a "dominant educated, middle-class dialect" (1977:21). In their study these samples are subjected to a computerized discrimination task, and the results show an error rate of 23% in the discrimination of /ø/ and /œ/, 26% in the discrimination of /œ/ and schwa, and as much as 40% in the discrimination of /ø/ and schwa. In a following identification task, in which all vowels in an individual speaker's system are plotted on logarithmic F1 and F2 scales, schwa receives a 14% identification score, the lowest of all vowels, while /ø/ and /œ/ receive 27% and 30% identification scores, respectively. Malécot and Chollet propose four factors that potentially contribute to the low acoustic uniqueness of schwa: one, a low functional load because schwa is virtually never contrastive, two, a low force of articulation with consequent low motor precision, three, the absence of a precise canonical acoustic and articulatory profile in the speakers' grammar because schwa is unstressed, and four, a shorter duration that entails undershoot. In a subsequent perception test, four expert participants and four naïve participants are asked to listen to a selective number of vowel samples and to classify them as identical to the word-final vowel in *veux* 'want$_{\text{1-SG-PRE}}$', assumed to be /ø/, as identical to the vowel in *veulent* 'want$_{\text{3-PL-PRE}}$', assumed to be /œ/, or as identical to the word-medial vowel in *vendredi* 'Friday', assumed to be schwa.[219] The results show a high error rate in that /œ/ and schwa, are identified only one third of the time. /ø/ is identified somewhat more frequently, although not significantly different from the other two vowels. In short, Malécot and Chollet (1977) find that the mechanical properties of schwa are not sufficiently salient to justify separate phonemic status. The phonetic factors, i.e. lower acoustic intensity and shorter duration, that distinguish schwa from the contiguous /œ/ and /ø/, are not used contrastively in French; consequently, the authors conclude that the categorical status of schwa depends on its phonological, not phonetic properties.

Identifying schwa based on phonetic properties is complicated to the extent that a number of methodological choices can blur the true phonetic details of schwa. First, collapsing formant

[217] Note that the degree of labialisation in [œ] and [ø] is subject to variation.
[218] In this section, the use of slashes, / /, and square brackets, [ ], follows the transcriptions in the various papers cited. Note that this does not imply that we agree with the usage of the different notations.
[219] The choice of reference words – the sole examples provided in the article – indicate that Malécot and Chollet (1977) use orthography to define which vowels are categorised as schwa, /œ/, and /ø/. Our definition of schwa as a vowel that alternates precludes the vowel in *vendredi* from our data set: its presence in the output is stable.

values of schwa occurrences across segmental contexts conceals the fact that schwa fluctuates between [œ] and [ø] depending on the surrounding consonants (Malécot 1976). Second, the acoustic properties of schwa are subject to inter-speaker variation. Whereas Delattre (1964) and Léon (1971, cited by Racine, 2008) base their acoustic definition on synthesised speech and the authentic speech of one single speaker, respectively[220], two recent studies each perform a multivariate analysis of variance in order to compare schwa with the stable mid front round vowels across speakers. First, Fougeron et al. (2007) examine a total of 8,236 vowel tokens, 3,294 schwas, 2,031 /ø/, and 2,911 /œ/, produced by 180 speakers who are part of the ESTER corpus.[221] Abstracting away from the vowels produced in contact with [ʁ], which has substantial co-articulation effects on adjacent vowels (cf. Tubach 1989, Fougeron et al. 2007), schwa emerges as distinct in all three formant dimensions. It has an intermediate aperture that is closer to /ø/ than to /œ/, it is more front than both /ø/ and /œ/ but is closer to /ø/ than to /œ/, and it has an intermediate degree of labialisation that is closer to /œ/ than to /ø/. In an in-depth analysis of twelve selected speakers, Fougeron et al. (2007) observe that, despite an important acoustic overlap, schwa is distinguished by at least one of the formants in the majority of cases. Within the group of twelve speakers, four patterns are observed: one speaker does not separate any of the vowels, one speaker merges schwa and /œ/, two speakers merge schwa and /ø/, and eight speakers produce a schwa that is distinct from /œ/ and /ø/. Fougeron et al. (2007) finally examine whether schwa is acoustically more variable than /œ/ and /ø/ and observe that it is subject to more variation only in the F2 dimension. Since co-articulation has a particularly strong effect on F2, they hypothesise that schwa is more sensitive to segmental context than /ø/ and /œ/. However, the corpus does not allow them to test this hypothesis.

Bürki et al. (2008) examine the realisation of schwa in read speech for the PFC survey points of Nyon (Vaud), Brunoy (Ile-de-France), and Quebec[222], and their results confirm the importance of taking into consideration inter-regional variation. Nine lexical items with an orthographic <e> are selected for analysis; all words containing <e> are subject to variation across speakers: four items that have a frequently alternating schwa in the word-initial syllable, i.e. *ch**e**mise* ‘shirt’, ***de**puis* ‘since’, ***pe**tit* ‘small’, and ***re**vanche* ‘revenge’, and five items that have a medial <e> that is occasionally realised, and particularly in more controlled speech, i.e. *méd**e**cin* ‘doctor’, *bêt**e**ment* ‘stupidly’, *dég**e**ler* ‘defrost$_{\text{INF}}$’, *détach**e**ment* ‘detachment’, and *indiqu**e**raient* ‘indicate$_{\text{COND-3PL}}$’. The data set thus comprises 294 occurrences of a potential schwa, 150 of which are phonetically realised. As a means to position schwa in the individual vowel space, three instances of [i, u, a, œ, ø] are also measured. The global results demonstrate that the Nyon and Quebec vowel systems are more open, i.e. have higher F1 values, than the Brunoy system. The cross-regional segmental analysis[223] confirms this general finding. With respect to F1, the Nyon and Quebec informants realise a schwa with a significantly higher F1, i.e. the vowel is more open, compared to the Brunoy speakers. With respect to F2, the three survey points are unique with regard to schwa; Quebec is the most anterior, then Brunoy, followed by Nyon; however, these differences are not significant. With respect to F3, inter-variety differences are significant. The Brunoy informants realise a vowel with a high F3, i.e. it is the least round,

[220] In Delattre (1964), the values for an average male voice are F1 = 500 Hz, F2 = 1200 Hz, and F3 = 1500 Hz. Léon (1971, cited by Racine, 2008) provides slightly different values for schwa, while explicitly expressing the need for a larger corpus; he gives F1 = 500 Hz, F2 = 1500 Hz, and F3 = 2500 Hz.
[221] The ESTER corpus consists of pre-planned and spontaneous speech in radio broadcasts (Galliano et al. 2005).
[222] The data on which this analysis is based are available at the PFC website: www.projet-pfc.net. For information about the project PFC, see Durand et al. (2002, 2009a).
[223] In this analysis, F1, F2, and F3 are extracted for each vowel and normalised using the Nearey procedure (Adank et al. 2004). Extreme values are filtered out (Gendrot & Adda-Decker 2005), and segmental context is controlled for. All analysed vowels occur in a [(post-) alveolar _ labial] context, e.g. *chemise* ‘shirt’ [**ʃ**(œ)**m**iz] vs. *dix-neuf* ‘nineteen’ [diz**n**œ**f**].

compared to the Nyon informants, who realise a vowel with a low F3, i.e. it is the most round. The Quebec informants are situated in between and have a lower F3 than the Brunoy informants and a higher F3 than the Nyon informants. When schwa is compared to [œ] and [ø], the intra-variety analysis reveals that, for Nyon all three vowels are distinct in the height dimension, with schwa closer to [ø] than [œ], whereas for Brunoy and Quebec schwa shares the aperture of [ø]. Concerning F2, schwa in the Nyon data is anterior to [ø] and [œ], which is different from the Brunoy data where schwa is identical to [ø] and anterior to [œ], and different from the Quebec data where schwa is identical to [œ] and posterior to [ø]. Finally, concerning F3, schwa is identical to [œ] in all varieties and hence less round than [ø]. Regarding intra-segmental variability, schwa does not vary to an extent broader than [ø] and [œ].

In short, these findings show that whereas schwa does not completely merge with [ø] or [œ], there are always overlaps between schwa and [ø] or [œ] in some formant dimension. Still, there are important issues that remain unanswered concerning how these data are to be interpreted phonologically, i.e. are the acoustic properties of schwa sufficiently salient to establish it as a contrastive segment, and do speakers perceive and phonologically value the subtle phonetic indices that distinguish schwa from [œ] and [ø]? For instance, Dauses (1973) argues that the phonetic profile of schwa is not sufficiently distinguished from [œ] and [ø] to serve a contrastive function.[224] His main argument is that during a dictation based on the informants' own controlled production[225], the majority of speakers confuse schwa with one of the mid front rounded vowels more than once during the test.[226] For instance, a speaker reads out loud the phrases *c'est comme je dis* 'it is like I say' and *c'est comme jeudi* 'it is like Thursday', and when confronted with his own production on tape, he mismatches the signal *je dis* with orthographic *jeudi.*

> 89,1% des élèves parisiens, 100% des élèves non parisiens et 100% des enseignants ont confondu au moins une fois dans le test l'*e* instable avec *eu* fermé et au moins une fois avec *eu* ouvert (en position atone). [...] Ce n'est qu'en position tonique que l'*e* se scinde en deux variantes combinatoires: *eu* fermé en syllabe libre, *eu* ouvert en syllabe fermée. […] En position accentuée libre, l'*e* instable se confond, pour la plupart des locuteurs, avec la réalisation du *eu* fermé (95,2% des élèves parisiens, 100% des élèves non parisiens, 62,5% des enseignants). (Dauses 1973:37)

The phonetic overlap that induces categorisation mismatch is confirmed in a perception test presented in Jenkins (1971). Jenkins presents the 69 synthetic vowels recorded by Scholes (1967a, 1967b) in random order to a group of 18 listeners.[227] For each vowel they hear, the participants are asked to write down a French word that contains the vowel. In a subsequent phase, the interviewer correlates the written answers and the formant values of the synthetic vowels and thereby creates a visual map of the participant's pronunciation (cf. Figure 5.1). The results show that five of the eighteen participants distinguish schwa, [œ], and [ø], but only one participant makes a consistent three-way distinction between the three vowels. Nine of the

[224] Note that Dauses (1973) does not carry out any acoustic analysis of the vowels.
[225] The corpus includes 64 students, ages 11-22 years, from the Paris region, fourteen students, ages 14-20 years, from outside of the Paris region, and eight teachers, the majority of whom originate from Paris.
[226] Dauses' results additionally reveal that for a number of speakers, "la distinction *eu* fermé *eu* ouvert […] disparaît en faveur d'un *eu* moyen" (1973:37).
[227] The participants are from different French-speaking areas, but all claim to speak "Standard French".

eighteen informants do not identify schwa; they only have a two-way distinction between [œ] and [ø].[228]

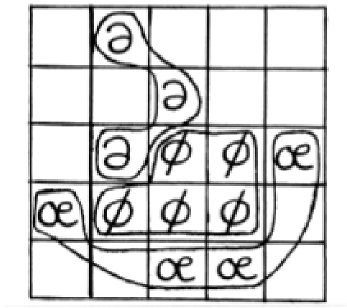

Figure 5.1: A visual map of a subject's pronunciation (Jenkins 1971:85)[229]

The above-mentioned studies not only show that schwa overlaps acoustically with [ø] and [œ], but also that the categorisation of the three vowels is problematic for many listeners. As previously indicated, this situation necessitates a discussion of the consistency of the mapping between phonology and phonetics. If schwa forms its own category, the above-mentioned studies show evidence that the phonetic interpretation of its phonological features varies across occurrences, both at the intra- and inter-speaker level. Conversely, if schwa does not constitute its own category, but is merely a variant of /œ/, then it accordingly must share the phonological features of the latter. In this scenario, the intra- and inter-speaker variation observed for schwa is not distinct from the variation observed for the non-alternating variant, cf. Anderson (1982):

> A certain amount of variation exists in the actual details of the realization of [schwa] [...] but the essential point is that this variation is shared by /ə/ and /œ/, which do not differ from each other [...] in their surface value. (Anderson 1982:537)

In the following sections, we pursue the question of whether the acoustic properties of schwa are sufficiently salient to define it as phonologically contrastive. We first use the results from a production test to provide a within-system acoustic analysis of the data from the six mothers present in the corpus (cf. Table 4.1). This test has two objectives: one, to establish whether schwa is unique in the individual system, and two, to determine what constitutes the input to the child. In a subsequent section, we examine the results from a perceptual evaluation test to further determine the uniqueness of schwa in relation to [œ] and [ø]. As already mentioned, if there are subtle acoustic differences between schwa, [œ], and [ø], they are not necessarily sufficiently salient for schwa to be perceived as a distinct vowel. In the perceptual evaluation test, we obtain information about how Swiss French adults perceptually interpret underlying schwa and /œ/; we discuss whether cues other than spectral values help the listener categorise a vowel token in the input as representing schwa or /œ/. Recall from Section 2.5.3.2.2 that we consider /œ/ to underlie both stable [œ] and stable [ø].

It is important to note that perception in acquisition is beyond the scope of this thesis, but the results from this test can, nonetheless, provide us with some insight into which cues are decisive for mapping the raw acoustic data to the alleged phonological categories schwa and /œ/.

[228] For the sake of completion, we provide the other results: one informant does not identify any of the three vowels, one identifies a few occurrences of [ø], whereas the final two informants identify [ø] and schwa, but not [œ].

[229] The vowels perceived as similar are circled in the diagram. A blank cell indicates that the speaker does not perceive the vowel as a French sound.

According to Escudero and Boersma (2003), the perception apparatus is finely tuned to the input in the sense that two speakers can interpret the same acoustic event differently because their phonological systems contain different phoneme-decision boundaries. In the course of language development these boundaries are acquired gradually through a constant evaluation of the match between the input and the semantic correspondent by the child's extant phonological grammar. The assumed degree of spectral variability for schwa and the stable mid front round vowels [œ] and [ø], which represent two abstract vowel categories schwa and /œ/, is interesting in light of Escudero and Boersma's (2003) proposal: if perceptual fine-tuning is a strategic adjustment to minimise the probability of confusion, the question remains how the developing grammar copes with and eventually sorts into categories a mixture of overlapping spectral values that do not serve to identify true contrastive pairs. It is our belief that a complete understanding of schwa requires an analysis of both production and perception data, and thus, in Section 5.3.2, we further highlight the importance of perception, a factor which, to this date, is sadly neglected in the majority of schwa studies.

5.3 Descriptive analysis

The hypotheses that are tested in this section are as follows:

> 1. In target Swiss French, the acoustic profile of schwa is compatible with an analysis in which schwa does not constitute a distinct category.
>
> 2. In target Swiss French, the auditory profile of schwa is compatible with an analysis in which schwa does not constitute a distinct category.[230]

5.3.1 Production test: the spectral properties of schwa in Swiss French

5.3.1.1 Goals and description of the test

Recall that the overall objective of the production test is to identify the (non-) uniqueness of schwa in Swiss French; specifically we look at the individual grammars that function as the primary input source to the children examined in this thesis, that of the mothers. In this section we focus solely on the spectral properties of schwa. However, the motivation behind the test is formal in the sense that we wish to establish evidence in favour of or against the one-category analysis (cf. Section 3.2.2.1). As a means to reach this goal, we analyse two aspects of schwa: First, we determine whether the phonetic realisation of schwa is unique or whether, within a speaker's system, the quality of schwa overlaps considerably with non-alternating [œ] and [ø] (cf. the results in Fougeron et al. 2007, Bürki et al. 2008). We hypothesise that in a one-category analysis separate acoustic clustering of alternating and non-alternating [œ] must be the output effect of some constraints other than just phonological contrast-driven requirements (cf. Flemming 2002, Boersma & Hamann 2008). Second, we examine the acoustic variability of schwa vs. /œ/. Recall that Fougeron et al. (2007) show that schwa fluctuates to a larger extent in the F2 dimension than do the neighbouring vowels. However, in a one-category analysis, there is no apparent reason for why alternating [œ] should be more frequently subject to co-articulation effects. Thus, in identifying the level of scattering in the vocalic space for schwa and /œ/ we can further empirically support or reject the hypothesis that schwa is a variant of /œ/.

[230] The consent form signed by the participants in the production and perception tasks is presented in Appendix II-1.

The data are gathered by the means of a production task in which the six mothers read out loud a number of phrases that contain schwa or a stable, mid front round vowel in various phonotactic contexts. Even though we define schwa as a vowel that alternates, in the construction of the list of phrases, as in Section 3.3, we use the orthographic representation of items as our starting point. Assuming graphic <e> represents a schwa, we select one single item per existing #C<e>C combination.[231] In this list all combinations of manner of articulation are represented, except for NasPlo, for which no #C<e>C item is found in the lexicon. Graphic <e> solely occurs in word-initial syllables in the test because of our analysis that underlying schwa is restricted to word-initial syllables and functional monosyllables. Graphic <eu>, assumed to be /œ/, on the other hand, occurs in word-initial, word-medial, and word-final syllables in the test. Note that <eu> in the word-final syllable is assigned prominence when it occurs in the phrase-final position. Thus, the test consists of 68 items with a #C<e>C sequence, 73 items with graphic <eu>, five items with an ObsLiq<e> sequence, and 17 distracter phrases.[232] Each #C<e>C item occurs twice, preceded once by a vowel-final word and once by a consonant-final word, e.g. *m*[ɔ̃ n]*eveu* 'my nephew' vs. *cha*[k n]*eveu* 'each nephew'.[233] The items are randomly distributed across a list consisting of a total of 152 phrases, and the order of appearance is identical for all test subjects. We refer to Appendix II-2 for a presentation of the list of phrases.

We only examine a subset of the data for the present acoustic analysis of schwa. Recall from Chapter 3 that a graphic <e> does not necessarily correspond to schwa. Thus, as our objective is to examine schwa vs. stable [œ] or [ø], we extract only those graphic <e> whose phonological alternation is established for Swiss French by Racine (2008), i.e. words with a *c.e.f.* value of -3 and higher, presented in Example (1).[234] Given that V#C<e>C is the locus for alternation, the items occurring in this context are selected for analysis. If schwa is absent in this context, we turn to the variant produced in the C#C<e>C context.[235]

(1) Items selected for spectral analysis I (*c.e.f.* values in parentheses)

a. #C<e>CV *besoin* (-0.58), *chemise* (2.0), *chenit* (0.5), *cheveux* (1.92), *dedans* (1.42), *degrés* (-1.83), *demain* (-1.75), *dessus* (0.33), *femelle* (-0.75), *fenêtres* (1.0), *gelé* (*gelée* 1.83), *genoux* (1.58), *jetait* (*jeté* -0.33), *levure* (0.25), *melons* (-2.67), *menait* (*meneur* -2.17), *meringues* (-2.0), *neveu* (0.75), *peluche* (1.17), *peser* (*pesée* -2.67), *petite* (1.67), *recherche* (0.92), *rejet* (-1.25), *renards* (-1.08), *repas* (0.42), *requins* (-1.08), *retour* (0.08),

[231] This methodological choice implies that the quality of schwa in a given segmental context cannot be compared across different items.
[232] Four nonsense words with graphic <e> and <eu> are included to check the potential influence of the orthographic representation on pronounciation, i.e. *chevir, cheuvir, fenasse*, and *feunasse*.
[233] In a C#C<e>C context, the nature of the word-final consonant is not controlled for. Recall, however, that the nature of this segment affects the alternation rate to some extent. For instance, it is commonly assumed that word-final sonorants do not hinder schwa absence in a following word, e.g. *par semaine* 'per week' [paʁs(œ)mɛn] and *une cheminée* 'a chimney' [ynʃ(œ)mine]. Whether this word-final consonant has an effect on schwa *quality* remains to be determined.
[234] We designed the test one year prior to the publication by Racine (2008), and a number of items present in her experimental protocol do not constitute part of our experiment and vice versa. Nevertheless, four verbal forms – *gelé, jetait, tenait*, and *venait* – are included in the spectral analysis even though they are not examined by Racine (2008). However, the Swiss French PFC data reveal that the vowel corresponding to graphic <e> in these forms does alternate, a finding strengthened by the elevated *c.e.f.* values obtained for items sharing the same verbal root, i.e. *gelée, jeté, tenue*, and *venue*.
[235] Note that Alice and Blanche produce *chenit* without schwa both times, and that a schwa in this item, consequently, could not be measured for these two speakers. Alice also produces *venait* without schwa, and thus, it could not be measured in the data for the same reason.

revue (-0.08), *secondes* (0.67), *semaine* (0.67), *tenait* (*tenue* -0.83), *velours* (-0.42), *venait* (*venue* -0.42). Total 33 items.

b. <eu># *Beaulieu*, *dégueu*, *deux*, *malheureux*, *mieux* (x2), *neveu*, *peureux*, *veut*, *vieux*. Total 10 items.

c. <eu>C# *aveugle*, *beutche*, *bœuf*, *chanteuse*, *émeutes*, *entraîneur*, *fleuve*, *fœhn*, *gueule*, *gueuze*, *heures*, *jeune*, *jeûne*, *joueur*, *malheur*, *Maubeuge*, *meubles*, *neuf*, *neume*, *neutre*, *neuve*, *pêcheur*, *seul*, *seule*, *sœur*, *veule*, *veulent*. Total 27 items.

The vowels corresponding to graphic <e> and <eu> are manually isolated in Praat. Prior to analysis, we re-examined the boundaries and eliminated as much preceding noise as possible, e.g. consonant friction and bursts. Formant transitions due to co-articulation are occasionally attested throughout the vowel duration and form part of the analysed data – this effect is primarily observed in the F2 dimension. The spectral frequencies of the formant triplet are automatically calculated in Praat by a function that extracts the mean formant value for the vowel across its total duration.

5.3.1.2 Results part I

In what follows, we depict the six individual systems that emerge from the formant analysis. In Figures 5.2 to 5.7 the F1 value is shown on the vertical axis and the F2 value is shown on the horizontal axis. We exclude F3 from the analysis because, as reported by Bürki et al. (2008), in the Nyon data the F1 and F2 dimensions for schwa are proven not to overlap completely with [œ] or [ø][236], while F3 is identical for schwa and [œ].

[236] For the sake of clarity, we repeat that schwa in the Vaudois variety is analysed as intermediate to [œ] and [ø] in the F1 dimension and as anterior to [œ] and [ø] in the F2 dimension.

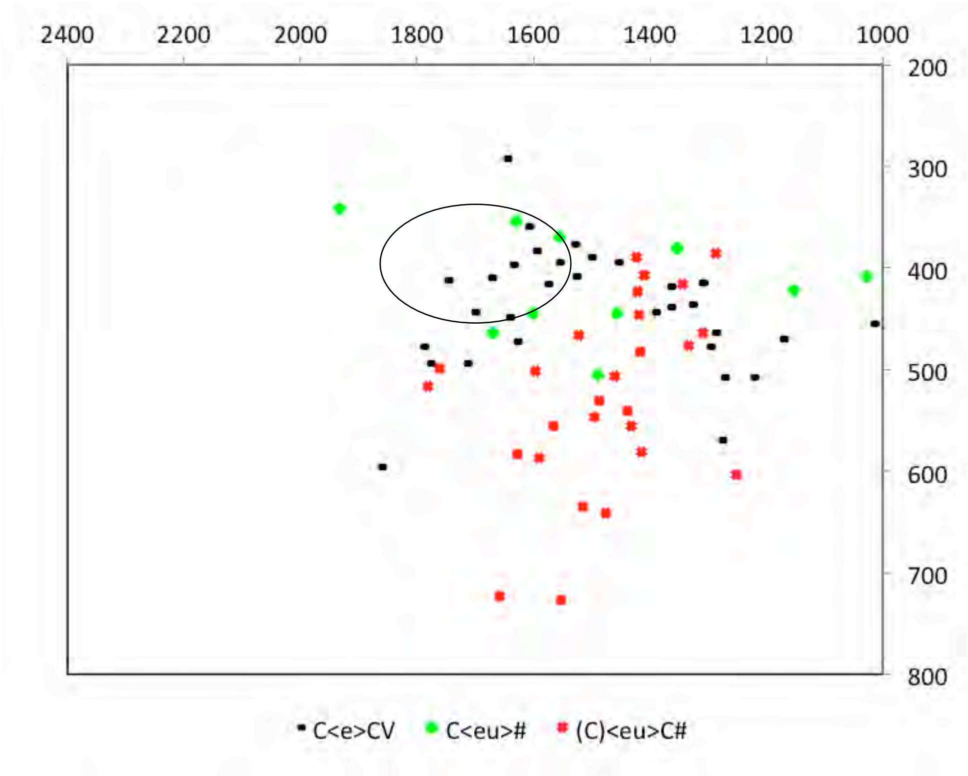

Figure 5.2: F1 and F2 values for graphic <e> and <eu>, from speaker Alice (mother of Guy)

Alice, whose system is presented in Figure 5.2, produces a schwa which in the F1 dimension frequently patterns with the <eu># vowel, e.g. *dedans* 'inside' with an F1=359Hz and *vieux* 'old' with an F1=342Hz. In the same area in the F1 dimension, we also find a subgroup of the <eu>C# vowels, the majority of which are lengthened, e.g. *émeutes* 'riots' with an F1=416Hz. It is worth noting that several occurrences of schwa are located in a close, anterior part of the vowel space, encircled in Figure 5.2. Among the more open schwa realisations, we observe the six items with a preceding – or in one case a following – [ʁ]; all of these are produced with a low F2, as expected, e.g. *repas* 'meal' with an F1=455Hz and F2=1016Hz. The remaining set of schwa-items are dispersed in the F2 dimension, ranging from a position shared with the above-mentioned close <eu>#, e.g. *besoin* 'need' with an F2=1311Hz and *émeutes* 'riots' with an F2=1344Hz, to a position shared with several more open vowels, e.g. *chemise* 'shirt' with an F1=414Hz and F2=1779Hz and *gueule* 'face (colloq.)' with an F1=517Hz and F2=1782Hz. In short, Alice produces a schwa that in the F1 dimension is frequently confused with close variants of /œ/[237], and which in the F2 dimension can be confused with more open variants of /œ/.

[237] Recall that we assume /œ/ phonologically represents the mid front round category, whether it is realised [œ] or [ø].

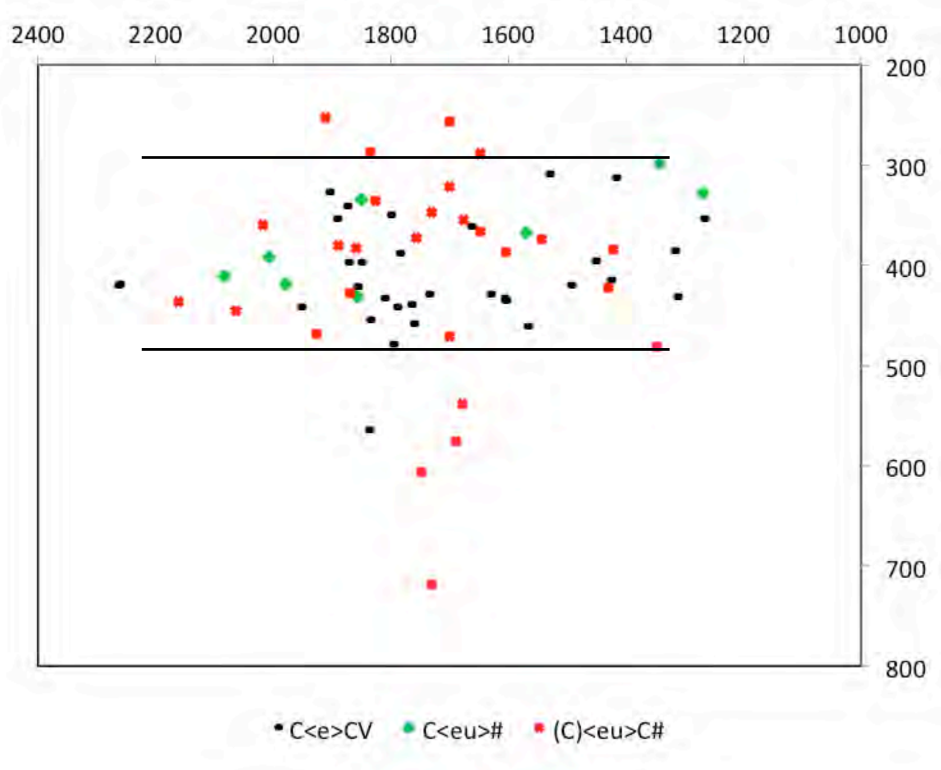

Figure 5.3: F1 and F2 values for graphic <e> and <eu>, from speaker Blanche (mother of Tom)

Turning to Blanche, presented in Figure 5.3, the overall distribution of the vowels is slightly more anterior and close than in Alice's system. Blanche's system is similar to Alice's to the extent that schwa is not realised as open as [œ] in front of [ʁ], e.g. *entraîneur* 'coach' with an F1=576Hz. Schwa also does not share the aperture of the <eu>C# vowels with the lowest F1 values, e.g. *neuve* 'new$_{\text{FEM}}$' with an F1=257Hz. Schwa seems to be positioned in an intermediate area in which we additionally find the <eu># vowels and the remaining <eu>C# vowels, e.g. *peluche* 'teddy bear' with an F1=388Hz, *dégueu* 'disgusting (colloq.)' with an F1=367Hz, and *seule* 'alone$_{\text{FEM}}$' with an F1=380Hz. In contrast to Alice's system, Blanche's [ʁ]-items do not form any consistent back pattern; nevertheless, four out of the six items in this context have the lowest F2-values, e.g. *retour* 'return' with an F2=1319Hz. In fact, we observe a clustering of schwa and /œ/ between 1700 and 1900Hz, albeit with several exceptions, both higher and lower. In short, Blanche's schwa does not occupy the close-anterior area that is observed for Alice, but instead it seems to be restricted to an intermediate height that /œ/ both shares as well as extends beyond to more extreme areas.

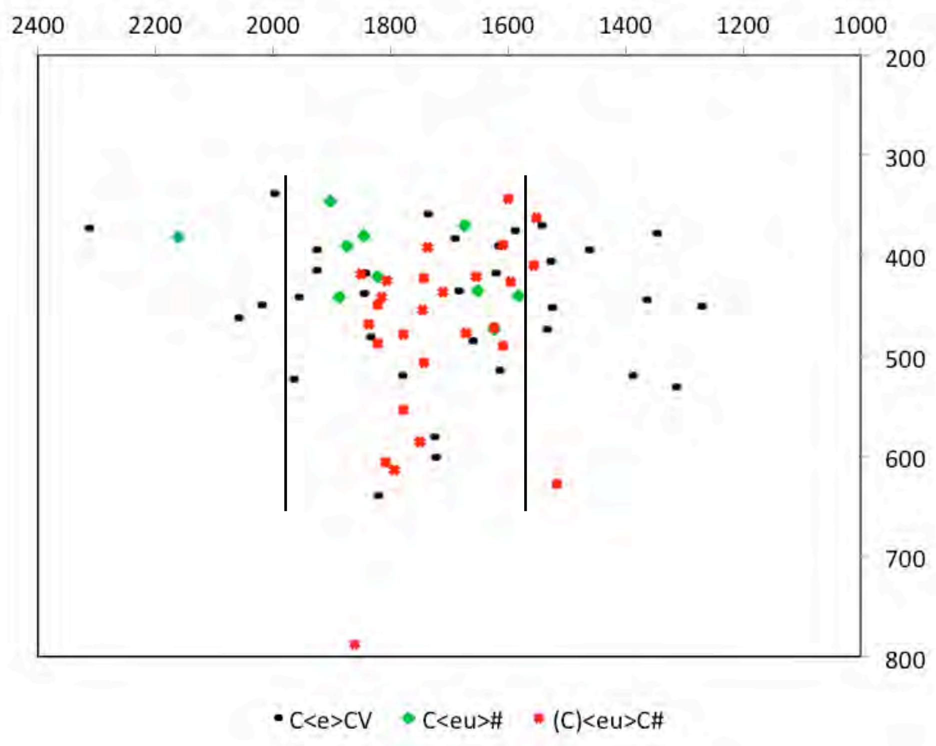

Figure 5.4: F1 and F2 values for graphic <e> and <eu>, from speaker Karoline (mother of Armand)

Karoline displays yet another scattering of schwa and /œ/, see Figure 5.4. The overall distribution in both spectral dimensions is rather similar to Blanche's system. Concerning F1, we once again observe that schwa rarely is produced with the aperture observed for open /œ/, e.g. *joueur* 'player' with an F1=628Hz. In the majority of occurrences, the aperture of schwa lies between 350 and 500Hz, a spectral frequency range shared with the <eu># vowels and the majority of the <eu>C# vowels, e.g. *demain* 'tomorrow' with an F1=438Hz, *Beaulieu* PROPER NAME with an F1=441Hz, and *fœhn* 'hair dryer' with an F1=437Hz. In the F2 dimension, on the other hand, schwa is distinguished from /œ/ by its distribution to the two extremes of the spectrum. First, we observe a co-articulation effect with the preceding consonant, i.e. all five items with initial [ʁ] are located in the posterior area, 1400Hz and lower. Second, Karoline partly patterns with the informants examined by Bürki et al. (2008) in that schwa spreads to a more front area, 1900Hz and higher. In short, schwa does not stand out with regard to height in the system, but does cover a larger part of the front-back range. While the back group can be explained as a co-articulation effect, the front group is more challenging in that there is no clear co-articulation effect to account for it.

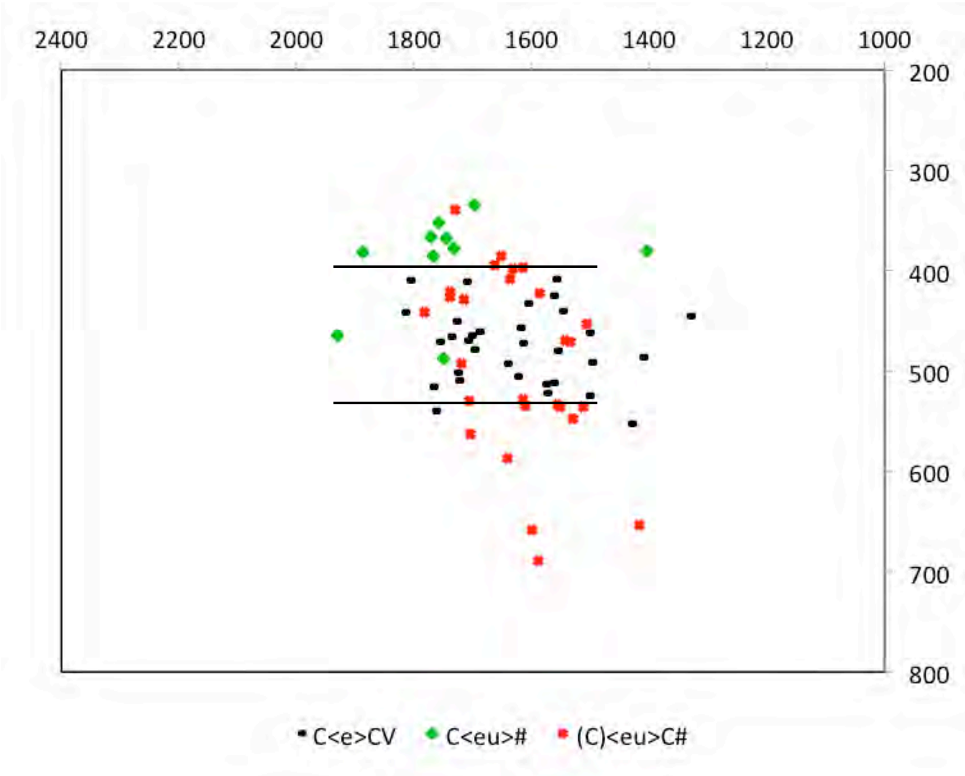

Figure 5.5: F1 and F2 values for graphic <e> and <eu>, from speaker Nina (mother of Janice)

A fourth pattern is revealed in Nina's system, see Figure 5.5. Compared to the three above-mentioned mothers, what is striking about Nina's system is the limited use of the F2 dimension, i.e. she displays a rather extreme clustering of schwa and /œ/ that only spans between 1500 and 1800Hz. Schwa does not stand out within this range, but is confused with both <eu># and <eu>C#. In the F1 dimension, on the other hand, we do observe a tendency to group schwa and /œ/ into separate clusters. Again, schwa is not as open as /œ/ in front of [ʁ], e.g. *pêcheur* 'fisherman' with an F1=654Hz. Note that /œ/ in *meubles* 'furniture' with an F1=689Hz patterns with /œ/ in front of [ʁ]. Likewise, schwa is not confused with the <eu># vowels, the majority of which are located at 400Hz and lower, e.g. *malheureux* 'unhappy' with an F1=334Hz. In the close area, we once again observe a small group of <eu>C# vowels, which, again, are generally lengthened, e.g. *gueuze* 'a Belgian beer' with an F1=339Hz. As claimed by Bürki et al. (2008), schwa seems to hold an intermediate position in the height dimension. Even if several occurrences of the <eu>C# vowels share the F1 value of schwa, e.g. *velours* 'velvet' with an F1=425Hz and *aveugle* 'blind' with an F1=423Hz, the three-way distinction between closed /œ/, mid schwa, and open /œ/ is noteworthy.

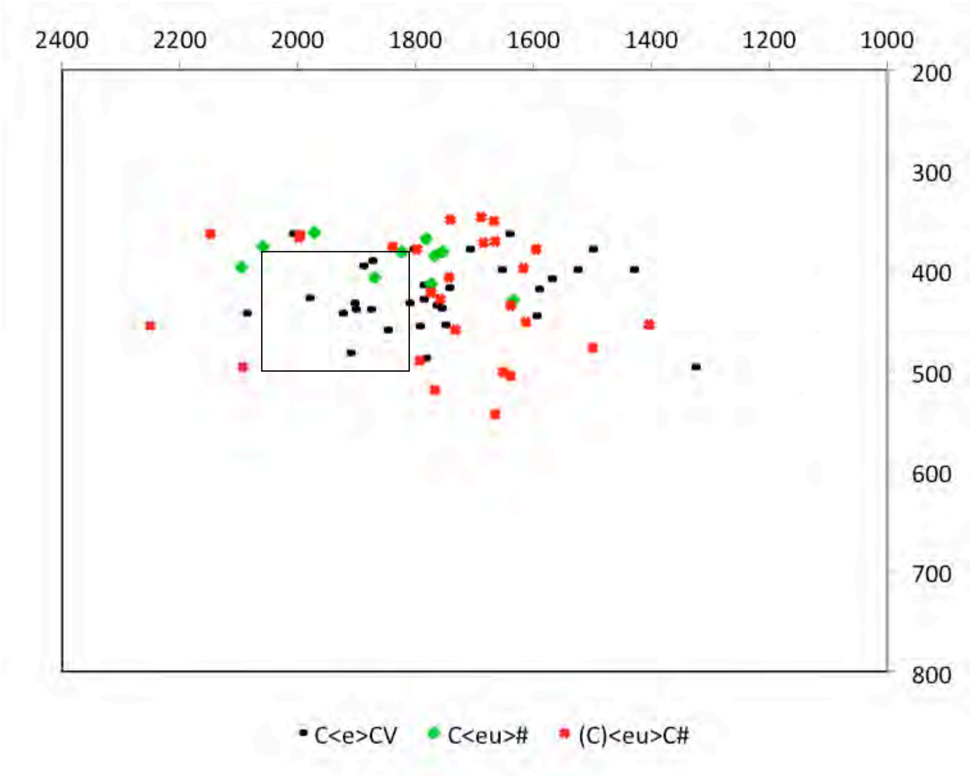

Figure 5.6: F1 and F2 values for graphic <e> and <eu>, from speaker Valentine (mother of Adèle)

Valentine's system, presented in Figure 5.6, is quite restricted, like Nina's system. However, whereas Nina displays a narrow distribution in the front-back dimension, Valentine displays a relatively narrow distribution in the height dimension, ranging from 350 to about 500Hz. *Meubles* 'furniture' is the one clear exception with an F1=544Hz. We can nevertheless distinguish a tendency to group vowels into three zones with respect to height. Like the other mothers, Valentine opens /œ/ in front of [ʁ], e.g. *sœur* 'sister' with an F1=505Hz. This open variant is also found in front of [l] in several instances, e.g. *veule* 'feeble' with an F1=496Hz. At the opposite end of the spectrum, we once again observe <eu>C# vowels, and again, in some cases they are lengthened, e.g. *jeune* 'young' with an F1=368Hz. The majority of <eu># vowels are found in this spectral area as well, e.g. *vieux* 'old$_{\text{MASC}}$' with an F1=362Hz. Schwa is located between 380 and 450Hz, i.e. in an area intermediate to the most open and most close occurrences of /œ/. Concerning the F2 dimension, we observe in the back region several occurrences of schwa in the context of [ʁ], e.g. *rejet* 'rejection' with an F2=1328Hz. In the mid region of F2, schwa is confused with the <eu># and <eu>C# vowels, but at 1800Hz and higher, schwa overlaps with /œ/ to a lesser extent; although, there are some exceptions, e.g. *gueule* 'face (colloq.)' with an F2=2148Hz. Because schwa is restricted to a more intermediate aperture, the mid-anterior area is dominated by occurrences of schwa, as illustrated by the polygon in Figure 5.6.

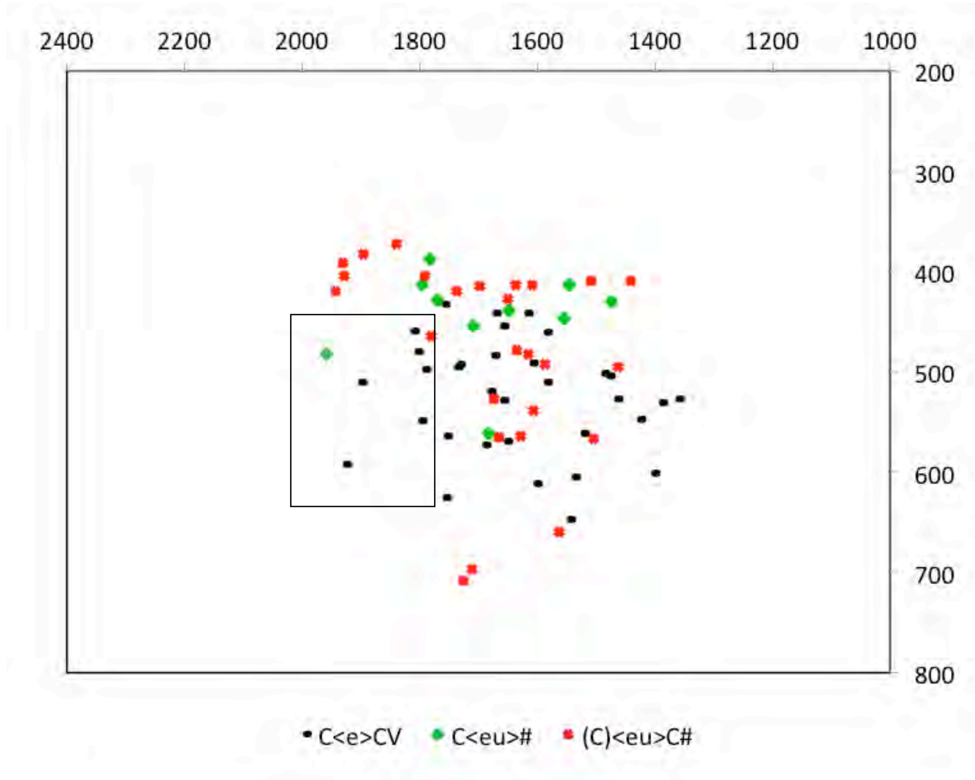

Figure 5.7: F1 and F2 values for graphic <e> and <eu>, from speaker Véréna (mother of Lucas)

Véréna's system, presented in Figure 5.7, displays patterns that share characteristics with several of the other mothers. For instance, in the F1 dimension, we observe high values at the one extreme of the scale for items closed by [ʁ], e.g. *pêcheur* 'fisherman' with an F1=709Hz. Also, at the opposite extreme we find <eu>C# vowels that are generally lengthened, e.g. *gueuze* 'a Belgian beer' with an F1=392Hz. Most occurrences of the <eu># vowels are restricted to the close area, e.g. *neveu* 'nephew' with an F1=388Hz. Concerning schwa, we observe that it is scattered over a large area in the F1 dimension, ranging from *dedans* 'inside' with an F1=433Hz to *renard* 'fox' with an F1=647Hz. While it is neither as open as the most open /œ/ nor as close as the most close /œ/, schwa is, nevertheless, confused with a large group of <eu>C# vowels, e.g. *secondes* 'seconds' with an F1=491Hz and *fœhn* 'hair drier' with an F1=493Hz. In the F2 dimension, Véréna patterns with Karoline to some extent in that three zones can be identified for schwa. In the back region, we find the items with [ʁ], e.g. *revue* 'review' with an F2=1389Hz. In the mid area, schwa is confused with the <eu># and <eu>C# vowels, e.g. *peluche* 'teddy bear' with an F2=1618Hz, *Beaulieu* PROPER NAME with an F2=1647Hz, and *neutre* 'neuter' with an F2=1650Hz. From around 1700Hz and higher, schwa is confused in the F2 dimension with a number of <eu>C# vowels. However, the fact that the latter <eu>C# group in general has a lower F1 than these anterior schwas implies that the two assumed categories do not completely overlap, e.g. *chenit* 'mess' with an F1=511Hz and F2=1901Hz and *Maubeuge* PROPER NAME with an F1=383Hz and F2=1895Hz. The schwas located in this anterior mid area of the vowel space are illustrated by the polygon in Figure 5.7.

The six charts reveal a number of different distributions of schwa in comparison to the non-alternating vowels, but none of the speakers completely isolate schwa in the spectrum, i.e. there is always some overlap in some dimension with the open or the close variant of /œ/. The question remaining is whether the incomplete overlap is sufficient to single out schwa as a unique vowel in the vowel space. Recall that in order to compare our data with Bürki et al.

(2008), we do not take into account the instances of graphic <e> in the word-initial syllable whose phonological correspondent is non-alternating, e.g. *quenelle* ‘meatball’, nor do we include the vowel corresponding to graphic <eu> in non-final syllables, e.g. *peureux* ‘fearful’. Comparing alternating and non-alternating vowels in non-final syllables could determine that the difference between schwa and /œ/ is an effect of the vowel’s position in the prosodic structure, and not an effect of the categorical distinction. For instance, if *vedette* ‘star’ with a non-prominent, non-alternating <e>, *beuglement* ‘bellowing’ with a non-prominent, non-alternating <eu>, and *besoin* ‘need’ with a non-prominent, alternating <e> contain acoustically similar vowels that are distinct from the vowel in *neuve* ‘new$_{\mathrm{FEM}}$’ with a prominent, non-alternating <eu>, then we could interpret the variability and partial phonetic autonomy, observed for schwa throughout this section, as an effect of the lack of acoustic prominence on the vowel, which would, in turn, entail segmental undershoot (Malécot & Chollet 1977).

5.3.1.3 Results part II

In order to rule out the prosodic position as having an effect on the quality of schwa and /œ/, we compare the schwa occurrences analysed in Figures 5.2 through 5.7 with nine occurrences of non-alternating <e> and twenty-one occurrences of non-alternating <eu> in the non-final syllable position, cf. Example (2). To illustrate the distribution of non-prominent, alternating <e>, non-prominent, non-alternating <e> and <eu>, and prominent, non-alternating <eu>, we present Nina’s system in Figure 5.8, below.

(2) Items selected for spectral analysis II with *c.e.f.* values in parentheses

a. #C<e>C *bedaines* (-5.25), *belons* (-5.67), *benêt* (-5.42), *felouque* (-4.14), *guenon* (-5.50), *quenelles* (-5.17), *querelles* (-6.0), *sevré* (*sevrage* -5.92), *vedette* (-4.83). Total 9 items.

b. #(C)<eu>C *beuglant*, *beuglée*, *beuglement*, *cheuvir*, *chneuquer*, *dégueulasse*, *deuxième*, *effleuré*, *feuilleté*, *feunasses*, *fleurie*, *heureuse*, *heurté*, *malheureux*, *Neuchâtel*, *neutralisé*, *peureux*, *pleuré*, *rugby*, *röstis*, *seulement*. Total 21 items.

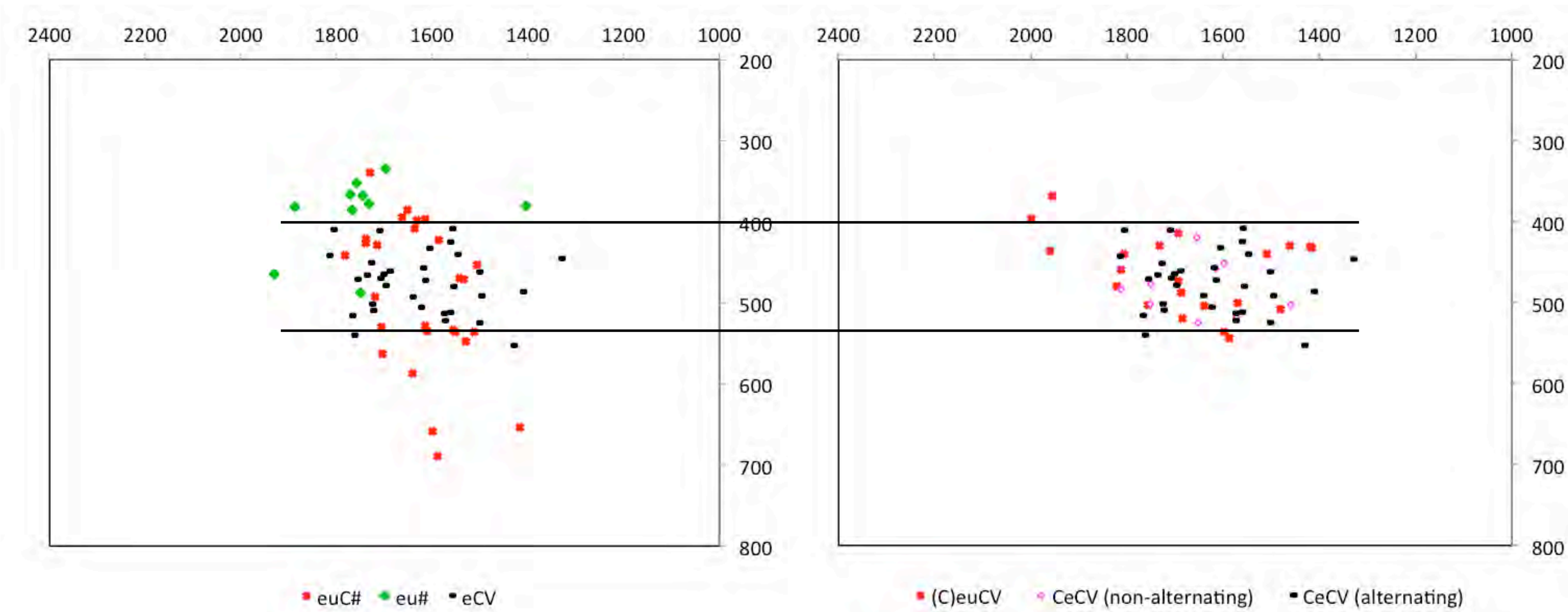

Figure 5.8: Comparison of alternating <e> with non-prominent, non-alternating <e> and <eu>, from speaker Nina (mother of Janice)

The comparison of the distribution of schwa vs. non-alternating, prominent /œ/, illustrated in Figures 5.2 to 5.7, and the distribution of schwa vs. non-alternating, non-prominent /œ/, illustrated in Figure 5.8, in the six mothers reveals a more important overlap in the latter case. First, for most mothers the extreme values observed for prominent /œ/ are not observed for the non-prominent realisations of the stable vowel. As seen in Figure 5.8, in the data from Nina, the boundaries that are previously drawn to indicate the position of schwa in comparison to the open and close prominent variants of /œ/ also encircle a large majority of the non-prominent vowel occurrences. This finding suggests that the extreme lowering and closure of /œ/ are dependent on prosodic properties assigned to the vowel, like intensity, pitch, and duration, which fits nicely with the comment in Féry (2003) that mid vowels in non-prominent positions are often subject to "idiosyncratic variation or neutralisation" (2003:250). Second, at least in the posterior area, the non-alternating vowel seems to be equally subject to co-articulation as schwa is, e.g. low F2 values are observed in Blanche's system for schwa and non-alternating vowels in an [ʁ]-environment, like *revue* 'review' with an F2=1315Hz and *heurté* 'run into$_{\text{PAST PART}}$' with an F2=1307Hz. Possible co-articulation effects on non-alternating <eu> are also found for several informants in the triplet *beuglement* 'bellowing', *beuglant* 'cheep cabaret', and *beuglée* 'bawl'. A phonetic retraction of the vowel may be induced by the following velar [g], e.g. with Véréna for whom we observe an F2=1376, 1448, and 1507Hz, respectively. However, this hypothesis must be advanced with caution because a velar context preceding, not following, a non-alternating vowel, as in *guenon* 'ugly woman', does not cause any particular posteriorisation compared to the other non-alternating <e>, e.g. compare for Véréna, *guenon* with an F2=1693Hz and *benêt* 'silly' with an F2=1700Hz.

5.3.1.4 Remarks on the results

To sum up the examination of the distribution of schwa and /œ/ in the vowel space, remember that the six individual systems display six different distributions of schwa with respect to the open and close variants of stable /œ/, albeit with a high degree of similarity between the systems. Note in particular three observations: one, the individual level of dispersion of schwa and /œ/ in the vowel space, two, the overlap of schwa and stable /œ/ in one, or both, of the formant dimensions, and three, the greater overlap of vowels in a non-prominent prosodic position. This latter finding shows that in the position in which schwa and /œ/ concur, the assumed phonetic merger seems to be a reality. If prosodic position is behind the subtle acoustic differences between schwa and /œ/ discussed in this section, then the claim that acoustic cues are the basis for vowel categorisation is weakened. If prosodic position determines output quality, categorisation of schwa and /œ/ depends on phonological distribution, i.e. alternation vs. non-alternation. The greater overlap of schwa and /œ/ in the non-prominent position strengthens the one-category hypothesis, whereby schwa is a variant of /œ/. The spectral variability observed in the data would not be a reflection of two categories schwa and /œ/, but of the different positions the vowels have in the prosodic structure.

However, there are two factors that may alter our conclusion that schwa is acoustically confused with /œ/. First, we examine raw data from a limited number of speakers who have produced a small and unbalanced number of vowel tokens representing schwa and /œ/; these numbers are too limited to draw any firm conclusions. For this thesis, however, the goal is to establish what the input to the children is, and we confine ourselves to a presentation of these initial and, nevertheless, revealing facts about the mothers' individual systems. Second, it is important to note that the vowels analysed in this section are extracted from read speech. Read speech differs from spontaneous speech in several ways, e.g. speakers tend to avoid regional prosodic characteristics and adopt what Simon (2003) refers to as a “standardised reading prosody”. Also, as observed by Picheny et al. (1986), vowels in carefully monitored read speech are less subject to reduction and modification compared to vowels in spontaneous speech.

The challenge with comparing read to spontaneous speech in French is that no one, to date, has compared the quality of schwa and /œ/ in read, spontaneous inter-adult, and child-directed speech (CDS). For instance, Bernstein Ratner (1984) reports that mothers disperse their vowels when directing their speech to telegraphic children.[238] She examines nine mother-child dyads, where the children are split into three groups, i.e. preverbal children who are more than nine months of age, holophrastic children[239], and telegraphic children with an MLU between 2.0 and 3.5.[240] While the speech directed to the preverbal children is almost identical to inter-adult speech, vowel dispersion increases as the child reaches a higher degree of linguistic competence. Bernstein Ratner compares her findings with those in Bard and Anderson (1983), who examine speech directed to older children, and she concludes that the period of segmental dispersion seems to be brief and rapidly decreases as the child grows older. If segmental dispersion is also a characteristic of read speech, we could form two hypotheses: one, that read speech and CDS are similar with regard to vowel production, and two, that Swiss French caregivers, for a limited period of time, use a more dispersed schwa and /œ/ when communicating with the young child and in doing so provide sufficient phonetic detail to allow the child to store them as two separate categories. Conversely, if schwa and /œ/ are not contrastive in French, there would be no reason for the mothers to amplify the spectral distance between the two vowels. Unfortunately, the mother-child dyads recorded for this thesis do not contain any preverbal or holophrastic children, and therefore, a comparison with the above-mentioned studies is impossible.

5.3.2 Perception test: the identification of schwa and /œ/

5.3.2.1 Introduction

In this section, the overall objective is to further investigate whether schwa is a unique sound in the vowel space, or whether it is confused with non-alternating [œ] or [ø]. Recall that schwa’s acoustic and auditory (non-) uniqueness has implications for a phonological analysis of the vowel. A confusion of schwa with non-alternating [œ] or [ø], i.e. non-uniqueness, provides a phonetic argument for the one-category analysis, while non-confusion, i.e. uniqueness, provides an argument for schwa as an autonomous category that is phonetically similar to, but distinct from, [œ] and [ø]. It is important to note that confusion of these vowels far from precludes the two-category analysis; however, this phonologically covert alternative, where the schwa category phonetically merges with another category, should be considered in case the more transparent analyses are ultimately rejected. Thus, whereas in Section 5.3.1, we analyse and compare the acoustic properties of schwa and non-alternating [œ] and [ø], we now turn to the perceptual salience of these vowels.

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[238] Telegraphic speech refers to the situation early in acquisition whereby children utter two- or three-word utterances in which functional categories might be missing (definition taken from Lust 2006).
[239] Holophrastic speech refers to the situation whereby children utter a single word whose intended meaning may correspond to a full proposition (definition taken from Lust 2006).
[240] MLU, the mean length of utterance, is defined as a ”[m]easure proposed, in studies of children's language, of the average number of grammatical units in what are deemed to be separate ‘utterances’. Taken to be an index of a child's linguistic development.” Definition taken from The Concise Oxford Dictionary of Linguistics (Matthews 2012).

Just as children have to develop a mastery of articulatory properties, they also must acquire a perception apparatus that is finely tuned to the ambient language (cf. Escudero & Boersma 2003). However, despite the attested early sensory capacity to discriminate speech sounds (cf. Vihman 1996, for a discussion and review of the literature), MacKain (1982) suggests that the child must have initiated categorisation in order to process contrastive features in the input. At least two hypotheses have been put forth concerning the acquisition of segmental categories. The Minimal Pair-Based Hypothesis (MacKain 1982) claims that the child starts to perceive two sounds as contrastive only when he has learned that the feature(s) distinguishing the two sounds gives rise to semantically different content. For this hypothesis to hold true the child's receptive lexicon must necessarily contain minimal pairs. However, other research indicates that it is not always the case that the lexicon includes minimal pairs when categorisation is initiated. For instance, Kuhl (1991) shows that the perceptual reorganisation for vowels begins at the age of six months despite the fact that lexicon growth is scarce in the first year of life (cf. Oviatt 1980). Also Caselli et al. (1995) show results that are problematic for the Minimal Pair-Based Hypothesis; they claim that English-learning eight-month-old children have a receptive lexicon of around 36 items, not two of which are likely to a form minimal pair. The Distribution-Based Hypothesis (cf. Maye & Gerken 2000), in contrast to the Minimal Pair-Based Hypothesis, claims that children do not base categorisation on their receptive lexicon, but rather on the distribution of phonetic exemplars in their input.

Whether schwa and /œ/ are categorised on the basis of minimal pairs or exemplar frequency is an intriguing question that merits discussion in a full account of the acquisition of schwa. As mentioned in Section 3.2.2.1, schwa and /œ/ in word-initial syllables do not distinguish between two words whereas schwa and /œ/ do potentially form minimal pairs in monosyllables, e.g. *je* 'I' [ʒ(œ)] or [ʒ(ø)] vs. *jeu* 'game' [ʒø] (cf. the conversational excerpt in the beginning of this chapter).[241] If schwa forms its own category, the Minimal Pair-Based Hypothesis, *ipso facto*, does not hold because the child's receptive lexicon cannot contain minimal pairs that contrast by schwa and /œ/. This leaves the Distribution-Based Hypothesis, according to which the child needs to be exposed to a reliable set of alternating schwa and non-alternating /œ/ so that he can gradually differentiate the two categories. A discussion on the frequency of schwa alternation in child-directed speech is continued in Chapter 6. In addition to the vowel ~ ∅ alternation, it could be the case that the subtle acoustic differences between schwa in word-initial syllables and /œ/ in word-final syllables serve as a second factor that discriminates between the two categories. However, this claim depends on the child's perception apparatus. We know that the perceptual system needs to be fine-tuned, and given the spectral variability presented in Section 5.3.1, it is far from obvious that the child is able to properly categorise schwa and /œ/ based solely on the vowels' formant frequencies. Thus, without further empirical support we cannot claim that the child pays attention to or even perceives these details.

5.3.2.2 Goals and description of the test

As an initial step toward establishing the perceptual salience of schwa, we designed a perceptual evaluation task based on extracts of read speech. Since no study to date, to our knowledge, examines how Swiss French listeners discriminate schwa and /œ/ as produced by Swiss French

[241] The only example of a minimal pair would be *jeunet* 'youngish$_{\text{MASC}}$' vs. *genêt* 'furze' in a variety of French where graphic <e> corresponds to an alternating vowel, and where the word-final vowel is [e] or [ɛ] in both items. As seen in Section 3.3.2, the vowel in *genêt* is highly infrequently subject to alternation in Swiss French, with a *c.e.f.* value of -4.18.

speakers, we confine the investigation at this point to an examination of adult subjects. Our working hypothesis, outlined in the beginning of Section 5.3, is that schwa is perceptually confused with /œ/, which potentially constitutes an argument in support of the one-category analysis. On the other hand, if the subjects successfully discriminate schwa from /œ/, we have an argument in support of the two-category analysis. Before describing the test and the results, we put forth the two hypothetical scenarios outlined in Example (3).

(3) Scenarios

a. Schwa and /œ/ are perceptually confused, implying identity is formed with regard to at least one of the following factors: formant frequency, length, intensity or pitch. Speakers solve the ambiguity problem through extensive use of semantic and syntactic context.

b. Schwa and /œ/ are not confused, implying sufficient dissimilarity either at the segmental or the supra-segmental level. Speakers are capable of distinguishing homophonic phrases without reference to contextual information.

In a production test carried out one year prior to the perceptual evaluation test, the six mothers read a list of 49 phrases, among which there are 16 randomly distributed (near-) minimal pairs. Segmentally, the two members of a pair are only distinguished by the presence of an assumed underlying schwa or /œ/. For the perceptual evaluation, ten minimal pairs were selected (cf. Example (4), where the extracted portion is underlined). In addition to the pair *des genêts* ‘furze;indef;pl’ and *des jeunets* ‘youngish;pl’ from the PFC protocol (Durand et al. 2002, 2009a) and the pair *à demain* ‘see you tomorrow’ and *à deux mains* ‘with two hands’, we use eight pairs originally tested by Dauses (1973:6-11). Note that the latter pairs include two items whose [œ], orthographically <e>, does not fall under the definition of schwa as an underlying vowel that alternates with zero, i.e. *brevet* ‘diploma’ with a non-alternating [œ], and *ample* ‘heavy’ with an optionally epenthesised word-final schwa. Despite the fact that their behaviour differs from schwa, we classify these items in the schwa category in the current chapter for the sake of consistency with the work by Dauses (1973). As shown in Example (4), in the production test the target structures are generally embedded in a larger unit in order to minimise the amount of attention drawn to the repeated presence of a mid front round vowel (cf. Appendix II-3 for the entire list of phrases). In the perceptual evaluation test, however, maximally three syllables are extracted from each phrase in order to reduce possible contextual influence on categorisation.

(4) Test material with the extracted portion underlined

a.	*ce que vous dites*	schwa	mono$_{\mathrm{PRON}}$	that what you say…
	ceux que vous dites	/œ/	mono$_{\mathrm{PRON}}$	those that you say…
b.	*comme je dis*	schwa	mono$_{\mathrm{PRON}}$	like I say
	comme jeudi	/œ/	initial$_{\mathrm{LEX}}$	like Thursday
c.	*ils sont à brevet*	schwa	initial$_{\mathrm{LEX}}$	they study for the ”brevet”
	ils sont abreuvés	/œ/	medial$_{\mathrm{LEX}}$	they are given water
d.	*ample rang*	schwa	final$_{\mathrm{LEX}}$	broad rank
	en pleurant	/œ/	initial$_{\mathrm{LEX}}$	cry$_{\mathrm{GER}}$
e.	*il reste debout*	schwa	initial$_{\mathrm{LEX}}$	he remains upright
	il reste deux bouts	/œ/	mono$_{\mathrm{DET\text{-}NUM}}$	there remains two pieces
f.	*à demain*	schwa	initial$_{\mathrm{LEX}}$	see you tomorrow
	à deux mains	/œ/	mono$_{\mathrm{DET\text{-}NUM}}$	with two hands
g.	*des genêts*	schwa	initial$_{\mathrm{LEX}}$	furze
	des jeunets	/œ/	initial$_{\mathrm{LEX}}$	youngish$_{\mathrm{PL\text{-}MASC}}$
h.	*le ré*	schwa	mono$_{\mathrm{DET}}$	the note D
	leurré	/œ/	initial$_{\mathrm{LEX}}$	deceived
i.	*apporte le rôt*	schwa	mono$_{\mathrm{DET}}$	bring$_{\mathrm{PRE\text{-}3SG}}$ the roast

	apporte leur eau	/œ/	mono$_{\text{DET}}$	bring$_{\text{PRE-3SG}}$ their water
h.	*le Genevois*	schwa	initial$_{\text{LEX}}$	the Genevan
	la jeune voix	/œ/	mono$_{\text{LEX}}$	the young voice

In Example (4), schwa and /œ/ hold the same position in their respective strings, but their syntactic and prosodic positions are not always identical. For instance, in Example (4-b) and (4-h), schwa occurs in a functional monosyllable, while /œ/ is in the initial syllable of a polysyllable and is a target for optional non-final prominence (cf. Section 2.5.2.2). In (4-e) the opposite pattern occurs, schwa is a target for non-final prominence, not /œ/. In (4-a) and (4-i), both schwa and /œ/ occur in a monosyllable, and in (4-g), they both occur in the initial syllable of a polysyllable. When two vowels occur in different prosodic positions they are susceptible of being subject to different prosodic constraints. From this perspective, we put forth the hypothesis that despite the lack of salient articulatory distance, the prosodic features are sufficient cues in a lexical judgement task to distinguish the vowels. Note that in French the two most important prosodic cues for word segmentation are vowel lengthening and pitch modulation in the word-final prominent syllable (Astésano 2001). Further, as already mentioned in Section 2.5.2.2, Swiss French has optional pitch modulation on penultimate syllables, which affects the word-initial syllable only in disyllables, e.g. *jeudi* 'Thursday' in Figure 5.9.[242] Since pitch modulation is potentially salient in a perception test with Swiss French speakers and listeners, we confine the focus of this study to the importance of pitch in perception, and leave the importance of other prosodic cues for future research.

(5) Hypothesis
Deprived of context, and faced with two segmentally identical strings, the subject makes use of the pitch contour in word segmentation.

The hypothesis in Example (5) predicts that pitch manipulation of pairs with different prosodic structures, e.g. *je dis* 'I say' vs. *jeudi* 'Thursday' (cf. Figure 5.9), has an effect on the perceptual evaluation. The hypothesis further predicts that pitch manipulation of pairs with identical prosodic structures, e.g. *le rôt* 'the roast' vs. *leur eau* 'their water', does not have an effect on the perceptual evaluation.

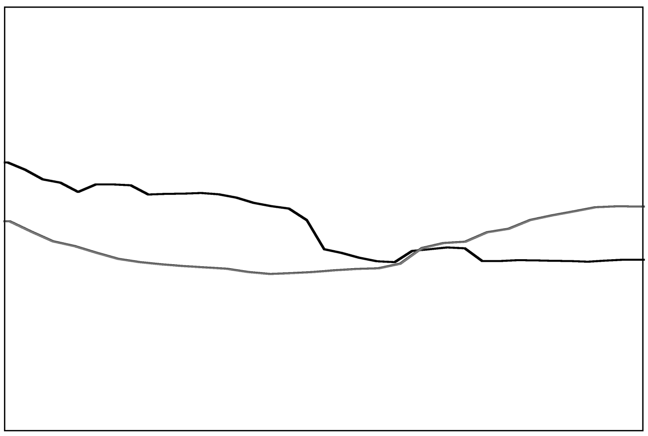

Figure 5.9: Pitch contour in *jeudi* (black line) and *je dis* (grey line), from speaker Blanche

[242] Swiss French prosody merits deeper attention, but a detailed description and analysis of the prosodic system is beyond the scope of this thesis. We refer to Section 2.5.2.2 for references on the topic.

Pitch manipulation is carried out in Praat (Boersma & Weenink 1992-2013) using the following procedure. First, select the two files representing the pronunciation of a minimal pair, e.g. *je dis* and *jeudi*. Second, select the function *To Manipulation* and separately extract the two pitch contours with the function *Extract pitch tier*. Third, save both pitch contours and manipulation windows to disc. Fourth, select the files *Pitch tier_jedis* and *Manipulation_jeudi* and use the function *Replace pitch*. The pitch of *je dis*, shown by the big-dotted green line in Figure 5.10, has now replaced the original pitch of *jeudi*, shown by the small-dotted grey line in Figure 5.10. For the pitch and the sound to align correctly, the duration of the vowels must be near-identical. Vowel length discrepancies could have been reduced through vowel manipulation in Praat, but since the aim of this study is to check the quality of acoustically real occurrences of schwa and /œ/, no vowel adjustments are performed. Inconveniently long silent intervals, on the other hand, which are sporadically found in phrases like *deux mains*, are removed in Audacity (Mazzoni 2004) prior to the above described manipulation operation. When pitch alignment is imprecise the resulting utterance sometimes contains creaky voice and no audible pitch. In order to reduce creakiness, the pitch value is increased by adjusting the relevant pitch points.

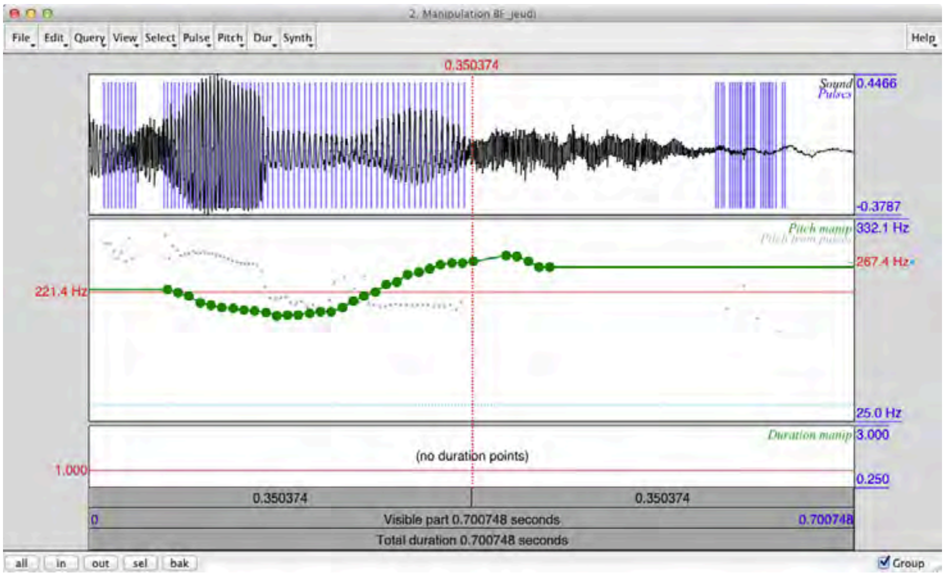

Figure 5.10: Pitch replacement in *jeudi*

Ignoring possible spectral differences between schwa and /œ/, there are two pairs in particular that are likely to be distinguished on the basis of their segmental make-up. The first example is *des genêts* 'furze;pl' [ʒ(œ)nɛ] and *des jeunets* 'youngish;pl' [ʒœne], where the word-final vowels are identical as [ɛ] or [e] in the two items for only three out of our six informants. A second example is *Genevois* 'Genevan' [ʒ(œ)n(œ)vwa] and *jeune voix* 'young voice' [ʒœn(œ)vwa], where phrase-medial schwa is more frequent in the first member, with five of six possible medial schwas present, than it is in the second, with zero of six possible schwas present.[243] Thus, in order to evaluate the perception of schwa and /œ/ when they are stripped of any secondary segmental influence, we delete the last one or two syllables from the non-manipulated files, i.e. *des ge(nêts)* [deʒ(œ)] vs. *des jeu(nets)* [deʒœ] and *Gen(evois)* [ʒ(œ)n] vs.

[243] As illustrated by *jeune voix*, word-final schwa insertion is not common in Swiss French. This is also the case when the word ends in a cluster. Recall that in read speech, however, the presence of schwa in a CC<e>#C environment is, nevertheless, more frequent, e.g. *ample rang* [ɑ̃pl(œ)ʁɑ̃] with five of six final schwas present.

jeun(e voix) [ʒœn]. In the manipulated files, we maintain the complete version as a means to examine the importance of segmental context when the pitch had been altered.[244]

The perception task comprises 302 sound files, which are divided into two blocks. Participants are familiarised with the task procedure through exposure to one single production of five word pairs from the Nyon corpus in the PFC database, two pairs without phonetic resemblance, e.g. *nuage* 'cloud' [nyɑːʒ] vs. *nuée* 'swarm' [nye], and three phonetically minimal pairs, e.g. *brun* 'brown$_{\text{MASC}}$' [bʁœ̃] vs. *brin* 'germ' [bʁɛ̃]. This initial task is intended to exercise their discrimination of similar segment strings, The experiment itself contains a random order of the 20 items given in Example (4), both in their true (T) and manipulated (M) forms. Six tokens per phrase, the experiment comprises a total of 240 items. In addition, 52 fillers are introduced and distributed at regular intervals.[245] The participant, wearing AKG® K26P stereo headphones, is asked to sit in front of a computer. In each trial, a sound file representing the pronunciation of one of the two members of a pair, e.g. *leurré* or *le ré*, is played automatically.[246] Thereafter, two orthographically transcribed phrases, e.g. *leurré* and *le ré*, are displayed on the screen in random order, and the participant is asked to click a button to select the orthographic phrase that corresponds to the one he thinks he has heard. He does not receive any confirmation on the result.[247] The test runs without pauses.[248] Sixteen monolingual non-linguists living within the vicinity of Nyon participate in the task. We have selected and divided the participants into groups on the basis of two criteria, i.e. former exposure to the phrases and first language. Group 1 is composed of the six mothers, who have previously read the 20 phrases. Group 2 is composed of eight local subjects, four men, four women, who are not familiar with the project. Group 3 is composed of two Norwegian women who have resided in the region for ten and twenty years, respectively.[249] With respect to Group 1, prior to the test, we did not inform them that their own productions are among the stimuli to be evaluated. When confronted with this fact afterwards, only a few of them had recognised their own voice during the test.

5.3.2.3 Results

Before we present the results, we give four factors that could hypothetically influence the evaluation process, in Example (6).

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[244] Recall that we do not expect *a priori* that pitch manipulation has an influence on the discrimination of *genêts* and *jeunets* because the prosodic structure is identical across the two items.

[245] The fillers consist of the six mothers' productions of *nu* [nu] 'nude$_{\text{MASC}}$' vs. *nue* [nuː] 'nude$_{\text{FEM}}$' from the reading task and four minimal pairs produced by five speakers from the Nyon PFC corpus, *botté* 'wearing boots' [bɔte] vs. *beauté* 'beauty' [boːte], *épais* 'thick$_{\text{MASC}}$' [epɛ] vs. *épée* 'sword' [epeː(j)], *patte* 'paw' [pat] vs. *pâte* 'dough' [pɑt], and *rat* 'rat' [ʁa] vs. *ras* 'close-cropped$_{\text{MASC}}$' [ʁɑ].

[246] We are grateful to Jan-Are K. Johnsen for designing the test in Inquisit (2007).

[247] The data could have been improved by the repetition of trials elsewhere in the test. However, as the aim is to test schwa and /œ/ in various prosodic environments, we decided to focus on a large number of different items instead of on a repeated exposure to a smaller number of recurrent items. A doubling of the ten pairs would probably have entailed concentration issues, given that the experiment in its present shape is already rather time-consuming.

[248] We underline that the substantial length of this task runs the risk of influencing the global results. The random distribution of the items, however, does reduce extra-linguistic effects on given trials.

[249] The third group is included to check whether acoustic or prosodic cues are more salient to native speakers than to near-native speakers. As their results do not radically differ from the others, they will not be further commented upon.

(6) Factors hypothetically influencing the evaluation process

a. The prosodic position of schwa and /œ/ is not identical across the stimuli. The importance of the prosodic cues is reflected in the higher error rate when schwa and /œ/ are in the same prosodic environment.

b. Group 1 has been exposed to the data one year prior and display lower reaction times (RT) and lower error rates.

c. The M-file is pronounced with the pitch of its complementary T-file. Pitch is an important cue for proper categorisation, and participants display higher error rates for M-files.

d. The M-file has an artificial sound and pitch alignment, which delays recognition of the phrase in comparison to its complementary T-file.

Figure 5.11 presents the correct answers as a percentage for the T-files, and is sorted by pair of items.

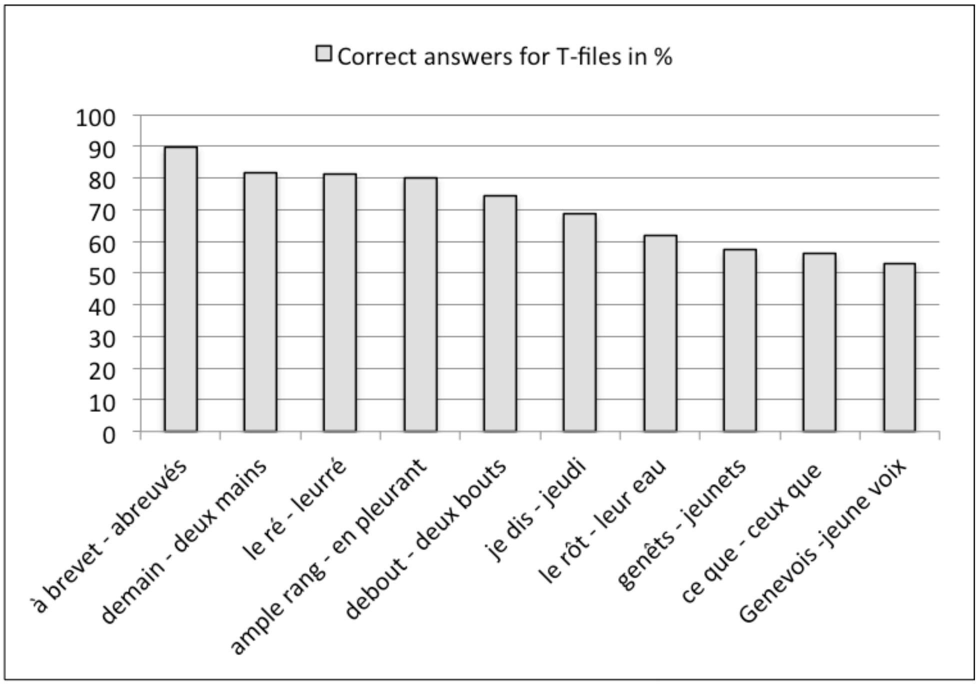

Figure 5.11: Correct answers for T-files, by percentage

In Example (6-a) we put forth the hypothesis that the level of ambiguity and, consequently, the error rate vary across the pairs as a result of the different prosodic position of schwa and /œ/. The overall results of the T-file data show a correct response rate of 71.02%.[250] However, some pairs seem more likely to be confused than others, e.g. in Figure 5.11, *le ré/leurré* is correctly identified in 81.25% of the cases, while *le rôt/leur eau* is only correctly identified in 61.97% of the cases.[251] The lowest identification rate is observed for the pair *ce que/ceux que* and the

[250] It is possible that the overall error rate (29%) is an indirect consequence of the very presence of signal manipulation in the test, M-files, and that the absence of these more confusing items, i.e. with sound and pitch mismatch, would reduce the error rate. The inclusion of a control group that listens solely to T-files would have helped to determine the rate of confusion imposed by the M-files. Since we did not include any control group, the error rate must be treated with caution.

[251] Recall that this test is designed with the aim of providing an indication of the (non-) uniqueness of schwa in Swiss French and of informing the discussion of the child language data. Thus, for testing the hypotheses in

reduced form pair *Gen(evois)/jeun(e voix)*, which indicates that the absence of differentiating prosodic cues renders categorisation more difficult.

Before establishing that prosody is the crucial factor in discriminating these vowels, we must address one factor hitherto excluded from consideration, i.e. the third formant, F3. Recall that the examination in Section 5.3.1 shows a substantial overlap between schwa and /œ/ in the F1 and F2 dimensions. According to Tubach (1989) and Fougeron et al. (2007), among others, F3 is important for the identification of the feature [round] in front vowels in French. While the lowering of F2 can indicate either posteriorisation *or* increased labialisation, F3 can only indicate rate of labialisation, and in this regard is less ambiguous. The salience of labialisation in *perception* could be confirmed at least in part if there is a correlation between the F3 values and the rates of correct identification. Figure 5.12 presents the mean F3 values for the /œ/-category and the schwa-category, per pair of items.

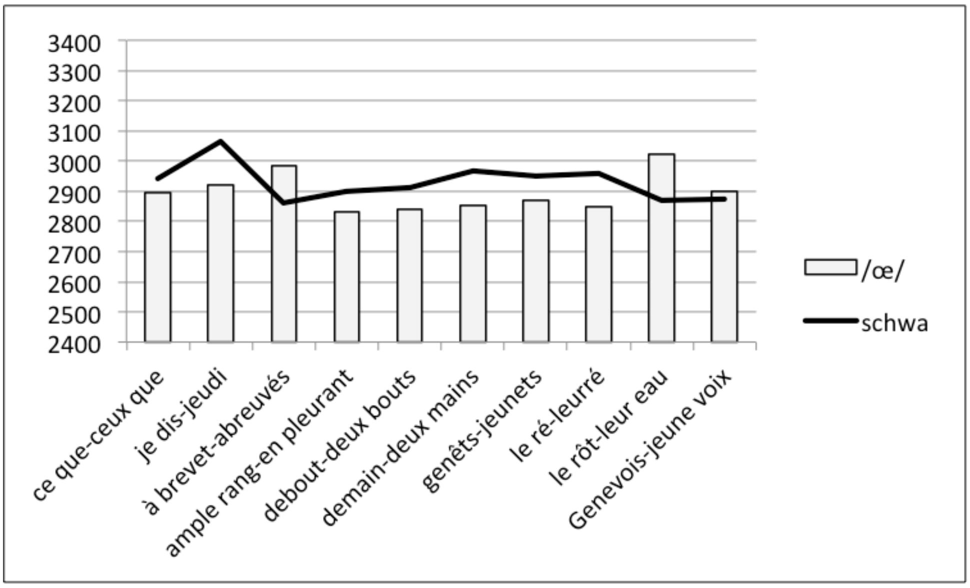

Figure 5.12: Mean of F3 for each item across six speakers

The mean values of schwa and /œ/ per item indicate that schwa generally has a higher F3 value, i.e. it is less labialised. This is true for all pairs except for *à brevet* and *abreuvés*, and *le rôt* and *leur eau*. Regarding the first exception, *à brevet* and *abreuvés*, recall that *brevet* contains an orthographic <e> that is classified in the schwa category even though it does not alternate. Given that their phonotactic contexts are similar, i.e. they both occur with a preceding ObsLiq-cluster, the sole factor that differentiates the two vowels is the prosodic position. The vowel in *brevet* is in a position that is subject to optional prominence and it is thereby more likely to reach its articulatory target. Regarding the second exception, *le rôt* and *leur eau,* both schwa and stable [œ] precede [ʁ]. As shown in Section 5.3.1, [ʁ] increases à vowel's F1 value and lowers a vowel's F2 value (cf. Tubach 1989). Concerning the effect of [ʁ] on F3, a re-examination of the production data presented in Section 5.3.1 reveals a variable difference in F3 between <eur># and <eu>C#, where C represents any consonant other than [ʁ], see Table 5.1.

Examples (6-a) and (6-c), we confine ourselves to search for tendencies and not for significant differences. However, the testing of reaction time in the hypotheses in Examples (6-b) and (6-d) is statistically accounted for.

Speaker	Mean F3, <eur>#	Mean F3, <eu>C#	Difference
Alice	2922	2909	13
Blanche	2909	2799	110
Karoline	3079	2882	197
Nina	2754	2704	50
Valentine	2938	2822	116
Véréna	2970	2832	138

Table 5.1: Mean F3 values for <eur># and <eu>C# and distance between the two categories, read speech from six mothers, calculated via the formula *Mean F3 <eur># − Mean F3 <eu>#*, per speaker, in Hz

Whereas the effect of [ʁ] in Alice and Nina's system is minimal, the other informants show an overall lower degree of labialisation when /œ/ precedes a word-final [ʁ]. If we return to the pair *le rôt* and *leur eau* in Figure 5.12, the labialisation disparity between the two vowels indicates that the vowel <eu> in *leur* is subject to delabialisation before *enchaînement*.[252] At the post-lexical level, [ʁ] in *leur* is resyllabified as the onset of *eau*, which consequently puts [ʁ] in the same syllabic position as [ʁ] in *rôt*. As shown in Figure 5.12, delabialisation does not happen to the same extent in the pair *leurré* and *le ré*. The blocking of delabialisation in this latter case fits nicely with the above-mentioned analysis where delabialisation happens prior to *enchaînement* because neither of these items has [ʁ] in coda position.[253]

The low rate of correct identification for *ce que* and *ceux que* and *Gen(evois)* and *jeun(e voix)* presented in Figure 5.11 is coincident with a small difference in F3 between the two members of the respective pairs; the difference in F3, between *ce que* and *ceux que*, calculated across speakers, is 47Hz, and the difference between *Gen(evois)* and *jeun(e) voix* is 24Hz. This observation fits nicely with an analysis that labialisation is an important cue for the discrimination of schwa and /œ/. Nevertheless, the differences in F3 within pairs do not seem to fully account for the rate of correct identification. Whereas the high rate of correct identification for *à brevet* and *abreuvés*, i.e. 90%, *demain* and *deux mains*, i.e. 82%, and *le ré* and *leurré*, i.e. 81%, is coincident with differences in F3 of more than 100Hz, the difference in F3 between *je dis* and *jeudi* is 141Hz, for which pair the rate of correct identification is only 69%.[254] Therefore, we suggest that factors other than spectral values are at work in vowel perception.

Our second hypothesis claims that Group 1, the mothers, would display lower reaction times (RT) and lower error rates because of their prior exposure to the stimuli. Independent samples T-tests reveal no significant difference in RT and error rate between Group 1, with a RT of 2133,79ms and an error rate of 35.13%, and Group 2, the other native francophone Swiss, with a

[252] *Enchaînement* in French is defined as "the linkage of a word-final consonant with the initial vowel of a following word" (Walker 2001:30), e.g. in *pour eux* 'for them', word-final [ʁ] in *pour* [puʁ] is resyllabified into the onset of *eux* [ø], i.e. [pu-ʁø].

[253] The individual F3 patterns, not presented here, reveal a high degree of inter-speaker variability. However, an in-depth examination of the various informants shows that, in the majority of cases, /œ/ is more labialised than schwa; the pair *le rôt* and *leur eau* is the one noted exception, and is mentioned above.

[254] For the sake of completion, we provide all mean values of F3, across speakers: *ce que* 2940Hz and *ceux que* 2893 Hz, with a difference in F3 of 47Hz, *je dis* 3064 Hz and *jeudi* 2922Hz, with a difference in F3 of 141Hz, *à brevet* 2859Hz and *abreuvés* 2985Hz, with a difference in F3 of 126Hz, *ample rang* 2900Hz and *en pleurant* 2832Hz, with a difference in F3 of 68Hz, *debout* 2910Hz and *deux bouts* 2839Hz, with a difference in F3 of 71Hz, *demain* 2968Hz and *deux mains* 2854Hz, with a difference in F3 of 114Hz, *genêts* 2949Hz and *jeunets* 2871Hz, with a difference in F3 of 78Hz, *le ré* 2959Hz and *leurré* 2849Hz, with a difference in F3 of 110Hz, *le rôt* 2870Hz and *leur eau* 3022Hz, with a difference in F3 of 52Hz, and *Genevois* 2874Hz and *jeune voix* 2898Hz, with a difference in F3 of 24Hz.

RT of 2236,79ms and an error rate of 34.42%;[255] the results of the T-tests are RT: $t(12) = -.58$, $p = .57$; and error rate: $t(12) = .34$, $p = .74$. Thus, having prior exposure to the phrases does not increase the mothers' performance. It is possible, however, that an inter-group difference would have emerged if the production task had taken place nearer to the time of the perceptual evaluation task.

Our third hypothesis claims that pitch is an important cue in the discrimination of schwa and /œ/ and that consequently the error rate would be lower for T-files than for M-files. This hypothesis seems to concur with our overall results, i.e. T-files are identified correctly 71.02% of the time and M-files 58.59% of the time. For the T-files, most subjects make mistakes for each pair; although, four subjects correctly identify *à brevet* and *abreuvés* and three (other) subjects correctly identify *demain* and *deux mains*.[256] For the M-files, the majority of the subjects display errors for each pair; although, three subjects correctly identify *à brevet* and *abreuvés*, one of whom also correctly identifies the T-versions of this pair (cf. above). Without further manipulation of other prosodic cues, we cannot confirm that pitch is the crucial factor that accounts for a difference in error rate between T-files and M-files, nor can we exclude the possibility that the speaker when confronted with an ambiguous phrase, an M-file, more likely reverts to randomly selecting his answer, and hence, more errors. However, if we go into the details of Figure 5.13, we observe that those pairs in which the disparity between rates of correct identification for T-files vs. M-files is the greatest, are the pairs whose members contain different prosodic structures.

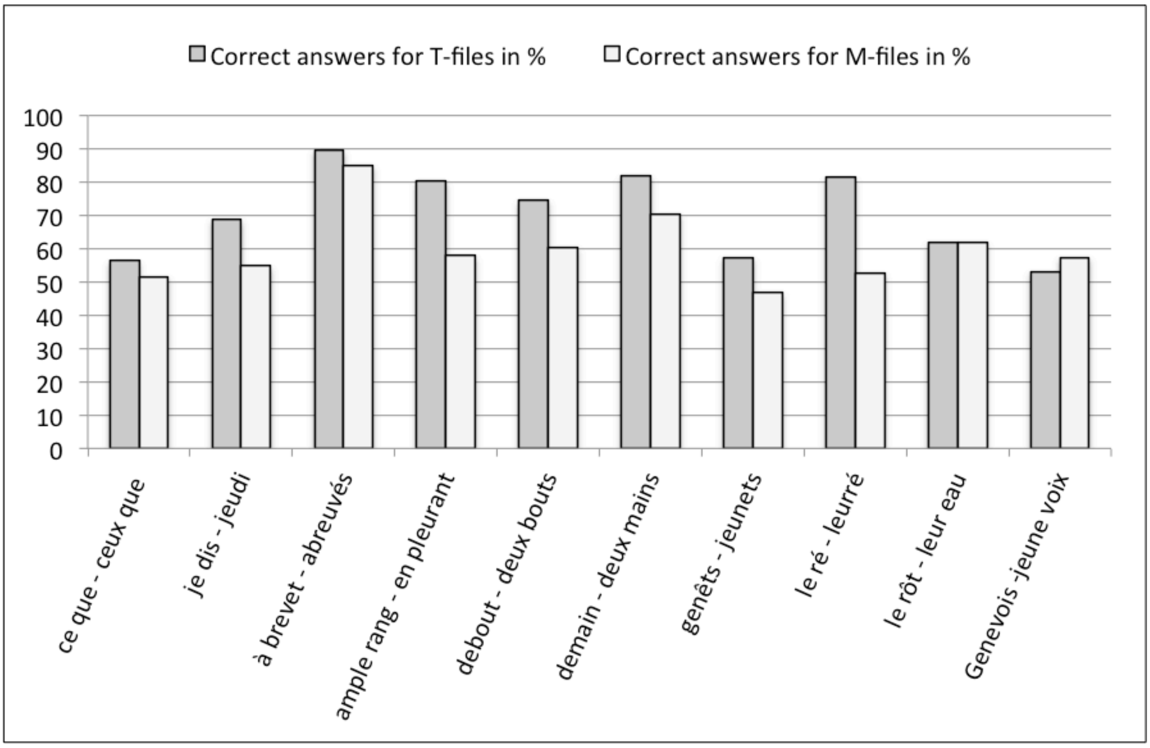

Figure 5.13: Correct answers for T-files and M-files, by percentage

[255] We are grateful to Jan-Are K. Johnsen, who has performed the statistical analysis.
[256] Note that in Dauses (1973), the number of subjects displaying errors varied considerably across items, e.g. while 37.5% of the subjects gave wrong answers to the pair *debout* and *deux bouts*, a total of 87.5% misidentified the pair *je dis* and *jeudi*.

For instance, one of the greatest disparities is found for the pair *ample rang* and *en pleurant*, where the disparity between of rate of correct interpretation of T-files and of M-files is 22.39%. Whereas /œ/ in *pleurant* is subject to optional prominence, with an F0 rise, schwa in *ample* can never be prominent. Thus, the problem of correctly identifying the manipulated items, i.e. with optional F0 rise on <e> in *ample* and absence of prominence on <eu> in *pleurant*, seems to indicate that pitch constitutes an important cue for perception. Another example is *le ré* and *leurré*, where the disparity between rate of correct interpretation of T-files and of M-files is 28.65%. Again, the prosodic position of the two vowels is different. The orthographic <e> is in a monosyllabic function word, whereas <eu> is in the initial syllable of a lexical polysyllable, and therefore, only <eu> is subject to an optional F0 rise. At the other end of the error scale, we find among others the pairs *ce que* and *ceux que* and *le rôt* and *leur eau*, with a disparity in rate of correct identification of 4.69% and 0%, respectively. As explained in the presentation of the test material (cf. Example (4)), schwa and /œ/ in these pairs hold the same position in the prosodic structure and neither of them are subject to optional pitch modulation. Pitch reversal consequently has no effect on the lexical judgement task.

We hypothesise in the scenario in Example (3a) that schwa and /œ/ are confused, and that formant frequency and pitch are two of the potential factors that cause the confusion. If it is true that pitch contributes to the confusion of schwa and /œ/, our results show that it cannot be the sole factor guiding participants in the perceptual evaluation process. As shown in Figure 5.13, the M-files are always correctly identified in more than 50% of the occurrences, except for the M-file pair *genêts* and *jeunets* that has a rate of correct identification of 46.87%; this observation indicates that other cues, e.g. vowel length or subtle acoustic differences, are, to a large extent, salient enough for correct identification to be carried out, despite pitch manipulation.

Our final hypothesis claims that the artificial sound and pitch alignment in the M-files would delay the reaction time (RT) in comparison to the authentic T-files. Given that the M-files consist of the segmental content of one element and the pitch contour of the other minimally contrastive element, the manipulated signal is ambiguous. The overall difference in RT between true items and manipulated items turned out not to be significant.[257] True items have an average reaction time of 2280.57ms; manipulated items have an average reaction time of 2290.07ms. This finding can be interpreted as yet another argument against pitch as a decisive factor in the perception of schwa and /œ/. A within-subjects repeated measures ANOVA was performed in order to investigate the effects of the response given to either true or manipulated items (correct vs. wrong response) on RT. RT was entered into the analysis as an independent variable, while the four possible response categories was entered as dependent variables (T1: true–correct, T2: true–wrong, M1: manipulated–correct, M2: manipulated–wrong). The analysis showed a significant effect of response categories on RT, $F(3, 45) = 17.67$, $p < 0.000001$ (cf. Figure 5.14). Because we hypothesised that responding (correctly) to true items (T1 in Figure 5.14) would be faster than judging manipulated items (M1 and M2), contrast analyses (planned comparisons) were performed to check for significant differences in RT between the reference category (T1) and other categories (T2, M1, M2). The contrast analyses showed significant differences between T1 and T2, $F(1, 15) = 36.82$, $p < 0.0001$, and T1 and M2, $F(1,15) = 42.59$, $p < 0.0001$, indicating that correct responses to true items take less time than wrong responses (to both true and manipulated items).

[257] We are grateful to Jan-Are K. Johnsen, who has performed the statistical analysis.

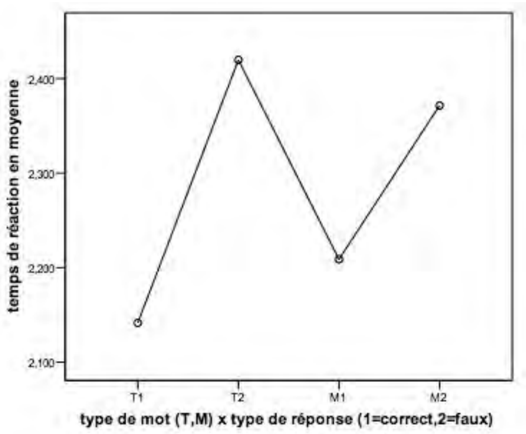

Figure 5.14: Mean reaction time for T1, T2, M1, M2, illustration taken from Andreassen (2007:80)

Interestingly, the difference in RT between true correct answers and manipulated correct responses is not significantly different, $F(1,15) = 2.93$, $p = 0.11$. This result indicates that pitch manipulation does not delay word recognition. In fact, whatever the prosodic conditions are within a pair or the intonational conditions (T vs. M), the subject seems to be able to access the stored items with identical ease. The intriguing result is the correlation of wrong response–delayed RT; it is possible that the relative frequency of the test phrases plays a role in this result. Lexical retrieval is beyond the scope of this thesis, but when we examine the error rate per phrase, we observe that the error rate is generally higher for the member of the pair that is composed of two words than for the member composed of one single word, e.g. *deux bouts* has 86 errors compared with *debout* which has 29 errors. Conversely, when both members are composed of the same number of words, the difference in error rate is greatly reduced, e.g. *le rôt* has 75 errors compared with *leur eau* which has 63 errors. When the subject hesitates, i.e. shows a longer RT, one could expect that he selects the correct alternative just as frequently as he selects the wrong alternative. However, the error rates presented above indicate that this is not the case.[258] Frauenfelder and Peeters (1990) carry out a simulation in the interactive-activation model TRACE (McClelland & Elman 1986), and show in word recognition tasks that a carrier word, e.g. *succeed*, is preferred to the two embedded words, e.g. *suck* and *seed*. On the basis of this finding, we put forth the possibility that the participants in this test, when hesitating, more frequently prefer the carrier word to the multi-word phrase because the former is more easily activated in the lexicon.

5.3.2.4 Remarks on the results

To sum up the discussion of the perception test data, we underline that the rate of correct identification of schwa vs. stable /œ/ is relatively high across speakers. For each item, with the exception of *jeunets*, the correct identification rate surpasses 50%. However, the rate of correct identification is shown to vary according to the different prosodic composition of the various

[258] For the sake of completion, we provide the remaining error rates: *ce que* 38 vs. *ceux que* 138, *je dis* 93 vs. *jeudi* 54, *à brevet* 39 vs. *abreuvés* 9, *ample rang* 68 vs. *en pleurant* 57, *à demain* 26 vs. *à deux mains* 85, *des genêts* 88 vs. *des jeunets* 90, *le ré* 57 vs. *leurré* 70, and *Genevois* 72 vs. *jeune voix* 100. The high disparity in error rate between *ce que* and *ceux que* is possibly due to frequency of use, e.g. a search on www.google.com (July 6th 2009) yields 282,000,000 hits for the former member and 54,700,000 hits for the latter. However, the frequency explanation remains mere speculation until other potential factors are ruled out.

test items; more errors are observed when schwa and /œ/ hold the same prosodic position in the string. Recall that the perceptual evaluation test is implemented as a means to further investigate the (non-) uniqueness of the acoustic properties of schwa. Even if we interpret schwa as being slightly different from stable /œ/, we cannot directly infer that these acoustic differences are sufficiently salient cues for categorisation. If we take into account that the child only gradually tunes in his perceptual apparatus on the basis of contrastive or frequent features in the input, we must question whether these acoustically fine differences, which are non-contrastive in French, are processed early in acquisition. The results presented in this section reveal that speakers do separate schwa and /œ/ when they have been stripped for semantic context, but, as already mentioned, the error rates vary to a large extent depending on the prosodic position of the vowel. This finding, thus, indicates that categorisation is facilitated by prosody.

5.4. Concluding remarks

In this chapter, the goal has been to determine whether or not schwa is confused with /œ/, and thereby provide additional evidence for or against the one-category hypothesis. The examination of adult Swiss French data from both a production test and a perception test has shown that schwa is only in part confused with stable /œ/. In production, schwa and stable /œ/ are more similar in a non-prominent position compared to stable /œ/ in a prominent position, which in general spans over a more important range in the height dimension. The position of the vowel in the prosodic structure has also proven important for the categorisation of the vowel in perception. Although the rate of correct identification surpasses 50% for the various test items, the error rate increases slightly when the two phrases are mapped onto a similar prosodic structure. Thus, we have established evidence in favour of and against the one-category hypothesis. We have shown that acoustically schwa and stable /œ/ overlap to a large extent and do not encourage a categorical split. Perceptually, we have shown that there is some confusion of the vowels, but not enough to reject the potential uniqueness of schwa. The question is which factors besides alternation actually help discriminate between schwa and /œ/, and whether these factors are inherent within the vowel or are assigned to it by prosody. What we can establish is the fact that the phonetic input to the child is often ambiguous, both acoustically and perceptually, and it seems that phonological alternation is the single unchallenged factor that assists the potential categorical split. In this regard, recall from Section 3.3.2 that the scarce overlap in distribution of alternating and non-alternating [œ], as viewed from a phonotactic, morphological, and lexical perspective, does not immediately favour a categorical split in the phonological analysis.

The inclusion of new data may further reduce the distributional distance between the two alleged categories. In Chapter 6, we turn our attention to the actual input to the children, i.e. the child-directed speech obtained in the recordings at the child's home. Keeping in mind the acoustic properties of schwa and /œ/ and the results from the perceptual evaluation task, we shift focus to the rate of schwa alternation in the input and to its potential impact on the acquisition of this phonological variable.

6. Schwa alternation in child-directed speech

Doucement [dusmɑ̃], Tom! Doucement [dusœmɑ̃]!

Blanche, the mother of Tom (3;05.23)

6.1 Introduction

Chomsky (1965) uses language acquisition as an argument for his theory of *nativism*, according to which our genetic programme contains a set of principles – a Universal Grammar – that determines what can constitute a possible natural language. According to the tenants of nativism, innate knowledge is a prerequisite for developing a linguistic system that is able to generate the complex e-language; not only must the child deduce his language's grammatical rules in the absence of overt negative evidence, but in addition, the child must be able to ignore and abstract away from the substantial number of ungrammatical structures present in the input, e.g. sentence fragments and slips of the tongue. Assuming this poverty of stimulus, the nativists claim that the input is an initiator or a facilitating aid for the operation of the innate mechanisms, and not a device that (partly) determines the path of acquisition.

In the 1970s and 1980s, researchers present results that show that child-directed speech (henceforth CDS) cross-linguistically share a number of features. They also observe clear discrepancies between CDS and inter-adult speech. These findings indicate that CDS forms a separate register whose use is specific to interactions with young children. In recent years, the importance of the input has regained interest in the field of theoretical linguistics as well as sociolinguistics; for instance, theoretical linguists develop learning algorithms in which the input plays a crucial role (cf. Hayes 2000, Boersma & Hayes 2001, Prince & Tesar 2004), and sociolinguists study the relationship between the caregivers' and children's usage of grammatical variables (discussion and references to follow). Despite the consensus in the literature that CDS plays at least an indirect role in acquisition, it remains to be established if, how, and to what extent it actually facilitates the acquisition of the various linguistic operations. A range of works from the late 1970s to the early 1980s (cf. Newport et al. 1977, Furrow et al. 1979, Hoff-Ginsberg & Shatz 1982, S. Barnes et al. 1983, Bohannon III & Hirsh-Pasek 1984, Gleitman et al. 1984, Hoff-Ginsberg 1985, Furrow & Nelson 1986, Scarborough & Wyckoff 1986) represent the rather heated debate about and the inconsistency of the results obtained. In particular, one outcome of this debate is that they raise many questions related to the theoretical and methodological approaches to the study of CDS. For instance, if there is a relationship between the use of CDS features and the child's level of linguistic competence, it could be obscured if the data are not gathered properly. According to Snow (1986), in data collection one should consider many factors and control for potential differences in individual adults and separately examine different communicative acts like playful speech compared to pedagogical speech. She recommends that one should also search for situation-specific fine-tuning of CDS. For instance, Snow and Goldfield (1982) study data spanning one year from one mother-child dyad. Examining the productions by the mother and the child during reading of a children's dictionary, they observe an increase in semantic complexity in the CDS and in the child's productions, which is related in particular to the pictures that are discussed the most. Finally, it is observed that parents shorten their utterances as a reaction to the child's non-comprehension –

indicating that shortening is not a default strategy in CDS (Snow 1986); see also Stine and Bohannon (1983), among others, for further discussion. Snow (1986) further emphasises the importance of controlling for the relationship between the particular CDS and the child's age and current language competence (cf. Newport et al. 1977, Furrow et al. 1979).

In this thesis, the recording of spontaneous child language data is conducted at home and with the mother present during the recording in the majority of the cases. As mentioned in Section 4.2.3.1, one of the goals of this sampling strategy is to obtain information about the nature of CDS. We inform the mothers that our project focus is on the L1 acquisition of phonology, but we provide few other details concerning our specific research questions. One could rightly object that the data to be presented in this chapter are biased by the setting in which they are collected, i.e. that the presence of the researcher and the microphone alters the CDS, and thus, that the schwa behaviour attested in the mother's speech during recording fails to reach a level of true spontaneity. However, given the sampling density, once weekly for three to five months, the rather informal atmosphere[259], and the amount of variation observed in the data, we conclude – without evidence to the contrary – that the mother's recorded linguistic performance is representative of her everyday speech, CDS included.

In Section 6.2, we present in more detail some recurrent CDS-features and highlight the ones that are important to our discussion. Since our interest is schwa alternation, we especially focus on the use of phonological variables in CDS. In Section 6.3, as a first step toward identifying the possible implications of CDS for the acquisition of schwa, we examine the rates of schwa alternation that are extracted from our corpus. In coding the data for contextual information, our goal is to address whether the rate of schwa alternation depends on the type of communicative context. This idea is based on personal communication with native francophone linguists, who claim that schwa presence is particularly salient in utterances where the transmission of the message is highly important, e.g. repetition of a previously uttered phrase and more disciplinary verbal actions. Following Snow (1986), we search for any individual strategies selected by the mothers; in Chapter 8, in light of these strategies, we discuss the potential influence that the input has on the child's production of schwa-items.[260]

6.2 Theoretical preliminaries

As pointed out by E. V. M. Lieven (1994), there is a tendency in the early works on CDS to view any adjustment in speech directed to children as being directly helpful to acquisition. This tendency, in later years, is taken to be a theoretically rather than empirically motivated reaction to Chomsky's (1965) view that CDS is highly unstructured (cf. Bennett-Kastor 1988, for a discussion). Nevertheless, the fact that several features are attested in a variety of languages and cultures is taken as evidence that CDS plays a concrete role in language learning, whether it is shown to "help or hinder the child in its language development" (Ferguson 1978:207). Ferguson (1978) lists several of the cross-linguistic characteristics of CDS. First, CDS is prosodically

[259] Given our non-native francophone status and the additional fact that we are "intruding" into their family life, we let the caregiver decide which form of address she was most comfortable with. Despite the informal character of the conversation, we mutually addressed one another with the formal *vous* throughout the recording period. The sole exception is Blanche, who after a few sessions proposed that we switch to the more informal *tu*.

[260] Nevertheless, we should not forget the methodological difficulty of obtaining reliable data for such an analysis. Recall from Section 4.2.2 that our corpus construction is primarily guided by the intent of collecting cross-sectional and longitudinal data. To fully control for the various factors outlined above, we need to know much more about the distribution of schwa both in situational context and in child language.

different from inter-adult speech, with higher pitch, more extreme intonational contours, slower speech rate, overtly more articulated pronunciation, less disrupted speech flow, and longer inter-phrasal pauses.[261] These modifications have several functions. Practically, they serve to obtain the child's attention in the conversation and they help to identify when the adult's speech is directed to the child. Grammatically, they facilitate comprehension and articulatory development by clarifying prosodic and segmental structure. CDS is also syntactically simplified[262], with shorter sentences, less frequent subordination, and frequent omission of function words and inflectional endings. Ferguson (1978) also identifies four typical aspects of the CDS lexicon. One, the CDS lexicon is limited to specific semantic areas, e.g. body parts and animals. Two, it makes frequent use of hypocorisms, e.g. in French using *tonton* 'uncle' instead of *oncle* 'uncle'. Three, it uses "baby talk" words in simplified constructions to refer to daily routines and activities, e.g. French *faire pipi* 'go to the loo'. Four, the CDS lexicon tends to imitate child language and makes use of the canonical syllable structure CVCV as well as avoidance of more complex or "difficult" segments, e.g. in English CDS the substitution of [w] for [r] in target *right* (Blount & Padgug 1977). Finally, a number of discourse features are attested in CDS cross-linguistically. For instance, questions and imperatives are used more frequently, the semantic content is typically closely related to the conversation act (cf. Ferguson 1978:211, on *here-and-now semantics*), and there is a strong inter-utterance semantic continuity.

Whereas many of the above-mentioned features co-occur in CDS, there is also a high degree of intra-register variability, which in general is triggered by other than grammatical factors. For instance, the strength of the relationship between the interlocutors seems to have an effect on the language that is used. Although recent research is less conclusive, see for instance Abkarian et al. (2003) for a review of the literature and Lovas (2011) who shows a differentiated behaviour in father/son-dyads and father/daughter-dyads, several papers from the 1980s claim that the father-child verbal interaction is influenced by the father's reduced familiarity with the communicative competence of the child. The father's CDS is characterised by shorter dialogues (Killarney & McCluskey 1981, cited by M. E. Barton & Tomasello 1994), fewer turns taken by the father (Rondal 1980), less responses to child utterances (Hladik & Edwards 1984), more frequent use of imperatives and directives (Malone & Guy 1982), and more extensive lexical diversity (Rondal 1980). We underline that CDS variability within the family is beyond the scope of this thesis, and that the fathers are consequently not recorded for this study. This methodological choice, therefore, prevents us from discussing the above-mentioned findings in light of more recent data.

Socio-economic conditions are also occasionally reported to influence on CDS, although the results are less conclusive. For instance, Snow et al. (1976) examine the CDS of eighteen Dutch mothers who are divided into three socio-economic classes, unskilled and semi-skilled working class, skilled lower middle class, and academic middle class; they observe that both skilled lower middle class mothers and academic middle class mothers produce significantly more expansions, more substantive deixis, and fewer modals and imperatives. The influence of the family's socio-economic level is perhaps best shown in the case of grammatical features that are subject to systematic variation (see below for discussion and references). Although French schwa receives much attention in the last fifty years, French liaison without a doubt shares this status of linguistic celebrity. Martin (2005, cited by Nardy, 2009), Dugua (2006), Chevrot et al. (2007), and Nardy (2008) all show that the number of variable liaisons produced by the child

[261] See Ferguson (1978) for references and examples of the distribution of cross-linguistic and language-specific characteristics of CDS.
[262] Several researchers raise the question about what actually constitutes syntactic simplicity in CDS, and argue that it is merely an artefact of semantic simplicity (Cross 1977, Snow 1977).

increases as a function of his family's socio-economic level. Nardy (2008) examines children aged 2-6 years old, and her findings show that the adult-like distribution of the liaison consonant is acquired at the age of 5-6. Children born into a higher socio-economic environment produce a higher degree of variable liaisons than children with working-class parents do. However, contradictory results in the literature render claims about the effect of socio-economic class on acquisition dubious. In fact, if we leave out phonological variables, to which we return shortly, there seem to be negligible grammatical effect from socio-economic conditions on child language. For instance, one may expect the construction of the lexicon to at least partly depend on the caregiver's effort to teach new lexemes to the child (Hoff 2003); while there might be some truth to this idea, there is no indication that more privileged caregivers have a higher success-rate than less privileged ones. Kern (2003) examines the developing lexicon in French infants and observes that the mother's educational level has a very low impact on the child's developing lexicon, i.e. the children whose mothers have no diploma produce slightly fewer words than the children whose mothers have a Bac+4, i.e. four years of higher education completed, after the baccalaureate. Bonada and Genty (2000, cited by Kern 2003) compare 48 children, ages 8-16 months, from a lower socio-economic level, with parents who have completed less than three years of *college*, with 48 children, ages 8-16 months, from a higher socio-economic level, with parents who have completed two or more years of higher education after the baccalaureate, and they observe no difference in the composition of the lexicon between the two groups.

One factor that undoubtedly leads to the intra-register variability reported by Ferguson (1978) is the estimated linguistic competence in the child. Recall from Section 5.3.1.4 that the mothers examined by Bernstein Ratner (1984) disperse their vowels more when directing their speech to children at the telegraphic stage than when they address children at the preverbal or holophrastic stage. On the basis of previous studies on segmental enhancement in CDS (cf. Moslin 1979, cited by Bernstein Ratner 1984, Bard & Anderson 1983), Bernstein Ratner (1984) claims that the phonetic enhancement of vowel features, which gains prominence in CDS as the addressee acquires more speech sounds, nevertheless rapidly disappears as a means to "allow their children to gain experience in processing the 'messy' vocalic and consonantal aspects of normal conversational interaction" (1984:577). A second example is Rondal (1980), who in his cross-sectional study of five French-speaking couples and their children, observes a correlation between the child's semantic and syntactic abilities and the tendency for both parents to increase lexical diversity, syntactic complexity, and sentence length, and to decrease the number of repetitions, expansions, and imperatives. This gradual decrease of CDS features turns out to be an effect of fine-tuning whose aim is to achieve optimal communication with the child. As already mentioned, some early works (cf. W. J. M. Levelt 1975, Moerk 1976) interpret the simplified and more clearly articulated – in comparison to inter-adult speech – structures of CDS as evidence for its role as a language-teaching device. This idea is rejected for a number of reasons, and is replaced by an analysis in which CDS rises as a "response to the pressures of communicating with a cognitively and linguistically naive child in the here-and-now" (Newport et al. 1977:124).

The communicative driving-force behind caregivers' speech is exemplified in Snow (1972), who examines the CDS of 42 American women, 12 mothers of children ages 9;05-12;04, 24 mothers of children ages 2;00-3;04, and 12 women without children. One of her experiments consists of three different tasks, telling a story, explaining how to sort a certain number of toys, and explaining a physical phenomenon; the mothers perform each task four times, i.e. in the presence and in the absence of their own child, and in the presence and in the absence of a child from the age group of which their child is not a member. In the absence of the child, the women are asked to pretend the child is present.[263] The absent condition always precedes the present condition. The results show that the level of complexity of the speech addressed to the present two-year-old child is significantly lower than in the other three contexts, which do not differ significantly from one another. We retain from this study that the physical presence of the young child has an effect on the CDS. More specifically, Snow analyses this finding as an indication of the importance of the feedback the child provides in a communicative context. We further interpret this finding to mean that if the mother's speech becomes too complex for the child to understand, one may expect the over-complexity to be reflected in the child's behaviour via loss of attention, or unwillingness to respond etc. By possessing means to adjust her speech, the mother can overcome this situation and reestablish communicative flow.

Although it is established that the main purpose of CDS is to function as a means of easing communication, it still remains to be determined to what extent the CDS features influence the acquisition of grammar. There is some evidence that the caregiver can help the child build up his vocabulary by providing information about lexical items and their mapping to the real world (see above), but the question of whether CDS through its very existence has an effect on grammar proper remains. As mentioned, one major obstacle to its potential to influence the acquisition process is the state of the child's current grammar; for instance, it is well known that the caregiver's attempt to correct the child's phonological form rarely succeeds. A famous example comes from N. V. Smith (1989), whose son Amahl correctly perceives [s] and [θ], but nevertheless, is incapable of distinguishing *mouse* from *mouth* in production. Given that the adult form is correctly perceived, we know the form is, thus, passed through a filter, i.e. the form is interpreted, analysed, and reconstructed in the child's own developing grammar. It is also worth noting that while the child needs to acquire segmental and phonotactic structure, all portions of the input do not receive the same amount of attention. Newport et al. (1977) suggest that the children have some sort of *filter of selective attention* intervening between the input and the output, which makes the child pay most attention to the salient portions of the input, e.g. stressed syllables, the initial position of the utterance, and lexical items whose referent is easily recognisable to the child. The results of these studies, in fact, turn upside-down the idea that CDS is a teaching device, in that "it is [the children] and not their caretakers who are the prime movers of the acquisition process" (Gleitman et al. 1984:70).

The observation that the effects of CDS are clearly biased by the child's grammar is particularly well exemplified when phonological variables are concerned. Further, research shows that the distribution of phonological variants is not necessarily identical in CDS and inter-adult speech. While the child's attention to phonological variation in the input is dealt with in Chapter 7, the remainder of this chapter focuses on the two questions of whether caregivers modify the rate of schwa alternation in CDS, and whether this modification speeds up or delays the acquisition of the phonological variable.

Ferguson (1977), in his review of the literature on CDS, mentions several processes that are characterised as "clarifying" and as entailing "lento speech". One process that he mentions is the higher production of vowels that are generally deleted, which includes schwa in French. Alongside a higher rate of schwa presence in CDS, we should expect a change in schwa behaviour in this register over time as the child gradually achieves advanced phonological competence. J. Smith et al. (2009), in their study of the rate of (t/d)-deletion in mother-child dyads, make several observations. First, the rate of (t/d)-deletion by children decreases with age.

[263] The women without children do not interact with the child, rather they are asked to make tapes suitable for use in an experiment in cognitive development with two-year-old subjects.

Second, the mothers more frequently produce [t, d] in CDS than in inter-adult speech. Third, the rate of (t/d)-deletion by mothers increases as the child grows older, and they thereby display an inverse pattern to the children.[264] The early, more extensive production of non-reduced forms by the mothers in J. Smith et al. (2009) can be viewed in light of the results in Foulkes et al. (2005), who focus on the phonetic realisations of /t/ in word-medial and word-final pre-vocalic positions in the CDS of Tyneside English (England). In inter-adult speech, /t/ is realised as [t] in only 10% of medial occurrences and in only 5% of final occurrences (Docherty et al. 1997); in other cases it is replaced by [ʔ], [d], or [ɹ]. In CDS, on the other hand, the [t]-rate increases to around 59% and 18% in the medial and final positions, respectively. Foulkes et al. (2005) hypothesise that the more frequent selection of [t] is an effect of creating phonological clarity. Not only is [t] the "standard form" (Foulkes et al. 2005:196), but for the caregivers it is also the most transparent version of its orthographic counterpart. Finally, since "a similar variant "[265] to [t] is selected in the word-initial position, the higher rate of [t] in word-medial and word-final positions reduces variability across phonological contexts. Foulkes et al. (2005) also put forward the hypothesis that the listener-oriented context causes CDS to be over-articulated (cf. the hyper-hypo continuum theory in Fernald 2000). Nevertheless, Foulkes et al. (2005) conclude their study with the claim that phonological clarity does not suffice as motivating force for the preference of [t] over the target-like variants; in fact, the extensive use of [t] causes the child to be exposed to more variability, not less. Even if the caregiver uses [t] in a variety of contexts and this helps the child to discover phonological representations, the within-context analysis is rendered more complicated. To put it more concretely, recall that the CDS of Tyneside English contains more variability than the inter-adult language, particularly in the word-medial context; while in this context the glottal stop is used more or less consistently in inter-adult speech, the child is exposed to two variants [t] and [ʔ], used equally.[266]

Before turning to our CDS data, we briefly reflect on what *phonological clarity* means for the acquisition of schwa. First, caregivers could consider the variant with schwa the optimal candidate because it constitutes the most transparent version of the orthographic representation of the word, i.e. there is a correspondence between a graphic <e> and a phonetic vowel.[267] Second, children could favour the variant with schwa because it is associated with a CVC(C)V syllable shape, which is a simpler syllable shape than the CC(C)V syllable shape of the variant without schwa. This hypothesis is supported, first, by studies showing that young children prefer to attempt target words with open syllables, in line with their own limitations on production (cf. Ingram 1974, Schwartz & Leonard 1982). Second, the hypothesis is further supported by the fact that the CV syllable shape is favoured in target French in general; processes like *enchaînement* and *liaison*, which resyllabifies a word-final consonant and realises an otherwise mute word-final consonant in the following empty onset position, respectively, are two examples of this preference for open syllables (Auer 1991). In this regard, note the observation

[264] We return to this study in more detail in Section 7.2.1.

[265] (Foulkes et al. 2005:196)

[266] The primary objection against an interpretation motivated purely by phonological clarity, in this case, is the finding of a greater use of [t] in the speech directed to girls. This gender-correlated difference is interpreted as a reflection of the women's stronger tendency to use standard forms (cf. Labov 1972, among others). More precisely, Foulkes et al. (2005) propose that the patterns observed in the data are a result of the mothers sensitivity to the "child's developing gender identity" (2005:198). This analysis is nonetheless rendered dubious by J. Smith et al. (2007, 2009) who present opposing results.

[267] Along the lines of Foulkes et al. (2005), we could further hypothesise that the version without schwa, which is less coherent with respect to the formal orthographic form, is socially more stigmatised than the version with schwa, and that the caregivers prefer transmitting the non-stigmatised version to their children. However, the absence of studies indicating that this is true for inter-adult speech prevents us from further considering this hypothesis.

by Jusczyk et al. (1994) that infants prefer to listen to frequently occurring phonotactic patterns compared to less frequently occurring patterns, which, again, reflects their sensitivity to the relative grammaticality of structures in the ambient language. All of the above-mentioned studies jointly imply that French-learning children should prefer CV shapes in perception, selection, and production, i.e. the variant of schwa-items with schwa present. Finally, we emphasise that according to the one-category and the traditional two-category approach (cf. Section 3.2), the variant with schwa is phonologically more transparent because the underlying form of the item contains a vowel. However, there is one major problem with the interpretation that a present schwa is phonologically clarifying. If the sole substantial difference between schwa and /œ/ is that the former alternates, which implies that the output of /œ/ constitutes negative input to schwa alternation, then the increased stability of schwa in CDS actually obscures the difference between the two alleged categories.[268] Whereas the full form provides information to the child about the underlying structure of the word, it hinders the identification in the lexicon of the items that are subject to alternation in the grammar.

The recent study by Liégeois et al. (2012) constitutes the sole study on schwa in CDS and child language, to the best of our knowledge. In this study, they examine the spontaneous speech of two French-learning children and their caregivers at two different points in time, at ages 2;04 and 3;00 for the first child and ages 3;00 and 3;06 years for the second child. Concentrating solely on the functional monosyllables with schwa, Liégois et al. first observe that rate of schwa absence is lower in CDS than in inter-adult speech. Second, they observe that the rate of schwa absence in CDS increases as the child develops linguistically.[269] Both observations are important as they accord the predictions made in the literature on phonological variables in CDS; in this chapter we determine whether the same observation can be made for schwa in the initial syllable of polysyllables.

6.3 Descriptive analysis

The hypotheses that are tested in this section are as follows:

1. The rate of schwa alternation in CDS is lower compared to inter-adult speech.
2. The rate of schwa alternation in CDS reflects a formal vs. informal stylistic differentiation.
3. The rate of schwa alternation in CDS increases as the child achieves more advanced phonological competence with respect to segmental and supra-segmental complexity.

Based on the phonotactic distribution of schwa in inter-adult speech (cf. Section 3.3.2.2) and the characteristics of CDS mentioned in the preceding section, there are at least three factors that should, *a priori*, influence the rate of schwa alternation in the speech of our six mothers; the type of lexical items, the phonotactic structure, and the situational context. In what follows, we examine the data in light of these three factors.

[268] In a one-category analysis, the greater presence of schwa in CDS does not obscure a target categorical difference. It is, nevertheless, problematic in that the output distribution of the two variants, alternating and non-alternating [œ], as presented to the child, differs from the target system.
[269] Liégois et al. (2012) also observe that the rate of schwa absence increases in the child's production as he grows older.

6.3.1 Types of lexical schwa-items in child-directed speech

Before presenting the data, recall that the choice of sampling strategy (cf. Section 4.2.3) has some implications for the CDS vocabulary obtained in this study; we recorded activities, the majority of which are interactional and playful, though with some rare exceptions.[270] Our corpus comprises a total of 1,189 occurrences of schwa-items, which are listed in Tables 6.1 and 6.2 and when available are paired with the item's *c.e.f.* value (cf. Racine 2008), given in parentheses.[271] Regarding items occurring fewer than five times in the corpus, shaded in grey in Tables 6.1 and 6.2, we take their low number of occurrences to be insufficient to draw any conclusion about their alternation admissibility in CDS. It is important to note that while the items in Tables 6.1 and 6.2 undoubtedly constitute only a subset of the schwa-items in these mothers' global CDS, we find the recurrence of items at the intra-speaker as well as at the inter-speaker level sufficient to authorise an initial analysis of the behaviour of schwa in this register. Nevertheless, we keep in mind that, given the amount of lexeme-specific behaviour, interpolating the rates of schwa alternation for items not present in our CDS corpus must be done with caution.

Table 6.1 presents an exhaustive list of the nominal and nominalised schwa-items attested in the CDS data, regardless of the context in which it is found, post-pausal, ##C<e>C, post-consonantal, C#C<e>C, or post-vocalic, V#C<e>C. The majority of items are also attested in the adult judgement data in Racine (2008) or in the inter-adult PFC production data, and generally display a (highly) frequent production rate (see Section 3.3 for an analysis of the two corpora); our hypothesis predicts that the alternation rate for these items should be lower in the mothers' speech and the percentages in Tables 6.1 and 6.2 indicate that this is in fact the case. However, note that the data in Tables 6.1 and 6.2 are not fully comparable as the judgement data and the inter-adult PFC data only comprise schwa-items in a V#C<e>C context.

[270] When the mothers, who on some occasions are more conscious of the recording situation than at other times, wanted to elicit child speech, they did so by urging the child to tell a story or to talk about past or future activities. In the majority of these cases, the child refused to follow up and continued with his own activity.
[271] See Section 3.3.2 for an examination of how *c.e.f.* values correlate with phonotactic, morphological, and lexical properties of the various schwa-items.

Item	Gloss	*c.e.f.*	% presence	Occurrences
besoin	need	-0.58	36	13/40
cela	this		0	0/2
celui	this/that		65	121/186
cerise	cherry	1.33	100	1/1
chemin	road	1.33	62	8/13
cheminée	chimney	2.08	100	2/2
chenille	caterpillar	0.83	80	4/5
chenit	mess	-	20	1/5
cheval	horse	1.58	69	102/148
chevalier	knight	-1.92	100	1/1
cheveu	hair	1.92	44	8/18
demi	half	0.17	20	2/10
demoiselle	miss	0.5	0	0/1
femelle	female	-0.75	100	1/1
fenêtre	window	1.0	86	6/7
fenouil	fennel	0.08	100	1/1
Genève	Geneva	-	84	21/25
genou	knee	1.58	67	2/3
lequel	which	-	59	16/27
monsieur	mister	-0.17	92	22/24
peluche	teddy bear	1.17	100	3/3
petit	small	1.5	20	95/467
remorque	trailer	-0.33	100	6/6
renard	fox	-1.08	100	19/19
repas	meal	0.42	100	2/2
requin	shark	-1.08	100	14/14
retour	return	0.08	0	0/1
seconde	second	0.67	0	0/4
secret	secret	-0.5	100	1/1
semaine	week	0.67	50	2/4
seringue	syringe	1.0	100	1/1

Table 6.1: Rate of schwa presence in nominal schwa-items, across all phonological contexts, CDS data from six mothers; by percentage and count, combined with *c.e.f.* values retrieved from a V#<e>C context (cf. Racine 2008)[272]

Given the discussion of phonological clarity in Section 6.2, we find it interesting to mention that the nominal data set contains a few instances of reiterations, where the first occurrence of the noun is realised without schwa and the second occurrence is realised with schwa. This is illustrated in Examples (1-a) and (1-b) below. The data set also contains a situation, cf. Example (2-a), that shows that the mother prefers the variant with schwa to the variant without schwa, thus, encourages the child to realise the former rather than the latter. The overtly stated preference for one form over the other is further attested when the mothers are presented with the PowerPoint test (cf. Section 4.2.3.2), see Example (2-b).[273]

[272] Two items with graphic <e> observed in our corpus and listed in Racine (2008), i.e. *chevreau* 'baby goat' with a *c.e.f.* of -5.58 and *faisan* 'pheasant' with a *c.e.f.* of -5.83, fall out of our definition of schwa because of the absence of vowel alternation.

[273] As a means to determine whether the PowerPoint test is perceived of as a formal situation, the six mothers were presented with the test toward the end of the recording period. We did not give them any directions concerning the nature of the task, but merely told them that there is a man (*Machine*) who wants to ask them some questions. Their

(1) Reiteration of schwa-items in CDS

a. Context: Tom (3;02.17) and his mother Blanche are playing animal lotto, and Blanche comments on the picture of a monkey.

Blanche	Il a des beaux ch[∅]veux, hein?
Tom	Quoi?
Blanche	Il a des beaux ch[œ]veux?

b. Context: Tom (3;02.24) and his Blanche are playing a Winnie-the-Pooh memory game, and Blanche comments on the size of Piglet.

Blanche	Tu as vu? Il est p[∅]tit comme une souris.
Tom	Quoi?
Blanche	Il est p[œ]tit comme la souris.

(2) Preference for the full phonological variant

a. Context: Janice (2;11.15) and her mother Nina are reading a picture book, and Janice comments on the picture of a girl in the bathroom.

Janice	Elle mouille les ch[∅]veux.
Nina	Elle mouille les ch[œ]veux?
Janice	Oui, dans le bain.
Nina	C'est quoi, ça?
	(Nina points at the girl's hair)
Nina	Les …?
Janice	Ch[œ]veux.
Nina	Ah oui.
Janice	Elle mouille les ch[œ]veux.
Nina	Oui.

b. Context: Nina, the mother of Janice, is "interacting" with the native Vaudois speaker during the PowerPoint test and comments on his realisation of the schwa-item *cheval*.

Nina	Il dit ch[∅]val mais nous on dit pas ch[∅]val.
	On dit c'est un ch[œ]val. On dit pas un ch[∅]val.

The data in Example (1) are unsurprising given the observations in previous works about the preference for apparent phonological clarity in CDS, and also given the claims that the very aim of CDS is to create and maintain communicative flow; the mother's response pattern clearly indicates that the child's feedback has an effect on CDS. The data in Example (2) are more difficult to explain on structural grounds. First, the schwa-less variant of *cheveux* produced by Janice is segmentally target-like, and as such, there is no grammatical reason why Nina should encourage her to repeat the word, with schwa present. Second, Nina's claim that "we do not use [the schwa-less variant of *cheval*]" cannot be understood other than as an idiosyncrasy. The judgement task in Racine (2008) shows a *c.e.f.* value of 1.58 for *cheval*, which indicates a very high rate of schwa absence across the linguistic community. Further, the occasional absence of schwa in both *cheveux* and *cheval* in the speech of the other mothers shows that the schwa-less variant can be used in conversation with children who are at different stages of phonological

reactions to the test are quite homogeneous in that the form containing schwa is by far the favoured version for all mothers.

development. Whatever the reason behind Nina's overt preference for the variant with schwa is, the selection of this non-reduced, and most transparent, faithful phonological form can be explained by a desire for phonological clarity.

We now return to the presentation of the data. Table 6.2 presents the exhaustive list of verbal forms attested in the CDS data, alongside the rate of schwa alternation attested in Swiss French inter-adult speech – recall that verbs are not part of the test material in Racine (2008). Again, the CDS data do generally display a relatively high degree of schwa presence, with the clear exceptions of <ser>, <fer>, and *venir*, whose levels of schwa presence amount to a scarce 4%, 11%, and 14%, respectively.

Item	**Gloss**	**PFC**		**% presence**	**Occurrences**
demander	ask	13	5/38	46	12/26
devenir	become	32	9/28	0	0/3
deviner	guess	-		100	1/1
devoir	must	48	23/48	79	11/14
fais-	do	1	1/87	33	8/24
fer-	do	0	0/11	14	2/14
jeter	throw	0	0/1	100	3/3
lever	lift	0	0/1	67	2/3
mesurer	measure	-		100	1/1
rebobiner	rewind	-		100	1/1
recasser	break again	-		50	3/6
recevoir	receive	29	5/17	31	4/13
recompter	recount	-		100	1/1
reconnaitre	recognize	50	5/10	67	2/3
reconstruire	reconstruct	-		100	1/1
recontinuer	start over	-		0	0/1
reculer	move back	-		33	1/3
redonner	give again	-		50	2/4
redormir	sleep	-		100	1/1
refabriquer	build up	-		0	0/1
refaire	redo	67	4/6	67	10/15
refermer	shut again	-		100	5/5
regarder	look	14		60	221/367
rejoindre	rejoin	100	1/1	100	1/1
relever	raise	100	2/2	0	0/1
remélanger	mix again	-		0	0/1
remettre	put back	36	5/14	76	26/34
remonter	go back	13	1/8	63	5/8
remuer	stir	-		100	2/2
renettoyer	clean again	-		0	0/1
repartir	leave	20	3/15	20	2/10
replier	fold (again)	100	1/1	100	1/1
reposer	put	50	1/2	100	2/2
repousser	push back	0	0/1	100	2/2
reprendre	retake	38	9/24	60	3/5
représenter	represent	20	1/5	100	1/1
rerefaire	redo again	-		100	1/1
reregarder	look again	-		0	0/1
ressembler	resemble	33	1/3	21	5/24
ressortir	appear	0	0/5	25	1/4

retenir	hold back	43	3/7	0	0/1
retirer	pull	100	1/1	0	0/2
retourner	return	29	2/7	29	2/7
retrouver	find (again)	35	6/17	17	1/6
revenir	come back	71	17/24	76	13/17
revoir	see again	50	6/12	100	1/1
secouer	shake	0	0/1	0	0/1
ser-	be (fut/cond)	2	1/46	4	2/48
tenir	hold	33	3/9	75	9/12
venir	come	11	7/64	11	4/35

Table 6.2: Rate of schwa presence in verbal schwa-items, across all phonological contexts, CDS data from six mothers; by percentage and count, combined with PFC spontaneous speech data retrieved from a V#<e>C context[274]

In conformity with the constraint(s) favouring schwa in the context C#C<e>C, the mothers realise schwa when it is preceded by two consonants in the majority of cases, e.g. from Nina: *on se repose* 'we have a rest' [ɔ̃sʁœpoz]. However, schwa presence in this context is subject to some variability induced by lexeme frequency, e.g. from Blanche: *une petite bête* 'a small animal' [ynptitbɛt], or by the nature of the surrounding consonants, e.g. from Karoline: *une chenille* 'a caterpillar' [ynʃnij]. The complete set of absent schwas in the context C#C<e>C, in addition to the context ##C<e>C, which also generally preserves schwa, consist of the following items: *celui(-ci/là)* with 19/72 absent schwas, *chenille* with 1/4, *cheval* with 2/29, *dedans* with 1/18, *demain* with 1/9, <fer> with 2/3, *lequel* with 1/11, *petit* with 44/65, *regarder* with 51/171, *reprendre* with 1/1, *reregarder* with 1/1, *retourner* with 1/1, and <ser> with 10/11 absent schwas. As already mentioned, we propose that the schwa absence in these cases is the result of the phonotactics, e.g. a secondary cluster with a fricative C_1 and a sonorant C_2 in *chenille* and <ser>, and the lexical frequency of items, e.g. highly frequently occurring *petit* and *regarder*. We return to the particular behaviour of *celui(-ci/là)* below.

An examination of Tables 6.1 and 6.2 reveals that in CDS few nominal and verbal schwa-items are realised with schwa in less than 50% of the cases, despite the high frequency of schwa absence in inter-adult speech reported for these schwa-items. The highest alternation rate observed for a noun is in *chenit*, with a schwa present in only 1/5 occurrences. The absence of schwa in *chenit* in CDS further lends support to the idea that this item is lexicalised without schwa in some individuals (cf. Racine & Andreassen 2012). Turning to *besoin*, it is attested with schwa present in 13/40 occurrences. This item only occurs in the set expression *avoir besoin de* 'need/have to', and as such, *besoin* does normally not receive the focus of the phrase, e.g. from Blanche: *Alors ils avaient* [bz]*oin d'une* <u>*vache*</u> *pour manger* 'so they needed a cow in order to eat', focus underlined. If we turn to the verbal forms, we observe a greater number of schwa-items, compared to the nominal forms, in which rate of alternation is high. For instance, the verbal stems *faire*, <fais> and <fer>, and *être*, <ser>, and several of the verbs with initial <re> display schwa presence in less than 40% of the cases. In light of the high *c.e.f.* values provided for the nouns, we propose that the relatively high percentage of schwa presence in the nouns

[274] The following schwa-items are classified as Other: *debout* 'standing' with 4/4 occurrences of schwa presence, *depuis* 'since' with 4/6, *dedans* 'inside' with 45/51 and *c.e.f.* of -1.42, *demain* 'tomorrow' with 15/16 and *c.e.f.* of -0.75, *dessous* 'under' with 5/5 and *c.e.f.* of 0, *dessus* 'over' with 40/57 and *c.e.f.* of 0.33, and *devant* with 11/17 and *c.e.f.* of 0.58. Note that the latter five items are classified as nouns in Chapter 3.3.2.2, which is in accordance with their classification in Racine (2008). We have used a different classification in the CDS data and the child language data because they are only attested with an adverbial function. This methodological choice does not in any way compromise the global results and the analyses thereof.

compared to the relatively low percentage of schwa presence in verbs is related to *here-and-now semantics*, i.e. nouns are used to label specific objects in a given activity carried out in the situation. Inspired by the hypotheses in Foulkes et al. (2005), we propose that the mother considers that the full form with schwa eases the transmission of the lexical mapping between the signal and the object, even if it is phonologically redundant. With respect to the verbs, on the other hand, most items listed in Table 6.2 are not content-loaded in the sense that they do not explicitly relate to a concrete activity in the situation. Recall that Newport et al. (1977) claim that the child primarily pays attention to items with a clear referent. The above-mentioned verbs do not have a clear referent, but rather support, link, or situate the other syntactic components in the information structure, or they constitute part of a set expression, e.g. *ça serait bien si…* 'it would have been good if…'.

The global results presented so far are merely suggestive and do not reflect any potential individual strategies. However, as is known, schwa alternation is subject to a certain level of inter-speaker variation, and nothing prevents the same of being true in CDS, as well. Thus, in what follows, we focus on two dyads for which we have the greatest and most variable data set available, i.e. Alice with Guy and Valentine with Adèle (cf. Table 4.1 for a description of these dyads). Before examining schwa behaviour relative to situational context (see below for supporting studies), we first concentrate on the rate of schwa alternation in some of the lexical schwa-items used by the two mothers. In Table 6.3, we present the results for eight items, each of which occurs five or more times in the CDS of at least one of the two mothers. Note that Table 6.3 presents the occurrences of schwa-items without regard to their phonological context, i.e. whether the schwa syllable is in a post-vocalic, post-consonantal, or post-pausal context. The different phonological contexts are commented upon if necessary.

Schwa-item	**Alice**		**Valentine**	
	% presence	**Occurrences**	**% presence**	**Occurrences**
celui (-ci/là)	100	40/40	0	0/26
cheval	100	31/31	46	11/24
dedans	100	18/18	83	5/6
venir/-u	15	3/20	10	1/10
demain	100	8/8	100	3/3
petit(es)	13	17/136	22	21/94
regarder	92	70/76	63	40/64
<ser>	3	1/34	0	0/1

Table 6.3: Lexeme-specific schwa behaviour in the CDS data from Alice (mother of Guy) and Valentine (mother of Adèle), by percentage and count

The results in Table 6.3 reveal similarities and dissimilarities between the two mothers. The first item on the list, *celui*, is realised with schwa by Alice, and without by Valentine. This form is particular because schwa absence is normally accompanied by deletion of the liquid, rendering the two output variants quite distinct, [sœlɥi] vs. [sɥi]. Since word-internal cluster reduction is rare in combination with schwa absence[275], we are not likely to witness regular schwa alternation in such cases, but rather, are likely to see evidence of two lexical forms of which one is stored as default for the speaker. Two other items reveal inter-speaker differences, i.e. *cheval* and *regarder*; again, Alice does not leave out schwa, whereas Valentine to a higher extent selects the reduced form. While Alice often prefers the full form of schwa-items, her data show

[275] Recall that the absence of epenthesis of a word-final schwa frequently entails reduction of the word-final ObsLiq-cluster, e.g. *pauvre* in Alice: *il a pas de tête ce* [pɔv] *cheval* 'he does not have a head this poor horse'.

schwa alternation in *petit*. However, this item is noteworthy because it is extremely frequent, with a frequency score of 1106 on Lexique.org, and it can be absent in context C#C<e>C. The peculiarity of *petit* is confirmed in the judgement task in Racine (2008), with a *c.e.f.* value of 1.5. Finally, the numbers for the verbal stem <ser> confirm that schwa alternation *is* authorised in Alice's CDS. However, she seems to be more restricted compared to Valentine regarding the items in which schwa alternation is allowed.[276]

If we follow previous arguments in the literature and claim that the degree of use of CDS features reduces as the child achieves more advanced linguistic competence, and if at the same time, we assume that the variant with schwa is preferred to a greater extent in CDS than in inter-adult speech, we deduce that Alice is the mother of a phonologically less advanced child compared to Valentine. However, first, by examining the biographical data of the two dyads for the period of time of the recordings we see that Alice is the mother of Guy, age 3;02.14-3;07.04, and Valentine is the mother of Adèle, age 2;07.08-2;10.13. Second, even if we do not measure the mean length of utterance (MLU) for the children, the spontaneous data show that Guy possesses a large productive vocabulary and that he has acquired segmental and phonotactic target-like structures. Adèle, on the other hand, frequently uses infinitival forms instead of finite verb forms; she replaces unbound personal pronouns with the bound form; she reduces target clusters; and she produces non-target-like consonants and vowels. Based on these observations, we conclude that there is no direct link between the individual mother's rate of schwa alternation and the general phonological competence of her child. At first glance, this observation is counter to the finding in Liégeois et al. (2012), wherein the level of schwa presence is found to increase proportionally with the child's phonological competence. Further, note that our data also do not support the hypothesis put forth by Foulkes et al. (2005) that the formal forms are more frequently transmitted to girls. Thus, it seems that other factors trigger the observed individual schwa behaviour, an issue to which we return in Section 6.3.3.

To summarise the main findings, many of the individual lexical schwa-items observed in our Swiss French CDS data are subject to a lower rate of schwa alternation than what is attested for inter-adult speech. This is in line with the earlier finding that CDS is characterised by a higher rate of production of the non-reduced phonological form. The examination of the various schwa-items has nevertheless revealed that some items form an exception to the rule; frequent words like *petit* and <ser> are produced in CDS to a large extent exactly as they are produced in inter-adult speech, i.e. with a high rate of schwa absence, regardless of the phonological context. Finally, the examination of two mothers, Alice and Valentine, has shown that schwa is subject to individual rates of alternation in CDS. Alice produces full forms more regularly than Valentine does, even though Alice is the mother of the child with the highest level of phonological proficiency. This observation goes counter to the finding that there is a correspondence between the rate of schwa alternation in CDS and the child's level of phonological competence (cf. Liégeois et al. 2012), which thus indicates that there are other factors that are not purely structural at work.

[276] The difference in the linguistic behaviour of Alice and Valentine is further revealed during the PowerPoint test carried out with the six mothers toward the end of the recording period. The test results reveal that these two mothers display the least similar schwa behaviours. While Alice realises one single occurrence of a schwa-less variant, in *petit*, Valentine realises several occurrences of this variant across all five test items, *cheval, chevir, fenêtre, fenasse,* and *petit*. These two mothers' reactions to the test situation diverge as well. Alice finds the test entertaining, but seems to be simultaneously very conscious of the construction of the game. She does not comment on the task during the test phase. Valentine, on the other hand, is amused by the task and interacts with her child Adèle during the whole test.

6.3.2 Phonotactic constraints

While the examination of the Swiss judgement data and inter-adult spontaneous production data presented in Section 3.3 show a high rate of schwa alternation in a variety of phonotactic contexts, recall from the same chapter that Algeo (1978) emphasises the importance of revealing any stylistically defined constraints on the grammaticality of the various phonotactic combinations. The nominal schwa-items in our CDS data (cf. Table 6.1) are observed to have a high rate of schwa alternation in the study by Racine (2008). As for the verbal schwa-items in our CDS data (cf. Table 6.2), they are observed to have a high rate of schwa alternation in the inter-adult PFC production data. Based on these two bodies of Swiss French data, there is no phonotactically or lexically motivated reason for expecting a different rate of schwa alternation in the CDS data. The data presented in Figure 6.1 do, however, indicate an inter-group difference. Given that the secondary clusters resulting from schwa absence vary in degree of well-formedness (cf. Section 3.3.2.2), we test whether there are some secondary clusters that are avoided in CDS. Figure 6.1 presents the rates of schwa alternation in the context V#<e>C in the CDS data and in the inter-adult PFC data, and is sorted according to type of secondary cluster. Although there are exceptions, to which we return shortly, the rate of schwa alternation in CDS is generally lower than in the PFC data.[277] This is in line with the literature that claims that the full form is more frequently selected in CDS. Note that the column representing the LiqLiq-clusters attested in the CDS-data is overlaid with hashing in Figure 6.1 because of the small number of occurrences; there are two occurrences with one instance of schwa presence, and the 50% rate of schwa alternation cannot be considered representative for this cluster type.

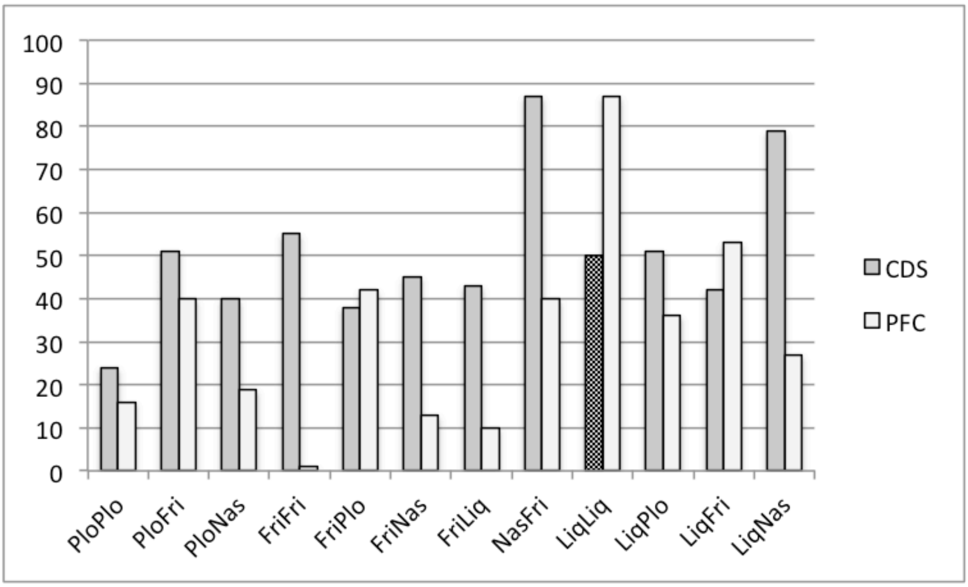

Figure 6.1: Schwa presence in the context V#C<e>C, according to type of secondary cluster, CDS and PFC spontaneous speech data, by percentage[278]

[277] Note that a comparison of the Swiss French CDS data and PFC data is also conducted in Andreassen (2011), in which the latter data are classified according to recording situation, formal vs. informal speech. The author shows that the rate of schwa absence in CDS is lower than the rate of schwa absence in formal inter-adult speech, which is a register that one assumes has a lower rate of schwa absence than informal speech has. CDS, thus, seems to constitute a register with a high level of formality.

[278] The PFC data comprise the nominal items in Table 3.9, judged as alternating in the results by Racine (2008), all verbal items in Table 3.10, as well as the following items with orthographic <e> that are attested with schwa absence in the PFC data: *chenit*, *rechange, représentative, Genève. genevois, cela, celui(-ci/là)*, and *depuis*. The data in Figure 6.1 in numbers: PloPlo: 105/440 (CDS) and 46/281 (PFC), PloFri: 59/115 (CDS) and 46/114 (PFC),

While a lower degree of schwa alternation is generally expected in CDS compared to inter-adult speech, it is nonetheless surprising to observe in CDS the high level of schwa presence in the contexts in which schwa is subject to near-categorical absence in inter-adult speech. This is particularly relevant to the secondary clusters of the type FriFri and FriNas. Regarding schwa presence in the CDS data in the FriFri context schwa is found in 55% of the cases and in the FriNas context in 45% of the cases, whereas in the PFC data in the FriFri context schwa is found in 1% of the cases and in the FriNas context in 13% of the cases.[279] A detailed examination of the schwa-items that constitute these context categories reveals that for the FriFri context the mothers produce schwa to a higher extent in both nominal and verbal forms. For instance, schwa in nominal items with the secondary cluster [ʃv] in the CDS data is realised in 61% (83/137) of the occurrences, and in the PFC data in 0% (0/9) of the occurrences; schwa in verbal items with the secondary cluster [fz] in the CDS data is realised in 20% (4/20) of the occurrences, and in the PFC data in 1% (1/87) of the occurrences. Note that although the numbers are low, the verbal forms seem to be more prone to schwa alternation than the nominal forms in the CDS data. The FriNas context also shows an important inter-group difference in that all nominal items in the PFC data display a 100% schwa absence, regardless of whether the fricative is a sibilant or a non-sibilant. This is different from the CDS data because the mothers occasionally produce schwa in all of attested nominal items; the one exception is *chenit*, which is produced without schwa in the single occurrence attested in a V#C<e>C context. The sole verb with a FriNas context, *venir*, shows less of an inter-group difference in that it is realised with a low level of schwa presence across both groups, i.e. in the CDS data it is realised with schwa in 6% (2/33) of the occurrences, and in the PFC data it is realised with schwa in 11% (7/64) of the occurrences.

The numbers seem to indicate that the differences between the two groups regarding the rate of schwa alternation are due to a stricter constraint on secondary clustering in the CDS, and it now remains to explain why there are exceptions. The near-categorical schwa absence in the verbal forms <ser> and <fer> constitutes a prime example of the different behaviour of schwa in CDS. Generally attested without schwa also in the PFC data, schwa absence in <ser> and <fer> nicely fits with the claim in Côté (2009) that schwa in an ObsLiq context is in the process of disappearing from the phonological representation of the word. If it is true that schwa is no longer part of these items' underlying form, then consequently, the high degree of schwa absence observed in CDS in <ser> and <fer> does not constitute a counter-example to the hypothesis that underlying schwa is preferably realised in the CDS register; under this view, in <ser> and <fer> there is no underlying schwa for the caregivers to produce faithfully.

Thus, to sum up this section, the comparison of the CDS data and the inter-adult FPC data at the level of the phonotactic structure of schwa-items has, first of all, reconfirmed that schwa is less

PloNas: 17/43 (CDS) and 13/70 (PFC), FriFri: 87/157 (CDS) and 1/97 (PFC), FriPlo: 3/8 (CDS) and 5/12 (PFC), FriNas: 39/87 (CDS) and 20/150 (PFC), FriLiq: 71/165 (CDS) and 7/67 (PFC), NasFri: 13/15 (CDS) and 4/10 (PFC), LiqLiq: 1/2 (CDS) and 13/15 (PFC), LiqPlo: 142/278 (CDS) and 74/207 (PFC), LiqFri: 31/73 (CDS) and 50/94 (PFC), LiqNas: 49/62 (CDS) and 11/41 (PFC). The secondary clusters PloLiq and NasNas are not included because in the CDS data they represent two and zero occurrences, respectively – all three produced with schwa. In the PFC data PloLiq and NasNas only represent one and zero occurrences, respectively – the one occurrence is produced with schwa.

[279] The inter-group difference is also important for the FriLiq context, but the examination of this context at the level of the individual schwa-item reveals that the rates of schwa presence in the two groups are similar. For instance, schwa in nominal items with the secondary cluster [sl] is realised in the CDS data in 59% (68/116) of the occurrences, and in the PFC corpus in 67% (6/9) of the occurrences; schwa in verbal items with the secondary cluster [sʁ] is realised in the CDS data in 3% (1/40) of the occurrences, and in the PFC data in 2% (1/46) of the occurrences.

prone to absence in CDS. Second, the examination of the different phonotactic combinations has revealed that the increased level of schwa presence in the mothers' speech concerns the majority of cluster types, but that there is no secondary cluster that is fully accepted in inter-adult speech that is meanwhile prohibited in CDS. In fact, where there is an important difference between the two data sets, the most plausible explanation resides in lexical properties of the schwa-item. If the two groups of speakers behave near-identically with respect to verbal forms, recognising an occasionally higher degree of schwa presence in the mothers' speech, their behaviour regarding nominal forms differs; while the mothers display an elevated preference for the full form of nominal items compared to the verbal items, the asymmetrical degree of schwa presence is not equally strong in the inter-adult PFC data. This is yet another indication that nominal forms receive a particular focus in CDS.

6.3.3 Contextual constraints

6.3.3.1 Theoretical preliminaries

In addition to the type of lexical item and phonotactic context, the third factor likely to exert an influence on schwa alternation in CDS is the situational context. As previously mentioned, there is an unspoken consensus among native francophone linguists that schwa is more frequently pronounced in hyper-articulate spontaneous speech, even in cases where a vowel is never produced in regular inter-adult speech, e.g. *Doucement! Doucement!* [dusmɑ̃ dusœmɑ̃] 'Slowly! Slowly!' uttered by Blanche, the mother of Tom (3;05.23). According to Labov (2001:437), "[l]inguistic variation is transmitted to children as stylistic differentiation on the formal/informal dimension […] Formal speech variants are associated by children with instruction and punishment, informal speech with intimacy and fun". J. Smith et al. (2007, 2009) test Labov's claim in their studies on phonological and grammatical variables in a number of mother-child dyads[280] comprising residents from Buckie, on the North-East coast of Scotland. In the first study, J. Smith et al. (2007) examine the *hoose* variable and *–s* in third-person-plural contexts. The *hoose* variable is a lexically conditioned alternation between standard /ʌʉ/ and local /uː/, e.g. *d*[ʌʉ]*wn* vs. *d*[uː]*wn* (J. Smith et al. 2007:70). The use of *–s* in third-person-plural contexts is a morpho-syntactic variable observed in plural noun phrases, e.g. *Your feeties* ***is*** *cold as well,* ***aren't*** *they?* (2007:80). The two variables manifest differently in the CDS in that the use of the local form is reduced for the *hoose* variable, but the distribution of the standard and local forms of the *–s* variable is similar to inter-adult speech. The two variables also behave differently in child language. Concerning the *hoose* variable, the child prefers the standard form at a young age and he only gradually begins to use the local form more frequently as he grows older. The two competing forms of the *–s* variable, on the other hand, are already acquired at an early age. It is important to note that, in the case of the *hoose* variable, both the child and the caregiver alter their speech in the course of the child's development. As the child gradually increases his use of the local form, the caregiver simultaneously decreases her use of the standard form; the two groups presumably converge at some point in development. If variation on the one hand is conditioned by age, it also seems to be conditioned by the caregiver's use of the variants in particular contexts. Thus, to test Labov's (2001) claim about the transmission of variation along the formal/informal dimension, J. Smith et al. (2007) develop a situational coding system, inspired by the work of Roberts (1997a). Four different contexts are coded for, *play, routine, teaching*, and *discipline*; the latter two, *a priori*, reflect a more formal style and hence the expectation that there is a reduced use of less formal variants. The expected pattern is found, for

[280] The studies comprise 24 and 11 dyads, respectively.

caregivers *and* children, but only for the *hoose* variable, i.e. the local form is used significantly more in *play* or *routine* contexts, while the standard form is more restricted to the *teaching* or *discipline* contexts. Concerning the *–s* variable, the caregivers display a slight, but insignificant, inter-contextual difference, and the children display no difference at all. Thus, the CDS only has a stylistic effect on the acquisition of the *hoose* variable, a finding that further confirms that not all linguistic, i.e. grammatically or stylistically conditioned, variables are acquired at the same time.[281] In the second study on mother/child-dyads in Buckie, Scotland, J. Smith et al. (2009) use the context-coding protocol from their 2007 study to obtain situational information about the distribution of (t/d)-deletion in mother and child speech. As with the *hoose* variable, the mothers use a higher rate of the standard variant, with the non-reduced forms with [t]/[d], in early CDS, and they gradually increase the rate of (t/d)-deletion as the child's competence develops. The examination of CDS and child language in the four contexts partly replicates the results from the *hoose* study; in CDS, the informal variants, with (t/d)-deletion, are more frequent in the *play* and *routine* contexts when compared to the *teaching* and *discipline* contexts, in which the formal variants are preferred. Different from the *hoose* study, however, the children in the (t/d)-deletion study do not perform any style shifting, which further confirms that stylistic and social conditioning enters into the grammar at different points of the child's development depending on the phonological variable in question.[282]

In short, the use of variants in CDS does not, by definition, have an effect on the acquisition of variation in the grammar. It is convenient at this point to take a step back and discuss what these studies imply for Swiss French CDS and the acquisition of schwa. Recall from Chapter **3** that the rate of schwa alternation is subject to a certain number of extra-linguistic constraints. In particular, a fast speech rate and a lax articulation increase the rate of schwa absence, while a slow speech rate and an energetic and "loud" enunciation, on the other hand, decrease the rate of schwa absence (Malécot 1976). If, as mentioned by Ferguson (1978), slow speech rate is a characteristic of CDS[283], and if we interpret Malécot's (1976) term *energetic* to mean 'more clearly articulated with a higher degree of non-obligatory prosodic prominences', then two of the factors that tend to trigger schwa presence are in fact cross-linguistically observed CDS features. Further, recall from Section 3.2.2.2 that Bazylko (1976) claims that the rate of schwa presence increases with the level of formality. Combining this claim with the definition of *teaching* and *discipline* contexts as formal contexts (cf. J. Smith et al. 2007, 2009), we expect the caregiver to select the variant with schwa in these contexts. Additionally, given the hypothesis by Foulkes et al. (2005) that the listener-oriented context causes CDS to be over-articulated, we suggest that this is particularly important in contexts where the mother either educates or corrects the child.

[281] Note that J. Smith et al. (2007) observe a clear correlation in usage of variants between the mother and the child. Among the children using both variants, one girl does not display the general pattern in that she does not use the more formal variant more frequently in the *teaching* or *discipline* contexts. As it turns out, this girl merely reflects her mother's usage pattern, which fails to reflect sensitivity to the situational context.

[282] See J. Smith and Durham (2010) for other variable processes that are subject, or not, to style shifting in CDS and child language.

[283] See Blount and Padgug (1977) for some interesting examples of language-specific aspects of CDS. They compare English and Spanish CDS and reveal, for instance, *Fast tempo* to be an important CDS parameter in Spanish. More specifically, they claim that combined with voice loudness, fast tempo helps to retain the child's attention.

6.3.3.2 Results: schwa alternation and situational context

In order to check for a link between schwa presence and the *teaching* and *disciplinary* contexts, we examine the CDS data in light of the four parameters established by Smith et al. (2007, 2009), i.e. *play, routine, teaching*, and *discipline*. We also include a fifth parameter *intimacy*, tested by J. Smith et al. (2009) but left out of their analysis because of a low number of occurrences. As mentioned, the range of recording situations in the corpus is mostly limited to play interviews; thus, as a means to capture all contextually conditioned nuances in the data, we split *play, routine*, and *teaching* into two sub-parts each. The general definitions of the situational contexts are adopted from the above-mentioned studies.[284] *Play (specific)*, abbreviated *play-spec* in Table 6.4, is used to label situations in which the mother plays with the child and fully takes part in the game through imitation or make-believe, while *play (general)*, abbreviated *play-gen* in Table 6.4, is used to label situations where the child plays and the mother interacts with him, without taking on an educational role, thus, in contrast to *teaching* (cf. below). *Routine (specific)*, abbreviated *routine-spec* in Table 6,4, is used to label situations where the mother talks about an object present in the situation, though not part of the specific game. *Routine (general)*, abbreviated *routine-spec* in Table 6.4, is used to label situations where the mother is talking about past or future activities, or interacting with the child about everyday, more general topics. *Teaching (focus)*, abbreviated *teaching-foc* in Table 6.4, is used to label situations where the mother takes an educational role in playing a game or reading a book. Finally, *teaching (context)*, abbreviated *teaching-con* in Table 6.4, is used to label situations utterances relate to the current play or reading situation. Table 6.4 provides an example for each of the above-mentioned codes.

[284] As already noted by J. Smith et al. (2009), *play* and *teaching* overlap to a large extent and as a result coding is more difficult. As a guideline, we restrict the label *teaching* for situations in which the mother takes on an educational role, e.g. reading a book, doing a puzzle etc.; whereas we use the label *play* for all utterances produced when the mother does not take on this role, e.g. playing with plastic animals, showing the child how to lift a toy crank, helping the child with the modelling clay. As shown in Figures 6.4 and 6.5, *teaching (context)* differs to some extent from *teaching (focus)*.

Code	**Utterance**	**Gloss**	**Context**	**Mother (age, child)**
Play-spec	*Vite au réparateur de rails!*	Hurry to the railway mender!	Alice and Guy are playing with the train.	Alice (3;03.13)
Play-gen	*Mais il va tomber dans le pot, bébé.*	But he is going to fall into the potty, the baby.	Adèle has been into her sister's room getting a pot for her baby doll, one that is too big.	Valentine (2;08.02)
Routine-spec	*Ah bon d'accord, ça va pas là-dedans, ça va là.*	Ah well okay, it's not going in there, it's going there.	After playing with cards, Valentine wants to put them back in the box. She is corrected by Adèle because she does not put them in the right place.	Valentine (2;09.30)
Routine-gen	*Mais je te mettrai plus tard Guy la crème sur le petit bobo.*	But I'll put some cream on your little sore later, Guy.	Guy asks if Alice can put some cream on the sore he has gotten after a fall.	Alice (3;03.19)
Teaching-foc	*C'est le cheval blanc, ça.*	That is the white horse.	Valentine is helping Adèle with a puzzle picturing three horses of different colours.	Valentine (2;09.02)
Teaching-con	*Tu vas ouvrir? Qu'est-ce qu'il y a là-dessous?*	Are you going to open? What is it under there?	Valentine and Adèle are playing with a "summer window" made in the kindergarten. Adèle has wrapped the paper water around the paper sun, and now wants to "open the water".	Valentine (2;09.30)
Discipline	*Non non, le nouk, c'est pas possible!*	No, no, the dummy, it's not gonna happen!	Guy has just eaten and puts the dummy in his mouth. Alice does not agree.	Alice (3;03.19)
Intimacy	*Je crois bien que c'est à toi de jouer, mon petit loup.*	I think it is your turn to play, my little darling.	Alice and Guy are playing with a domino, and Guy does not fully understand how to play the game correctly.	Alice (3;05.16)

Table 6.4: Illustrations of situational contexts for Alice (mother of Guy) and Valentine (mother of Adèle)

We retrieve the desired data from the corpus by using a script[285] in Phon (Rose & Hedlund 2006-2013) that combines a search for various situational contexts with the presence or absence of schwa in the mothers' speech (cf. Appendix II-4 for an illustration). The number of present or absent schwas in each context is, thus, generated automatically, and includes both polysyllabic and monosyllabic schwa-items. The total numbers, regardless of the prosodic and phonotactic position of schwa, are provided in Table 6.5.

[285] We are grateful to Greg Hedlund at the Memorial University of Newfoundland for designing the script for the present study.

Code	Alice		Valentine	
	Schwas present	**Schwas absent**	**Schwas present**	**Schwas absent**
Play-spec	16	18	-	-
Play-gen	100	98	75	96
Routine-spec	138	153	69	105
Routine-gen	216	248	147	298
Teaching-foc	270	177	105	121
Teaching-con	128	132	79	96
Discipline	26	21	2	-
Intimacy	3	6	1	2

Table 6.5: Monosyllables and polysyllables with schwa, token counts for each *situational context*, CDS data from Alice (mother of Guy) and Valentine (mother of Adèle), by count

At first glance, the global numbers presented in Table 6.5 do not indicate any particular difference in rate of schwa alternation across the situational contexts. Before rejecting the importance of the situation, however, we also examine the occurrences of schwa in the initial syllable of polysyllables in isolation (cf. Tables 6.1 and 6.2). We comment on the monosyllables when they are relevant for the discussion. The occurrences coded for *intimacy* and *play-spec* are insufficient in number to be included in the following analysis. Concerning *discipline*, we obtain two occurrences in Valentine's data and in both cases schwa is present; in Alice's data we obtain 27 occurrences. In Alice's data, six out of eight schwas in polysyllables are present, with the exceptions being two instances of *Comment tu* [dm]*andes?* 'How do you ask?'. It is worth noting that immediately after one such example when Guy (3;03.19) does not answer, Alice repeats the phrase twice, each time with schwa present, i.e. *Comment tu* [dœm]*andes?* We take this shift in the selection of variant as evidence for the preference for the full form in a situation where the caregiver more overtly requires a reaction from the child. Concerning the monosyllables coded as *discipline* in Alice's data, we observe schwa variation, e.g. there is consistent absence in *Tu es pas obligé* [d] *t'essuyer* [l] *nez sur* [l] *coussin,* [ʒ] *t'ai vu.* 'You don't have to blow your nose on the pillow, I saw you', and consistent presence in *Mais tu* [tœ] *mouches pas sur* [lœ] *T-shirt! […] Alors tu* [tœ] *calmes un peu.* 'But you don't blow your nose on the T-shirt. […] So calm down a bit'. The most illustrative example of the difference between a disciplinary verbal action and a non-disciplinary verbal action concerns the verbal stem <ser> 'be$_{\text{FUT/COND}}$'. In Alice's data there are 34 occurrences of this verbal stem with several different inflectional endings represented; as it turns out, schwa is absent in all situational contexts, e.g. there is absence in the context *routine-gen*: *Une fois qu'Helene* [sʁ]*ra partie qu'est-ce qu'on va faire?* 'Once Helene has left what are we going to do?'. However, we observe one occurrence of <ser> with schwa, in the the context *discipline*: *Non, tu l'auras quand Helene* [sœʁ]*a partie.* 'No, you can have it [the dummy] when Helene has left'. The general absence of schwa in this verb combined with its presence in exactly this situational context fits nicely with the intuition by native francophone speakers that schwa presence is more extensive in corrective situations; schwa is present in the output to improve transmission of the message in a heavily listener-oriented situation.

The rates of schwa presence and absence in the remaining contexts are depicted in Figures 6.2 and 6.3. The results show that Alice produces the variant with schwa in the context *play-gen* in 56% (33/59) of the occurrences, in the context *routine-spec* in 65% (57/87) of the occurrences, in the context *routine-gen* in 49% (55/111) of the occurrences, in the context *teaching-foc* in 59% (66/112) of the occurrences, and in the context *teaching-con* in 57% (49/86) of the occurrences.

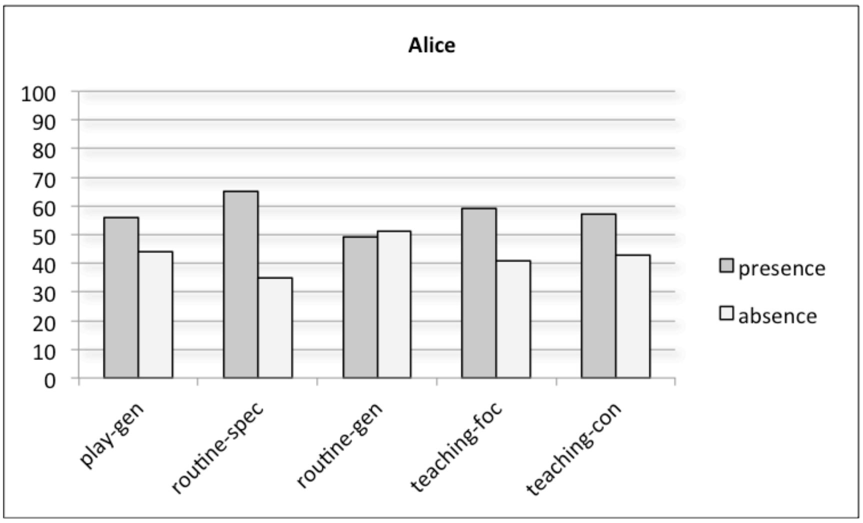

Figure 6.2: Schwa alternation by situational context, word-initial syllable, all phonological contexts, CDS data from Alice (mother of Guy), by percentage

As for Valentine, the results show that she produces the variant with schwa in the context *play-gen* in 38% (18/47) of the occurrences, in the context *routine-spec* in 36% (26/73) of the occurrences, in the context *routine-gen* in 23% (24/104) of the occurrences, in the context *teaching-foc* in 43% (44/103) of the occurrences, and in the context *teaching-con* in 30% (19/64) of the occurrences. From a global perspective, the data indicate that Alice and Valentine select different strategies when it comes to schwa presence in CDS. Alice is seemingly more focused on the transmission of the full underlying form.

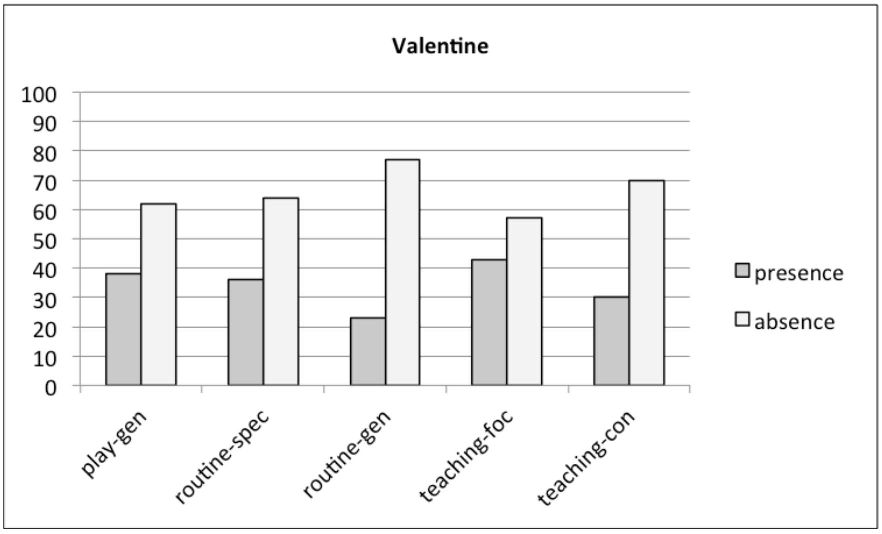

Figure 6.3: Schwa alternation by situational context, word-initial syllable, all phonological contexts, CDS data from Valentine (mother of Adèle), by percentage

However, these results must be interpreted with caution because a number of factors, unsurprisingly, have the potential to influence the rate of schwa alternation, e.g. the phonotactic environment of schwa, the lexeme-specific constraints, and the mother's type of response (cf. E.

V. M. Lieven 1978).[286] We first set aside schwas in the contexts C#C<e>C and ##C<e>C because these schwas are prone to display a higher rate of presence. The schwas in Alice's CDS in the remaining context, V#C<e>C, in which schwa is free to alternate in inter-adult speech, reflect a more balanced pattern with an approximately even distribution of the two variants. The detailed results show that Alice, in the context *play-gen*, uses the variant with schwa in 49% (22/45) of the occurrences, in the context *routing-spec* in 52% (32/61) of the occurrences, in the context *routine-gen* in 38% (29/76) of the occurrences, in the context *teaching-foc* in 53% (47/88) of the occurrences, and in the context *teaching-con* in 48% (29/60) of the occurrences. Note that our data support the prediction that *routine-gen* is informal and displays a higher rate of schwa absence, whereas within our data there is no difference between *play-gen* and the remaining contexts regarding frequency of schwa absence.

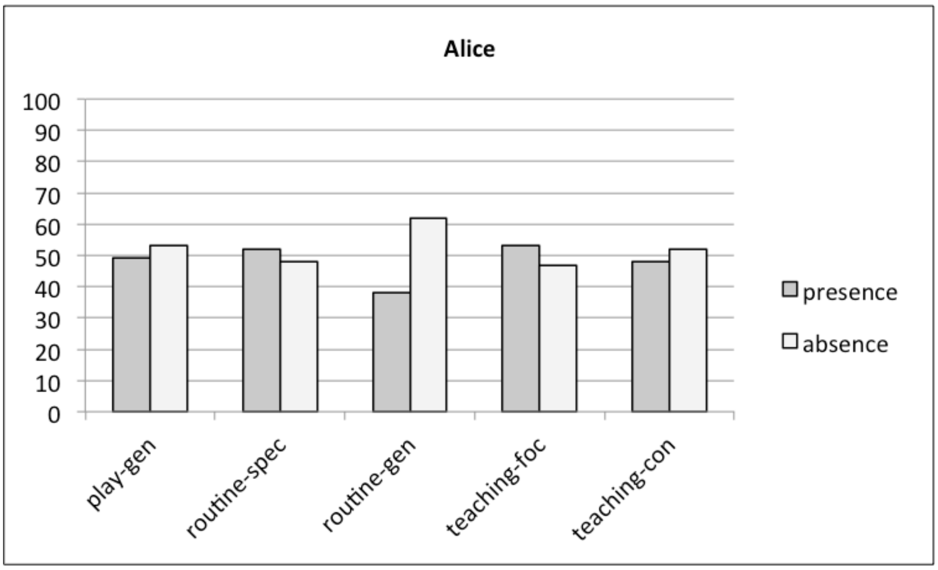

Figure 6.4: Schwa alternation by situational context, word-initial syllable, in the context V#C<e>C, CDS data from Alice (mother of Guy), by percentage

As for Valentine, the detailed results show that she, in the context *play-gen*, uses the variant with schwa in 30% (11/37) of the occurrences, in the context *routine-spec* in 29% (17/59) of the occurrences, in the context *routine-gen* in 21% (19/92) of the occurrences, in the context *teaching-foc* in 41% (31/74) of the occurrences, and in the context *teaching-con* in 27% (12/44) of the occurrences. Note that while the slight difference between *teaching-con* and *routine-spec*, seen in Figure 6.3, is neutralised in Figure 6.5, Valentine nevertheless, retains the highest rate of schwa presence in the context *teaching-foc*; this finding is predicted by our hypothesis that *teaching* is a formal context that is characterised by schwa presence in the CDS.

[286] Difference in speech rate is yet another factor that potentially interferes, but we leave this aspect for future studies.

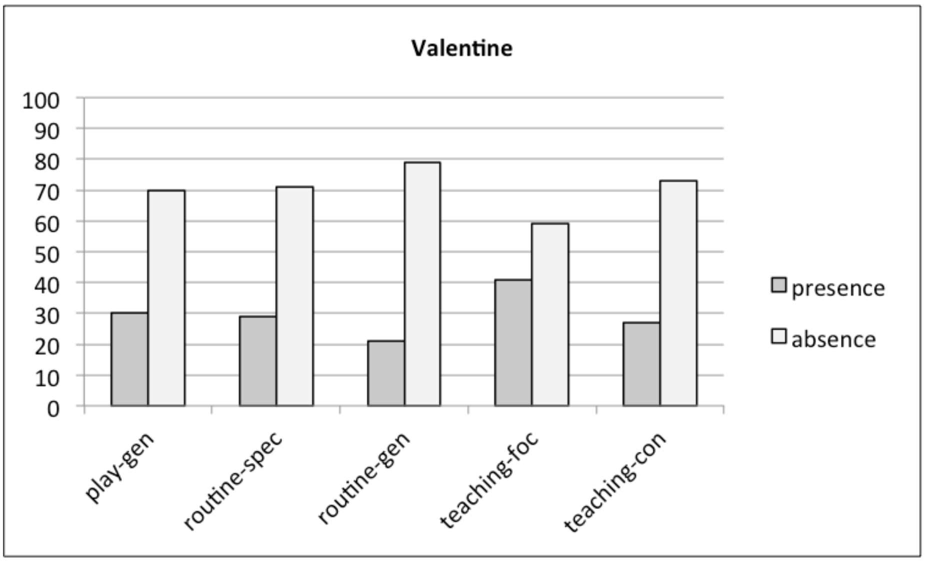

Figure 6.5: Schwa alternation by situational context, word-initial syllable, in the context V#C<e>C, CDS data from Valentine (mother of Adèle), by percentage

With respect to lexeme-specific behaviour, we recall from Table 6.3 that Alice and Valentine prefer different variants of the items *celui(-ci/là)* and *regarder*, i.e. Alice selects the variant with schwa, and Valentine the one without. These individual lexical idiosyncrasies are not likely to influence the data retrieved from the context V#C<e>C, simply because a large number of the occurrences are restricted to context ##C<e>C; therefore, they are excluded from the graphs in Figures 6.4 and 6.5. Thus, setting aside these items that are likely to confuse the more general picture of inter-speaker variation while also acknowledging that the number of occurrences per speaker is too small to yield any statistically significant results, we suggest that the distributions depicted in Figures 6.4 and 6.5 reflect a rather accurate picture of the mothers' individual styles.

Finally, although we examine only two caregivers and have only a small number of results, we put forward, with strict caution, that this inter-speaker variation is, in part, related to socio-economic conditions. Both mothers are currently stay-at-home mothers, but their level of education differs. Valentine has attended *école supérieure de commerce*, which is vocational education at the secondary level, whereas Alice has a university degree in Education Sciences. If the claim by Lucci (1976), that speakers with an elevated educational status have a better command on the situationally differentiated use of a schwa-item's two phonological variants, is true, then the difference in educational attainment between the mothers may explain the higher level of schwa presence in Alice's CDS. Of course, this claim cannot be confirmed without an analysis of a more comprehensive data set that also includes inter-adult formal and informal speech.

To sum up this section, the examination of schwa alternation in light of situational context in two mothers has lent some support to the claim that the full phonological variant is preferred in an educational or disciplinary context, whereas the reduced phonological variant is preferred in a *routine* context. Although the numbers are scarce, the data also reveal individual schwa behaviours that cannot be explained as a reflection of the child's phonological proficiency. These differences can perhaps instead be explained as a reflection of the mothers' relative mastering of different linguistic registers.

6.3.3.3 Results: schwa alternation and response type

The final factor mentioned in Section 6.3.2.2 as potentially influencing the rate of schwa alternation, i.e. the mother's type of response, has yet to be discussed in the schwa literature. Recall from Section 6.2 that the prime objective of CDS is to achieve optimal communication with the child. Optimal communication is controlled by the child in that communication depends on his comprehension and interest in the conversation topic, see Snow (1986):

> These are, in fact, very special kinds of conversations, in that the partners are very unequal. The mother can speak the language much better, but the child nonetheless can dominate the conversation […] Thus, at a semantic level, the mother's speech is very much shaped by the child's linguistic abilities, his cognitive abilities, his ideas and interests. (Snow 1986:80-81)

As a result of the particular kind of conversation, the types of responses provided by the mother differ considerably from the response types regularly found in inter-adult speech. E. V. M. Lieven (1978), for instance, in her study of the spontaneous speech in two English-speaking mother-child dyads, reveals and (re-)defines six recurrent response types.[287] We focus on the three types that are relevant for the present discussion, i.e. *corrections*, *expansions*, and *extensions*.[288] First, with *corrections*, the mother explicitly corrects the child in order to render his utterance syntactically, semantically, or phonologically well-formed. Second, with *expansions*, the mother expands on the child's utterance; she adds, replaces, or moves material in order to render it syntactically correct. Third, with *extensions*, in addition to expanding on the child's production, the mother extends his utterance to include excess semantic information. The new content is not necessary for the syntactic well-formedness of the utterance, but it does represent positive feedback in terms of the development of the topic of conversation; additionally, it allows the mother to encourage the child to be further engaged in the conversation (S. Barnes et al. 1983). Finally, E. V. M. Lieven (1978) mentions a high percentage of word-by-word repetitions, either of the child's utterance or the mother's own utterance[289], but she does not include these in her list of definitions nor in the subsequent analysis.

All of the above-mentioned response types involve a repetition of one or several word(s) that the child initially uttered. Relevant for the present discussion is the relationship between the child's production and the mother's repetition of the schwa-item. The question is whether the mother responds with the variant uttered by the child, or whether she maintains her own strategy, e.g. compare Alice's more stable schwa presence and Valentine's more frequent schwa absence.[290] Moreover, does the response type influence the mother's selection of phonological variant, i.e. is presence vs. absence of schwa in CDS predictable on the basis of response type? Two hypotheses emerge from our knowledge about response types and schwa. First, given the structural and generally non-semantic target of corrections, we hypothesise that in corrective responses the mother provides the full structural form, i.e. with schwa present. In particular, this is the case when a correction is made with regard to phonological structure. Second, given that in expansions the mother focuses on the non-grammaticality of the child's utterance, i.e. by

[287] See E. V. M. Lieven (1978) for references to previous works examining these response types.

[288] The residual categories are *query*, *ignore*, and *ready-made* (cf. E. V. M. Lieven 1978:182-183, for definitions).

[289] Snow (1972) claims that the mother's repetition of her own utterances is a means to increase the child's processing time of a phrase. In line with later work by Newport et al. (1977), Snow (1972) hypothesises that the child first pays attention to the sentence's major components. The repetition, thus, allows the child to focus on minor constructions, like subordinate clauses, which he may have missed during the first exposure to the phrase.

[290] It is important to underline that it remains to be determined whether the rate of schwa alternation in the speech of individual children is the trigger for these two strategies. This aspect will be left for future research.

completing or correcting in order to render the phrase syntactically grammatical, we hypothesise that the mother's expansion includes all grammatical parts of the child's utterance. Given that the presence or absence of schwa is grammatical and freely selected in the context V#C<e>C, this hypothesis predicts that the mother should repeat the variant initially produced by the child. We further hypothesise that this strategy of schwa-variant repetition is part of a more general objective to draw the child's attention to the truly non-grammatical parts of his previously uttered phrase. Third, recall that an extension may also include an expansion of the phrase. Based on what is previously proposed for expansions, we hypothesise that the presence of a schwa-item in the newly added information triggers two possible strategies. If this schwa-item is heavily content-loaded, i.e. it has a clear referent for the child, the vowel is produced in order to maximise the transmission of the message. In the second case, where the schwa-item is not the locus for focus in the phrase, transmission, and thereby phonological clarity, is consequently rendered less important.

Before presenting the data, we note that some response types are susceptible to having an indirect effect on the prosodic and phonological structure of the phrase. For instance, when the mother corrects the child's utterance, we hypothesise that emphatic stress accompanies the transmission of the message in order to draw the child's attention to the corrected part of the phrase. Importantly, emphatic stress requires a syllable nucleus to dock onto and therefore, it entails an increased likelihood of schwa realisation.

Returning to Alice and Valentine, both use a variety of response types when interacting with their children. The corrective utterances including a schwa-item that we observe in the data all present the variant with schwa, regardless of the type of correction that is made, see the examples in Table 6.6. However, the types of corrections performed by the two mothers differ in that Alice comments on phonological, morphological, and semantic errors, while Valentine in the majority of cases makes only phonological corrections. The literature on the mother's fine-tuning to the child's linguistic competence suggests that we should consider the corrections presented in Table 6.6 as a reflection of the mother's sensitivity to the current child grammar.[291] Guy has a near-adult phonological system and displays practically no articulatory errors; nevertheless, he has not fully mastered irregular noun declension and complex tenses such as the conditional and future. Adèle, on the other hand, reveals a phonological system that is undergoing development. Even if she, too, displays many morphological and syntactic errors, it is possible that Valentine in this period focuses on the lexical items and considers declension, inflection, and word order to be of secondary importance. Hirsh-Pasek et al. (1984), in their replication of the study by Brown and Hanlon (1970), focus on the number of repetitions in the parental speech of 40 English-speaking dyads, and observe that not only are mothers more inclined to repeat ungrammatical than grammatical sentences, but they are also more sensitive to the errors displayed by the two-year-olds than those displayed by the older children. They propose that this may be due to the high number of errors produced by the young children, which makes them easier to perceive. It is important to underline that so far we have only examined the parental utterances with schwa; if it turns out that Valentine primarily focuses on segmental errors, one could hypothesise that in addition to the shift in rate of sensitivity to ungrammatical forms with age and competence, there is also a shift in sensitivity to *type* of ungrammatical forms with age and competence. Any claim about whether the initial focus on segmental errors is a reflection of the perceptual salience and semantic importance of the individual segments must, at this point, be advanced as a mere speculation.

[291] Moerk (1976), in a study of 20 English-speaking mother/child-dyads, observes that whereas older children receive corrections of target consonant clusters, younger children primarily receive corrections of single consonants.

	Child utterance	**CDS utterance**	**Prosodic cues σ_1**	**Context**
Phono- logical correction	[pu a teje mwa] *pour ? tenir moi* to ? hold me (Adèle 2;09.23)	[puʁ tœ **tœ**niʁ] *pour te tenir* to hold you	- H tone	Change diapers on bathinette
	[haθjø] *monsieur* mister (Adèle 2;07.10)	[œ̃ **mːœ**sjø] *un monsieur* a mister	- Lengthened consonant (15ms)	Puzzle with picture of boy
	[ɛnə mwa ʌtame] *maitenant moi refermer* now me close (up) again (Adèle 2;09.29)	[**ʁœ**fɛʁme] *refermer* close (up) again	- H tone	Play with “summer window” in paper
	[mwa ɔve mwa] *moi enlever moi* me take off me (Adèle 2;08.02)	[ɑ̃**lœ**ve…ɑ̃**lœ**ve] *enlever … enlever* take off (the pants), take off	- <en>: H tone, increased intensity - No prominence on inserted schwa	How to avoid poop in pants
Morpho- logical correction	[ʃœvo] *maintenant c’est chevaux* now it’s horse (Guy 3;03.13)	[**ʃœ**val] *cheval* horse	- H tone	Play with animal domino
	[ʁɔkɛ̃] *un terriblement requin* a terribly shark (Guy 3;05.02)	[**ʁœ**kɛ̃] *un terrible requin* a terrible shark	- <ter>: H tone and increased intensity - No prominence on schwa	Ball with pictures of sharks
Semantic correction	[dʏɔʁ] *il faut un peu aller dehors* we must go a out a bit (Guy 3;05.02)	[**dœ**dɑ̃] *dedans* inside	- increased intensity	Play with a ball inside

Table 6.6: Phonological, morphological, and semantic corrections, CDS data from Alice (mother of Guy) and Valentine (mother of Adèle)

The examples in Table 6.6 illustrate that the word that is subject to correction frequently receives prominence on the initial syllable. When prominent initial syllables contain an underlying schwa, the presence of the vowel is more optimal than its absence because a phonetic vowel is the preferred docking site for prominence. In fact, Garnica (1977) shows that one of the characteristics of CDS is the assignment of multiple prominences per phrase. For French, one may hypothesise that the assignment of multiple prominences in CDS entails a higher rate of prosodically prominent schwa syllables compared to inter-adult speech. If this is true, the perceptual salience of schwa is enhanced in the child’s input. Recall from Section 2.5.2.2 that Swiss French is characterised by optional non-final prominence. Also, recall from Section 2.5.4 that speakers from Neuchâtel, Switzerland, accept the variant without schwa more easily than speakers from Nantes, France, do. These findings taken together, there is no evidence that optional non-final prominence increases the rate of schwa presence in inter-adult Swiss French. The question remains, however, whether there is a link between non-final prominence and rate of schwa presence in Swiss French CDS.

Evidence for the assumed difference in schwa alternation between a phonological correction and an extension is nicely demonstrated in an interaction between Valentine and Adèle (2;09.23). Adèle is in the living-room doing a puzzle picturing three horses. Valentine, who is in the kitchen and thus unable to examine the puzzle herself, asks Adèle to tell her about the picture. Adèle tells her mother that *ça c'est un jeu à cheval* [tɔvală] 'that is a game with horses'. Valentine repeats and corrects with the schwa present, *un cheval?* [ʃœvalœ̆] 'a horse', and then builds on the child's utterance, but with the schwa absent: *Ah, puis il y en a plusieurs de chevals?* [ʃval] 'Ah, and are there several horses?'. In this extension, the mother neither retains the variant selected by Adèle nor the one she previously selects herself, i.e. the one with schwa present. This goes against our hypothesis and indicates that the selection of variant in this case is more complex than predicted.

Pure word-by-word repetitions seem to follow a different principle than the corrections; in the cases attested in the data, the mother repeats the variant of the schwa-item used by the child. As schwa presence and absence are both equally grammatical, the mother does not need to correct the vowel in order to render the phrase grammatical (cf. Table 6.7 for examples). There is one exception in Table 6.7, which is the absence of a correspondence between Adèle's production of *petit chat* and the following repetition by Valentine. As previously mentioned, *petit* is particular by its frequency of occurrence and schwa absence in the context C#C<e>C. In this case, Valentine produces a schwa that is not uttered by Adèle, and it is possible that the explanation resides in Adèle's reduction of target cluster [pt] to [t]. To put it more precisely, Valentine's utterance potentially constitutes a phonological correction and not a mere repetition. However, the reason for not classifying this example as a correction is that [ti] for *petit* is also found in regular adult speech and does not constitute an incorrect form, *per se.* The hypothesis that [ti] is not considered sufficiently ungrammatical by the mother is shown in Example (3-b), where Adèle's production [ti] is followed by an expansion by the mother containing [pti].

Child utterance	**Mother utterance**	**Gloss**
Adèle	**Valentine**	
un puzzle à [tɔ]val (2;09.23)	un puzzle et un [ʃœ]val?	a puzzle (with/and) a horse
des [pø]tits lapins (2;09.15)	oui c'est [pœ]tit lapin	(yes it is) small rabbit(s)
c'est là-[de]dans (2;08.16)	c'est là-[dœ]dans ouais	it's in there (yes)
[∅]ti chat (2;07.10)	un [pœ]tit chat	(a) small cat
Guy	**Alice**	
non c'est le [∅]tit garçon (3;07.04)	oui c'est le [pt]tit garçon	(no/yes) it's the little boy
c'est pas marqué Suisse [dʏ]ssus (3;06.13)	non c'est pas marqué Suisse [dœ]ssus	(no) it does not say Switzerland
sauter par-[dø]ssus [l] but (3;06.13)	sauter par-[dœ]ssus [l] but, non	jump over the goal (non)
un [mt]it fil (3;06.13)	un [pt]it fil	a small thread

Table 6.7: Repetition of a child production, CDS data from Valentine (mother of Adèle) and Alice (mother of Guy)

Before we look at the examples of expansions, presented in Table 6.8, we mention that our sampling strategy may have encouraged the mothers to repeat the children's utterances, potentially leading to a greater use of expansions than what is normal in their CDS (cf. Wells 1982). Nevertheless, we only find examples of expansions in the data from Valentine, which is a natural consequence of the fact that Guy, Alice's child, produces few grammatical errors.[292]

[292] We underline that we restrict ourselves to analysing utterances with schwa.

Recall that our hypothesis on expansions claims that the variant of the schwa-item produced by the child is repeated in the parental expansion because the presence or absence of schwa is not ungrammatical and hence should not be altered. It could be due to chance or insufficient empirical material, but Valentine's expansions support our hypothesis. When Adèle produces no vowel corresponding to target schwa, Valentine does not realise schwa in her expansion, and vice versa. If Adèle produces a vowel, her mother repeats it. The third example in Table 6.8 shows there is one exception in the data. Adèle produces a vowel that is not repeated by Valentine. Again, the exception concerns the item *petit*, which in Valentine's CDS has an overall deletion rate of 78% (73/94). If we take into account both the high rate of schwa absence in Valentine's CDS and the sporadic schwa absence in Adèle's productions, then we could propose that the absence of repetition is a reflection of the mother's sensitivity to the child's schwa alternation in *petit*. The lack of other examples prevents us from further elaborating on this issue.

Adèle	**Valentine**
Schwa presence in productions of child and mother	
θa pɪtit *ça petite* that small$_{\text{FEM}}$ 'That is small' (2;07.10)	sa sɛ pœti *ça c'est petit* that that is small$_{\text{MASC}}$ 'That is small?'
wa a lu əni *voit un loup venir* see$_{\text{PRE-SG}}$ INDEF wolf come$_{\text{INF}}$ '…sees a wolf coming' (2;08.02)	il a vy vœniʁ lœ lu il a vu venir le loup he AUX see$_{\text{PAST-PART}}$ come$_{\text{INF}}$ DEF wolf 'He saw a wolf coming?'
pɑti kɔθɔ dowa babuθ petits cochons Dora Babouch small$_{\text{PL}}$ pig$_{\text{PL}}$ D B 'Small pigs Dora Babouch' (2;07.25)	doʁa ɛl a dɛ pti kɔʃɔ̃ Dora elle a des petits cochons D she has iNDEF small$_{\text{PL}}$ pig$_{\text{PL}}$ 'Dora, she has small pigs?'
Schwa absence in productions of child and mother	
ti paθo ale dɔ lo *petit poisson aller dans l' eau* small fish go$_{\text{INF}}$ in DEF water 'Small fish go in the water'(2;09.02)	sɛ pti pwasɔ̃ ki va dɑ̃ lo *c'est petit poisson qui va dans l'eau* it is small fish that go$_{\text{PRE-3SG}}$ in DEF water 'It is small fish that goes in the water?'
mwa made mwa *moi demander moi* me$_{\text{STRESSED}}$ ask$_{\text{INF}}$ me$_{\text{STRESSED}}$ 'Me ask me' (2;08.22)	ty dwa dmɑ̃de wi *tu dois demander oui* you must$_{\text{PRE-2SG}}$ ask$_{\text{INF}}$ yes 'Yes you have to ask'

Table 6.8: Expansions of a child's production, Adèle and her mother Valentine

Finally, the extensions in Table 6.9 show a less straightforward distribution of the variants with and without schwa. In accordance with our hypotheses, we first examine the extensions in which schwa is part of the expanded phrase. In these examples, the mother retains the presence or absence of schwa in the child's previous production; hence, the claim that schwa absence or presence is not perceived as ungrammatical is further strengthened.

Child utterance	Mother utterance	Gloss
Adèle	**Valentine**	
pas là-[de]dans là-[∅]dans (2;09.29)	d'accord ça va *pas là-[dd]ans*	ok, it is not going in there
moi [ɔ]fais (2;09.15)	tu *[ʁœ]fais* à l'envers?	you're doing again upside down?
[ɔ]garder (2;09.02)	tu veux *[ʁœ]garder* d'abord?	you want to look first?
moi pas [a]garder la télé (2;08.22)	tu peux pas toujours *[ʁœ]garder la télé*	you cannot always watch TV
laisser un tout [∅]tit moment (2;09.02)	*un tout [pt]it moment* pendant qu'elle range	a short moment while she gathers her things
tout [∅]tit peu (2;08.09)	un *tout [pt]it peu* seulement	just a little bit
papy est [∅]nu chez moi (2;08.09)	une fois *il est [vn]u chez toi?*	once he came to your home?
moi deux ans et [∅]mi moi (2;08.09)	tu as *six ans et [dm]i* toi? Ben dis donc …	you're six and a half years? You don't say …
Guy	**Alice**	
une toute [pø]tite chambre (3;07.04)	dans les prisons il y a des *toutes [pœ]tites chambres*	in the jails there are very small rooms?
[dɘ]main soir (3;03.19)	*[dœ]main soir* on fait la fête? Pourquoi on fait la fête *[dœ]main soir*?	Tomorrow we are celebrating? Why are we celebrating tomorrow?
le [pt]it (3;05.30)	*le [pt]it* frère de Christian?	Christian's baby brother?
le tout [pt]it bout il est là (3;03.19)	*le tout [pt]it bout* du panier?	the tiny part of the basket?
là il voit un tout [ft]it peu (3;03.19)	oui *il voit un tout [pt]it peu* avec seulement un œil	yes, he can see a little bit with only one eye
on [a]fabrique (3;03.19)	ah *on [ʁf]abrique* une patte, bien sûr	ah, we remanufacture a paw, of course
c'est un [mt]it cochon (3;03.13)	mais oui dans l'histoire des six *[pœt]its cochons*	but yes, in the story about the six small pigs

Table 6.9: Extension of a child's utterance that include schwa in the expansion, data from Adèle and her mother Valentine, Guy and his mother Alice

Note that there are two exceptions, written in the bottom of Table 6.8, that merit some discussion. In the utterance *Ah on [ʁf]abrique une patte, bien sûr*, Alice does not reproduce the schwa initially uttered by Guy in *On [a]fabrique*. A combination of two factors may account for the schwa absence in her speech: first, *refabriquer* is a verb and as such does not have a concrete referent in the situation; second, it contains word-initial [ʁ], which frequently triggers schwa alternation in inter-adult speech. Also, we cannot ignore the possibility that the occasional schwa absence in this segmental context in Guy's speech (cf. Section 7.3) may contribute to schwa absence in his mother's speech. In the second example, *Mais oui dans l'histoire des six [pœt]its cochons*, when we additionally look at how prominence is assigned, we see that Alice stresses every second syllable in nominal phrase *six petits cochons*; [**si**-pœ-**ti**-kɔ-**ʃɔ̃**] (cf. the tonal peaks in Figure 6.6). To create an alternating rhythm, in this case, the presence of schwa is required.

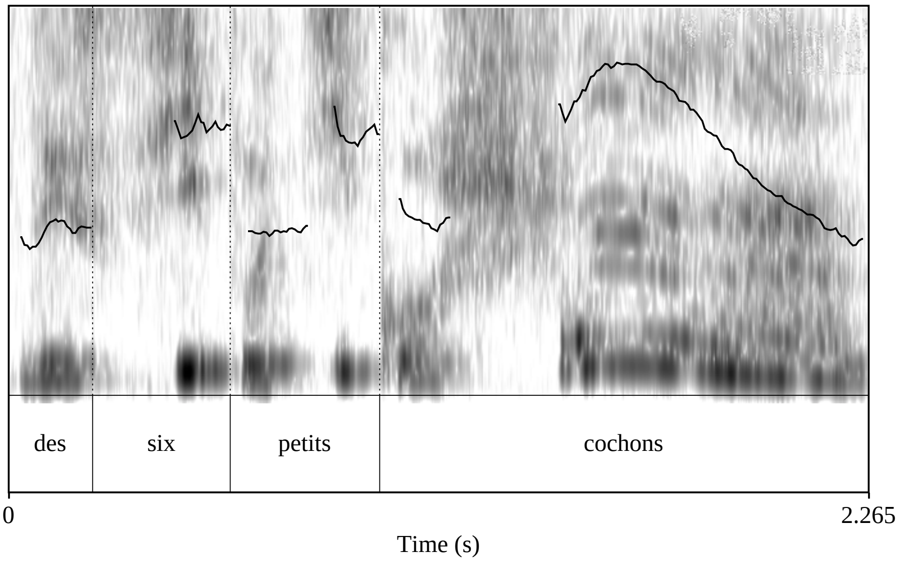

Figure 6.6: Intonational peaks in *des six petits cochons,* speaker Alice

Concerning extensions, we hypothesise that new information is realised with or without schwa depending on the “semantic load” of the given item. In other words, items with a clear referent contain schwa, whereas there are less strict restrictions regarding schwa presence for items that does not receive focus. The data reveal that there is schwa variation in the mothers’ extensions, however the scarce amount of examples, some of which are presented in Table 6.10, does not allow us to present even a preliminary conclusion.

Child utterance	**Mother utterance**	**Gloss**
Adèle	**Valentine**	
les fleurs (2;09.29)	aux [pt]ites *fleurs* oui	*to the small flowers yes*
trois (2;09.23)	*trois* [ʃœ]vaux?	*three horses?*
…au lit papa (2;07.10)	il mettait *au lit papa*? Il [ʁœ]met Tchoupi au lit?	*he put into the bed, daddy? He puts Tchoupi back into the bed?*
Guy	**Alice**	
arc-en-ciel (3;05.02)	oui ça [ʁs]emble à un *arc-en-ciel*	*yes it looks like a rainbow*
cochons (3;03.27)	il y avait quatre [pœ]tits *cochons*?	*there were four small pigs?*
truc (3;03.05)	ah c’est un [pt]it *truc*	*ah, it’s a small thing*
jouer (3;02.14)	ah ils vont *jouer* à [ʒn]ève?	*ah, they’re gonna play in Geneva*
pas aimé (3;02.19)	oui [sœ]lui de papa tu as *pas aimé*	*yes, you didn’t like your daddy’s*

Table 6.10: Extension of a child’s production without schwa in the expansion, data from Adèle and her mother Valentine, Guy and his mother Alice

Before concluding this section, recall from Section 6.2 the increased use of questions in CDS (see Savić 1974, cited by Ferguson 1978). For instance, the mother frequently repeats the child’s utterance but recasts it as an interrogative in order to maintain semantic continuity and to encourage the child's turn-taking (Snow 1986). In particular one example in the data from Valentine, presented in Example (3), clearly indicates the mother's interest in clarifying what the child has just said. In the context, Adèle (2;07.10) is playing with her socks and refers to something as becoming old or big (target *grand*), and Valentine tries to interpret the referent. The focus is on the two alternative referents (*tu* 'you' and *chausettes* 'socks'), not the verb, and as predicted by our hypothesis, schwa is absent in *devenir* 'become'.

(3) Clarification via interrogative

<u>Adèle</u>	<u>Valentine</u>
w̃a ja ɣɔt	*toi tu* [dv]*iens grande ou c'est les*
me$_{\text{STRESSED}}$ become$_{\text{PRE-SG/3PL}}$ big$_{\text{FEM}}$	*chausettes qui* [dv]*iennent grandes?*
'I/mine is/are becoming big' (2;07.10)	'you are becoming big or is it the socks that are becoming big?'

A different kind of clarification is revealed in Alice's recasts, which further confirms the usage of schwa presence as an emphatic element in the transmission of a more directive message. In one context, Guy (3;03.05) is in his room and does not want his mother to go there, he utters *Non, elle va pas* [vn]*nir* 'No, she's not going to come'. Alice, who is currently in the living-room, hears the child and recasts his phrase as a question: *J'ai pas* [l] *droit* [d] [vn]*nir?* 'I'm not allowed to come?'. When Guy refuses to answer, the mother comes into his room and repeats the question, this time with schwa present in the polysyllable, i.e. *Guy, j'ai pas* [l] *droit* [d] [vœn]*ir?* In short, Alice displays a CDS in which schwa presence seems to function as support in quite specific conversational contexts, i.e. in directive verbal actions, in emphasised elements in a general context, and finally in more educational situations. For the latter context, we observe a difference in schwa behaviour between different schwa-items that may be explained by overt phonological competence in the child as well as the lexeme-specific frequency of schwa absence in Alice's inter-adult register. See Example (4).

(4) CDS reflecting a child system on the verge of alternation

a. Schwa presence

Guy	Il r**e**met sur les arbres (3;03.19)	*He puts back on the trees*
Alice	On peut plus les r**e**mettre sur les arbres	*It is not possible to put them back on the trees*
Guy	Mais c'est quel jour? (3;03.13)	*But what day is it?*
Alice	C'est le deuxième jour de la s**e**maine	*It is the second day of the week.*
Guy	C'est quoi?	*What is it?*
Alice	C'est l∅ mardi. C'est un jour d**e** la s**e**maine	*It's Tuesday. It's a day of the week.*

b. Schwa absence

Guy	C'est un p∅tit ch∅nit (3;02.14)	*It's a small (worthless) thing*
Alice	Mais c'est pas un p∅tit ch∅nit, Guy	*But it's not a small (worthless) thing, G.*

In sum, the results presented in this section have first of all shown that schwa presence is categorical in corrections of a segmental character, which indicates that the schwa vowel is important for drawing attention to the syllable in question. The data have further revealed that the variant of the schwa-item uttered by the child is also selected by the mother in certain repetitions, expansions and recasts, as long as the situational context does not specifically require schwa presence (cf. discussion on situational contexts in Section 6.3.3.2). To end this section, we emphasise that discourse features in CDS are beyond the scope of this thesis, and that the examples provided above function merely as a sketch of the situationally conditioned schwa behaviour in the child's input.

Before concluding this chapter, we briefly discuss orthographic representation as a second type of input to the child.

6.4 Postscript: orthography as indirect input

Our sampling strategy, presented in Section 4.2.3, is appropriate for studying the interaction of schwa and phonological constraints on consonant sequencing and syllable deletion in child language. Before turning to the child language data in the next chapter, we find it important to briefly mention one type of input to the child that is hitherto not properly presented, the orthography. On several occasions we mention that in reading, the presence of schwa is stronger than in spontaneous speech; a pattern also found in nursery rhymes and songs.[293] Although the orthographic representation is important for the global understanding of schwa, the primary interest in this study lies in the shape of the underlying representations prior to the acquisition of literacy skills. At this pre-reader stage, word recognition cannot rely on orthographic representations and must rely solely on the verbal input. In this regard, there is a recent study by Racine et al. (accepted for publication) that analyses the relative importance of orthography and frequency of variants for the recognition of schwa-items by pre-readers, ages 5;01-6;00, and readers, ages 9;00-10;06. Using a word-monitoring experiment, they show that items with schwa in the initial syllable and items with schwa in the word-medial syllable – words which according to our definition of schwa are subject to schwa epenthesis – are treated differently by the two groups. In both groups the variant with schwa is recognised faster than the variant without schwa in items with schwa in the initial syllable. For items with word-medial schwa, the pre-readers take more time to recognise the variant with schwa than the variant without schwa. For the readers, both variants are recognised equally fast. Racine et al. (accepted for publication) interpret these results to show the importance of orthography for the recognition of phonological variants. Pre-readers only rely on the frequency of variants in the auditory input and thereby need more time to recognise the variant with schwa of words like *bracelet* 'bangle' [bʁasəlɛ], infrequent in their auditory input. Readers, on the other hand, act like the adults (cf. Racine & Grosjean 2005) and make use of the orthographic representation (alongside frequency), which corresponds to the variant with schwa: *brac<u>e</u>let* = [bʁas<u>ə</u>lɛ].

The difference between pre-readers and readers with regard to schwa alternation is observed in a study by Goudaillier (1985). The following presentation and discussion on the linguistic production by ten six-year-old children, who have begun to attend school in Vervins, Northern France, indicate that the acquisition of literary skills also has an impact on the spontaneous production of items with graphic <e>:

> Dans *48%* des cas (28/59), le "*e* instable" n'est pas prononcé; dans *40%* des cas (24/59), il l'est, ce sous forme "centralisée", "neutre" ([ə]); on peut cependant noter que la situation d'enquête agit vraisemblablement, puisque des "e" sont prononcés là où l'enfant n'en

[293] One factor separating read speech from nursery rhymes and songs is the more frequent realisation of the word-final orthographic <e> in the latter two cases. Morin (2003) labels these *ornamental schwas*. This effect is nicely illustrated by our speaker Janice on several occasions in her spontaneous speech.

> produit pas habituellement; il est toutefois important de noter que presqu'un cas sur deux ne comporte pas de "e", contrairement à d'autres régions comme celle du Midi de la France. Les prononciations "arrondies" [ø̹], ne représentent que *12%* des cas (7/59). L'absence du "e" occasionne des formes telles [ʃmiz] *chemise*, [ʃv̥al] *cheval*, [ʒn̥ɷ] *genou*, [ʃv̥ø] *cheveux*, etc. (environ *50%* des occurrences).
>
> Telle était la situation relevée par l'enquête menée en Octobre 1979; lors de celle que j'ai effectuée en Mai 1980 auprès des mêmes enfants, la situation avait évolué de manière sensible sur ce point précis; l'école avait opéré son rôle de standardisation. Divers exercices de lecture effectués en classe entre octobre et mai auraient provoqué chez les enfants une prise de conscience du découpage syllabique des mots; de ce fait, pour les mêmes mots enquêtés (*cheval, cheveux*, etc.), ils se trouvaient désormais en situation d'hésitation, ne sachant plus s'il convenait d'employer ou non un "e" dans ces termes. Toute spontanéïté de prononciation était perdue. Ceci est un cas typique de perte d'un régionalisme (chute du "e") au détriment d'une normalisation/standardisation basée ici sur la forme écrite du terme (présence du "e"). (Goudaillier 1985:70-71)

It seems beyond doubt that the introduction of orthography has an impact on the child's treatment of schwa-items. One cannot reach a full understanding of schwa before understanding the exact nature of the transition to literacy. However, it is the non-readers who interest us here; thus, in the following chapters, we aim to contribute to the answer of two important questions: one, which factor – perhaps other than orthography – can cause the observed preference for the variant with schwa in non-readers' perception, and two, can this factor also account for the distribution of schwa in the non-readers' production?

6.5 Concluding remarks

In this chapter, we have presented and discussed our data on schwa behaviour in child-directed speech (CDS). At the outset of Section 6.3, we put forth three hypotheses: one, that schwa alternation in CDS reflects a higher degree of vowel presence compared to inter-adult speech, two, that CDS reflects a stylistic differentiation along the formal/informal dimension and three, that caregivers show sensitivity to the child's phonological competence. First, although the CDS data have shown that schwa alternation *does* take place also in this register, they have lent some support to the first hypothesis by indicating a lower rate of schwa absence than in inter-adult speech. The lower degree of schwa absence in CDS may be the effect of emphatic stress or a phonological clarity process. Whatever its motivation, this observation strengthens the general finding in previous CDS literature that the full phonological form is more optimal in CDS than the equally grammatical reduced form. The rate of alternation, however, seems to be somewhat regulated by the context in which the word is uttered. In support of our second hypothesis, an educative or a directive context favours schwa presence to a greater degree than does a more playful context. Although a broader study is required, the latter observation lends support to our second hypothesis and further strengthens the finding in previous literature that phonological variants in CDS are distributed along a scale of formality. The third hypothesis merits further discussion in that the child's phonological competence has not immediately shown to correspond to the rate of schwa alternation in the CDS. Alice, who is the mother of a child with a near-target-like system, produces a higher rate of variants with schwa than Valentine, who is the mother of a child that is still in the process of phonological development. This result by itself indicates that non-phonological factors are at work, and that an empirically balanced sociolinguistically oriented study is warranted.

To conclude Part II of the thesis, we underline that the potential effect of schwa alternation in CDS on the acquisition of schwa remains to be established. First, is it susceptible of delaying the categorisation process? Second, does it delay or speed up the understanding of the distribution of variants? As mentioned earlier, in some cases the children are not sensitive to variation in the input before they reach a certain level of phonological competence. In this regard, therefore, we find it most important to focus on the structural, phonological constraints in the children's grammar. A study of situational constraints in children's grammar must be left to future research. Nevertheless, given the fact that our child language data to be presented shortly indicate a certain sensitivity to schwa alternation in the immediate input, we cannot exclude the latter factor from the present work altogether.

The adult data presented in Chapters 3, 5 and in the current chapter form the background material for the analysis in Chapter 7 to follow. Having established the phonological, phonetic, and contextual behaviour of schwa in Swiss French, we now turn to the core of this thesis, the examination of the child language data.

PART III

SCHWA IN CHILD LANGUAGE

7. Schwa behaviour in child language

C'est petit peu renard ça
[sa ti pɛ kona sa]

Adèle (2;07.25) is at home, playing with a puzzle illustrating
Dora the Explorer, Boots, and the fox named Swiper.
She explains to her mother that on
one of the pieces there is a little part of the fox.

Je besoin de faire pipi et je reviens
[e jɛ̃ d fɛʁ pipi e ʒʌ ʁɔvjɛ̃]

Guy (3;05.23) is at home, playing with a train and a boat.
He suddenly has to go to the bathroom
but explains that he will be back.

7.1 Introduction

The preceding chapters have revealed the complexity of French schwa, and it goes without saying that a complete analysis of schwa alternation must examine a multitude of factors. From the examination of inter-adult data in Section 3.3 we have concluded that phonotactic, morphological, as well as lexical constraints are at work at the intra-grammar level. In addition, from the child-directed speech data presented in Section 6.3 we have concluded that the input to the child does not correspond to the estimated frequency of variants observed in inter-adult speech, which indicates that the rate of schwa alternation in the input changes during the course of acquisition. The data from the Swiss French caregivers have further revealed that schwa alternation is sensitive to the situational context, i.e. an educative context is shown to exhibit a higher level of schwa presence than a playful context.

In this chapter, we analyse the child language data in order to determine to what extent the various internal and external factors play a role in the acquisition of schwa alternation. First, in Section 7.3.2 we examine the children's spontaneous production of target schwa-items in light of their predicted alternation rate and secondary cluster type in order to determine the preferential patterns in their individual grammars. In particular we examine the nominal and verbal forms that are available across the different age groups, and we compare these results with the adult alternation rates presented in Sections 3.3 and 6.3. The examination of schwa behaviour in spontaneous speech is the foundation for establishing a tentative developmental path with regard to output structures that the children prefer. The goal of Section 7.3.3 is to identify how the learner linguistically reacts to schwa alternation in the immediate input. Does the learner use intra-grammar constraints allowing his preferential pattern, or does the learner imitate the input at the expense of his own preferential grammar? The semi-controlled data are first, and foremost, examined in light of the type of the item, i.e. cluster type, and true vs. nonsense word, across the various age groups; extra-linguistic data are also included to shed light on the linguistic data. Section 7.4 provides an explanation to the alternation patterns attested in the child language data by testing the data against two challenges that are reported in the acquisition of phonology literature. Section 7.4.2 is devoted to the challenge of consonantal sequencing, and Section 7.4.3 to the challenge of syllable deletability. To lend support to the hypotheses about the importance of phonotactic and syllabic constraints, we include independent evidence from the production data that are outside the group of schwa-items, i.e. items with complex onsets or rising diphthongs, e.g. *place* 'place' [plas] and *pieds* 'foot$_{PL}$' [pje], and items with vowels other than schwa in the non-prominent syllable, e.g. *ballon* 'balloon' [baˈlɔ̃].

In the next section, before turning to the presentation and analysis of the data, we present some theoretical preliminaries of the acquisition of phonological variables and their implications for the acquisition of schwa.

7.2 Theoretical preliminaries

7.2.1 The acquisition of phonological variables: previous research

Acquisition literature has primarily been focused on invariable processes in the target language. Recently, however, the acquisition of systematic variation has gained more attention as researchers have come to consider variation less a "by-product of the learning process, but an integral part of acquisition itself" (Roberts 2005:153-154). Further, regarding the order of acquisition of grammatical variables and grammatical invariables, Kerswill (1996) underlines that "[e]xactly when a child acquires a feature of his or her first dialect depends on the linguistic level, the complexity of the conditioning, and the child's age" (1996:199). Although the primary interest of this work lies in the intra-grammar constraints that regulate target schwa alternation, we cannot neglect the potential importance of the order of acquisition of grammatical and extra-grammatical constraints. According to Labov (1989), if the acquisition of phonological variables is governed by innate principles, then articulatory constraints should, by definition, be acquired prior to stylistic and social constraints. Labov's prediction is borne out by the findings by J. Smith et al. (2009), who report that for (t/d)-deletion in Scottish English, the phonological constraints that generate the preferential variation pattern are acquired before the stylistic ones.[294,295] J. Smith et al. (2009) examine children, ages 2;11-3;11, and across the eleven subjects the plosive is deleted in 34.5% of the total 501 occurrences; none of the children realise categorical preservation or deletion of the word-final apical segment. Most children exhibit a decrease in deletion rate, i.e. the full form with plosive becomes more frequent across phonological contexts as the child grows older. This change stands in direct opposition with the behaviour of the caregiver, who exhibits a gradual increase in deletion rate as the child grows older. Whereas the modification in the child's speech is considered to reflect the waning importance of a phonological constraint on consonant clustering, the caregiver's opposite pattern is explained as the gradual decrease of a more careful articulation in the child-directed speech (CDS). Further, the child does not reflect the style shifts used by the caregiver wherein less frequent deletion is observed in more formal situations. Left-hand and right-hand context, in addition to age, is the only significant factor that regulates (t/d)-deletion by the child.

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[294] The phonological constraint on (t/d)-deletion is that there is a higher deletion rate in the context C[t/d]#C than in the contexts C[t/d]#V and C[t/d]##. The stylistic constraint on (t/d)-deletion is that the consonant deletes more frequently in an informal speech style (cf. J. Smith et al. 2009:72; see also Wolfram 1969). Additionally, (t/d)-deletion rate is sensitive to the morphological composition of the word, i.e. the deletion rate is highest in monomorphemic words, and lowest in the weak past tense (J. Smith et al. 2009).

[295] See also Roberts (1995, 1997a, 1997b).

While stylistic constraints are not applied for target (t/d)-deletion in the child's production, J. Smith et al. (2007) test the hypothetical universality of the order *Linguistics first – Stylistics second* on other variables. They compare the acquisition of two variables that are both subject to grammatical and extra-grammatical constraints, the *hoose* variable and the use of inflectional *-s* in 3PL contexts.[296] The two variables exhibit different behaviour in several aspects. First, for the *-s* variable, both variants are present in the child's production from early on, whereas for the *hoose* variable, only the diphthong is authorised initially. Given that the *-s* variable requires the acquisition of a large number of linguistic constraints compared to the *hoose* variable, the authors claim that one could not predict the order of acquisition of variables based on apparent "simplicity". Second, although the linguistic complexity of the *-s* variable outranks its stylistic complexity, the linguistic constraints are acquired first. For the *hoose* variable, on the other hand, the lexical and the stylistic constraints are acquired simultaneously. J. Smith et al. (2007) analyse the asymmetrical acquisition of the two variables to be a function of their relative sociolinguistic weight as transmitted to the child by the caregiver. Concerning the *hoose* variable, the caregivers diverge from the linguistic community by their more frequent use of the diphthong [ʌʉ], which is the variant judged as having a "widespread, prestigious currency outside the community" (2007:91). Concerning the *-s* variable, the caregivers pattern with the linguistic community which, according to the authors, indicates a lower level of awareness with regard to its contextual conditioning. With *hoose* variable, then, the child is exposed to enough stylistically regulated variation that he first uses the standard variant categorically. With the *-s* variable, the child receives inter-adult variation patterns that fail to trigger any contextually conditioned usage. The presence or absence of overt stylistic regulation in the input, thus, seems to have a direct effect on the child's mastery of stylistic constraints.

The above-mentioned works conclude that the input patterns are paramount to the acquisition of variables, but we claim that, *a priori*, the general state of the developing phonological grammar may hinder the acquisition of the target variable. This idea originates from the massive empirical support for the claim that certain incoming invariable structures can be blocked from surfacing in the child's output. For instance, as already mentioned in Section 6.2, there is little evidence that the caregiver's correction of pronunciation errors has any short-term effect on the child's production. The following is an illustrative example from de Villiers and de Villiers (1979):

> […] Nicholas went from correctly pronouncing *turtle* at the age of fifteen months to pronouncing it as *kurka* at eighteen months. Systematic attempts to correct his pronunciation over a period of two months had no effect and the following interaction was typical:
>
> Peter: Say *tur.*
> Nicholas: *Tur.*
> Peter: Say *till.*
> Nicholas: *Till.*
> Peter: Say *turtle.*
> Nicholas: *Kurka.*

[296] We repeat from Chapter 6.3.3.1 the main characteristics of these variables. The *hoose* variable concerns the alternation between the "standard" variant [ʌʉ] and the local variant [uː] in a restricted subset of the lexicon, e.g. *You need to come d[uː]wn here, put that d[ʌʉ]wn!* (J. Smith et al. 2007:70). The *–s* variable concerns the use of inflectional *–s* in the context of 3PL noun phrases, e.g. *So what are they doing on Tuesday in the picture? What's the boy and the girl doing on Tuesday?* (J. Smith et al. 2007:80). Although the local [uː] and the use of *–s* are both disfavoured in more formal speech, style shifting is far more prominent for the former than for the latter variable.

> At twenty months Nicholas could produce the component syllables correctly but not the whole word regardless of how often we corrected him. (de Villiers & de Villiers 1979:109)

We provide a second example of an adult correction failing to have an effect on the child from our own database. Word-final sonorants are banned in Adèle's (2;08.22) grammar, which yields non-faithful production and repetition of target *pomme* 'apple' [pɔm] and *pull* 'sweater' [pyl].

(1) Non-faithful production of target word-final sonorants (Adèle 2;08.22)

Adèle:	Les [pʌt].
Valentine:	Pommes.
Adèle:	[pʌt].
Valentine:	Pommes.
Adèle :	[…]
Valentine:	[…] Ça c'est une pomme.
Adèle:	Oui!
Valentine:	Comment tu dis, toi?
Adèle:	[pʌt].
Valentine:	[…] Puis ça c'est, s'appelle comment? Ça c'est quoi?
Adèle:	Le [pytə].
Valentine:	Pull.
Adèle:	Ça pantalon.
Valentine:	Pantalon oui, mais ça c'est comment?
Adèle:	[pyt˺].
Valentine:	Pull.
Adèle:	[pyt˺].
Valentine:	[…] Pull puis pomme.
Adèle:	[pʌt].
Valentine:	Non pas po[t], pomme.
Adèle:	Uh pas [pʌt].[297]

If target reproduction of *pomme* and *pull* is unattainable because the grammar filters out the structural elements that are still prohibited in the output, i.e. [m, l] in the coda position, then it logically follows that the child is better equipped for adapting to the target form, whether it is categorical or variable, once his phonological knowledge is more advanced. Thus, returning to our discussion on variables, we claim there is a link between the inability to accept corrections on pronunciation and the selection of phonological variants in early child language; if one of the input variants is phonologically unavailable to the child because of high-ranked constraints banning its structure, it is plausible to assume that the child selects the alternative variant whose output form is available in his grammar. In this scenario, then, the grammar inhibits the child both from producing the alternation altogether, and from acquiring the extra-grammatical constraints on variation transmitted to him by the caregiver. These are free to operate on the grammar once both variants are authorised.[298] This is the case for the *hoose* variable in Scottish English; J. Smith et al. (2007:79) observe that "[o]nce the children start using both forms, they quickly acquire the external stylistic constraints on its use […]".

[297] Adèle's negative reaction to Valentine's repetition of her non-target form indicates that Adèle correctly perceives the word-final [m]. This is in line with the textbook example of *fish*, presented in N. V. Smith (1989), whereby the child only accepts the correct target form *fish* and not *fis*, while still being unable to produce the former himself.

[298] Note that a second scenario is plausible, whereby the child uses the "unavailable" variant in a modified form. We return to this alternative scenario in Section 7.2.2.

We end this section with a short comment on the caretaker, the "linguistic role model". If there is a gendered difference in the input regarding the use of a phonological variable, the child is shown to acquire the mother's variation pattern more readily (cf. Roberts 1997b, Foulkes et al. 1999, in support of this view, and Vihman 1993, in opposition to this view). To our knowledge, there are no examples in the literature on phonetic or phonological adjustment in the father's CDS. However, there are two independent factors that lead us to hypothesise that there is an asymmetry in the use of phonological variants between the mother's and the father's CDS. First, as already mentioned, in the case of gendered differences in CDS, the child tends to adopt the female patterns. Given that this is explained as an effect of the child spending more time with the female caregiver in the early years, it indirectly indicates that the stronger presence of a male caregiver would yield a different input to the child. Second, as already mentioned in Section 6.2, several works from the 1970s and 1980s – see M. E. Barton and Tomasello (1994) for references – show that the male caregiver is less sensitive to the child's linguistic knowledge and functions as such as a linguistic "bridge to the outside world" (Berko Gleason 1975:293). Thus, if the mother's CDS is characterised by a high degree of one variant, like the non-deleted form of the (t/d)-variable, the diphthongised form of the *hoose* variable, and the form with schwa of the schwa variable, which are all unreduced, more "standard" variants, the logical implication is that the father transmits a more balanced use of the two phonological variants that is nearer, or identical, to their frequency of use in the adult linguistic community.

We choose to introduce the father's role at this point because it may be the case that the child exhibits his full linguistic capacities when interacting with a more "demanding conversation partner". Recall that Crain and Wexler (1999) propose that the rejection of one of the alternative forms does not necessarily imply its ungrammaticality; it could merely reflect a preference in the grammar for one form over the other.[299] Thus, in our case, if both variants are available to the child, but one of them is greatly dispreferred, it is possible that an interaction with a conversation partner that frequently uses this dispreferred variant in the CDS triggers the child to change his output. In fact, the importance of observing the child in an unfamiliar context is noted by Brown (1973) in his study on the acquisition of morphology and syntax in English.

> [W]e do not presently have evidence that there are selection pressures of any kind operating on children to impel them to bring their speech into line with adult models. It is, however, entirely possible that such pressures do operate in situations unlike the situations we have sampled, for instance, away from home or with strangers. (Brown 1973:412)

7.2.2 The acquisition of phonological variables: implications for schwa

In Section 7.2.1 we present two phonological variables in English, i.e. (t/d)-deletion and the *hoose* variable. If we take the traditional view and claim that schwa is present in the underlying form, then schwa alternation differs from (t/d)-deletion by the fact that the former implies sequencing of underlyingly *non-adjacent* consonants. If cluster reduction of underlyingly *adjacent* consonants, observed for the (t/d)-deletion variable, is a preferred strategy in child language, then it follows that the sequencing of non-adjacent consonants should also be dispreferred in the output. Conversely, the *hoose* variable is similar to the schwa variable in that both require a definition of a lexical subset in order to separate the items that display categorical

[299] Note that Crain and Wexler (1999) discuss grammatically ambiguous sentences and how to interpret the preference for one reading over another. Even if their results cannot be of any direct use in our study, we find it reasonable to assume that their claims can be extended to include a preferential phonological grammar in which output candidates compete.

behaviour from those that display variable behaviour. With both variables there are non-alternating and alternating forms; for the *hoose* variable there are non-alternating and alternating [ʌʉ] and for the schwa variable there are non-alternating and alternating [œ] (cf. Section 3.3.2). J. Smith et al. (2007) observe that the youngest children are categorical in their use of the diphthongised form, despite their exposure to variation in the input. The Swiss French CDS data in Section 6.3 also reveal variation, although a high rate of schwa presence is attested across the corpus. Thus, despite the fact that there are two variants of schwa-items present in the input, the possibility exists that the young children do not use both variants. Therefore, the first important aspect to consider in this chapter is whether the child exhibits schwa variation, i.e. whether the child in his production makes use of two alternative forms for a single schwa-item.

(2) Hypothesis A1
Two variants of a given schwa-item are not available to the child.

Hypothesis A2
Two variants of a given schwa-item are available to the child.

If variation is attested, Hypothesis A2, whether it is in the naturalistic setting or in the semi-controlled one (cf. Section 4.2.3), then a second important aspect concerns the conditions in which the two variants are used. Recall the theoretical possibility that one of the variants is strongly dispreferred, albeit available for use in given situational contexts. As a first step toward determining the relative importance of extra-grammatical factors for the production of schwa-variants, we test the hypothesis in Example (3).[300]

(3) Hypothesis B1
Two variants of a given schwa-item are available to the child, and their use is constrained by the input.

The input distribution pattern may be of durable or transient importance. As regards durable importance, recall that lexeme-specific schwa alternation frequencies in the individual speaker reflect the frequencies attested for the linguistic community (Racine & Grosjean 2002). We refer to Section 3.3.2.2 for alternation frequencies in Swiss French. As regards transient importance, a study on imitated speech by Leonard et al. (1978) reveals that imitative utterances are subject to the same production constraints as utterances produced spontaneously. They further observe some cases in which the syllabic and the segmental structure of the child's imitative production are not attested in his spontaneous speech. Interestingly, though, in some of these situations, the child rapidly switches to a production that conforms with his own production grammar.

> In our study, there were a few instances when, after imitating a nonsense word, the child turned and handed the referent object to the mother, naming it as he presented the object. In nearly half of these instances, the child's production changed, seemingly in a direction more consistent with the production constraints operating on his spontaneous speech. The following examples are representative.
>
> (1) (Experimenter hands object to David)
> *Here's an adʒadʒ* *adʒə*
> (David turns to mother) *adə*

[300] Recall, however, that target alternation rates vary from one schwa-item to another.

(2) (Experimenter hands object to Gil)
Here's a ʃoðz *ʃot*[s]
(Gil walks over to mother with object) *tʃot*[s]

(Leonard et al. 1978:413)

The authors suggest that, although limited in number, the imitative occurrences followed by the production of a modified form indicate that the child's perceptual-motor abilities are more advanced than his phonological system. Our Hypothesis B1 does not concern the nature of the variant produced by the child, i.e. whether it has been filtered through the child's phonological grammar or whether it is a surface-based repetition of the input. Rather, the hypothesis predicts that the child exhibits overt sensitivity to schwa alternation in the input and selects an output in accordance with the latter. For a discussion on the nature of the schwa-item in the child's production, see Section 7.4.

In this chapter we also test a hypothesis about schwa alternation that focuses on the interaction of intra-grammatical and extra-grammatical constraints. Recall that the order of acquisition of intra-grammatical and extra-grammatical constraints depends on the variable in question, i.e. in some cases both types of competence develop simultaneously, whereas in other cases, grammatical competence is prerequisite for the extra-grammatical competence to develop. Regarding schwa alternation, it is important to determine whether the child exhibits overt sensitivity to variation in the input even if he does not master both target variants, e.g. *cheval* 'horse' [ʃœval] ~ [ʃval], with preservation of the schwa position and realisation of target [œ] vs. deletion of the schwa position and sequencing of the surrounding consonants. To put it more precisely, if one of the target variants is unavailable, we hypothesise that the child, nevertheless, is able to realise schwa alternation by circumventing the problematic part of the target structure.

(4) Hypothesis B2
Exposed to variation in the input, two variants of a given schwa-item are available to the child. The dispreferred variant is modified to conform with production constraints that operate on his spontaneous speech.

Finally, given that we assume the behaviour of schwa in child language is intimately linked to the development of the phonological grammar in general, we expect there to be a developmental path that leads to target-like schwa alternation. Five hypothetical steps are presented in Figure 7.1, which reflect an ordering of *Phonology first – Stylistics second*. The first hypothetical step is the categorical deletion of the entire schwa syllable, [CV_1]. This is in line with previous research (cf. Fikkert 1994, Demuth & Johnson 2003) that shows that unstressed syllables are deleted across the board at an early stage. We further hypothesise that deletion of [CV_1] syllables is retained longer for schwa-items than for other items because schwa absence is one of the variants attested in the input and, thus, constitutes a viable alternative regarding syllable structure.[301] The second hypothetical step contains two options. The first option is the faithful production of the schwa syllable. The motivation behind the production of this structure is either to avoid consonant sequencing or to avoid syllable deletion, both of which are known obstacles to the child's language development (cf. Fikkert 1994, Rose 2000, A. Carter & Gerken 2004); see the analysis in Section 7.4. The second option is the preservation of [CV_2], alongside [CV_1CV_2], where [CV_2] functions as a schwa-less variant in contrast to the newly installed variant with schwa presence. This alternative is in line with claims that intra-grammatical and

[301] Note that output [CV_2] does not constitute a viable alternative when it comes to segmental faithfulness, /CV_1CV_2/ ⟶ [CV_2] includes the deletion of one underlying consonant.

extra-grammatical constraints develop in tandem. The third hypothetical step is the gradual emergence of a schwa-less variant with a secondary cluster next to the, still preferred, variant with schwa. The motivation behind the gradual process is either the acquisition of the various cluster types or the mastery of syllable deletion in the different schwa-items. The fourth step is the establishment of the structural requirements, i.e. the grammar authorises both consonant sequencing and syllable deletion. Recall that in the case of the *hoose* variable, once both variants are available to the child, he rapidly masters their distribution. We hypothesise that the same is true for schwa alternation; once the prosodic and segmental structure is acquired, the child sets out to learn the rates of schwa alternation for both the various schwa-items and the different situational contexts. This is in line with claims that a certain degree of phonological competence must be attained before extra-linguistic factors can be focused on. The fifth step is the demonstration of competence with the lexically and situationally defined rates of schwa alternation. At this step, the child graduates from the developmental path and his schwa alternation is target-like.

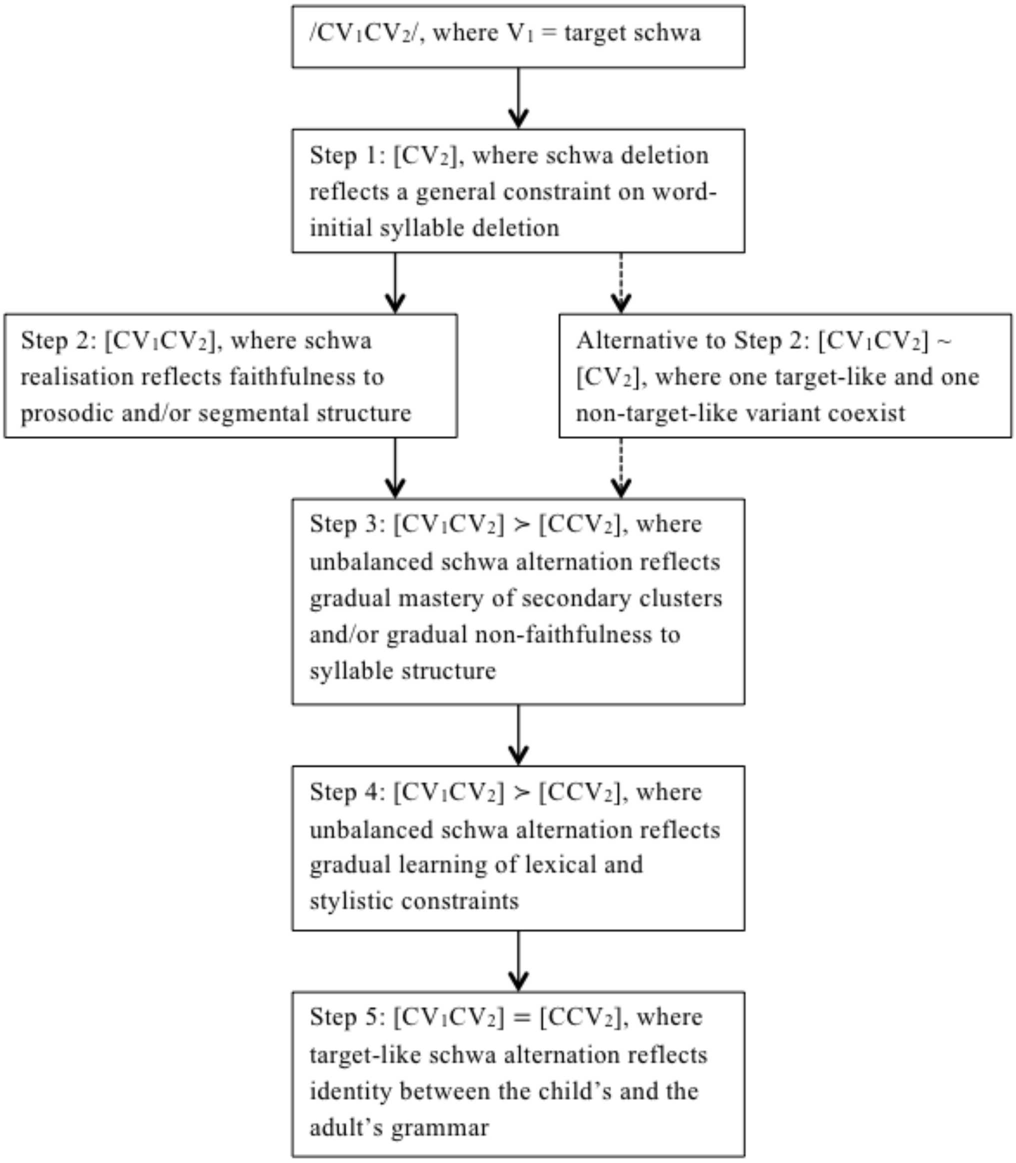

Figure 7.1: Hypothetical steps on the developmental path toward target-like schwa alternation

As a means to obtain empirical support for or against Hypotheses A and B, and further, to test our hypothetical developmental path, the child must be observed interacting with conversation partners who are likely to reveal the child's full linguistic capacities. First, the recording sessions at home, or in the kindergarten in the case of Fabienne and Henri (cf. Section 4.2.2), where the child interacts with the mother or the researcher in more or less free play, are intended to trigger the spontaneous production of schwa-items. Second, recall from Section 7.2.1 that a male caregiver or a stranger, less adapted to the child's linguistic level, may trigger the production of both preferred and non-preferred variants of the schwa-item. This is the goal of the test recordings in the kindergarten, where the child primarily interacts with the male Vaudois speaker, coded *Machine*. *Machine* qualifies as a challenging communication partner because he produces a high degree of the child's dispreferred variant.

Section 7.3 is a presentation of the data in the child language corpus. We first present the data obtained in the naturalistic setting. Next we turn to the data obtained in the semi-controlled setting. The main focus is on schwa presence vs. absence, types of output structures observed, and the child's sensitivity to the immediate input. These results serve as a basis for the analysis in Section 7.4 where we examine schwa behaviour in light of consonant sequencing and syllable deletion. Before we turn to the data, it is appropriate to mention that, until this point, we have not challenged the assumption that schwa alternation is a complete process, i.e. that schwa is either present or absent in the output. However, phonetic studies show that schwa in target French varies between "full", more or less reduced, and completely absent in the phonetic output.[302] Although we do not know when or how schwa in child language becomes subject to target-like phonetic gradience, this additional factor, nevertheless, necessitates the establishment of unambiguous guidelines for the classification of schwa occurrences. Thus, as a means to reduce the possibility of erroneous interpretation of the data, in Section 7.3.1 we provide a definition of schwa presence vs. absence in child language prior to the classification and analysis of the data.

7.3 The data

7.3.1 Methodology: the definition of a present vs. an absent schwa in child language

A common practice in traditional generative analyses of schwa alternation is to classify the vowel as either present or absent in the output. In this dichotomy schwa either occupies a slot in the phonological representation and is phonetically realised as a vowel [œ] or [ø], or it is absent from both the phonetic string of segments and the structure onto which these segments are mapped.[303] However, with the introduction of new technology researchers have been able to take finer measurements of the vowel that show that schwa presence is gradient in terms of duration (Bürki et al. 2007, Bürki et al. 2011). Further, if we take into account the finding that an absent schwa may leave traces in the phonetic output (Fougeron & Steriade 1997, 1999, J. Barnes & Kavitskaya 2002)[304], then it becomes clear that a thorough account of schwa alternation cannot be reduced to a question of strict presence or absence of a full vowel. Rather, the extended range of schwa reduction types can be used to formulate hypotheses regarding the mapping from the phonological to the phonetic form. First, a phonological schwa can

[302] See Fougeron and Steriade (1997, 1999), J. Barnes and Kavitskaya (2002), and Bürki et al. (2007, 2011)
[303] Note that in the framework of Government Phonology the absence of a phonetic schwa does not entail absence of the phonological slot (see for instance Charette 1991, Scheer 1999, 2000, 2005, cf. Section 3.4.3.3).
[304] See Côté and Morrison (2007) for an alternative explanation of these phonetic traces in monosyllables.

hypothetically surface as a non-vocalic segment, which serves the role of realising the nuclear position (on the alternation between schwa and syllabic consonants, cf. Toft 2002). Also, another hypothesis in the extreme case of phonetic schwa reduction, i.e. reduction to zero, is that the segment is structurally preserved, albeit without any phonological features attached to it (for a similar claim, cf. Rialland 1986). In sum, the classification of schwa occurrences must account for both phonetic gradience in terms of vowel duration and the potential mismatch between the phonological and the phonetic representation of the vowel. Thus, as a means to determine what constitutes a present vs. absent schwa, in what follows we perform a strict bottom-up classification; at this point we focus only on the type of segmental material filling the target schwa position. Figures 7.2 to 7.9 are examples of the various output structures observed in the child language corpus. All examples are realisations of the word *cheval* 'horse', with target pronunciation of [ʃœval] or [ʃval], produced in the semi-controlled setting.

First, Figure 7.2 depicts the realisation of schwa as a phonetic and prosodically prominent vowel. Henri (2;04.29) produces [ˈfɵˈvaj]. The unifying characteristic for these occurrences of schwa is that they are equally or more prominent compared to the word-final syllable nucleus – the locus for obligatory phrasal prominence in Swiss French.[305]

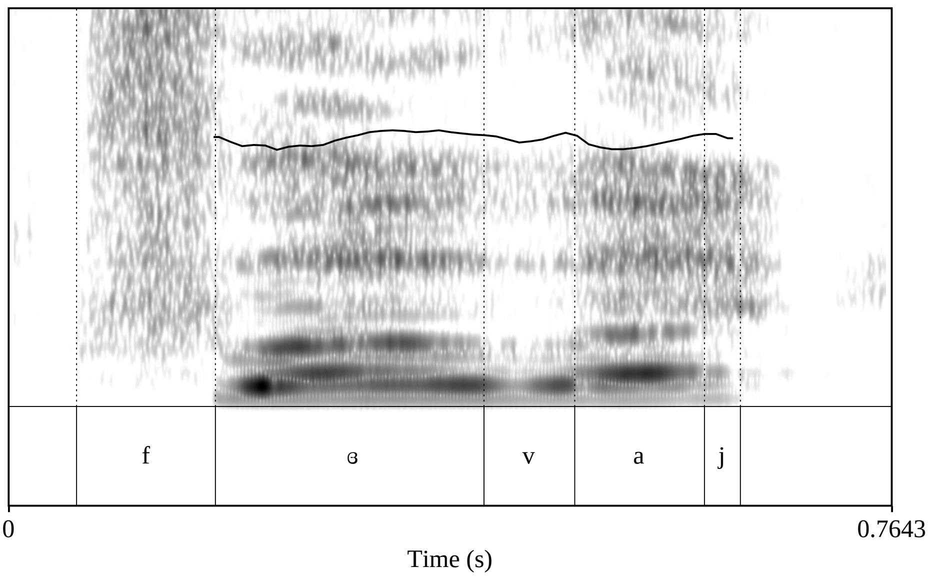

Figure 7.2: Full prominent vowel in [ˈfɵˈvaj], from Henri (2;04.29), pitch indicated by solid line[306]

Figure 7.3 depicts another type of schwa presence, which consists of full but non-prominent schwa vowels. Guy (3;04.26) produces [ʃœ̞ˈval]. In contrast to the previous example, in this case schwa is inferior to the word-final syllable nucleus [a], with regard to both pitch height and intensity.

[305] See Section 2.5.2.2 for details on non-final prominence in Swiss French.
[306] The word is extracted from the utterance: *A deux chevals* (target *chevaux*), *courent pas* 'There are two horses, (they) do not run'.

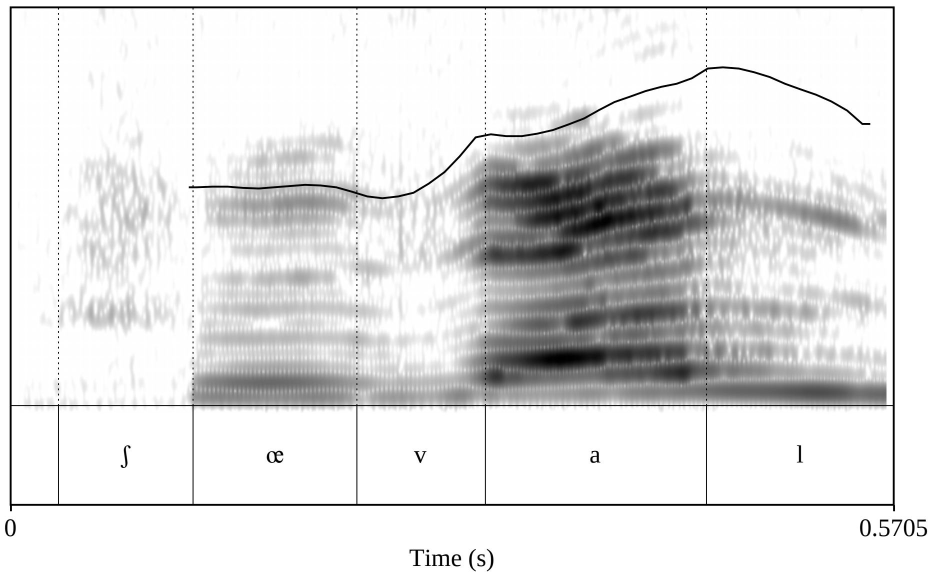

Figure 7.3: Full non-prominent vowel in [ʃœ̥ˈval], from Guy (3;04.26), pitch indicated by solid line[307]

For these two types of output structures, we observe sporadic occurrences of consonant deletion across the corpus[308], e.g. deletion of C_1 in ***refais*** ‘redo$_{1\text{-SG-PRE}}$’ [ʁœfɛ] ~ [ʁfɛ] → [ɔfɛ] (Adèle 2;09.23), deletion of C_2 in *fenêtres* ‘window$_{\text{PL}}$’ [fœnɛtʁ] ~ [fnɛtʁ] → [vaɛ] (Armand 3;03.17), and deletion of C_1 and C_2 in *renard* ‘fox’ [ʁœnaʁ] ~ [ʁnaʁ] → [ɛaʁ] (Armand 2;11.28).

In order to isolate reduced schwas, as starting point we use the classification used by Bürki et al. (2007), who contrast complete vowel absence, with 0ms duration, with vowel presence of a shorter or longer duration, defined as “a voiced portion and a formant structure” (2007:1027).[309] The variability in duration is clearly attested in our child language data. A comparison of the schwa produced by Guy (3;04.26) in Figure 7.3 above and the one produced by Tom (3;05.16) in Figure 7.4 below, reveals that the duration of schwa relative to the carrier word is 20% and 4%, respectively.[310] Despite the weaker salience of the latter example in terms of both duration and intensity, we classify it, for the time being, as a present vowel alongside the full vowels.

[307] The word is extracted from the utterance: *…et un cheval, il court* ‘… and a horse, he is running’.
[308] The transcriptions in this chapter are of the following format: [fœnɛtʁ] ~ [fnɛtʁ] → [vaɛ]. The left-hand transcription is the adult output, which is the input to the child. The right-hand transcription is the child output. The arrow between the two transcriptions has no value besides establishing a relation between the input to the child input and the child’s output.
[309] Bürki et al. (2007) do not observe any vowel with a duration shorter than 16ms. It is precisely this small gap (0-16ms) that allows them to propose a bimodal rather than a continuous distribution of schwa duration. However, see Bürki et al. (2011) and Section 7.4.2.5 for discussions on the classification of reduced schwas.
[310] Word-relative duration is calculated on the formula *Vowel duration / Word duration x 100* (cf. Racine & Andreassen 2012).

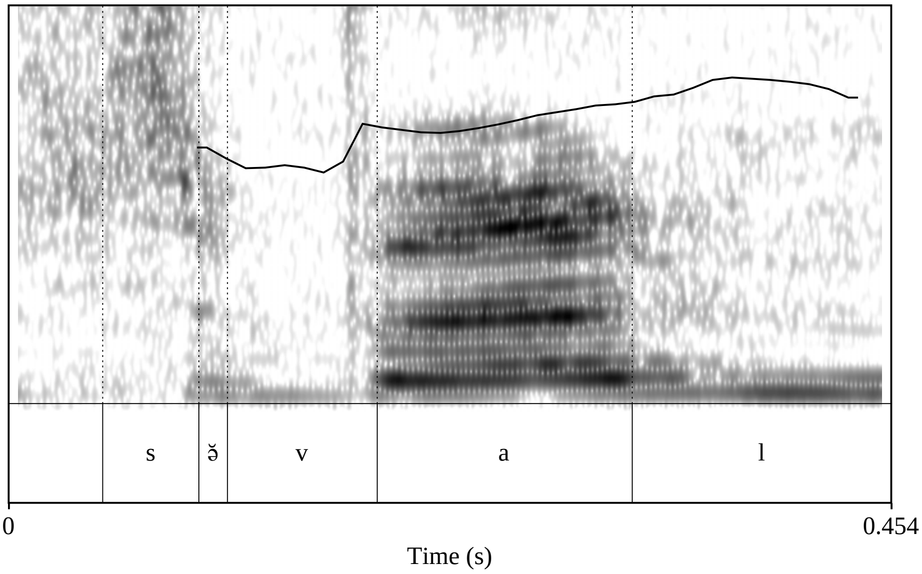

Figure 7.4: Reduced vowel in [sə̆val], from Tom (3;05.16), pitch indicated by solid line[311]

In line with Bürki et al. (2007), zero vowel duration between C_1 and C_2, which form the secondary cluster, is classified as an absent schwa. The resulting consonant sequence is exemplified in Figure 7.5, which depicts a realisation by Albert (3;01.11) of an initial unvoiced fricative with 35% word-relative duration, and a contiguous voiced fricative with 21% word-relative duration.

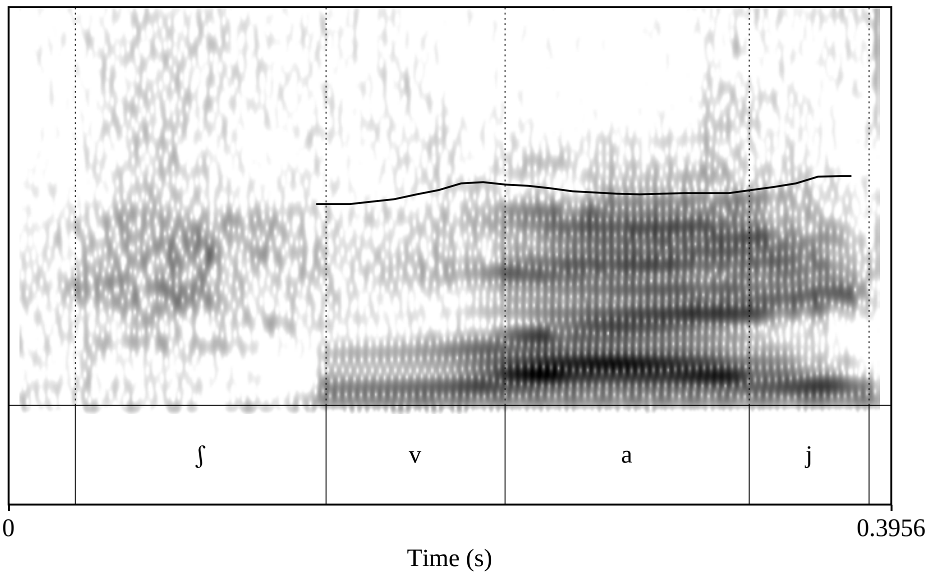

Figure 7.5: Consonant sequence in [ʃvaj], from Albert (3;01.11), pitch indicated by solid line

[311] The word is extracted from the utterance: *Il va attraper le cheval et heureusement * court très vite* 'He's gonna catch the horse and luckily * runs very fast'. The "*" marks replace unidentified material. Note that unfortunately the short vowel duration of reduced schwa prevents us from proposing an exact quality of the vowel in the transcription, and therefore, we use the generic IPA-symbol for schwa, [ə].

Alongside variability in vowel duration, the data also reveal variability in consonant duration. Figure 7.6 depicts two consecutive realisations of *chevaux* 'horse;pl' by Guy (3;02.22), in which the consonant sequence has a word-relative duration of 85% and 66%, respectively.

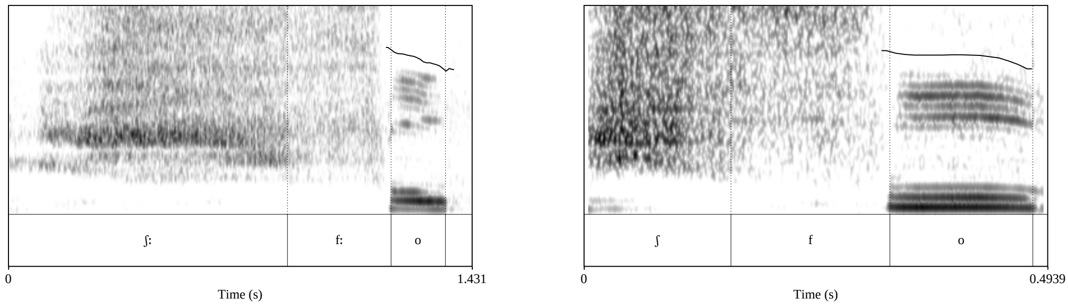

Figure 7.6: Lengthened consonant in [ʃ:f:o] vs. [ʃfo] from Guy (3;02.22), pitch indicated by solid line[312]

Figure 7.7 depicts a realisation in which there is a slight inter-consonantal silence. Tom (3;05.16) produces [s̩(.)val] with a 55ms empty portion between the two fricatives, which is 13% word-relative duration. Note that zero vowel duration is the decision-making criterion for classifying these occurrences as having an absent schwa, alongside the contiguous consonant sequences presented in Figures 7.5 and 7.6.

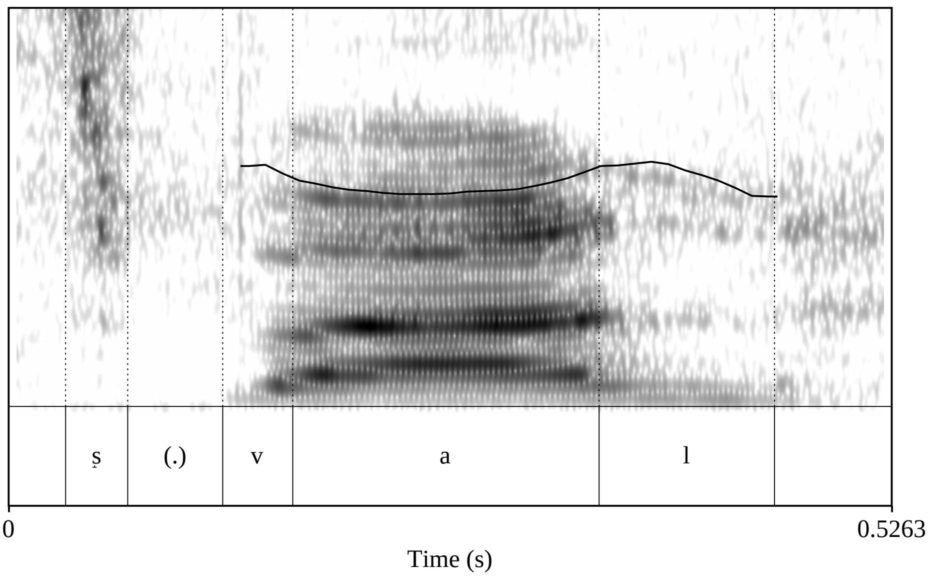

Figure 7.7: Split consonant sequence in [s̩(.)val], from Tom (3;05.16), pitch indicated by solid line

In our data, we also attest schwa occurrences in which zero vowel duration is accompanied by the absence of one of the surrounding consonants, giving rise to a spelled-out CV_2 structure

[312] The words are extracted from the utterance: *Chevaux noir et chevaux blanc* (target *cheval*) 'black horse and white horse'.

from a target CV_1CV_2 structure[313]: accordingly, this case falls into the category of absent schwas. Figure 7.8 presents the monosyllabic output [jan] realised by Fabienne (2;02.15), where the consonant is replaced by a glide. Note that in some rare cases both consonants are deleted in the output.[314]

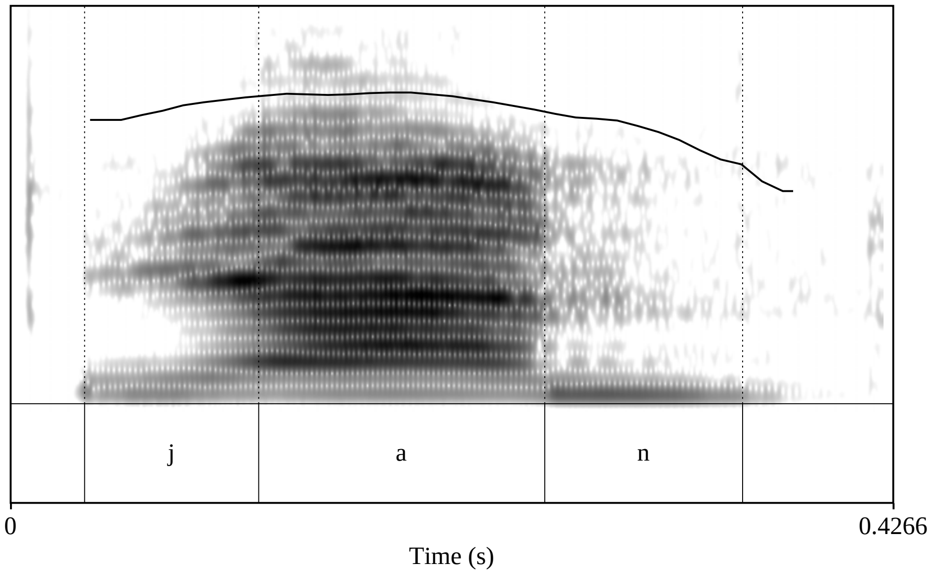

Figure 7.8: CV-absence in [jan], from Fabienne (2;02.15), pitch indicated by solid line

There is a final output structure, presented in Figure 7.9, that is rare and attested in the speech of two children only, Fabienne and Armand. Vocalic material *is* produced in the target schwa site; however the vocalic material is a doubling of the final vowel, and with no intervocalic consonant.[315] In line with our classification that a present schwa requires a voiced portion and formant structure in the target schwa site, these occurrences are to be included in the category of present schwas.

[313] For the ease of presentation, and also since our corpus mainly contains disyllabic schwa-items, we present the schematic target structure as CV_1CV_2. However, it would be more precise to use CV_1CV_2(C)(V). The symbol (V) represents a word-final, post-consonantal vowel insertion, which occurs more or less sporadically for all output structures presented in this section. The consonant (C) following V_2 is put in parentheses for two reasons; first, a disyllabic schwa-item does not necessarily end in a consonant, e.g. *petit* 'small$_{\text{MASC}}$' [pœti] ~ [pti]. Second, for consonant-final disyllables, the word-final consonant is occasionally omitted by the child, e.g. *cheval* [pa] (Kim 2;11.14).

[314] Deletion of schwa and both consonants is only attested for Fabienne (2;03.12), e.g. *cheval* [an].

[315] Pitch contour is the main criterion for determining the presence of two syllables here. As covered in more detail in Section 7.4.2, there is a recurrent pitch contour on phrase-final disyllables that consists of a melodic rise on the penultimate syllable followed by a salient fall. The very same pitch contour is observed for the occurrences presently under discussion.

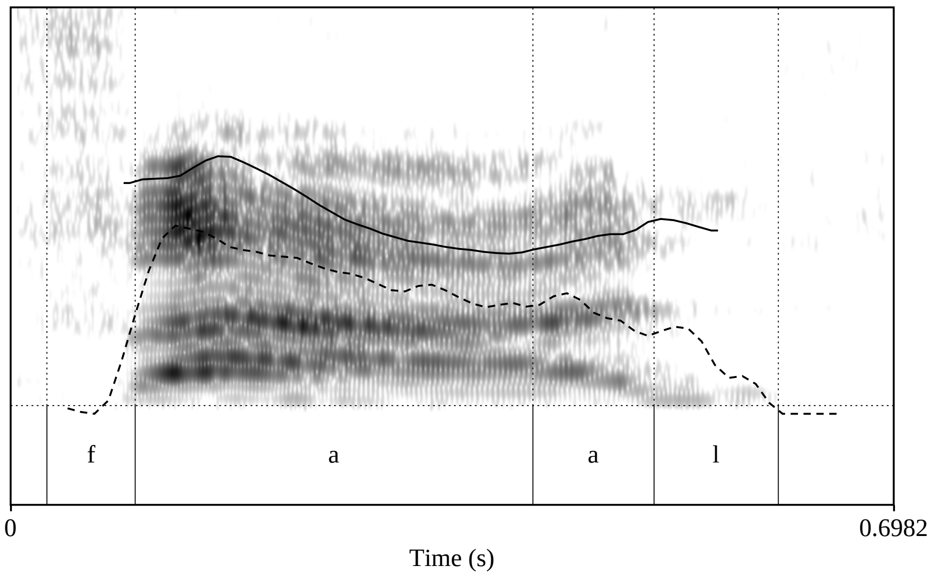

Figure 7.9: Vowel doubling in [ˈfaal], from Armand (2;11.21), pitch indicated by solid line, intensity indicated by dotted line

The reason we conclude our discussion of schwa classification with vowel doubling is that we want to call attention to the observation that in child language, contrary to the ambient phonology, schwa presence does not necessarily correspond to a situation in which the target schwa site is filled with a distinct vowel that occurs in an inter-consonantal position. We have also shown that the target schwa site can be filled with a reduced vowel (cf. Figure 7.4), indicating the presence of phonetic gradience. However, we underline that, at present, the relationship between the phonological and the phonetic representation of schwa is not entirely clear. We postpone our analysis of the phonological form behind these particular structures until Section 7.4.2.

We summarise the above-mentioned output structures in Table 7.1.[316] Each output structure is given a label that is used in our descriptive analysis in Section 7.3.3. In this regard, it is worth mentioning that label E comprises all output structures containing a consonant sequence.[317]

[316] The classification of the various occurrences of schwa into the different groups is based on an auditory examination of the signal complemented by a visual inspection of the spectrogram and the pitch contour in Praat. This implies that no threshold in terms of measurement has been set to determine whether a vowel is full or reduced, or whether a consonant is lengthened or not.

[317] The various output structures labelled E are discussed extensively in Sections 7.4.1 and 7.4.2.

Figure	Output structure	Present schwa	Absent schwa	Label
7.2	Full prominent vowel	√		A
7.3	Full non-prominent vowel	√		B
7.4	Reduced vowel	√		D
7.5	Consonant sequence		√	E
7.6	Lengthened consonant		√	
7.7	Split consonant sequence		√	
7.8	CV-absence		√	F
7.9	Vowel doubling	√		C

Table 7.1: Classification of output structures

In Sections 7.3.2 and 7.3.3, to follow, we present the data from the naturalistic and the semi-controlled settings, respectively. We remind the reader of the hypotheses to be tested alongside the presentation of the data:

(5) Hypotheses, repeated from Examples (2), (3), and (4)

Hypothesis A1	Two variants of a given schwa-item are not available to the child.
Hypothesis A2	Two variants of a given schwa-item are available to the child.
Hypothesis B1	Two variants of a given schwa-item are available to the child, and their use is constrained by the input.
Hypothesis B2	Exposed to variation in the input, two variants of a given schwa-item are available to the child. The dispreferred variant is modified to conform with production constraints that operate on his spontaneous speech.

7.3.2 Schwa behaviour in a naturalistic setting

In Section 4.2.3.1, we present the data collection methodology for the spontaneous child language data, and in what follows, we examine those data. In order to reveal potential inter-speaker variation, the main focus of this section will be the presence vs. absence of schwa in the speech of the individual children. Within the individual results, we examine the presence vs. absence of schwa in light of lexical class, the phonological context of the schwa-item, i.e. whether the item is in a post-pausal, post-consonantal, or post-vocalic position, and the segmental composition of the schwa-item. We underline that the results presented here are part of the empirical support for the analysis laid out in Section 7.4.

7.3.2.1 Presence vs. absence of schwa in light of age and lexical class

Recall from Section 4.2.2 that, in addition to the test sessions, six of the thirteen children are recorded at regular intervals at home with the caregiver present, i.e. Lucas, Adèle, and Janice from age group 2, and Armand, Tom, and Guy from age group 3. Recall, also, that no subject from age group 1 was available for recording at home and, that we, therefore, intensified the recording frequency of Fabienne and Henri during the last months to include semi-directed play sessions in the kindergarten.

One consequence of starting to record spontaneous speech at different points in time for different subjects is that our data include considerable variability in the number of schwa-items obtained per subject. Table 7.2 lists the number of analysable occurrences for each of the eight children, and each list is subdivided into three categories; one, nominal forms including nouns, pronouns, adjectives, and toponyms, two, verbal forms, and three, other forms including adverbs and prepositions. Note that we also extract adverbial phrases like *là-dessus* ‘on here/there’ [ladœsy] ~ [ladsy] and the set expression *au revoir* ‘goodbye’ [oʁœvwaʁ] ~ [oʁvwaʁ]. In these cases, schwa, which in the non-complex forms, e.g. *dessus* and *revoir*, is in a word-initial syllable, is now in a word-medial position. As shown in Table 7.2, the lowest overall numbers of occurrences are retrieved from the data from Fabienne, age group 1, six sessions, and Henri, age group 1, seven sessions. The highest numbers are retrieved from the data from Tom, age group 3, 19 sessions, Adèle, age group 2, 12 sessions, and Guy, age group 3, 16 sessions.

Subject		**Occurrences initial syllable**			**Occurrences medial syllable**	**Total**
Name	**Age group**	**Nominal forms**	**Verbal forms**	**Other**		
Fabienne	1	12	6	0	1	19
Henri	1	82	9	3	4	98
Lucas	2	203	70	9	17	299
Adèle	2	210	200	18	77	505
Janice	2	245	93	21	11	370
Armand	3	233	50	28	6	317
Tom	3	383	148	19	13	563
Guy	3	247	153	47	19	466
Total		1615	729	145	148	2637

Table 7.2: Number of occurrences of schwa-items, per category per child in the naturalistic setting, by count

We first focus on the occurrences of schwa in a medial position. The numbers in Table 7.2 reveal that Adèle is unique among the subjects because the number of medial occurrences in her data is 77, and it never exceeds 20 in the data for the other children. Table 7.3 lists the number of present or absent schwas for the four most overall frequent items with schwa in medial position for each child. For *au revoir*, the schwa-less variant is categorically preferred. There is slightly more inter-speaker variation in the results for the adverbial phrases. While for *en/là-dessous* the schwa-less variant is the only variant attested, both variants are attested in *au/en/là-dessus*. Adèle and Guy display a certain amount of variation overall, but note that Adèle, by far, prefers the schwa-less variant. As for the other children, despite the small amount of data, they nevertheless show a tendency to select only the schwa-less variant. Finally, concerning *là-dedans*, three types of distribution emerge in the data. First, some children select the schwa-less variant only, Armand and Tom. Second, Guy displays alternation with preference for the variant with schwa. Third, some children alternate while still displaying a preference for the schwa-less variant, Lucas, Adèle, and Janice.

In sum, schwa in medial position is subject to alternation, albeit with a strong preference for the schwa-less variant in the majority of cases in age groups 2 and 3. Concerning age group 1, the amount of data is not sufficient to propose any conclusion.

Age group	Subject	*là-dedans*		*au/en/là-dessus*		*en/là-dessous*		*au revoir*	
		P	**A**	**P**	**A**	**P**	**A**	**P**	**A**
1	Fabienne	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)
1	Henri	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)
2	Lucas	17% (1)	83% (5)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	100% (9)
2	Adèle	36% (18)	64% (32)	17% (4)	83% (20)	0% (0)	0% (0)	0% (0)	0% (0)
2	Janice	33% (2)	67% (4)	0% (0)	100% (1)	0% (0)	100% (2)	0% (0)	100% (2)
3	Armand	0% (0)	100% (2)	0% (0)	100% (3)	0% (0)	100% (1)	0% (0)	0% (0)
3	Tom	0% (0)	100% (11)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)
3	Guy	83% (5)	17% (1)	60% (3)	40% (2)	0% (0)	0% (0)	0% (0)	0% (0)
	Total	32% (26)	68% (55)	24% (9)	76% (29)	0% (0)	100% (5)	0% (0)	100% (14)

Table 7.3: Schwa presence and absence in medial position, per child, by percentage and count

Next we turn to the items with schwa in the initial syllable. Nominal forms are by far the most frequent category of tokens in the corpus and constitute 65% of the analysable data with schwa in this position. Verbal forms constitute the second most frequent category, 29% of the items in this position, followed by the “other” category, 6% of the items in this position. In both the nominal and verbal categories we find items that are considerably more frequent than others. The adjective *petit* ‘small$_{\text{MASC}}$’ is in the corpus 516 times, which is 32% of the nominal category. The pronominal form *celui (-ci/là)* ‘this$_{\text{MASC}}$ (here/there)’ is in the corpus 363 times, which is 22% of the nominal category. The verb *regarder* ‘look$_{\text{INF}}$’ is in the corpus 457 times, which is 63% of the verbal category.

The first aspect to examine is whether schwa-items are subject to alternation in child’s spontaneous speech; however, before we present these results, note that we do not discuss the underlying form of the variants of schwa-items at this point. Our main interest lies in the search for the number and type of output forms, with or without schwa, attested for the various items. In accordance with our definitions of present and absent schwa (cf. Section 7.3.1), we first display in Table 7.4 the percentage and count of schwa presence or absence for each category for each child.

Age group	Subject	Nominal forms P	Nominal forms A	Verbal forms P	Verbal forms A	Other P	Other A
1	Fabienne	67% (8)	33% (4)	83% (5)	17% (1)	0% (0)	0% (0)
1	Henri	80% (66)	20% (16)	22% (2)	78% (7)	100% (3)	0% (0)
2	Lucas	37% (76)	63% (127)	89% (62)	11% (8)	89% (8)	11% (1)
2	Adèle	40% (84)	60% (126)	73% (145)	27% (55)	100% (18)	0% (0)
2	Janice	55% (135)	45% (110)	86% (80)	14% (13)	52% (11)	48% (10)
3	Armand	52% (122)	48% (111)	82% (41)	18% (9)	96% (27)	4% (1)
3	Tom	71% (272)	29% (110)	85% (126)	15% (22)	89% (17)	11% (2)
3	Guy	56% (139)	44% (108)	65% (100)	35% (53)	74% (35)	26% (12)
	Total	56% (902)	44% (712)	77% (561)	23% (168)	82% (119)	18% (26)

Table 7.4: Schwa presence and absence per category per child, by percentage and count

Table 7.4 reveals that the majority of children prefer the variant with schwa to the variant without across all three categories. There are some individual exceptions. For example, Lucas and Adèle, in age group 2, more frequently realise schwa-less variants in the nominal category, whereas Henri, in age group 1, more frequently realises schwa-less variants in the verbal category.[318] Further, the comparison of the three categories shows that, in general, the difference in frequency between the variant with schwa and the variant without is more limited in the nominal category than in the verbal category for all age groups. This is an interesting result in light of the finding in J. L. Smith (1997) that there is a greater faithfulness to nouns, whereby one should expect a higher frequency of schwa absence in the verbal forms. The sole exception to this pattern is Guy, the oldest child in the corpus, who displays a slightly more balanced distribution of the variants in both the nominal and the verbal categories. The difference in frequency between the two variants is greatest in the “other” category. Although we cannot neglect the scarcity of occurrences attested for this category, there is a clear preference for the variant with schwa in all children, except for Fabienne for whom there are no data, and for Janice and Guy, who realise some schwa-less variants as well.

7.3.2.2 Presence vs. absence of schwa in light of the leftward context

Recall from Chapter 1.2.2 the target French distribution of the variants with and without schwa with respect to the leftward context: while there is a general ban on schwa absence in a post-pausal or a post-consonantal context, there is a general preference for schwa absence when the

[318] Interestingly, note that Adèle, who uses both variants of the adverbial phrases *au/en/là-dessus* and *là-dedans*, albeit with a preference for the schwa-less one, is consistent in the use of the variant with schwa in the non-complex forms, i.e. *dessus* and *dedans*. This indicates that faithfulness to the schwa syllable is more important in the initial, prosodically more prominent position.

schwa-item is in a post-vocalic context.[319] Table 7.5 displays the percentage and count of schwa presence and absence in the three different contexts in our data. The global results indicate that there is no difference between schwa-items in a post-pausal or a post-consonantal context and those in a post-vocalic one. In the light of adult data, the schwa-items produced by children in the post-pausal and post-vocalic contexts deviate from the target rule. In the Swiss French PFC corpus, schwa in the post-pausal context is present in 89% (57/64) of the occurrences and in the postconsonantal context it is present in 71% (175/248) of the occurrences. In the post-vocalic context, schwa is present in a scarce 28% (334/1206) of the occurrences in the PFC data. The children display a slightly lower degree of schwa presence than adults in the post-pausal context, 66% vs. 89%, respectively, i.e. the children are more inclined to select the schwa-less variant phrase-initially. On the other hand, the inter-adult PFC data display a considerably lower degree of schwa presence than children in the post-vocalic context, 28% vs. 62%, respectively, i.e. the children are less inclined to select the schwa-less variant phrase-internally. An examination of the individual schwa-items indicates, however, that the child-specific distribution in the post-pausal context is lexically conditioned, i.e. there are an important number of utterances that start with the schwa-less variants of *celui(-ci/là)* and the imperative form of *regarder*. Table 7.5 reveals further inter-speaker differences. Whereas Lucas, age group 2, frequently selects the schwa-less variant in both post-pausal and post-vocalic contexts, Tom, age group 3, frequently selects the variant with schwa in both contexts: with these patterns, Lucas conforms to the target-like pattern in the post-vocalic context, while Tom conforms to the target-like pattern in the post-pausal context. Janice, age group 2, reveals a third distribution whereby the variants with and without schwa are realised relatively frequently in both the post-pausal and post-vocalic contexts. Janice's pattern approaches the distribution observed for target Swiss French, although with a considerable degree of schwa presence in the post-vocalic context.

[319] As mentioned in Section 3.3.3.2, there are exceptions in adult French to the ban on schwa absence following a pause and a consonant. According to Dell (1985), schwa absence is grammatical in a post-pausal context as long as the surrounding consonants are not PloPlo, with *petit* being a noticeable exception. Also, Dell claims that schwa can be absent in a post-consonantal context in a limited subgroup of the words with an initial FriSon-sequence.

Age group	Subject	##C<e>C		C#C<e>C		V#C<e>C	
		P	**A**	**P**	**A**	**P**	**A**
1	Fabienne	75% (3)	25% (1)	0% (0)	0% (0)	71% (10)	29% (4)
1	Henri	70% (39)	30% (17)	100% (10)	0% (0)	79% (22)	21% (6)
2	Lucas	53% (49)	47% (44)	65% (13)	35% (7)	50% (84)	50% (85)
2	Adèle	66% (86)	34% (45)	78% (7)	22% (2)	53% (154)	47% (134)
2	Janice	82% (62)	18% (14)	65% (24)	35% (13)	57% (140)	43% (106)
3	Armand	56% (35)	44% (28)	61% (11)	39% (7)	63% (144)	37% (86)
3	Tom	74% (49)	26% (17)	86% (42)	14% (7)	75% (325)	25% (110)
3	Guy	65% (55)	35% (29)	66% (35)	34% (18)	59% (184)	41% (126)
	Total	66% (378)	34% (195)	73% (143)	27% (54)	62% (1063)	38% (657)

Table 7.5: Schwa presence and absence in light of phonological context, per child, by percentage and count

In what follows, we turn our attention to the different schwa-items in order to determine whether the high degree of schwa presence can be explained as a function of the segmental context surrounding schwa or as a function of the item itself.

7.3.2.3 Presence vs. absence of schwa in light of the individual schwa-item

Recall from Section 3.3.2.2 that the segmental context surrounding schwa has a certain effect on the rate of schwa absence. While we do not focus on the factors that are decisive for alternation rate in this section, we do classify our data according to type of secondary cluster, in preparation for Section 7.4.1 where we scrutinise the secondary clusters. Thus, Tables 7.6 to 7.8 list all of the schwa-items attested in the data obtained in the naturalistic setting; the data are classified according to the type of secondary cluster, category, and number of occurrences of schwa presence and absence. Tables 7.6 to 7.8 contain schwa-items with a target initial plosive, fricative, and liquid, respectively. As regards schwa-items with an initial nasal, we only attest one single item, i.e. *monsieur*, in the spontaneous child language data, and this is commented upon in the text. Thus, in what follows, we comment on the data in Tables 7.6 to 7.8 in light of both the individuals' selection of variant(s) and the rates of alternation observed in CDS corpus (cf. Section 6.3) and in the judgement data in Racine (2008). We refer to our inter-adult speech corpus, the PFC data (cf. Section 3.3.2.2), in the comments on the verbal forms. Further, in order to maximise the information available on schwa behaviour across the different schwa-items, we complement the comments on the data from the eight children obtained in the naturalistic setting with comments on the schwa-items produced by all thirteen children during the test sessions, produced either spontaneously or as a reaction to the PowerPoint test.[320] Note

[320] The realisations of *cheval, chevir, fenêtre, fenasse,* and *petit* that were used as test-items during the kindergarten recordings are not included here (cf. Section 7.3.3 for an analysis).

that in some cases during the kindergarten sessions the child's realisation of a schwa-item may be triggered by the researcher's preceding realisation of the schwa-item. This possible situation is similar to the one during the recording sessions at the child's home, where the caregiver or the researcher indirectly or directly encourages the child to produce particular words.

We first examine schwa-items with a target initial plosive, cf. Table 7.6.

C_1	**C_2**	**Nominal forms**				**Verbal forms**				**Other**			
Plo	Plo	petit	516	247P	269A					depuis	2		2A
										debout	10	10P	
										dedans	60	48P	12A
	Fri	besoin	25	11P	14A	tenir	15	13P	2A	devant	19	15P	4A
						devenir	13	11P	2A	dessous	9	7P	2A
						devoir	1		1A	dessus	36	30P	6A
	Nas	demi	16	5P	11A	demander	12	8P	4A	demain	9	9P	
	Liq	pelouse	2	2P									
		peluche	15	15P									

Table 7.6: Schwa-items with target initial plosive, classified according to cluster type and lexical category, from 8 children in the naturalistic setting, by number of occurrences per item, and by occurrences of schwa presence (P) and schwa absence (A) per item

The word *petit* 'small$_{\text{MASC}}$' is subject to highly frequent schwa absence in the adult registers, but is frequently realised by all of the children. Both variants, with and without schwa, are present in the data from each subject, from which we conclude that the two variants are available in all age groups. However, there is more variability regarding the other attested nominal forms. The word *besoin* 'need' is subject to frequent schwa absence in the adult registers, and is attested with both variants in the data from Armand, Tom, and Guy. In the data from Lucas the word is found without schwa and in the data from Janice it is found with schwa. A similar pattern is found for *demi* 'half', which is frequently subject to schwa absence in the CDS and judgement data. The word is attested with both variants in the data from Janice and Kim; in the data from Adèle and Lucas the word is only attested without schwa. In the data from Janice, Tom, and Guy, the two items with a PloLiq-cluster, i.e. *pelouse* 'lawn' that is frequently attested without schwa in the judgement data and *peluche* 'teddy bear' that is attested with schwa in CDS and as alternating in the judgement data, are observed with schwa only; additionally, *peluche* is found with schwa in the data from Kim.

We turn our attention to the verbs. Schwa alternation is only found in the data from Janice and Guy. In the word *tenir* 'hold$_{\text{INF}}$', which alternates in the CDS and PFC data, Guy uses both variants, whereas Lucas, Adèle, and Armand produce the variant with schwa only. In the data from Janice, on the other hand, solely the schwa-less variant is attested. Regarding *devenir* 'become$_{\text{INF}}$', which frequently alternates in the PFC data, no intra-speaker variation is attested in the child language data. Whereas Adèle realises the schwa-less variant, Armand, Tom, and Guy realise the variant with schwa. However, Guy selects the schwa-less variant in *devoir* 'must$_{\text{INF}}$', which alternates in the CDS and PFC data. There is a slightly higher level of variation in the child language data for *demander* 'ask$_{\text{INF}}$', which has a high degree of schwa absence in the CDS and PFC data, because Janice and Guy use both variants. Further, Adèle selects the schwa-less variant only, while Eric displays two realisations of the variant with schwa.

Finally, concerning the schwa-items in the "other" category, Guy selects the schwa-less variant in *depuis* 'since', which is a rather surprising observation given the low degree of schwa absence attested in the CDS and PFC data. On the other hand, for *debout* 'standing', Adèle, Théa, Armand, Tom, and Guy use the variant with schwa. This is in line with the target distribution whereby the variant with schwa is selected by both the caregivers and the informants in the PFC corpus. There is more variability in *dedans* 'in here/there', in both the adult and the child language data. In adult speech, there is a low degree of schwa absence in the CDS data compared to a high degree of schwa absence in the PFC data. Regarding the children, Lucas, Adèle, Théa, Armand, and Eric use the variant with schwa, while Janice, Tom, and Guy display alternation between the two forms. Janice and Guy use both forms for *devant* 'in front of', in contrast to Adèle, Kim, Théa, and Tom, for whom we only attest the variant with schwa. Note that the caregivers and the PFC informants frequently select the variant with schwa, as well. Turning to *dessous* 'under' and *dessus* 'on', these words are subject to variation in the child data. For *dessous*, Lucas, Janice, and Guy use both variants, while Armand and Tom use the variant with schwa. For *dessus*, Janice, Armand, Tom, and Guy use both variants, while Henri, Adèle, and Théa use only the variant with schwa. Both *dessous* and *dessus* are subject to alternation in adult speech, although a higher degree of schwa absence is observed in *dessus*. The final item with an initial plosive is *demain* 'tomorrow'. Henri, Adèle, Armand, and Guy use only the variant with schwa. This is in line with the adult data, given the rather high rate of schwa presence in the judgement data and the categorical presence of schwa in the CDS data.

In sum, the individual results show that some children display schwa variation for a relatively large number of items; this is particularly true for Janice, age group 2, and Tom and Guy, age group 3. As for the other children, if both variants are sporadically attested in the data, then the tendency is to preferentially realise one of the variants, and in most cases, the selected variant is the one with schwa. For some items, the children show the opposite behaviour, e.g. *demi* and *demander*, which Adèle realises without schwa. Finally, this overview is not complete without providing information on the distribution of the two variants in the case of alternation. An inspection of the individual results reveals that in the majority of cases the variant with schwa is preferred by far. For instance, while Guy produces *besoin* with and without schwa with equal frequently, 8 and 7 occurrences respectively, his realisation of *demander* includes 14 occurrences with schwa and a mere 1 without.

We next look at schwa-items with a target initial fricative, see Table 7.7.

C_1	C_2	Nominal forms				Verbal forms				Other
Fri	Plo					jeter	5	4P	1A	
	Fri	ceci	2	2P		fais-	5	5P		
		cheval	301	224P	77A					
		chevalier	1	1P						
		cheveu	35	13P	22A					
	Nas	femelle	2	2P		venir	38	9P	29A	
		fenêtre	57	44P	13A					
		chemin	2	2P						
		cheminée	11	11P						
		chenille	3	3P						
		chenit	1		1A					
		semaine	2		2A					
		Genève	19	18P	1A					
		genou	1	1P						
	Liq	celui (-ci/là)	363	63P	300A	fer-	1		1A	
		cerise	7	6P	1 A	ser-	23		23A	

Table 7.7: Schwa-items with target initial fricative, classified according to cluster type and lexical category, from 8 children in the naturalistic setting, by number of occurrences per item, and by occurrences of schwa presence (P) and schwa absence (A) per item

Tom realises the word *ceci* ‘this here’ with schwa present, which is in line with the PFC data. The adult corpora differ with regard to *cheval* ‘horse’; while it is subject to highly frequent alternation in the judgement data, the variant with schwa is by far preferred in the CDS data. Among the children, Tom is an exception because, to a certain extent, he realises both variants of the word; the remainder of the children prefer only one variant. Henri and Guy categorically select the variant with schwa, whereas Lucas, Adèle, and Janice display evidence of a marginally available schwa-less variant. One occurrence of the schwa-less variant is attested in the data from each of the three children. Fabienne and Armand, on the other hand, prefer the schwa-less variant. While Fabienne is categorical in her choice of the schwa-less variant, Armand, nevertheless, realises a few occurrences of the variant with schwa. Guy realises the word *chevalier* ‘knight’, which is subject to possible but infrequent alternation in the judgement data, with schwa. Regarding the word *cheveu(x)* ‘hair’, there is more variability. The judgement data show a near-obligatory absence of schwa. However, despite the fact that the CDS data has a more even distribution of the two variants, several of our subjects display alternation. Janice, Armand, Tom, and Guy use both variants, while Henri and Lucas use the schwa-less variant only. Adèle patterns with Henri and Lucas, but she also produces one occurrence of the variant with schwa. For Théa we attest one single occurrence of a variant with schwa. Tom produces the word *femelle* ‘female (animal)’ twice with schwa present, even though the word alternates in the judgement data. In the CDS data it is attested only once, with schwa present.

On the other hand, several children, i.e. Lucas, Janice, Armand, and Guy, realise the word *fenêtre* ‘window’ using both variants. Henri, Adèle, and Tom realise the variant with schwa only, which is not in line with the frequent schwa alternation attested in the adult judgement data. In the CDS data, on the other hand, schwa absence in this item is less frequent than what is expected on the basis of the judgement data. The dissimilar adult patterns are attested also in *chemin* ‘road’, with a more frequent alternation in the judgement data compared to the CDS data. In our child language data, this item is found with schwa presence only, and this in the data from Tom and Guy. Also for *cheminée* ‘chimney’, subject to highly frequent absence in the judgement data but with schwa presence in CDS, only the variant with schwa is attested for

Henri, Lucas, Adèle, Janice, Lambert, Eric, Tom, and Guy. *Chenille* 'caterpillar' is produced with schwa in a more or less categorical fashion in our CDS data, all while being subject to a high level of schwa frequency in the judgement data. The data from Tom reveal schwa presence for this item. A different pattern is found for *chenit* 'mess (reg.)', which is realised without schwa by Guy. This is in line with both the CDS and PFC data, in which schwa is near-categorically absent. Guy also displays schwa absence in *semaine* 'week', in line with the judgement data and the CDS data. Further, the toponym, *Genève*, is subject to alternation. It is frequently absent in the PFC data but is somewhat less frequently absent in the CDS data. Lucas, Tom, and Guy realise both variants. The other children who realise this item, Fabienne, Adèle, Kim, Théa, and Janice, solely select the variant with schwa present. The word *genou* 'knee' is produced with schwa present by Adèle, which goes counter to the very high level of schwa absence in the adult judgement data. In the CDS data, however, both variants are attested. The word *celui (-ci/là)*, which is one of the most frequently occurring schwa-items in our spontaneous speech data, is subject to a high level of schwa absence in CDS. Despite this fact, all of the children, except the two youngest ones, Fabienne and Henri, exhibit both variants. Note that Tom is unique in his particularly frequent use of the variant with schwa. Further, note that Adèle and Armand, excluding a few occurrences of the variant with schwa observed in their data, pattern with Fabienne and Henri in that they exhibit a strong preference for the schwa-less variant. The word *cerise* 'cherry' is judged to be highly frequently alternating in target Swiss French, and is attested once in our CDS data, with schwa. As for the children, Eric produces it as alternating. The schwa-less variant of the word is found once in the data from Henri and once in the data from Lucas, but their preferred form is the variant with schwa. The other children, Adèle, Janice, Kim, Théa, Lambert, Albert, Tom, and Guy, categorically select the variant with schwa. Finally, the overview of the nominal forms is not complete without including two items attested during the test sessions. The word *secret* 'secret' is realised once with schwa by Janice, and the word *seconde* 'second' is realised twice without schwa, by Eric. Both items are frequently alternating in the judgement data, and *seconde* is also observed without schwa in the CDS data.

Turning now to the verbal forms, *jeter* 'throw$_{\text{INF}}$' is realised with schwa by Janice, Armand, and Tom. Only Guy displays both variants of this verb. This item is subject to frequent alternation in the PFC data, but in the CDS data only the variant with schwa is observed. The imperfect form of the verb *faire* 'do$_{\text{INF}}$', i.e. <fais>, is highly frequently realised without schwa in the CDS and PFC data. In the child language data, however, we attest five occurrences of this verbal stem in Tom's data, all of which are realised with schwa present. The verb *venir* 'come$_{\text{INF}}$' is attested in a higher number of children. Janice, Tom, and Guy display variation in their use of schwa. Théa, Lambert, and Armand only use the variant with schwa. Lucas categorically selects the schwa-less variant. Adèle generally patterns with Lucas, although one occurrence of the variant with schwa is attested in her data. In both adult registers schwa absence is frequent. The verbal stem <fer> 'do$_{\text{COND/FUT}}$' is realised without schwa by Tom. The verbal stem <ser> 'be$_{\text{COND/FUT}}$' is realised without schwa by Janice and Guy. This production pattern is in line with the CDS and PFC data, in which schwa absence is near-categorical.

Once again, alternation between the two variants seems to be restricted to a specific group of words, and is displayed by only some of the children, i.e. Lucas and Janice from age group 2, and Armand, Eric, Tom, and Guy from age group 3. Although some sporadic occurrences of the complementing variant are attested, most children show a strong preference for one variant, the nature of which varies from one schwa-item to another. For instance, whereas Adèle prefers to produce the word *cheval* with schwa, she prefers to produce the word *cheveux* without. By and large, and in line with the schwa-items with an initial plosive, it is the variant with schwa that prevails across the child language corpus, which in some cases goes against the target distribution pattern. Other items fully conform to the target distribution pattern, e.g. no instance with schwa is observed for the verbal stems <fer> and <ser>.

As for schwa-items with a word-initial target nasal, the sole item attested in the child language data is the word *monsieur* ‘mister’, and it occurs 108 times. While this word is subject to frequent alternation in target Swiss French, none of the children who produce this item select the schwa-less form, with the exception of Guy who produces one occurrence of the schwa-less variant.[321]

Finally, we turn to the items that have a target initial liquid, see Table 7.8.

C$_1$	**C$_2$**	**Nominal forms**				**Verbal forms**				**Other**
Liq	Plo	lequel	7	6P	1A	repartir	16	14P	3A	
		repas	1	1P		repasser	4	4P		
		repassage	1	1P		reperdre	1		1A	
		retour	1	1P		reposer	1	1P		
		requin	31	30P	1A	replier	1	1P		
						reprendre	1	1P		
						redonner	1	1P		
						retomber	1	1P		
						retourner	11	11P		
						retrouver	3	3P		
						regarder	457	368P	89A	
						recommencer	2	1P	1A	
						reconnaître	3	2P	1A	
						recouvrir	2	2P		
						reculer	2	2P		
	Fri					lever	6	6P		
						refabriquer	1	1P		
						refaire	39	36P	3A	
						refermer	7	7P		
						refiler	1		1A	
						revenir	15	15P		
						revisser	3	3P		
						recevoir	5	2P	3A	
						ressauter	1	1P		
						ressembler	2	1P	1A	
						ressortir	2	1P	1A	
						rejouer	1	1P		
	Nas	remorque	46	46P		remettre	20	20P		
		renard	38	38P		remonter	5	4P	1A	
	Liq					relever	1		1A	

Table 7.8: Schwa-items with target initial liquid, classified according to cluster type and lexical category for 8 children in the naturalistic setting, by number of occurrences per item, and by occurrences of schwa presence (P) and schwa absence (A) per item

The nominal form *lequel* ‘which$_{\text{MASC}}$’ is attested with schwa alternation in our CDS data. The word is also attested in the data from Janice, Armand, and Guy. While Janice displays variation, Armand and Guy produce only the variant with schwa. For all nominal forms with an initial /ʁ/

[321] Note that there are no realisations of *monsieur* in the data from Kim, Théa, and Lambert.

schwa is categorically present. The only one occurrence of schwa absence with initial /ʁ/ is an occurrence of *requin* 'shark'. This form is realised by Tom, who, thus, has both forms available for this particular word. Otherwise, the variant with schwa prevails across the board: *requin* is categorically realised with schwa by Armand and Guy, and, as we have seen, near-categorically by Tom. The children's near-categorical realisation patterns with the CDS data all while contrasting with the judgement data, in which the word is subject to frequent alternation. Further, Tom realises *repas* 'meal' with schwa, Guy realises *repassage* 'ironing' with schwa, and Armand realises *retour* 'return' with schwa. However, each of these items is subject to highly frequent schwa alternation in the judgement data. Additionally, Henri, Armand, Eric, and Guy realise *remorque* 'trailer' with schwa and Adèle, Janice, Armand, Tom, and Guy realise *renard* 'fox' with schwa. The latter two items display different behaviours in the CDS compared to the judgement data. While in the judgement data schwa absence is frequent, in the CDS data schwa presence prevails. Finally, before we turn to the verbal forms, note that the data from the kindergarten sessions contain an item not present in the data from the recordings at home. Eric realises the expression *en retard* 'late', without schwa, which is in line with both the CDS data and the judgement data.

We now turn to the verbs, for which there are, in general, only a few occurrences per item. The word *repartir* 'leave again$_{\text{INF}}$' is produced with a high degree of schwa absence in CDS, and Guy realises it as alternating. Armand and Eric categorically realise the variant with schwa. Further, Guy selects the variant with schwa for the word *repasser* 'pass by, iron$_{\text{INF}}$'; it is observed with absence in the PFC data. Tom realises the word *reperdre* 'lose again$_{\text{INF}}$', which is not attested in our adult data, without schwa in the one time it occurs. Armand produces a single occurrence of the word *reposer* 'put back, rest$_{\text{INF}}$', with schwa present. In the CDS data the word is attested with schwa. In the PFC data the word is produced without schwa. Janice produces a single occurrence of *replier* 'fold again$_{\text{INF}}$ with schwa, which is in accordance with both adult registers. Guy produces a single occurrence of *reprendre* 'retake$_{\text{INF}}$' with schwa. Alternation is attested in both adult registers. Janice and Théa produce two occurrences, one each, of *redonner* 'give back$_{\text{INF}}$' with schwa. In the CDS data the word is attested with alternation. Lucas produces one occurrence of *retomber* 'fall again' with schwa. Lucas, Janice, Armand, Tom, and Guy produce *retourner* 'go back$_{\text{INF}}$' with schwa. In both the CDS and PFC data the word is attested as frequently alternating. Guy produces *retrouver* 'find again$_{\text{INF}}$' with schwa. In both the CDS and PFC data the word is attested frequently without schwa. Concerning *regarder* 'look$_{\text{INF}}$', as already mentioned, this item constitutes a significant portion of our data on verbal forms. In both adult registers it is subject to alternation. Many of children produce the word with alternation, as well, with the exceptions of Kim, Théa, Lambert, and Albert, for whom we only observe the variant with schwa during the kindergarten sessions. Guy produces the verb *recommencer* 'start over$_{\text{INF}}$' with alternation. Alternation is also attested in the PFC data. This verb is found only with schwa present in the data from Lambert. Further, the verb *reconnaître* 'recognise$_{\text{INF}}$' is attested with schwa in Tom's data, but without schwa in Guy's data. Meanwhile, it is attested as alternating in the CDS and PFC data. The verb *recouvrir* 'cover up, hide$_{\text{INF}}$' is realised with schwa in Tom's data. It is not attested in our adult data. The verb *reculer* 'move back$_{\text{INF}}$' is realised as alternating in CDS and with schwa in Armand's data.

The verb *lever* 'rise$_{\text{INF}}$' is attested as alternating in the PFC data, and with schwa by Adèle, Janice, Théa, Armand, and Tom. Only in Guy's data is this verb observed as alternating. Further, there is a single realisation of *refabriquer* 'reconstruct$_{\text{INF}}$' in Guy's data, and he produces it with schwa, which is contrary to the CDS data where the schwa-less variant is attested. The verb *refaire* 'do again$_{\text{INF}}$' is realised with schwa in the CDS data and as alternating in the PFC data. The data from Janice, Tom, and Guy pattern with the PFC data in that alternation is attested.

Fabienne, Adèle, and Lucas realise the variant with schwa exclusively. The verb *refermer* ‘close (again)$_{\text{INF}}$’, on the other hand, does not display variation in the children’s data. Adèle, Armand, and Guy categorically select the variant with schwa, which is in line with the CDS data. Unattested in the adult data, the verb *refiler* ‘unload$_{\text{INF}}$’ is produced with schwa by Guy. The verb *revenir* ‘come back$_{\text{INF}}$’ is attested as alternating in both of the adult registers. Lucas, Adèle, Armand, Tom, and Guy realise it with schwa. Further, the verb *revisser* ‘screw on again$_{\text{INF}}$’ is found without schwa in Guy’s data. As regards *recevoir* ‘receive$_{\text{INF}}$’, Janice produces it without schwa. Guy, Adèle, and Eric produce it with schwa, even though it is subject to highly frequent alternation in both of the adult registers. Further, *ressauter* ‘jump back$_{\text{INF}}$’ is attested with schwa in the one occurrence produced by Armand, and *ressembler* ‘resemble$_{\text{INF}}$’, which is subject to alternation in both of the adult registers, is attested with schwa in Guy’s data but without in Janice’s. Inter-speaker variation is further observed for *ressortir* ‘go out again$_{\text{INF}}$’, which is realised with a high degree of schwa absence in the PFC data, but with a low degree of schwa absence in the CDS data. Armand produces it with schwa, and Tom produces it without. Regarding *rejouer* ‘play again$_{\text{INF}}$’, Guy produces the item only once and realises it with schwa. *Remettre* ‘put back$_{\text{INF}}$’ is more frequent in the child language data, however, without any important level of schwa absence. While Tom produces the word with alternation, Henri, Lucas, Adèle, Janice, Théa, Armand, and Guy only realise the variant with schwa. The verb is subject to a relatively frequent rate of alternation in both the CDS and the PFC data. However, Guy displays alternation in the verb *remonter* ‘raise up$_{\text{INF}}$’, which is in line with both of the adult registers. The sole occurrence of this item found in the data from Janice is realised with schwa. Janice does realise the verb *relever* ‘lift up again$_{\text{INF}}$’ without schwa. In the CDS data it is subject to schwa absence.

In sum, only a restricted number of items are observed with schwa alternation among the individual speakers, and once again, it is in particular Janice, age group 2, and Tom and Guy, age group 3, who realise both variants. In the other cases, the children categorically select the variant with schwa. There are some instances of schwa absence in items for which we do not attest schwa presence, observed in the data from the children who display alternation, i.e. Janice, Tom, and Guy. The schwa-less variant is completely absent from the children in age groups 1 and 2, with the noted exception of Janice. The sole schwa-item for which alternation is attested across the board is *regarder*. The word has a very high frequency of occurrence in our child language corpus, and the majority of children, regardless of age, show the availability of both variants. Finally, we mention that the high degree of schwa presence in the child language data is, generally, not in line with the distribution of schwa in the target language. Both the CDS data and the PFC data exhibit a relatively high degree of schwa absence in /ʁ/-initial words.

7.3.2.4 Summary

The examination of the child language data obtained in the naturalistic setting has revealed a series of interesting findings. First, the number of different schwa-items realised by the children during the recordings is relatively small compared to inter-adult speech, especially when we take into account the number of hours of recording per child. The small number of verbal forms attested in the younger children Fabienne, Henri, and Adèle is particularly revealing. This finding is of theoretical and methodological interest. First, if these data are representative for the number of schwa-items the child uses and the variants thereof, then we need to incorporate this fact into our discussion on the categorisation of schwa. Recall from Section 3.3.2 that the overlap in distribution between schwa and stable /œ/ is scarce at best. If it turns out that the child’s early lexicon contains only a subset of the schwa-items used by the adults, then only those schwa-items used by the child should guide our theoretical discussion on the categorisation of schwa. Second, regarding methodology, if the data are representative, then it is clear that schwa-items are produced at a lower frequency in child language than in adult language. As indicated by Tomasello and Stahl (2004), it is this frequency that should guide the density of recording of spontaneous speech. However, if the data are not representative, it is clear that an alternative or complementary method of speech sampling is required to ensure data reliability.

The spontaneous speech data have further revealed a high degree of schwa presence across the child language corpus. This is interesting given that the majority of schwa-items that the children use are subject to highly frequent schwa absence in target Swiss French. However, a certain level of target-like schwa alternation is attested for some schwa-items by some of the children in age group 2, Janice, and age group 3, Tom and Guy. This observation indicates that schwa alternation is gradually emerging, even though nothing in our data allows us to conclude that this phenomenon is installed simultaneously across the lexicon. The lexeme-specific behaviour is particularly well attested in Adèle, age group 2, who categorically selects the schwa-less variant for certain items, while selecting the variant without schwa for others (cf. Footnote 318 on the difference in the behaviour of schwa in *au/en/là-dessus* and *dessus*). This observation is important regarding the discussion on the child's underlying representation of the schwa-items. If schwa is present in the phonological form, we need to identify both the mechanism that triggers schwa presence vs. absence in two phonologically identical forms, e.g. *cheval* vs. *cheveux*, and the element that changes in the grammar when the two forms start displaying a similar behaviour.

Finally, concentrating on the schwa-items with an initial liquid, the spontaneous speech data may indicate a higher degree of schwa presence in nouns than in verbs. Although the number of nominal forms is smaller than the number of verbal forms, the older children, who display schwa alternation in verbs with initial /ʁ/, are seemingly less inclined to produce the schwa-less variant of nouns with the same secondary cluster type. Whether this reflects a higher faithfulness to nouns, as suggested by Côté (2009:95) or whether this reflects an authorisation of general schwa absence in verbs with <re>, remains mere speculation at this point.[322]

7.3.3 Schwa behaviour in a semi-controlled setting

In Section 4.2.3.2, we present our methodology for indirectly provoking the production of schwa-items, and in what follows, we explore the data obtained in the semi-controlled setting. In order to reveal potential inter-speaker variation, the main focus of this section is on the presence vs. absence of schwa in the individual children. Within the individual results, we further examine the presence vs. absence of schwa in light of cluster type, word type, and output structure. Thereafter, we turn our attention to the children's overt sensitivity to variation and discuss their linguistic and extra-linguistic reactions to schwa presence vs. absence in the immediate input. We underline that the results presented here are part of the empirical support for the analysis laid out in Section 7.4.

[322] For a discussion on initial <re>, cf. Hansen (1994).

7.3.3.1 Presence vs. absence of schwa in light of age, cluster type, and word type

In Section 4.2.3.2 we present the PowerPoint test that targets the production of polysyllabic words with schwa in the initial syllable, i.e. *cheval, chevir, fenêtre, fenasse,* and *petit*. Half of our subjects is exposed to the test five times, whereas the other half is exposed to the test four times (cf. Table 4.1).[323] Further, not all children complete the test each time, which entails a corpus that contains an uneven number of occurrences across children and sessions. The occurrences from all complete and partially complete test sessions are included in the following descriptive analysis.

Table 7.9 lists the number of analysable occurrences of the five test items for each child. Fabienne, age group 1, and Lucas, age group 2, realise the smallest number of total occurrences, across four and five sessions, respectively, while Janice, age group 2, and Guy, age group 3, realise the greatest number of occurrences, across five sessions each.

Subject		**Occurrences of test items**					**Total**
Name	**Age group**	***cheval***	***chevir***	***fenêtre***	***fenasse***	***petit***	
Fabienne	1	33	5	7	3	5	53
Henri	1	56	11	12	18	16	113
Lucas	2	25	4	17	13	5	64
Adèle	2	23	16	28	24	14	105
Janice	2	58	44	35	33	33	203
Kim	2	40	30	14	17	16	117
Théa	2	37	22	14	18	9	100
Armand	3	54	8	10	11	18	101
Lambert	3	52	41	29	21	16	159
Eric	3	40	5	9	32	18	104
Albert	3	46	25	8	12	22	113
Tom	3	45	30	25	23	19	142
Guy	3	64	41	33	36	23	197
Total		573	282	241	261	214	1571

Table 7.9: Five test items, per item per child, by count

The word *cheval* has the highest rate of occurrence across all children, and it constitutes 36% of the analysable data. The elevated percentage is an expected consequence of the word's equal presence in both versions of the test, the *chevir*-version and the *fenasse*-version, and of its higher frequency than *fenêtre*. Also, *cheval* is often attested in side comments triggered by the pictures. Conversely, the nonsense words are rarely used outside direct responses to the pictures provided during the test setting because they have no referents in the real world and are, therefore, not part of the child's actual experience. Further, as regards *fenêtre*, we assume this item occurs at a lower frequency than *cheval* in the child's speech. Evidence supporting this assumption comes from a study by Marvin et al. (1994), who examine lexical usage-frequency in English-speaking preschool children. They develop a list of the most frequently occurring content words in child speech productions. The word *horse* (*cheval*) is included on that list, but

[323] For the sake of completion, we list the number of times the children are exposed to the two versions of the picture tasks, the one including *chevir* and the one including *fenasse*. For the *chevir* version, Eric is exposed once; Fabienne, Henri, Adèle, Lucas, Kim, and Théa are each exposed twice; Janice, Lambert, Armand, Albert, Tom, and Guy are each exposed three times. For the *fenasse* version, Fabienne, Henri, Adèle, Lucas, Janice, Kim, Théa, Lambert, Albert, Tom, and Guy are exposed twice; Eric and Armand are each exposed three times. Note that Armand is exposed to the test six times, as the fifth time results in almost no data.

window (*fenêtre*) is not. Finally, although *petit* has the lowest rate of occurrence in the test input, its global rate of occurrence in the children's output approaches *fenêtre*. The word *petit* is, on several occasions during the test, spontaneously inserted in the child's production. Test items, thus, occur in the child's production without their being directly related to the pictures. These occurrences, when attested within the test phase, are included in the total number of occurrences, which for all test items combined amounts to a total of 1571 occurrences.

As mentioned in Section 7.2.2, we must first determine whether the child exhibits schwa alternation. Given that we have not yet established the criteria for distinguishing target-like, phonologically conditioned alternation from purely developmental variation, we cannot make claims about the underlying structure of output schwa, nor about whether the observed variants are related output versions of one single input form. Thus, in accordance with our definition of present vs. absent schwa (cf. Section 7.3.1), Figure 7.10 displays the percentage of schwa presence for each item, across all children and all sessions (cf. Table 7.1 for output structures A-D). In the majority of cases, for each test item, the variant with schwa is selected. The lowest rate of schwa presence is observed for *petit*, at 73%, 156/214 occurrences. Recall that this item is a highly frequently occurring adjective that often occurs in a pre-nominal and target unstressed position, and is subject to highly frequent schwa absence in the ambient language. In light of these facts, we cannot exclude the possibility that *petit* is stored or processed differently from the four nouns.

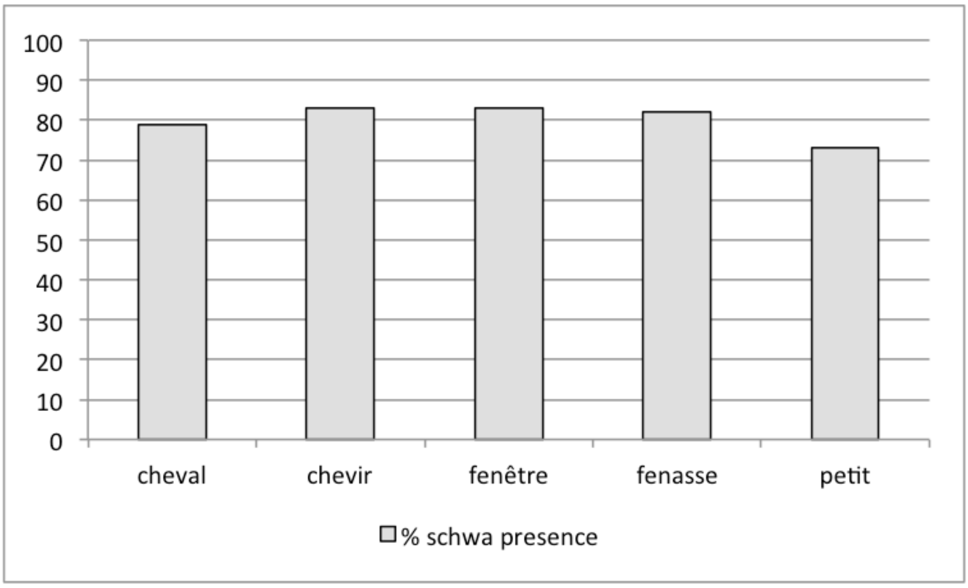

Figure 7.10: Schwa presence per test item, all children, by percentage[324]

We expect, *a priori*, that a developmental tendency emerges in the data because this is a cross-sectional study, i.e. we expect schwa alternation to be greater in the data from the older children. Table 7.10 presents the percentages of schwa presence vs. absence per test item per child. As predicted, a more complex picture emerges in which different degrees of schwa alternation are attested for the various children.

[324] The following are the totals for schwa presence for each item: *cheval* (454/573), *chevir* (233/282), *fenêtre* (199/241), *fenasse* (214/261), and *petit* (156/214). The total number of occurrences with schwa presence is 1256/1571, 80%.

Age group	Subject	*cheval* P	*cheval* A	*chevir* P	*chevir* A	*fenêtre* P	*fenêtre* A	*fenasse* P	*fenasse* A	*petit* P	*petit* A
1	Fabienne	15% (5)	85% (28)	100% (5)	0 (0)	57% (4)	43% (3)	0 (0)	100% (3)	80% (4)	20% (1)
1	Henri	96% (54)	4% (2)	100% (11)	0 (0)	67% (8)	33% (4)	89% (16)	11% (2)	75% (12)	25% (4)
2	Lucas	92% (23)	8% (2)	100% (4)	0 (0)	76% (13)	24% (4)	92% (12)	8% (1)	40% (2)	60% (3)
2	Adèle	100% (23)	0 (0)	69% (11)	31% (5)	86% (24)	14% (4)	54% (13)	46% (11)	64% (9)	36% (5)
2	Janice	97% (56)	3% (2)	86% (38)	14% (6)	69% (24)	31% (11)	52% (17)	48% (16)	73% (24)	27% (9)
2	Kim	95% (38)	5% (2)	100% (30)	0 (0)	100% (14)	0 (0)	100% (17)	0 (0)	94% (15)	6% (1)
2	Théa	89% (33)	11% (4)	68% (15)	32% (7)	93% (13)	7% (1)	94% (17)	6% (1)	78% (7)	22% (2)
3	Armand	28% (15)	72% (39)	88% (7)	12% (1)	90% (9)	10% (1)	73% (8)	27% (3)	100% (18)	0 (0)
3	Lambert	83% (43)	17% (9)	78% (32)	22% (9)	97% (28)	3% (1)	81% (17)	19% (4)	69% (11)	31% (5)
3	Eric	85% (34)	15% (6)	80% (4)	20% (1)	100% (9)	0 (0)	97% (31)	3% (1)	33% (6)	67% (12)
3	Albert	59% (27)	41% (19)	76% (19)	24% (6)	88% (7)	12% (1)	100% (12)	0 (0)	59% (13)	41% (9)
3	Tom	93% (42)	7% (3)	80% (24)	20% (6)	80% (20)	20% (5)	91% (21)	9% (2)	84% (16)	16% (3)
3	Guy	95% (61)	5% (3)	80% (33)	20% (8)	79% (26)	21% (7)	92% (33)	8% (3)	83% (19)	17% (4)
	Total	79% (454)	21% (119)	83% (233)	17% (49)	83% (199)	17% (42)	82% (214)	18% (47)	73% (156)	27% (58)

Table 7.10: Schwa presence vs. absence per test item per child, by percentage and count

First, an examination of the results in light of age group reveals that schwa alternation is attested across the board, albeit not by all children. Kim, age group 2, exhibits a near-stability of schwa. As regards cluster type, *petit* is subject to alternation in all age groups, with the important exception of Armand, age group 3, for whom we only attest the variant with schwa. Cluster type [ʃv], as in *cheval* and *chevir*, is subject to variation especially in the children belonging to age group 3. On the other hand, cluster type [fn], as in *fenêtre* and *fenasse*, displays a different behaviour in that it is subject to variation especially in the data from the younger children, age groups 1-2. Finally, regarding word type, the one observation to retain from Table 7.10 is the fact that, for the children in age group 2, nonsense word *chevir* seems more easily subject to alternation than true word *cheval*. At the individual level, we observe several interesting differences. As mentioned, schwa alternation is not attested for the same items among the children. For instance, for the true words, Adèle categorically selects the variant with schwa for *cheval*, but displays alternation for *fenêtre*. Kim and Eric, on the other hand, display variation for *cheval*, but they categorically select the variant with schwa for *fenêtre*. Further, although all subjects prefer the variant with schwa across the board, a different preference pattern for *cheval* is observed for Fabienne, age group 1, and Armand, age group 3; they prefer the schwa-less variant.

Table 7.10 displays the individual rates of alternation, and we now turn to the question whether these individual rates reflect a developmental path with regard to schwa alternation. In order to provide an initial answer to this question, in what follows, we examine the performance of the various age groups with respect to each of the three cluster types, i.e. [ʃv], [fn], and *petit*, and this in light of the various moments during the recording period. We pay most attention to the true words.

The first cluster type to be examined is [ʃv], found in *cheval* and *chevir*. The individual results for *cheval* reveal no unambiguous developmental pattern. Although, there is one regularity in the data: the children in age group 2 categorically select the variant with schwa in the initial sessions, while in later sessions they allow for a low degree of schwa absence. Adèle is the sole exception in that she displays no alternation throughout the recording period. Even though the sampling frequency of *chevir* is reduced in comparison to *cheval*, the claim that there is an initial preference for the variant with schwa in age group 2 is somewhat strengthened by these children's productions of *chevir*. However, the claim that there is a gradual emergence of schwa absence in age group 2 is challenged by the data from age group 3. Tom and Guy, age group 3, near-categorically select the variant with schwa for *cheval* throughout the recording period. Interestingly, though, Tom's realisations of *chevir* reveal an abrupt change from a categorical schwa presence in the first two sessions, to a preference for the schwa-less variant in the final session. The reverse pattern, i.e. change from a preference for the schwa-less variant to preference for the variant with schwa, is attested in the data from Armand, age group 3. Armand prefers the schwa-less variant for *cheval* in the first test sessions. In the fourth session, he begins by producing three consecutive polysyllables for *cheval*, i.e. [fað̞̆ɛʁ], [fahĕlɛʁ̥] and [fã̝ʎɛʁ]. It is worth mentioning that the switch in preference or the emergence of a second variant seems to be gradual in nature. Armand, in the very same test session, switches back to the preferred monosyllabic version [fal] once he has been exposed to the schwa-less variant in the input (cf. Section 7.3.3.3.2, Example (19)). While the preference for the schwa-less variant is not common among the children in age group 2 or 3, it is attested for Fabienne in age group 1. She prefers the schwa-less variant in all sessions, and it is not until the final session that she realises a near-target-like production of *chevaux* 'horse;pl', [ṣɒːv̥o]. When we combine this observation with the results from age group 2, with near-categorical presence of schwa, it is reasonable to hypothesise that Fabienne is transitioning into a syllable-faithful stage, in which schwa is phonetically realised as a vowel. Interestingly, the preference for the schwa-less variant attested for *cheval* in the data from Fabienne and Armand, is not repeated in their data for *chevir*. Thus, we cannot claim that this strategy is selected for the [ʃv] cluster type in general. However, recall that for these children, the number of occurrences for *chevir* is particularly small, i.e. five and eight occurrences for the whole recording period, respectively.

The second cluster type to be examined is [fn], found in *fenêtre* and *fenasse*. Concentrating on the true word *fenêtre*, we observe that for the children in age group 2 the stability of the variant with schwa that is observed for *cheval* is not observed for *fenêtre*. In fact, despite the lower rate of occurrence of *fenêtre*, compared to *cheval*, Lucas produces variants with and without schwa in each session, and Janice, who has a near-categorical presence of schwa for *cheval*, selects the schwa-less variant of *fenêtre* in the second session, and she even prefers it in the fifth session. The emerging preference for the schwa-less variant is also found in Janice's realisations of the [fn] nonsense word *fenasse*. Adèle, who does not alternate in *cheval*, starts producing a low number of schwa-less variants for *fenêtre* in her two last sessions. Her realisations of *fenasse* conform to this pattern in that she goes from no schwa deletion in the first test session to a preference for the schwa-less variant in the second test session containing this item. In contrast, Théa is near-categorical in her production of schwa in that she produces a single occurrence each of the schwa-less variant of *fenêtre* and *fenasse*, and this in the last session. Finally, Kim does not produce schwa absence for the [fn] cluster type. Turning to Tom and Guy, age group 3, recall that they show a near-categorical presence of schwa in *cheval*. For the [fn] cluster type, they display different behaviours. While Tom categorically realises the variant with schwa during the first two sessions, Guy uses both variants already in the first session. Note that they both categorically realise schwa in *fenasse* in the first session, but after further exposure in the second session they begin to authorise the schwa-less version. Finally, we mention that Fabienne, age group 1, exhibits alternation in *fenêtre* in the first session, but she moves to categorical schwa presence in the second session. Unfortunately, the scarce amount of data prevents us from proposing any conclusion. However, it is interesting to note that Fabienne seems to differ from Armand when it comes to *fenêtre*. While they both display early schwa absence in *cheval*, different from Fabienne, Armand selects the variant with schwa for *fenêtre* in a near-categorical fashion in both sessions. These observations suggest that Fabienne treats *cheval* and *fenêtre* in a similar manner, i.e. she has a preference for the schwa-less variant that is replaced gradually by a preference for a variant with schwa, while Armand treats the two items differently, i.e. with stable schwa presence installed in *fenêtre* but not (yet) in *cheval*.

The final test item *petit* is selected for this study because of its frequent schwa absence in the input. Three observations are worth noting from the examination of the individual results. First, the two variants are available to children in all age groups from the outset of the recording period. Second, the preference for the variant with schwa is surprisingly strong across subjects, especially given the high amount of schwa deletion in the CDS data (cf. Section 6.3.1). Third, Armand, once again, constitutes an exception in that no occurrence of the schwa-less variant is attested in his data, which, yet again, illustrates that his preference for the schwa-less variant is not applied across the board. He, thus, stands in sharp contrast to Eric, a fellow subject in age group 3, who prefers the schwa-less variant of *petit* in all sessions.

To conclude this section, we put forth the claim that schwa-items, in a global fashion, pass through three phases in development:

(6) Proposed stages in the development of schwa-items based on test results
1. Preference for the variant without schwa
2. Strong preference for the variant with schwa
3. Preference for the variant with schwa, with gradual authorisation of the schwa-less variant

This section has focused on the presence vs. absence of schwa in the various test items, and the next step is to determine which output structures are selected by the various children to represent a present vs. an absent schwa.

7.3.3.2 Selection of output structures

We have hitherto coded the occurrences of schwa as present or absent, with the intention to remain as neutral as possible with regard to the phonological structure behind the phonetic signal. Having presented the rates of schwa presence vs. absence for the individual children, we now find it appropriate to re-introduce the various phonetic realisations of the schwa-items and to examine their relative importance in the corpus, cf. Figures 7.2 through 7.9. First, this examination serves as a basis for Section 7.3.3.3, where we examine the distribution of output structures in light of variation in the input. Second, the examination constitutes a first step in the analysis of the phonological structure underlying the phonetic signal that is produced, and of the constraints operating on these structures, extracted in Example (7) for convenience.

(7) Output structures, extracted from Table 7.1

Present schwa		Absent schwa	
Full, prominent vowel	A	Consonant sequence	E
Full, non-prominent vowel	B	Lengthened consonant	E
Vowel doubling	C	Split consonant sequence	E
Reduced vowel	D	CV absence	F

In what follows, we present the output structures according to the amount of phonetic material representing the schwa syllable there is, i.e. along the scale of full vowel to reduced vowel to consonant cluster to consonant deletion.

First, the most frequent output structure in the corpus is schwa realised as a full vowel that is more or equally prominent to the word-final syllable, Output structure A (cf. Figure 7.11); it amounts to 65% (1024/1571) of the data. It is observed in all children and for all test items, with *fenasse* produced by Fabienne being the sole exception. As expected on the basis of the results in Section 7.3.3.1, Fabienne and Armand use this output structure least frequently, 25% (13/53) of the occurrences and 40% (40/101) of the occurrences, respectively. For the remainder of the subjects, schwa is realised as a full prominent vowel in more than 50% of the cases.[325] The latter observation does not pattern with one of the characteristics of target French phonetic schwa because in target French schwa generally lacks prosodic prominence. As we are merely examining results from question and answer test sessions, at this point, we cannot determine whether this prominence is grammar-internal or whether grammar-external factors, such as emphasis, come into play.

[325] For the sake of completion, we provide the percentage and count for the remaining 11 children: Henri 79% (89/113), Lucas 72% (46/64), Adèle 66% (69/113), Janice 61% (124/203), Kim 88% (103/117), Théa 66% (66/100), Lambert 73% (116/159), Eric 57% (59/104), Albert 59% (67/113), Tom 66% (94/142), and Guy 70% (138/197).

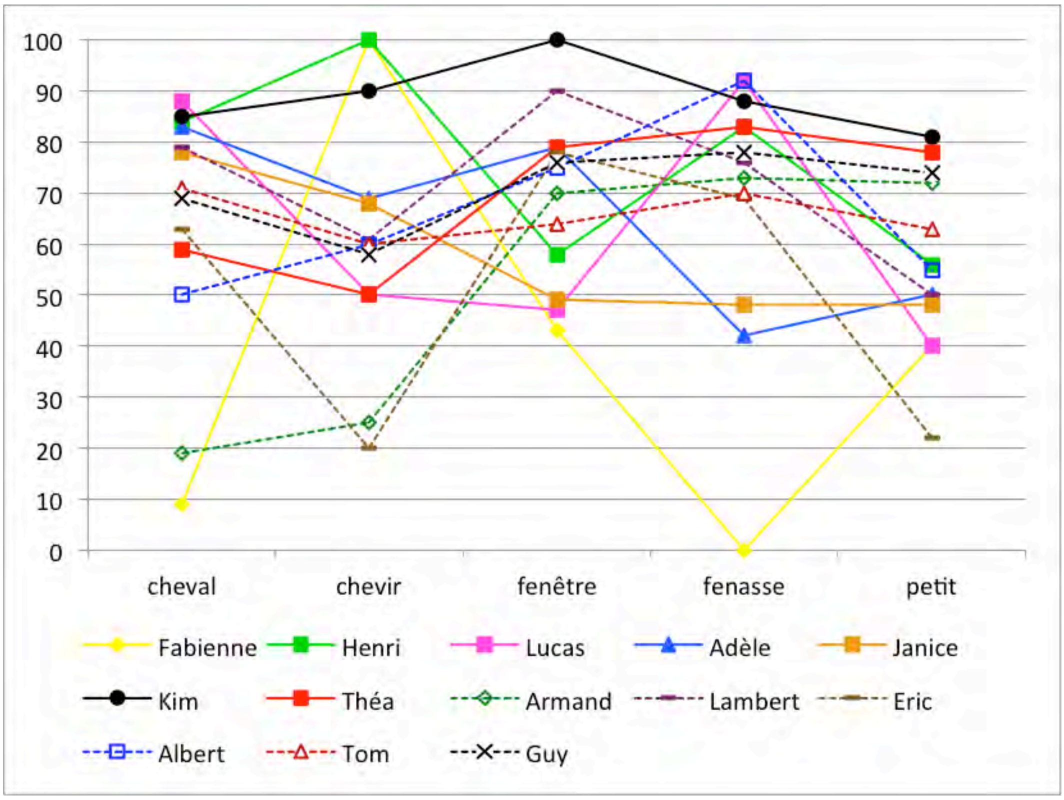

Figure 7.11: Schwa as a full, prominent vowel, Output structure A, per test item per child, by percentage[326]

Figure 7.12 illustrates that the rate of schwa realised as a full non-prominent vowel, Output structure B, is clearly lower when compared with its prominent counterpart. Full, non-prominent schwa constitutes 12% (181/1571) of the totality of occurrences. All children use this structure infrequently, indicating that typically when schwa is realised as a full vowel, it is realised as prominent. Three children seem to diverge from the other children, i.e. Lucas and Eric produce a full non-prominent vowel for *chevir* in 50% and 60% of the cases, respectively, and Fabienne produces a full non-prominent vowel for *petit* in 40% of the cases. However, at least for Lucas and Fabienne, these percentages are not representative of the totality of their results because they produce this output structure in only 3% (2/64) and 6% (3/53) of the cases, respectively.[327] As regards Eric, on the other hand, he, alongside Tom and Guy, realises schwa as a full non-prominent vowel in 15% of occurrences or more when all items are taken into account. For further discussion on the variable use of this strategy among the children, i.e. Eric, Tom, and Guy vs. the others, we refer to Section 7.4.2.

[326] Although the data are not continuous, the data in Figures 7.11 to 7.16 are presented as line graphs for the purpose of illustration.

[327] For the sake of completion, we provide the percentage and count for the remaining 11 children: Henri 11% (12/113), Adèle 10% (10/105), Janice 13% (27/203), Kim 9% (11/117), Théa 12% (12/100), Armand 8% (8/101), Lambert 8% (13/159), Eric 19% (20/104), Albert 9% (10/113), Tom 15% (21/142), and Guy 16% (32/197).

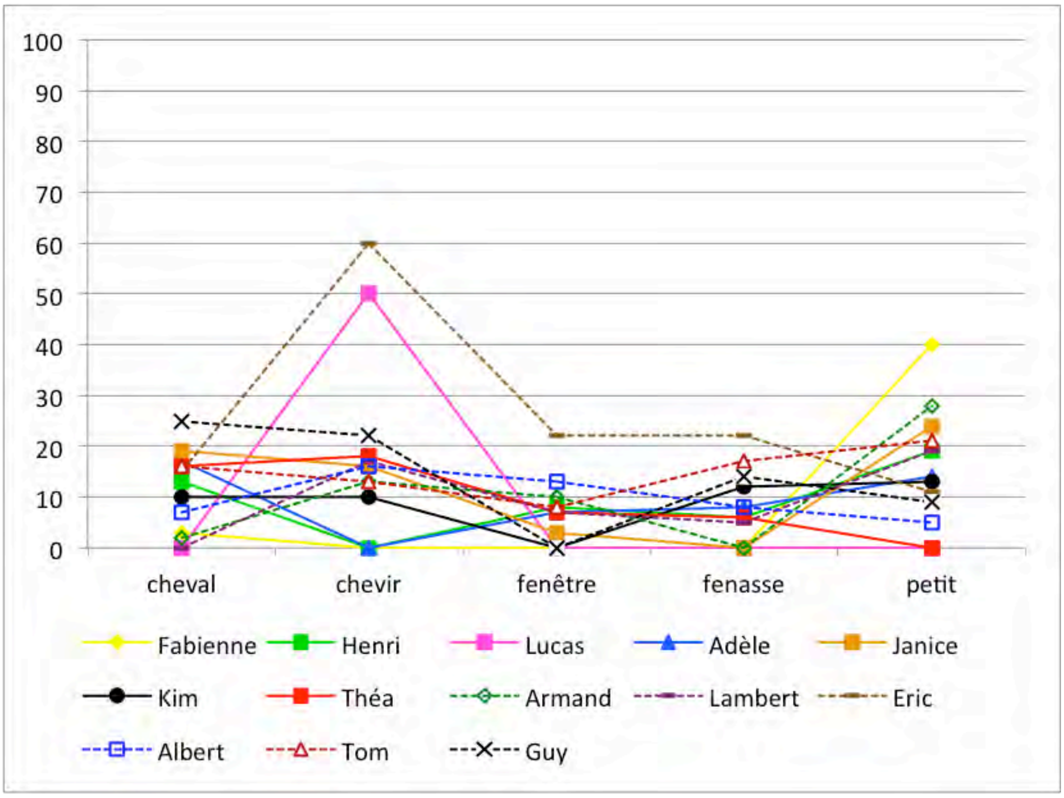

Figure 7.12: Schwa as a full, non-prominent vowel, Output structure B, per test item per child, by percentage

The third output structure that contains a full schwa vowel is the case of doubling the final vowel with no intervening consonantal material, Output structure C. The number of occurrences of this type is low and constitutes less than 1% (11/1571) of the corpus. Further, vowel doubling is attested in only two of the children, Fabienne, age group 1, and Armand, age group 3. Fabienne uses vowel doubling in 4% (2/53) of the occurrences. Armand uses vowel doubling in 9% (9/101) of the occurrences. Figure 7.13 reveals that this output structure is not selected across the board. It is not attested in the data for *fenasse* and *petit*. Also, although Figure 7.13 indicates a high score on *chevir* in the data from Armand (50%), this must be analysed with caution: Armand produces *chevir* fewer than ten times in the test sessions during the recording period, four of which are produced with vowel doubling. The low frequency of this output structure does not make it less interesting. In fact, we need to examine in more detail the output structures that compete with vowel doubling in these children, and further, the intra- or extra-grammatical motivations for selecting the latter.

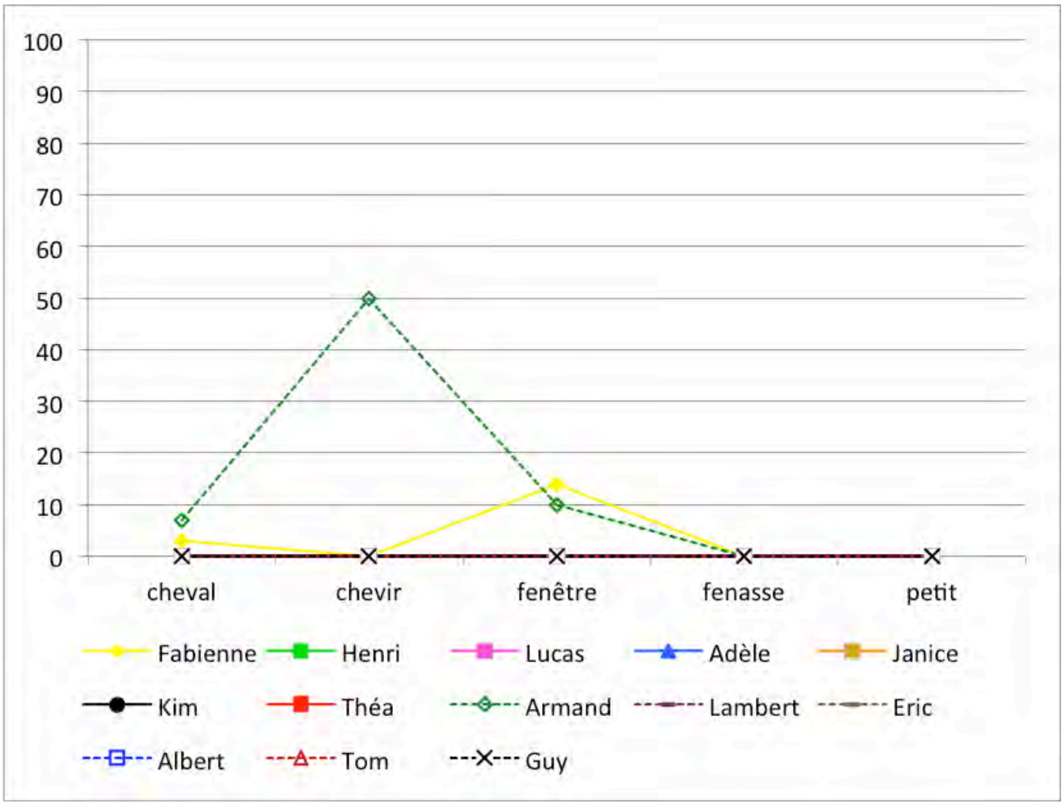

Figure 7.13: Schwa as part of a doubled vowel, Output structure C, per test item per child, by percentage

Figure 7.14 depicts the occurrences of schwa as a vowel of reduced acoustic salience and of short duration, Output structure D. After vowel doubling, Output structure D is, by far, the least frequent output structure in the corpus; it constitutes 3% (40/1571) of the total number of occurrences. The reduced schwa is most frequently observed for the true words *cheval* (16/573) and *fenêtre* (15/241). In contrast, it is never observed for *petit*. The individual results show that Fabienne and Henri, age group 1, Kim, age group 2, and Armand, age group 3, do not have this output structure in their inventory. For the remainder of the children, its frequency ranges from 1%, with Adèle, who produces 1/105 occurrences, to 9%, with Lucas, who produces 6/64 occurrences.[328] Despite its low frequency in the corpus, the reduced schwa is interesting in that it constitutes an intermediate segment that is a cross between a phonetically present and a phonetically absent schwa, which again raises questions about its phonological status.

[328] For the sake of completion, we provide the percentages and numbers for the remaining children: Janice 4% (8/203), Théa 7% (7/100), Lambert 1% (2/159), Eric 5% (5/104), Albert 1% (1/113), Tom 6% (8/142), and Guy 1% (2/197).

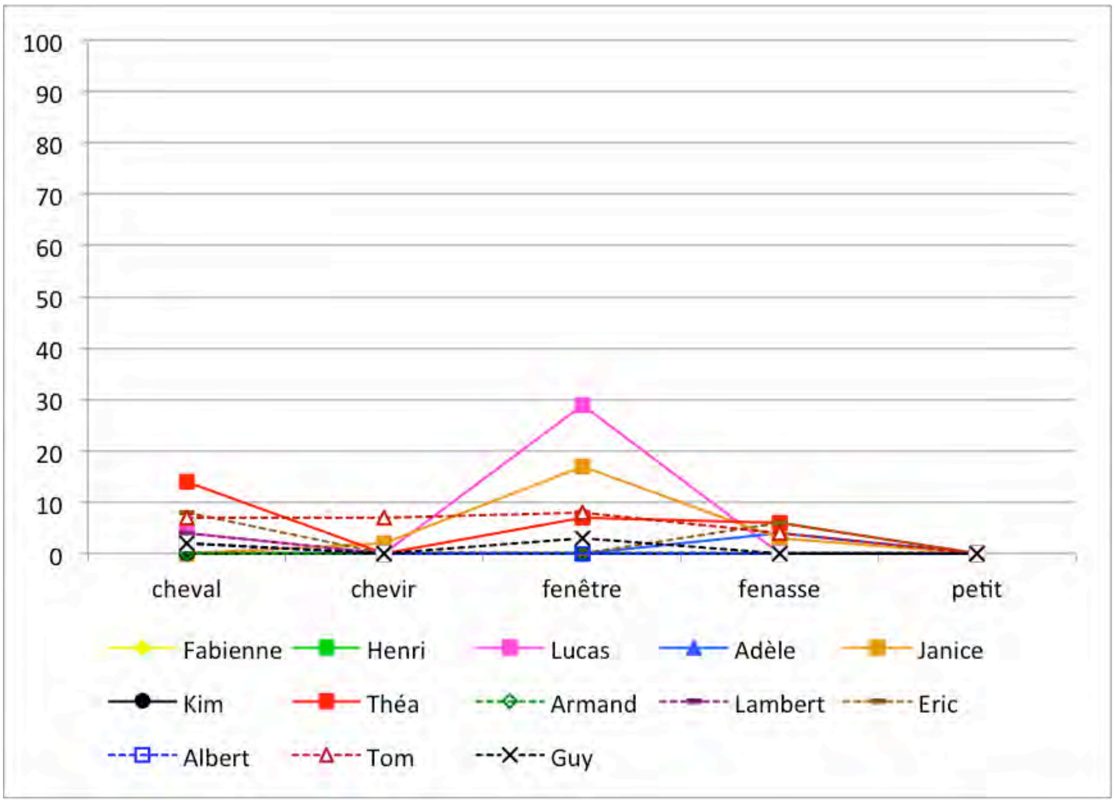

Figure 7.14: Schwa as a reduced vowel, Output structure D, per test item per child, by percentage

Recall from Section 7.3.1 that a consonant sequence can be realised as contiguous or as split by a brief silence. Further, the individual consonants can vary in length across occurrences. As these cluster variants are examined in more detail in Section 7.4.2, for the time being, we collapse the three variants into one group, Output structure E (cf. Figure 7.15). This structure is the second most frequent output structure in the corpus, only behind Output structure A; it constitutes 14% (215/1571) of the corpus. The examination of individual results reveals a nice continuum according to the age of the child: Age group 1 produces the lowest rate of consonant sequencing, i.e. Fabienne in 9% (5/53) of the occurrences and Henri in 3% (3/113) of the occurrences. The majority of children in age group 3 produce a consonant sequence in 15% of the occurrences or more; Albert displays the highest rate for this structure and produces a consonant sequence in 26% (29/113) of the occurrences. However, the correlation between age and consonant sequencing is not perfect: Janice and Kim, age group 2 and very close in age, have different behaviours regarding this structure. Janice selects this output structure in 20% (40/203) of the occurrences, while Kim selects it in 1% (1/177) of the occurrences. If we further take into account that Guy, who is the oldest subject, prefers this structure in 13% (25/197) of the occurrences, which is a lower rate than for Janice, it seems clear that positive correlation between consonant sequencing and age is not necessary.[329] Rather, there are several factors that are capable of causing a mismatch, and these may be intra-grammatical as well as extra-grammatical.[330]

[329] For the sake of completion, we provide the percentage and count for the remaining 7 children: Lucas 11% (7/64), Adèle 11% (12/105), Théa 12% (12/100), Armand 16% (16/101), Lambert 18% (28/159), Eric 18% (19/104), and Tom 13% (18/142).

[330] Recall that Janice and Guy are recorded at home on a regular basis for this study, and therefore, we possess both spontaneous speech and CDS for these children. As for Kim, he is only recorded at the kindergarten in a semi-

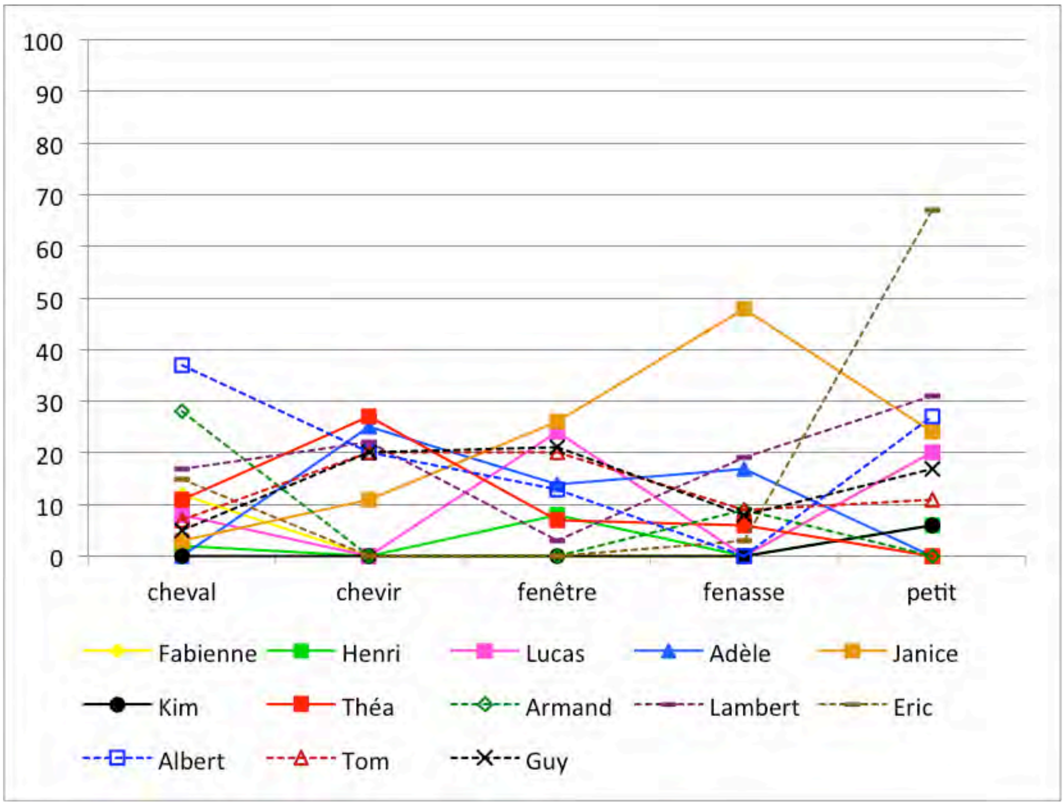

Figure 7.15: Schwa absence and consonant sequencing, Output structure E, per test item per child, by percentage

Finally, Figure 7.16 illustrates the frequency of cases in which the absence of schwa is accompanied by the deletion of one (or both) of the surrounding consonants, Output structure F. The lack of a CV syllable constitutes 6% (100/1571) of the total number of occurrences. The numbers per child indicate that the selection of this output structure is most frequent for Fabienne, who uses it in 57% (30/53) of the occurrences, and Armand, who uses it in 28% (28/101) of the occurrences. A more detailed examination of Armand's data reveals that CV absence is mainly observed for the word *cheval* (44%, 24/54). However, this strategy does not prevail for the other items. A similar observation is made in the data from Adèle, for whom we observe that CV absence constitutes 12% (13/105) of the occurrences. However, in her data, by item, CV absence is attested in 29% of the occurrences of *fenasse* (7/24), but it is never attested for *cheval* (0/23). Regarding the remaining children, the overall use of Output structure F never exceeds 10%.[331] Given that deletion of an entire syllable is not an uncommon phenomenon in child language, what needs to be determined is whether the selection of CV absence for schwa-items constitutes an instance of general syllable deletion, or whether it is a strategy used specifically for schwa-items.

controlled setting, and therefore, nothing can be said about the amount of schwa variation in his spontaneous speech or in the CDS of his caregiver(s).

[331] For the sake of completion, we provide the percentage and count for the remaining 10 children: Henri 8% (9/113), Lucas 5% (3/64), Janice 2% (4/203), Kim 2% (2/117), Théa 3% (3/100), Lambert 0% (0/159), Eric 1% (1/104), Albert 5% (6/113), Tom 1% (1/142), and Guy 0% (0/197).

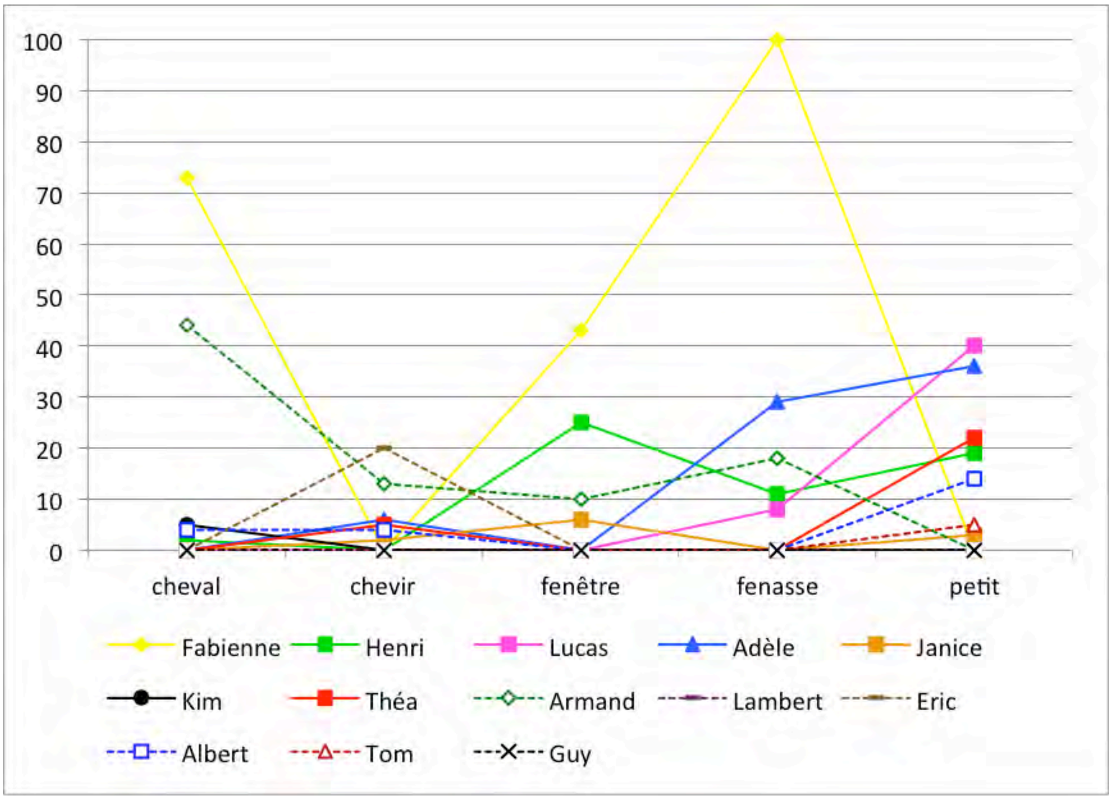

Figure 7.16: Absence of schwa and consonant, Output structure F, per test item per child, by percentage

Table 7.11 summarises and organises the main findings of this section according to what is expected under our hypothetical developmental path. In the first phase, we expect there to be deletion of the schwa syllable, in the next phase we expect syllable stability, and in the final phase we expect the gradual emergence of secondary clusters. While the decrease in CV deletion in the course of acquisition, cf. Column <CV_2> in Table 7.11, is clearly illustrated by the comparison of Fabienne and the older children, it is worth noting that Armand is unique in age group 3 because of his high rate of CV deletion. When we set aside the data from Fabienne and Armand, the schwa syllable is frequently present across the corpus. However, faithfulness to the schwa syllable, cf. Column <CV_1CV_2> in Table 7.11, is particularly strong in the data from Henri, age group 1, and Kim, age group 2, which nicely fits with our hypothesis. Further, the gradual emergence of the secondary cluster, cf. Column <$C(V_1)CV_2$> in Table 7.11, corresponds well with age, given that subjects from age group 3 more frequently use clustering than children from the other age groups do. However, note that clustering is most frequent in the data from Janice, age group 2, which shows, yet again, that there is no necessary link between age and phonological development. Finally, Table 7.11 shows that the production of reduced schwa, cf. Column <Cv_1CV_2>, is found only in the speech of children who realise a certain number of consonant clusters. This finding indicates that the two output structures emerge simultaneously.

Age group	Child	CV_2	CV_1CV_2	Cv_1CV_2	$C(V_1)CV_2$
1	Fabienne	57	34	0	9
1	Henri	8	89	0	3
2	Lucas	5	75	9	11
2	Adèle	12	75	1	11
2	Janice	2	74	4	20
2	Kim	2	97	0	1
2	Théa	3	78	7	12
3	Armand	28	56	0	16
3	Lambert	0	81	1	18
3	Eric	1	76	5	18
3	Albert	5	68	1	26
3	Tom	1	81	6	13
3	Guy	0	86	1	13

Table 7.11: Main groups of output structures and their presence in the child's output, by percentage

In this section, we set out to examine the relative importance of the various output structures in our corpus. The data reveal that – in the case of a present schwa – a full prominent vowel is the preferred version (Output structure A). In the case of an absent schwa, the production of a consonant sequence is the most frequently selected structure (Output structure E). Additionally, there are two output structures that avoid a full vowel and circumvent the problem of consonant sequencing, one, schwa is produced as a reduced vowel (Output structure D), and two, a consonant is deleted (Output structure F). In what follows, we examine the results presented in the latter two sections in light of schwa variation in the immediate input. As schwa reduction (Output structure D) and consonant deletion (Output structure F) stand in contrast to the full prominent vowel without inducing consonant complexity, we claim that the child uses these as a reaction to absence of schwa in the immediate input.

7.3.3.3 Sensitivity to variation in the input

7.3.3.3.1 Classification criteria

We remind the reader that the PowerPoint test is designed to encourage interaction between the child and a native Vaudois speaker, coded *Machine*. For each schwa-item presented in the PowerPoint, pre-recorded sound-files of both the variants with and without schwa are available; according to the protocol, we decide on the spot which of the two variants the child should be exposed to. The main idea is to play the variant not preferred by the child, in order to see whether he switches to the variant given in the input, or whether he continues to use the default variant (cf. Section 4.2.3.2 for more details). In order to reveal whether or not schwa variation in the input has an immediate effect on the child's production during the test, all schwa occurrences retrieved from this part of the corpus are classified according to which variant in the input precedes the child's utterance. Three main categories are established: *Input*, *No Input* and *Intro*. First, *Input* covers the child's production of a schwa-item that also occurs in the immediate input. We define "immediate input" as Machine's labelling of an item depicted on a slide that directly precedes the child's production of the same lexical item. For an example, see the excerpt from a "dialogue" between Machine and Tom (3;03.29), presented in Example (8).

(8) Picture of a horse and a dog

Machine: Maintenant il y a deux animaux. Tu peux me raconter ce que c'est?
Tom: Un cheval et un chien.
Machine: Oui c'est un chien. Oui c'est un cheval. Ils font quoi les deux animaux?
Tom: Le chien tire sa langue et puis l'autre * qui court.

Picture of a cat and a horse

Machine: Là aussi il y a deux animaux. Tu peux me raconter ce que c'est?
Tom: Un chat et puis un ch… un cheval.
Machine: Oui c'est un chat. Oui c'est un cheval. Il fait quoi le chat?
Tom: Mais il veut attraper le cheval.
Machine: Et le cheval, il fait quoi?
Tom: Ben, il court.

In order to identify the child's sensitivity to the input (cf. Hypothesis B1, Section 7.2.2), the *Input* category is further divided into four subgroups, which are defined by the pairings of the variant(s) realised by Machine, or in some cases by the researcher, and the variants realised by the child. First, *presence – presence* (PP) represents the cases when schwa is present both in the input and in the child output, e.g. Researcher: *C'est deux chevaux?* Fabienne (2;05.00): *Oui, deux chevaux* [ʂ̣ɒːɣ̥o]. Second, *presence – absence* (PA) represents the cases when schwa is present in the input and is absent in the child output, e.g. Machine: *C'est un cheval.* […] Armand (3;01.22): *C'est un ch'val* [fvæʎ]. Third, *absence – presence* (AP) represents the cases when schwa is absent in the input and present in the child output, e.g. Machine: *Une f'nêtre.* […] Guy (3;02.22): *Deux fenêtres* [fœ̞nɛtʀ]. Finally, *absence – absence* (AA) represents the cases when schwa is absent both in the input and in the child output, e.g. Machine: *C'est un ch'vir aussi.* […] Adèle (2;08.29): *A deux ch'virs* [θti].

Second, *No Input* covers the child's production of a schwa-item that is separated from the input by some interruption, even if that schwa-item is present in the input. The two kinds of interruption are in the form of a filler slide[332] (*No Input-I*) or an unexpected interruption of the task, like the child introducing an unrelated topic into the conversation, or another child entering the task (*No Input-II*). The purpose of establishing this category is to identify the variant selected when there is no immediate stimulus, i.e. to determine whether the proximity of the input is relevant to its influence on the child's subsequent production. Since the results of the two *No Input* categories do not diverge, the occurrences classified as *No Input-I* and *No Input-II* are henceforth analysed as one group.

Finally, *Intro* covers the child's very first production of a given schwa-item in each particular session, i.e. it has not been uttered in the input, nor by the child. We isolate these occurrences because if the results in the *Input* category indicate that the immediate input influences the child's selection of variant – it is relevant to observe the variant selected by the child in the total *absence* of input. Recall our claim that a challenging conversation partner could trigger the child to select non-preferred variants. If this is the case, then, *a priori*, the very first production of the schwa-item should constitute the child's default variant.

[332] The filler slides contain pictures without schwa-items, e.g. a teddy bear (*nounours*) or a snail (*escargot*). Note that slides containing both non-schwa-items, e.g. a cat (*chat*) or a dog (*chien*), and schwa-items are not considered filler slides, despite the possibility that they are capable of attracting the child's attention *between* the forms classified as immediate input and subsequent output. We rule them out as fillers because the schwa-item is simultaneously visible on the screen.

Before turning our attention to the results, it is relevant to comment on three issues related to the design of the test and its implementation. First, the non-static design allows us, if needed, to adjust the procedure according to the child's level of attention and comprehension. For instance, if the child starts to talk about something else or is distracted by some external factor[333], we are able to wait and proceed with the test by replaying the stimulus or by providing it ourselves. In other cases, the child, directly or indirectly, asks us to repeat the stimulus. It necessarily follows that the data contain a certain amount of variability. First, both the total number of schwa-items and the number of items with present or absent schwa in the input vary between recording sessions. If the frequency of variants in the input has an effect on the child's selection of variant (for a discussion on input frequency of variants in adult French, cf. Racine 2008), the outputs that are preceded by one vs. several stimuli should be examined separately.[334] We do not focus on the frequency of variants in the input, but we refer to Section 9.3 for a brief comment.

Second, the children each react differently when faced with the pictures and the auditory stimuli. As already indicated in Section 7.3.3.1, the number of occurrences varies considerably from one child to another and from one session to another (for the same child).

The third issue is the input source. Recall that the *immediate input* refers to the most recent production of an item preceding the child's own; thus, it follows that the Machine, the researcher, and an occasionally present second child each may function as the input source. The pre-recorded Machine always leads the conversation, but, as already mentioned, certain situations necessitate some improvisation on the part of the researcher. Concerning the second child present, he sometimes answers more quickly than the subject, which creates a new input for the subject. One can assume that the child pays more attention to some input sources than others. For instance, the fact that the subject has a closer relationship with his peer than with Machine or the researcher, could make the subject pay more attention to the former than to either of the latter. Also, the child could be less receptive to input from the researcher than from Machine. Machine is not physically present but merely consists of pre-recorded phrases, which, *a priori*, makes him as a more challenging conversation partner; the children may not know whether or not he is capable of adapting his speech to the child's linguistic level. Therefore, it is possible that the child pays more attention to Machine and puts more effort into communicating with him. Note that in the presentation of the data, we do not classify the productions according to the input source.

7.3.3.3.2 Linguistic reactions to variation in the input

To begin this section, we first examine the global results for the three categories *Input*, *No input*, and *Intro*: *Input* constitutes 66% (1038/1571) of the corpus, *No Input* constitutes 25% (399/1571) of the corpus, and *Intro* constitutes 9% (134/1571) of the corpus. We concentrate on the results for *Input* for the various test items, *cheval, chevir, fenêtre, fenasse*, and *petit*. The *presence – presence* (henceforth PP) pairing is by far the most frequent pattern and it constitutes

[333] As mentioned in Chapter 4.2.3.3, we record the children next to or in the changing room, into which parents or other children frequently would enter.

[334] To be more precise, the repeated exposure to a given variant could strengthen this variant at the expense of the complementary one, which in the data would show the child favouring the production of the former over the latter. For instance, Lambert (3;02.12) selects the schwa-less variant after the repeated exposure to schwa-less variant by Machine: *C'était une f'nasse. Elle fait quoi la f'nasse?* Note that this example does not determine whether it is the frequency or the mere presence of the schwa-less variant that is decisive for his subsequent selection of the schwa-less variant.

47% (488/1038) of the corpus. The second most frequent pattern is *absence – presence* (henceforth AP), at 30% (311/1038), and third, is *absence – absence* (henceforth AA), at 16% (166/1038). *Presence – absence* (henceforth PA) is the least frequent response pattern at a scarce 7% (73/1038) of the corpus.[335] The total numbers show that, in the case of schwa absence in the input, which is 45% (477/1038) of the occurrences in the *Input* category, the children prefer to realise the variant with schwa, which is not in conformity with the input. In the case of schwa presence in the input, which is 54% (561/1038) of the occurrences in the *Input* category, the children, again, prefer to realise the variant with schwa, which in this case is in conformity with the input. The cases of *absence-presence*, 30% of the *Input* category, and of *presence-absence*, 7% of the *Input* category, indicate that the child does not blindly imitate the variant he has most recently been exposed to.

Figure 7.17 depicts the distribution of the four response patterns for each of the test items, by count. The columns in the left-hand picture expose the results with schwa presence in the input, and the columns in the right-hand picture expose those with schwa absence in the input. First, the graphs show that, globally, the children have been exposed to a higher number of instances of schwa absence for the true words than for the nonsense words. This is a consequence of the novelty of the nonsense words, and the researcher's attempt to familiarise the children with these items by intuitively using the variant with schwa in the input more often than the schwa-less variant. Second, the graphs indicate that despite the novelty of the nonsense words, the children do not consistently follow Machine. In the case of schwa absence in *chevir* and *fenasse* in the input, the children use both variants; they either use the most recently heard variant, without schwa, or they use the variant with schwa, which is the form to which they are introduced in the first session.

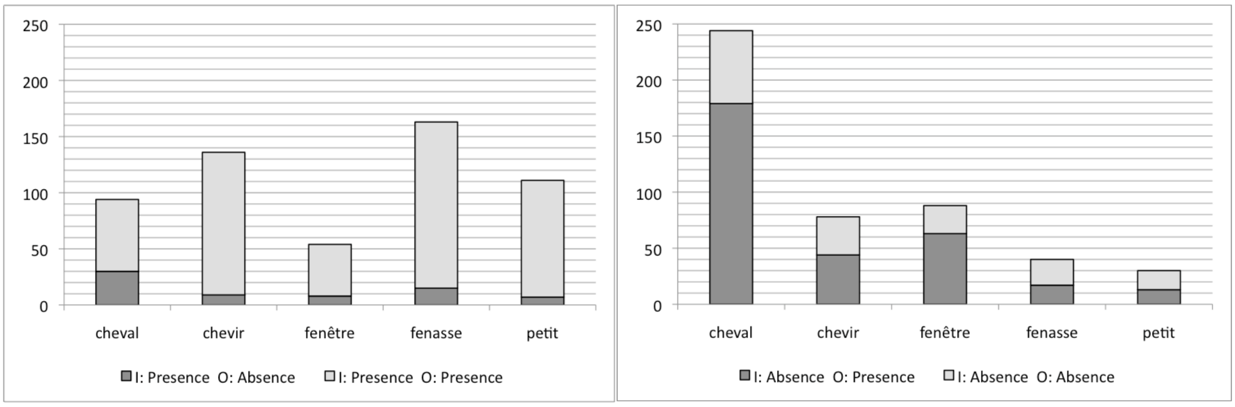

Figure 7.17: Response patterns per test item, all children, by count

The finding that there is a preference for the variant with schwa in the *Input* context is strengthened by the responses observed in the *No Input* and *Intro* contexts, depicted in Figure 7.18. The variant with schwa is selected in more than 80% of the cases in the corpus; the one exception is *petit*, for which the schwa-less variant is preferred in almost half the cases. The preference for the variant with schwa in situations where there is no immediate input indicates that the realisation of the schwa-less variant is triggered, at least partly, by schwa absence in the input, i.e. it does not constitute the child's default form. Note that Fabienne and Armand, who are the only subjects that prefer the schwa-less variant of *cheval* (cf. Table 7.10), are responsible for 25% (15/60) of the absent schwas in the *No Input* category, and for 50% (11/22) of the

[335] The total number of each response pattern are: PP (489/1038), PA (69/1038), AP (316/1038), and AA (164/1038).

absent schwas in the *Intro* category. The fact that these numbers are from an input-free context strengthens the claim of a (more or less lexically specified) preference for schwa absence for Fabienne and Armand.

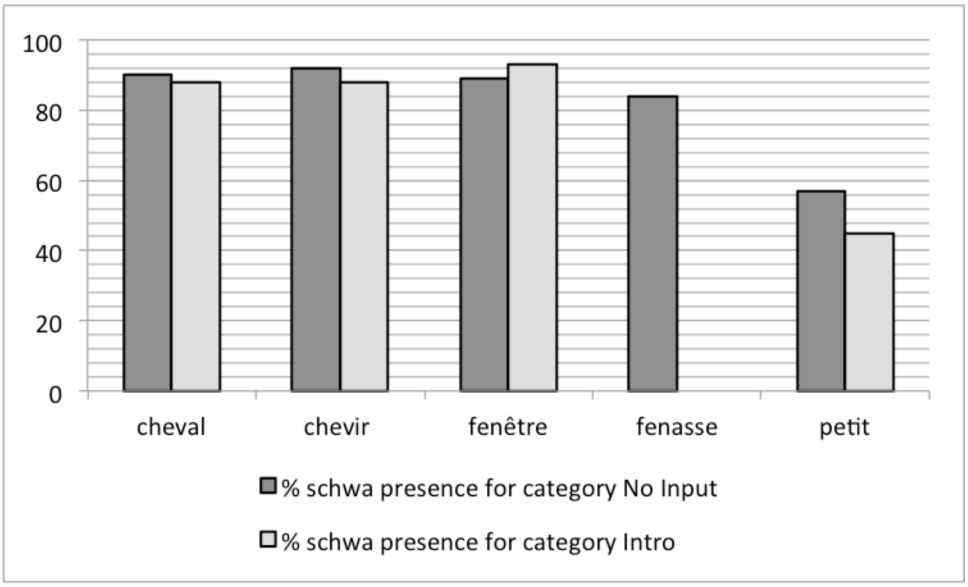

Figure 7.18: Schwa presence for categories *No Input* and *Intro*, all children, by percentage[336]

Table 7.10 shows that the degree of schwa alternation and the degree to which alternation is item-conditioned vary across children. In order to determine which factors are responsible for these inter-speaker differences, we first turn to the individual response patterns and examine whether some of the children are more susceptible to adapting to the immediate input. As expected, when confronted with schwa presence, Fabienne and Armand deviate from the others by showing rather low sensitivity to the input. The remaining children use the same variant as the input. With schwa absence in the input, the picture is very different. Most children do not conform to the input and, instead, use the variant with schwa. Fabienne and Armand are notable exceptions because they seem to greatly prefer the schwa-less variant. It is further worth noting that all children display a certain degree of schwa absence when confronted with the schwa-less variant in the input. This is particularly interesting in the case of Henri, Kim, and Théa, who never select this variant when the variant with schwa is given in the input.

[336] The number of occurrences with schwa presence per category per test item are: *No Input*: *cheval* 158/175, *chevir* 55/60, *fenêtre* 47/53, *fenasse* 49/58, and *petit* 30/53. *Intro*: *cheval* 53/60, *chevir* 7/8, *fenêtre* 43/46, *fenasse* 0/0, and *petit* 9/20.

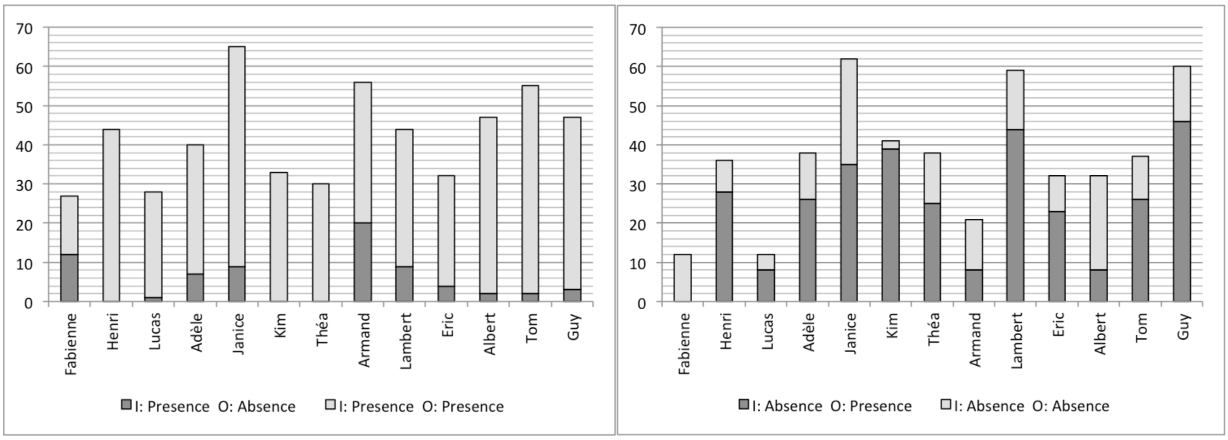

Figure 7.19: Response patterns per child, all test items, by count

Table 7.10 further shows that the rate of schwa variation per child varies across the different test items. In Figures 7.20 to 7.24 we present the frequency of the various response patterns for each test item, *cheval, chevir, fenêtre, fenasse,* and *petit,* for each child, in order to determine whether the sensitivity to variation in the input depends on the lexical item itself. Note that the data are only classified according to the test item, and not the session, which implies that, at this point, we do not focus on developmental changes within the individual child.

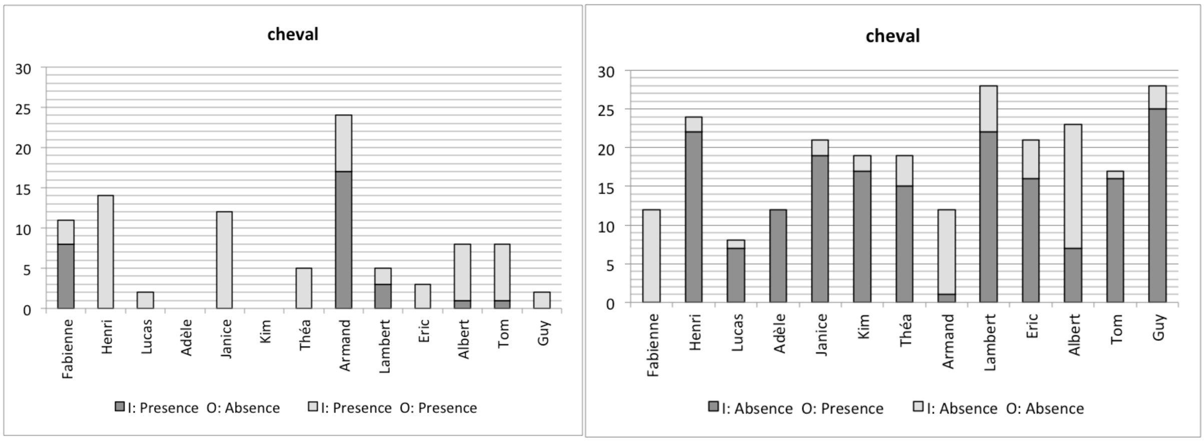

Figure 7.20: Response patterns for test item *cheval* per child, by count

Before commenting on the results, we mention that the greater number of occurrences of schwa absence in the input is mainly due to the experimental design, i.e. to expose the child to schwa absence until he switches from schwa presence to schwa absence in production. Therefore, the high rate of schwa absence in the input is a consequence of the fact that the children, in the majority of cases, repeatedly select the variant with schwa. If we turn to the results for the test item *cheval*, two observations in particular are worth mentioning. First, we remind the reader that the children in age group 2 are near-categorical in their selection of the variant with schwa, whereas the children in age group 3 realise more variation (cf. Table 7.10). The response patterns depicted in Figure 7.20 show that children in these groups are more frequently exposed to the schwa-less variant than the variant with schwa; the small discrepancy between the age groups 2 and 3, then, does not seem to be a result of a dissimilar rate of absence in the input, but, rather, of a difference in *sensitivity* to the input. This idea is further strengthened when we go into detail on some of the individual sessions for the subjects in age group 2. While there is no instance of AA in the data from Adèle, the one AA occurrence in the data from Lucas (2;09.01) is not spontaneous, and, instead, is a direct imitation that is explicitly encouraged by the researcher, who asks him: *Ch'val. Tu peux essayer de dire?* 'Horse. Can you try to say [it]?'. Further, the two AA occurrences in the data from Kim are attested in the last session (age 2;11.14) as a direct repetition of the input.[337] Schwa absence as a direct repetition is also found for Eric, age group 3. The only instances of schwa absence in his first three sessions are direct repetitions, e.g. Eric (2;11.16): *Un cheval.* Machine: *Oui c'est un ch'val.* Eric: *Oui c'est un ch'val.* Albert, age group 3, on the other hand, seems to be sensitive to the input because he selects the variant with schwa in 88% (7/8) of the cases with schwa presence in the input, and the schwa-less variant in 70% (16/23) of the cases with schwa absence in the input. Finally, we note that the claim that Armand has a strong preference for the schwa-less variant is furthered strengthened when we consider the stimulus. Regardless of whether the input contains schwa or not, the schwa-less variant, by far, dominates his output selections, 7 PP vs. 17 PA, 1 AP vs. 11 AA. Thus, on the basis of a comparison of Adèle, who shows no sensitivity to absence in the input, Armand, who shows low sensitivity to presence in the input, and Albert, who shows sensitivity to absence and presence in the input, we claim that the level of sensitivity to the input varies across our subjects. Further, we suggest that age plays a role, although not categorically. Albert and Armand, age group 3, display distinct individual behaviour when it comes to *cheval*.

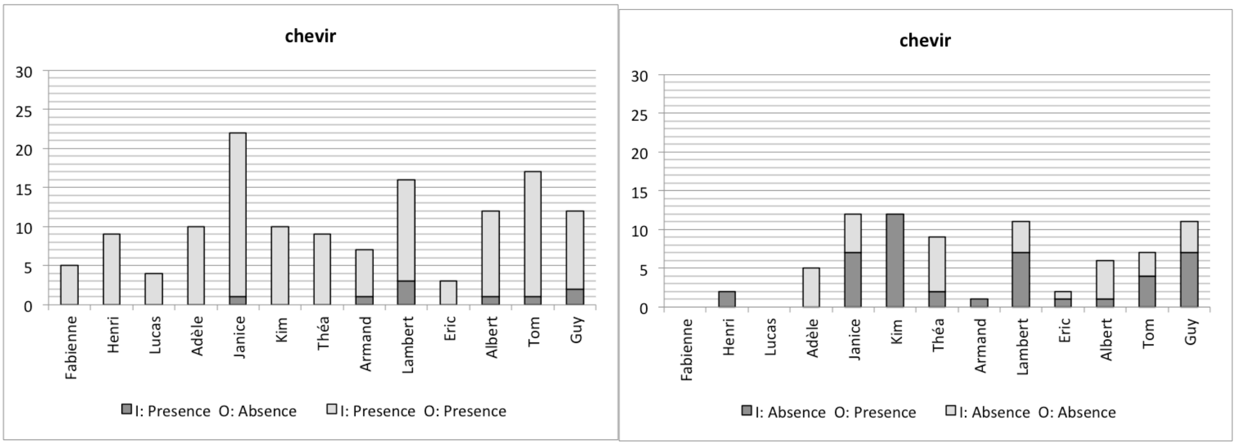

Figure 7.21: Response patterns for test item *chevir* per child, by count

If we turn to the linguistic reactions to the nonsense word *chevir*, presented in Figure 7.21, we first notice that the amount of schwa presence in the input is somewhat higher than the amount of schwa absence. As indicated earlier, one likely reason is that the nonsense word is always introduced by Machine, and, thereafter, confirmed by Machine, using the variant with schwa present in both cases, e.g. *C'est un chevir* (introduction). *Oui, un chevir* (confirmation). A second reason is the child's reaction to the nonsense word itself, e.g. rejection of the word or refusal to answer when the phonetic composition of the word is altered through schwa absence. We return to these extra-linguistic reactions in Section 7.3.3.3.3. Recall that Adèle, age group 2, is not sensitive to the schwa-less variant of *cheval* in the input, and Kim, age group 2, is likewise not sensitive during the first three sessions. The results for *chevir* differentiate the two children; whereas Adèle always adopts the schwa-less variant produced in the input, Kim categorically selects the variant with schwa. Concerning Albert, his strong sensitivity to the

[337] The dialogue develops as follows: Machine: *Tu peux me dire ce que c'est?* Kim (simultaneously): *Des chevals.* Researcher: *C'est quoi?* Kim: *Des chevals.* Machine: *C'est deux ch'vaux rouges?* Researcher: *Ils sont rouges?* (pointing at one of the horses) *Ça c'est quoi?* Kim: *Un cheval… Puis un cheval … vert.* Researcher: *Oui, on va écouter le monsieur et voir ce qu'il dit.* Machine: *C'est un ch'val noir et un ch'val blanc.* Kim: *Un* [fã] *noir … un* [pa] *blanc.*

input attested for *cheval* is also attested for *chevir*. However, even more interestingly, some children who show a low, or no, degree of sensitivity to the input for *cheval* show a somewhat higher degree of sensitivity to the input for *chevir*, e.g. Théa, age group 2, and Guy, age group 3. The response patterns observed for Armand are also interesting in the sense that he generally refuses to linguistically react to the schwa-less variant of *chevir* in the input. Across three sessions with *chevir*, we find only one single production in a context with schwa absence in the input. Armand's degree of linguistic reaction to schwa presence in the input is slightly better, but still lower than the other children in age group 3.[338]

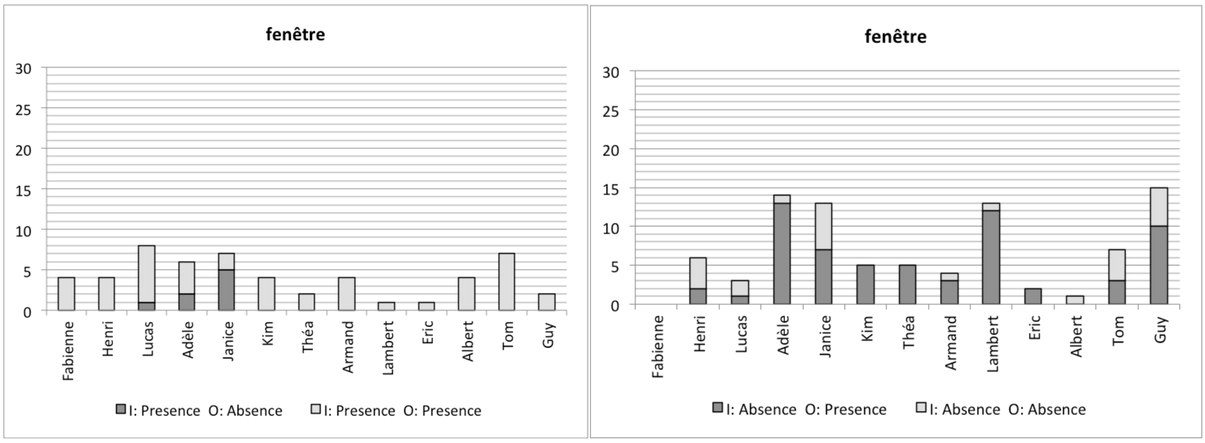

Figure 7.22: Response patterns for test item *fenêtre* per child, by count

Moving to *fenêtre*, the number of occurrences without schwa in the input is once again higher than the number of items with schwa in the input. Again, this is primarily a result of the construction of the test, i.e. the child's frequent use of items with schwa leads to a high degree of items without schwa in the input. The graph on the left in Figure 7.22 reveals that only three children produce the PA response pattern, i.e. Lucas, Adèle and, Janice. They all belong to age group 2, and interestingly, Lucas and Adèle do not show any instances of the response pattern PA for *cheval* or *chevir*. When we add to these results the fact that both children have one instance each of schwa absence in a case where there is no immediate input, *Intro* and *No Input*, respectively, it seems as if the schwa-less variant for *fenêtre* is more accessible than the one for *cheval*. However, it goes without saying that this cannot be confirmed on the basis of this limited amount of data. We finally mention the two oldest children, Tom and Guy, for whom we observe the AA pattern in only 6% (1/17) and 11% (3/28) of the occurrences for *cheval*, respectively; they display the AA pattern for *fenêtre* in 57% (4/7) and 33% (5/15) of the occurrences, respectively. Although the numbers from Tom and Guy are too low to confirm that *cheval* and *fenêtre* behave differently, they do add to the impression that different schwa-items are not necessarily treated identically in the grammar.

[338] The low reaction rate observed for Eric is expected because he is exposed to *chevir* in only one session.

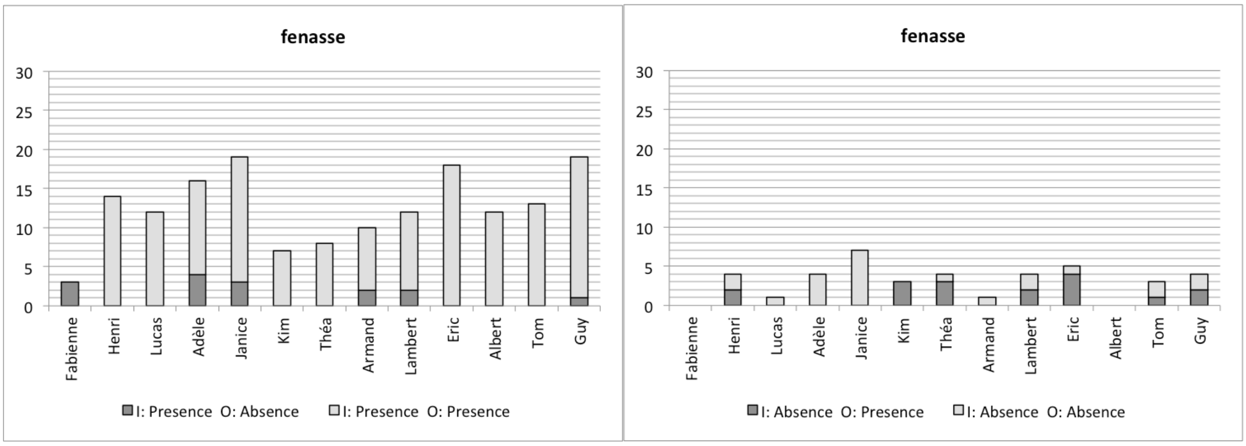

Figure 7.23: Response patterns for test item *fenasse* per child, by count

We now turn to the nonsense word *fenasse*. Note that the number of reactions to schwa absence in the input is substantially lower than the number of reactions to schwa presence in the input, as is in the case of *chevir*. A possible explanation for this is provided in Section 7.3.3.3.3. As regards the results, presented in Figure 7.23, the one observation worth mentioning for *fenasse* concerns Adèle and Janice, age group 2. Not only do they conform to the schwa absence in the input, 100% (4/4) and 100% (7/7) of the occurrences, respectively, but they also select the schwa-less variant, to some degree, in reaction to schwa presence in the input, 25% (4/16) and 16% (3/19) of the occurrences, respectively. We further note that Janice's patterns for both *fenasse* and *fenêtre* are somewhat similar. Adèle, on the other hand, seems to more easily accept the schwa-less version of *fenasse* than the schwa-less version of *fenêtre*. Again, the scarce amount of data for the AP and AA response patterns for these two children make it difficult to draw any conclusion.

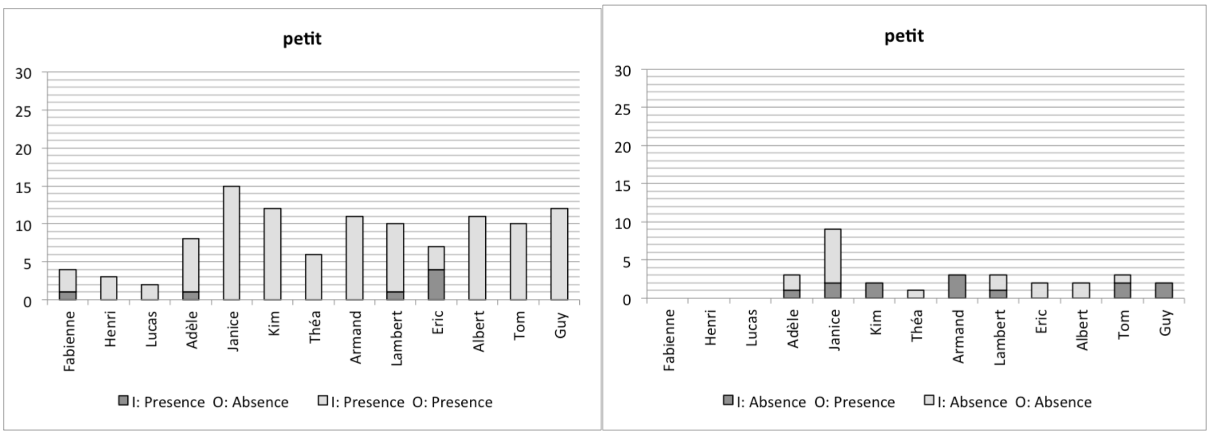

Figure 7.24: Response patterns for test item *petit* per child, by count

Finally, we examine the response patterns observed for *petit*. While we assume that the child is frequently exposed to the schwa-less variant of this item, our main interest lies in the child's reaction to the presence of schwa in the input. While there is little to be said about the graph on the right in Figure 7.24, with absence in the input, we observe that all children select the variant with schwa near-categorically in the case of schwa presence in the input. The sole exception to this observation is Eric, age group 3, who in 67% (4/6) of the occurrences selects the schwa-less variant. Given the less than 60% preference for the variant with schwa in the *No Input* and *Intro* categories (cf. Figure 7.18), and the high alternation rate of *petit* in adult Swiss French, this item merits particular attention in the analysis in Section 7.4.2.6.

We now turn to the output structures[339] attested in the three categories, *Input*, *No Input*, and *Intro*. Figure 7.25 first shows that schwa as a full prominent vowel (Output structure A, cf. Section 7.3.3.2), which is established as the most frequent output structure, is most frequently used in the PP and AP contexts. Likewise, consonant sequencing (Output structure E), which is established as the second most frequent output structure, is most frequently used in the PA and AA contexts.[340] Note that in cases without immediate input, *No Input* and *Intro*, Output structure A is also preferred.

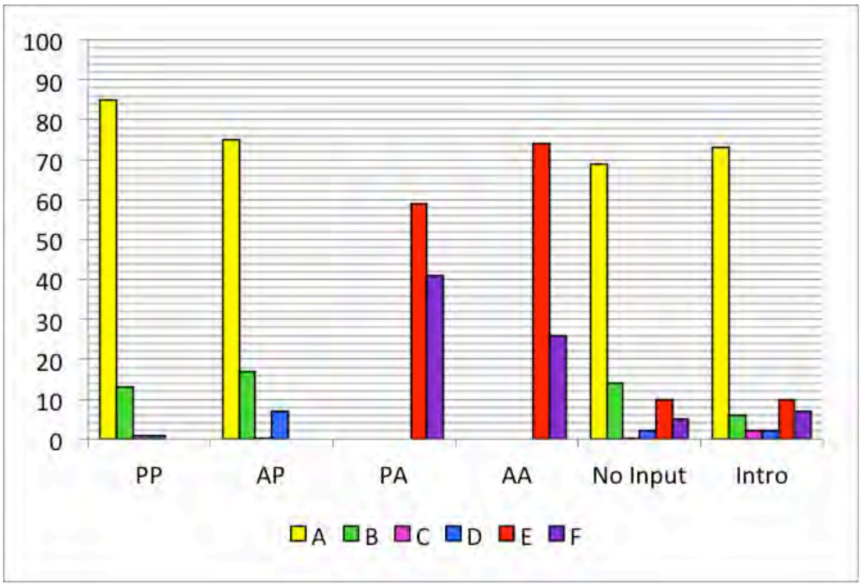

Figure 7.25: Selection of output structure in light of response pattern, by percentage

Previously, we hypothesise that the reduced vowel (Output structure D) and CV deletion (Output structure F) are preferentially selected in response to schwa absence in the input, as a means to alternate with the full schwa vowel, while also circumventing the problem of consonant sequencing. In fact, when we examine the distribution of the reduced vowel, the results conform to the hypothesis in that schwa reduction occurs most frequently in combination with the AP response pattern, i.e. when the child is exposed to the schwa-less variant in the input (cf. Table 7.12 for details).

[339] We remind the reader of the definition of the output structures, presented in Sections 7.3.1 and 7.3.3.2. Regarding a present schwa there is, full prominent vowel (A), full non-prominent vowel (B), vowel doubling (C), and reduced vowel (D). Regarding absent schwa there is, consonant sequence, lengthened consonant, or split consonant sequence (E), and CV absence (F).

[340] We remind the reader of the definitions of the response pattern abbreviations: PP is presence in the input and the output, AP is absence in the input and presence in the output, PA is presence in the input and absence in the output, and AA is absence in the input and the output.

	Number of occurrences	%
PP	6	15
AP	23	57
No Input	8	20
Intro	3	8

Table 7.12: Distribution of schwa as a reduced vowel, Output structure D, in light of input category and response pattern, by count and percentage

Turning to CV-deletion (Output structure F), we observe at first glance that, contrary to our hypothesis, this output structure seems to be more frequent as a reaction to schwa presence in the input than as a reaction to schwa absence in the input. However, a detailed examination of the data reveals that the individual idiosyncrasies are responsible for these results (cf. Table 7.13).

Child	Response pattern PA	Response pattern AA
Fabienne	11	9
Henri	-	6
Lucas	-	1
Adèle	5	5
Janice	1	3
Kim	-	2
Théa	-	2
Armand	11	10
Eric	-	1
Albert	-	3

Table 7.13: Distribution of CV deletion, Output structure F, by response pattern, by count

The data in this section show that the child generally selects the variant with schwa when confronted with schwa presence in the input. Further, the data show that Fabienne, age group 1, and Armand, age group 3, are unique in that they repeatedly realise the schwa-less variant in cases where their peers select the variant with schwa. Table 7.13 strengthens this observation because these two children in particular are responsible for 79% (22/28) of the instances of CV deletion in a PA context, which indicates that these two children have a reduced sensitivity to the variant with schwa in the input. The results in the right-hand column in Table 7.13 also show there are individual differences regarding sensitivity to the input. While only four subjects, including Fabienne and Armand, are attested with CV deletion in the PA context, we attest CV deletion in the AA context in no less than ten out of the totality of thirteen subjects. The preference for CV deletion in the AA context compared to the PA context is even further strengthened in that 66% (4/6) of the occurrences of CV deletion in a PA context that are not produced by Fabienne and Armand, constitute a series of self-repetitions of *fenasse* by Adèle (2;09.23): [maθːtă], [maːθtə], [maːθ], and [maːsə].

To sum up this section on linguistic reactions, we first repeat that the children show various degrees of overt sensitivity to variation in the input. Further, the children who are seemingly sensitive to alternation in the input, do not react identically to all five test items. Before we analyse these findings in light of our hypotheses A and B (cf. Section 7.2.2), it is necessary to discuss whether the data obtained in the test recordings can be considered reliable and thereby suitable for use in the analysis in Section 7.4.

7.3.3.3.3 A note on the reliability of the test session data

Section 4.2.2 references a study by Racine (2007), in which 30 readers, ages 8;07-10;00, and 30 non-readers, ages 5;06-6;09, are subjected to a word preference test containing 40 nouns with schwa in the initial syllable. The child is presented with both variants of the schwa-item and is asked to repeat the one he prefers, which overall turns out to be the variant with schwa present. The data obtained in the semi-controlled setting in our study strengthen this finding. The variant with schwa is preferred at the expense of the schwa-less variant.

We put forth the claim that the general development of the phonological grammar has an impact on schwa behaviour in child language, but it still remains to be determined whether the data from the test sessions are representative for the individual children, whose individual phonological competences greatly differ. As one of the main goals in this work is to provide an explanation for the behaviour of schwa in child language, we need to determine whether our semi-controlled data constitute reliable data for our analysis. Data reliability is repeatedly discussed in the literature, e.g. by Lust et al. (1999), who stress the importance of examining a number of subjects longitudinally, and by Chomsky (1964), who highlights the importance of gathering data in a variety of contexts. Additionally, Bennett-Kastor (1988) underlines the importance of not discarding the type of linguistic behaviour that Chomsky considers to be the result of "grammatically irrelevant conditions as […] distractions, shifts of attention and interest, and errors (random or characteristic)" (Chomsky 1965:3). An example of each of these discussions is given below.

> Mere description of particular behaviors is of limited use. Analyses of properties of the *course* and *nature* of acquisition computed over individual behaviors, however, can provide data that indirectly reflect abstract principles and parameters of initial and universal grammatical competence. (Lust et al. 1999:435)

> [R]ather devious kinds of observations of his performance, his abilities, and his comprehension in many different kinds of circumstance will have to be obtained, so that a variety of evidence may be brought to bear on the attempt to determine what is in fact his underlying linguistic competence at each stage of development. (Chomsky 1964:36)

> [It] is just these conditions with which the acquiring child must cope in his or her efforts to achieve communicative competence. […] [F]alse starts, errors, breakdowns, and other limitations are windows onto the processes underlying language and its development. They may be important clues to transitional periods. (Bennett-Kastor 1988:76)

Regarding the study of schwa alternation in child language, recall from Section 4.2.3 that both spontaneous data and semi-directed data have specific disadvantages. Thus, a combination of the two types of data is considered more likely to reveal information about both what is preferred and what is available, elucidated by spontaneous speech and semi-controlled speech, respectively. Regarding semi-controlled speech, one could object that the variant realised in this setting does not necessarily reflect the child's linguistic competence, but rather, merely is an unprocessed reflection of the adult stimulus. Whether the imitation is passed through grammar or not seemingly depends on the child's level of linguistic competence. Leonard et al. (1981) observe that, prior to the 50-word stage, the reproduction of consonants by young children, ages 1;04-2;00 at the outset of the study, in imitative speech diverges considerably from the realisation of consonants in spontaneous speech. For older children, consonant production in the nonsense words (imitative speech) is more similar to their behaviour in spontaneous speech. This latter finding is analysed as an indication that the older children have entered a stage where words are segmented into discreet sounds and where the different sounds are filtered through the developing system. Although our corpus does not contain children as young as the test subjects in Leonard et al. (1981), and that it is more likely that the results obtained in our test are not surface-based imitation, nonetheless, their study is important as it stresses the importance of sampling data from children at various stages in development. As our data show, a cross-sectional approach reveals a range of linguistic behaviours in the test situation. Finally, concerning the nonsense words themselves, Leonard et al. (1981) observe that the child is more likely to reproduce a nonsense word containing an as yet non-attempted consonant if he shows little understanding of this very word. This finding is analysed to be a consequence of the fact that the word has not entered the lexicon, and that an imitation is not filtered through the child's grammar, but more likely based on the surface characteristics of the input itself. We keep this finding in mind when we further examine the results for the nonsense test items used in our study, i.e. *chevir* and *fenasse*.

Thus, returning to our own study, several issues need to be discussed in order to validate our data for a linguistic analysis. For instance, one could ask whether the reproduction of the schwa-less variant is filtered through grammar or whether it constitutes a linguistically unanalysed reflection of the input. Several observations, which are related to the fact that sensitivity to variation in the input does not just take the form of an immediate repetition of the variant in the immediate input, suggest that an analysis takes place. For instance, in several cases when the child selects the schwa-less variant as a reaction to absence in the input, he rapidly switches back to the default variant, which for most children for most test items is the variant with schwa; see the excerpt from the dialogue between Machine and Eric (2;11.16), in Example (9), where they discuss a picture targeting the production of the schwa-item *cheval*.

(9) Picture of a horse and a cat

Eric	Un [ˈʃʏ̩ˈvo].
Machine	Oui c'est un ch'val.
Eric	Oui c'est un [ˈs̠ʷ.val].
Machine	Il fait quoi le chat?
Eric	Il bouge la queue.
Machine	Il bouge la queue.
Machine	Et le ch'val il fait quoi?
Eric	Il court.
Machine	Il court toujours.

Picture of elephants

Machine	Tu as vu des animaux comme ça ici?
Eric	Oui.
Machine	C'est quoi?
Eric	Des éléphants.
Machine	Oui c'est des éléphants.

Picture of a small and a big horse

Machine	Alors cet animal on a déjà vu. Tu peux me raconter?
Eric	Un [ˈʃjʌ̹ˈval]. Hé, il y a un bébé [ˈʃɞˈval]! Il y a un bébé [ˈʃəˈval]!

Section 7.2.2 presents the work by Leonard et al. (1978); they show that an appropriate imitation of the input is sometimes followed by usage of a less marked form that is "more consistent with the production constraints operating on his spontaneous speech" (1978:413). If it is true that this switch between two forms reveals more of the full linguistic capacities of the child, then it seems plausible that the change back to the variant with schwa that we observe reflects the

availability of two competing forms, one of which the current phonological system, to a large extent, favours. This idea seems to be further strengthened by the fact that some children do not exhibit the switch between two forms, or if they do, then to a lesser extent than the others; recall Adèle, who does not produce the schwa-less variant at any point during the test sessions. In Adèle's case, it seems plausible that the *lack* of a variant switch reflects the availability of only one phonological variant.

Extra-linguistic reactions are a second source of data that suggest sensitivity to variation in the input. It is well known that children, in particular the very young, tend to be distracted, lose interest, or simply refuse to participate in the experiment, more so than adults do. An explanation of this child-specific behaviour may reside in the linguistic complexity of the task as well as in the construction of the experiment itself (cf. for instance Bennett-Kastor 1988, Lust et al. 1999). An examination of the total numbers of occurrences obtained per subject in the test sessions reveals that the lowest numbers are obtained for Fabienne, age group 1, 53 occurrences, and for Lucas, age group 2, 64 occurrences. The highest numbers are obtained for Janice, age group 2, 203 occurrences, and Guy, age group 3, 197 occurrences (cf. Table 7.10). Interestingly, Armand, who like Guy belongs to age group 3, is subjected to the test six times, but only reaches an overall number of occurrences of 101. Some of the count differences are seemingly due to loss of attention, which again seems to be related to age. While Fabienne rapidly loses interest and never completes the PowerPoint test, Guy is very patient and carries out the test in its full length. Other count differences between children seem to involve the construction of the test. For instance, in some cases the child considers the repetition of the schwa-item to be superfluous, and gives an answer with omission of the word; see the following excerpts from Adèle (2;08.29) and Janice (2;10.11), each of them discussing pictures targeting the production of the schwa-item *cheval*.

(10) <u>Picture of a big horse</u>
Machine Alors cet animal on a déjà vu. Tu peux me raconter?
Adèle Oui aussi un [ˈtəˈvaɖ].

<u>Picture of one big and one small horse</u>
Researcher Puis maintenant on a quoi?
Adèle A deux …a deux *. Ça un bébé, là la maman!

(11) <u>Picture of one black and one white horse</u>
Janice Un [ʃɞˈvalɛ].
Machine C'est deux ch'vaux rouges?
Janice Non, un noir et un blanc.
Researcher Alors c'est quoi, c'est un chien blanc?
(pointing to the screen)
Janice Non un [ˈʃœ̧val] blanc!
Researcher Et puis ça?
(pointing to the screen)
Janice Un [ˈʃœˈval] noir.

Sometimes, the child focuses on aspects of the picture other than what is intended by the researcher; see Adèle (2;08.05) who is looking at pictures that target the production of the schwa-item *fenêtre*.

(12) Picture of one window

Adèle	Une [ˈtʌ̹ˈnɛt].
Machine	Une f’nêtre.
Adèle	Ouvert.
Researcher	Elle est ouverte?
Adèle	Oui, regarde ouvert.
Researcher	Et puis maintenant?
Adèle	Fermé.
Researcher	Oui elle est fermée.
Adèle	Ouvert.

Picture of two windows

Researcher	C’est quoi ça?
Adèle	Ouvert.
Researcher	Mais c’est quoi?
Adèle	A huit sept huit sept huit … sept.
Researcher	Oui, c’est quoi? C’est une porte?
Adèle	Oui, non c’est [ˈtʌˈnɛt].

Other inter-speaker differences seem to reflect the individual child’s relative mastery of the phonological complexity of the test. For instance, sometimes the child willingly labels the picture, using his default variant, but after confirmation by Machine who uses the child’s non-default variant, the child selects another lexical item. For instance, Lucas (2;08.10) goes from producing *cheval* to producing *coco*, and thereafter he decides to stop playing. Another strategy is simply to refuse to answer. For instance, Armand (3;03.17), after five productions of the variant with schwa for the word *fenêtre*, suddenly decides to refuse to label pictures with windows for the rest of the test session.

(13) Picture of a horse

Lucas	[ˈʃœˈvală].
Machine	C’est un ch’val.
	(a second horse added on the slide)
Machine	Et puis ça c’est quoi?
Lucas	C’est coco.
Researcher	Mais c’est quoi comme animal?
Lucas	C’est coco.
Researcher	Oui. Mais ça s’appelle comment? C’est quoi comme animal?
	(pointing to the screen)
Lucas	On ferme. Ferme. Ferme monsieur.

(14) Picture of a big house with large windows

Armand	[ʏˈmɛːt] aussi.
Machine	Dans les f’nêtres
Researcher	Tu vois, la lumière elle est dans les f’nêtres.
Armand	Oui.

(Picture of big house)
(Picture of a door)

Picture of a window

Machine	Est-ce qu’on trouve d’autre chose dans une maison?
Armand	Euh…
Researcher	C’est quoi ça?
Armand	Pas ça.

(he starts talking about something he has seen in a house)

Researcher	C’est quoi ça?
Armand	Je sais pas.

Picture of two windows

Machine	Et ça c’est quoi?
Armand	Je sais pas.

(he starts playing with a toy)

Machine	C’est deux f’nêtres.
Armand	* gratter.

(he has recently had the chickenpox and it itches)

Concerning the nonsense words, the child occasionally forgets their names in cases where there is no immediate input, which is most likely explained as a consequence of the lexical item not yet being properly stored in the lexicon. Another reaction indicating the lexical weakness of the nonsense words is shown by in Guy (3;03.22). After sixteen realisations of *fenasse* in one session, with three input variants with schwa and four input variants without schwa, Guy suddenly forgets its name after being exposed to two variants without schwa in the input:

(15) Picture of two big *fenasses*, one white and one black

Guy	Une [ˈfœ̞ˈnas] blanche et une [ˈføˈnas] noire.
Machine	C’est une f’nasse noire et une f’nasse blanche.
Guy	Il a compris là.
Researcher	Il a compris.

Picture of two small *fenasses*, one white and one black

Machine	Et celles-ci, grandes ou petites?
Guy	Petites, et moyennes même.
	C’est un … je sais pas comment ça s’appelle maintenant.

Some productions of nonsense words depart from the more regular form found in the child’s speech, which further adds to the possibility that these items are not properly stored in the lexicon. For instance, Adèle’s (2;09.24) schwa-less variant of *fenasse* is in most cases [maθ] (and variants thereof, cf. Example (16) below). Toward the end of the test session, however, another form emerges:[341]

(16) Picture of a *fenasse* and a window

Machine	Elle est où la f’nasse?
Adèle	Là c’est la [ˈn͌͡nnat]. C’est la [ˈt^{n}nːas].

(picture of horses)
(picture of two girls)
(picture of teddy bear)
(picture of two horses)

[341] This is the last test session where Adèle is exposed to *fenasse*, thus, nothing can be said about the strength of this alternative form.

Picture of two *fenasses*

Adèle	C'est euh … C'est quoi ça?
Researcher	C'était quoi? Je me rappelle plus.
Adèle	Des [ˈçː.n̥͡napə] des [ˈn̥.kʃ̃ap].
Researcher	C'est des ˈfenasses.
Adèle	Des [ˈmeˈnajθɛ̆].

A final performance factor that indicates that the production of the test-items is a genuine reflection of the child's system, and not a surface-based imitation, comes from the child's hesitations, false starts, and incomplete forms. Given that an absent schwa entails consonant sequencing, the above-mentioned "performance errors" may provide further evidence for the current grammaticality of the two variants in the individual children' grammars. For example, after being exposed to the schwa-less variant, we observe that some children attempt to produce a consonant sequence, then pause, and then switch to the variant with schwa. This linguistic behaviour contrasts with other children who never attempt the consonant sequence present in the input, e.g. Fabienne. For instance, Kim (2;09.26), who near-categorically produces schwa, with the noted exceptions of two occurrences of *cheval* in his last session, hesitates after repeated exposure to an item with schwa absence; he finally selects his default pattern and produces the variant with schwa (cf. Example (17)). Lambert (3;00.13) seemingly has problems with both producing the schwa-less variant present in the input and selecting the correct morphological form, which is target singular *cheval* and not target plural *chevaux* (cf. Example (18)). Finally, Armand (3;03.10), who starts to spontaneously produce the target-like form of *cheval*, shows great hesitation when he is presented with schwa absence in the input (cf. Example (19)). This behaviour is contrary to the previous sessions where he does not attempt the full form.

(17) Picture of a horse and a dog

Kim	Un [θ̠ɛ̹ˈvaʎ] puis un chien.
Machine	Oui c'est un chien. Oui c'est un ch'val. Il fait quoi le ch'val?
Kim	Au galop! Au galop!
[…]	

Picture of a horse and a cat

Machine	Là aussi il y a deux animaux. Tu peux me raconter ce que c'est?
Kim	Un chat puis un [θ] puis … un [ˈθœ̹ˈvaːj].

(18) Picture of one black and one white horse

Machine	C'est deux ch'vaux rouges?
Lambert	C'est un [θ̹ta] blanc … c'est un [ðœ], c'est un, c'est un [ˈθɔˈvɔ] blanc, c'est … c'est un [ˈθ̠ɜˈvø] … c'est un [ˈθ̠ɔ̹ˈvɔ] noir.

(19) Picture of a horse

Armand	C'est un [ˈfo] … un [ˈçyˈval].
Machine	C'est un ch'val.

(researcher adjusts sound level of loud speaker)

Researcher	C'était quoi ça alors? C'est quoi ça?
Armand	Un [ˈçyˈval].

(a second horse added on the slide)

Machine	C’est un ch’val. Et puis ça c’est quoi?
Armand	Est aussi un … un…
Researcher	C’est quoi? (pause) C’est un chien?
Armand	Non…
Researcher	C’est quoi alors?
Armand	(whispers) [fal].

7.3.3.4 Summary

The examination of the child language data obtained in the semi-controlled setting has revealed a series of interesting findings. First, the semi-controlled data show a considerable preference for the variant with schwa in the data from the majority of children, which patterns with the observations we have made for the spontaneous data. Yet again, we observe a lexeme-specific preference for the schwa-less variant in the data from Fabienne, age group 1, and Armand, age group 3, particularly for *cheval*. Also this finding is in line with the data from the naturalistic setting.

All children exhibit a certain degree of sensitivity to variation in the input. The selection of the non-preferred variant tends to occur after the child is exposed to this variant in the immediate input. However, the degree of sensitivity varies at three levels. First, when all test items are examined as a group, all the children from age group 3 except for Armand, in addition to Janice, age group 2, show slightly more sensitivity to schwa absence in the input when compared to the remaining children from age groups 1 and 2. This is promising in light of our hypothesis that schwa alternation becomes available only at a certain point in phonological development. The non-negligible sensitivity to the input observed in the other children is also promising in light of our hypothesis that schwa alternation is available even if the required phonological complexity is not yet mastered. Concerning phonological complexity, it is appropriate to recall another finding from the semi-controlled data. For several children who are sensitive to schwa absence in the input, the output structure they select is not always the target-like CC, but is, in some cases, a reduced schwa (Output structure D), or a CV deletion (Output structure F). This finding indicates that the child’s alternation is not necessarily the target-like alternation between a full schwa vowel, CVC, and a secondary cluster, CC.

Second, the semi-controlled data have revealed a difference between cluster types in that schwa absence is more frequent with target secondary cluster [fn], *fenêtre* and *fenasse*, compared to [ʃv], *cheval* and *chevir*. Although exceptions do occur, i.e. Kim, age group 2, who produces practically no schwa absence, this finding suggests that the nature of the secondary cluster, [fn] or variants thereof, makes the item more easily subject to schwa absence, at least compared to items containing the secondary cluster [ʃv] (or variants thereof). Third, the level of sensitivity to the input varies as a function of the word type. Across all age groups, schwa absence is more frequent in the nonsense words, *chevir* and *fenasse*, than in the true words *cheval* and *fenêtre*. This is particularly revealing for cluster type [ʃv], in which the level of schwa absence is globally quite low. This suggests that regarding *cheval*, both the shape of the secondary cluster and its well-established presence in the child’s lexicon hinder schwa absence. Regarding *chevir*, on the other hand, the word is not properly stored and is thereby more prone to being produced in conformity with the preceding input.

7.3.4 Concluding remarks

This section has presented our child language corpus consisting of data obtained in a naturalistic and a semi-controlled setting, and we now return to the hypotheses presented in Section 7.2.2, repeated in Example (20) for convenience.

(20) Hypotheses tested in Section 7.3, repeated from Examples (2), (3), and (4)

Hypothesis A1	Two variants of a given schwa-item are not available to the child.
Hypothesis A2	Two variants of a given schwa-item are available to the child.
Hypothesis B1	Two variants of a given schwa-item are available to the child, and their use is constrained by the input.
Hypothesis B2	Exposed to variation in the input, two variants of a given schwa-item are available to the child. The dispreferred variant is modified to conform with production constraints that operate on his spontaneous speech.

Hypotheses A1 and A2 differ with regard to how many variants of a given schwa-item are available to the child. Both the spontaneous and the semi-controlled data have revealed that in the majority of cases, the child generally prefers one variant per schwa-item. In the speech of most children and for most schwa-items, the variant with schwa is preferred, but in some specific cases we observe a categorical use of the variant without schwa. The variable behaviour of a given schwa-item across children, like *cheval* with schwa for Guy, but without schwa for Armand, indicates that the children treat the various schwa-items differently. In the spontaneous data, some items are subject to target-like schwa alternation; in particular, this is observed for Janice from age group 2 and Tom and Guy from age group 3, which indicates that schwa alternation gradually emerges and spreads throughout the lexicon. This finding is further strengthened by the semi-controlled data, where the older children display the highest degree of target-like alternation, i.e. [CV_1CV_2] ~ [CCV_2]. As for the other children observed in the naturalistic setting, the realisation of two forms for a given schwa-item is rare; nevertheless, it indicates that schwa alternation is gradually acquired. One interesting example in this regard is Adèle, age group 2, who selects the variant with schwa in *cheval* and the schwa-less variant in *cheveux*, even though both items contain a target secondary cluster [ʃv] and are subject to frequent schwa alternation in the target language. Despite her strong preference for one of the variants, the second variant is marginally present in her data.

Hypothesis B1 claims that the selection of one variant over the other is constrained by the input. We put forth that the input could either have a long-term effect, i.e. the child uses the variant preferred in the linguistic community, or a short-term effect, i.e. the child uses one variant while remaining sensitive to the alternative variant that is used in the immediate input. First, from the comparison of child language data with adult data (CDS and PFC data), we conclude that in many cases, there is a mismatch between the variant selected by the children and the one selected by the adults. For instance, while schwa-items with secondary cluster [pl] are preferably realised without schwa in adult French, the children categorically select the variant with schwa. Also, while the verbal stem <fais> is realised without schwa by the adults, Tom, age group 3, displays a categorical schwa presence. Other forms also indicate that the input frequencies do play a role in the child's production: the verbal stems <fer> and <ser> are observed without schwa in both children and adults. However, the comparison of Adèle and Tom, for instance, leads to the conclusion that the children only gradually conform to the input frequencies: whereas Adèle near-categorically selects the variant with schwa in *cheval*, Tom is observed with several spontaneous productions of the schwa-less variant. Second, the data from the test sessions reveal that the children are sensitive to schwa alternation in the input, but to different degrees. Even though one variant is strongly preferred, the realisation of the dispreferred variant in the input does, in many cases, trigger the child to realise the dispreferred variant in his subsequent output. In most cases, however, the child eventually falls back to his default variant later in the test. This finding suggests that two variants are available to children even if the grammar strongly favours the production of only one of the variants. The observation that some of the younger children are less sensitive to the input further indicates that a certain level of phonological complexity needs to be in place before both variants are available. On the other hand, less sensitivity does not necessarily mean no sensitivity, and most children display a certain level of adjustment to the input, although with a non-target-like outcome. For instance, as a reaction to schwa absence in the input, some children display the realisation of two alternative structures. The reduced schwa is primarily attested in children who also produce secondary clusters. CV deletion is primarily attested in children who do not produce secondary clusters.

In sum, all four hypotheses repeated in the beginning of this section are at least partly supported by our data. However, it is crucial to keep in mind that schwa-items behave differently with respect to each other and that these behaviours may vary across children. The goal of the next section is to identify the factors that are responsible for the lexeme-specific and child-specific behaviour, and this in light of the general development of the phonological grammar. Given our claim that schwa behaviour in the child's language reflects the current state of his grammar, in what follows, we examine the distribution of schwa in light of consonant sequencing and non-prominent syllable deletion, which are two phenomena that need to be mastered in order to realise target schwa alternation in French.

7.4 Elements of analysis

In Section 7.2 and 7.3 we show that the presence of schwa is by far the preferred solution in the naturalistic setting as well as in the semi-controlled settion. In this section, we examine two possible explanations for the child's faithfulness. First, in Section 7.4.1, we discuss the possibility that schwa is realised as a means to avoid the word-initial consonant sequence #[CCV-], which is commonly considered to be acquired later than #[CVCV-]. In order to establish independent evidence to support this hypothesis, we first look at the children's mastery of primary clusters. According to the literature, the prosodic structure of primary clusters is acquired prior to the prosodic structure behind secondary clusters.[342] The idea behind this approach is from the early OT literature on acquisition that claims that markedness outranks faithfulness in the child's grammar (Gnanadesikan 2004). If it is true that phonological structure gradually develops from less to more complex syllable structures, then it follows that mastery of secondary clusters implies mastery of primary clusters, but not vice versa, and that target-like schwa alternation should not be allowed before the latter cluster type is acquired. Second, in Section 7.4.2, we discuss the possibility that schwa presence is required by constraints that minimally demand the preservation of syllable nuclei, irrespective of a faithful production of the surrounding consonants or the schwa vowel itself. Importantly, however, in order to establish

[342] Recall from Section 3.2.2.2 the definition of primary vs. secondary clusters, borrowed from Bazylko (1976). Whereas a primary cluster refers to a sequence of underlyingly adjacent segments, e.g. [sm] in *smarties*, a secondary cluster refers to a sequence of underlyingly non-adjacent segments, e.g. [sm] in *semaine*, where schwa is traditionally assumed to separate the two consonants in the phonological representation.

whether schwa is identified as being “weaker” in the child’s grammar and, thus, as the one vowel that needs to be protected from deletion, it is necessary to start the discussion by examining the child’s faithfulness to non-prominent, word-initial syllables in general.[343] If we observe a broader tendency of unstressed syllable deletion, then the sporadic absence of schwa could be a mere effect of a dominating prosodic constraint that targets *all* unstressed syllables. On the other hand, if all the other vowels in the word-initial syllable are stable in the output, the observed schwa absence could be an indication that the grammar singles out schwa as the one vowel to target for deletion. Finally, in order to disentangle the effects of syllable-preserving constraints from the effects of phonotactic constraints, it is crucial to identify instances where the latter constraints cannot be responsible for schwa presence, e.g. in cases where schwa presence is accompanied by the absence of one or both surrounding consonants.

7.4.1 Consonant sequencing

7.4.1.1 Introduction

In this section we present the primary and the secondary clusters in our child language data, with the following goals in mind. First, the comparison of the two types of clusters reveals the individual children’s relative mastery of the two. Second, the examination of the primary clusters serves as basis for understanding potential repair strategies applied to the secondary clusters. After the presentation of the data follows a discussion on the link between mastery of consonant sequencing and schwa alternation. Prior to this, however, we review previous works on the acquisition of consonant clusters that are relevant for the analysis of our data.[344]

7.4.1.2 Theoretical preliminaries

The main task in the acquisition of primary and secondary clusters is to build the prosodic structure required for a faithful input-output mapping of the underlying consonants. Earlier work on syllable-initial complexity in acquisition indicates that the child’s development is guided by the nature of the consonants (cf. Fikkert 1994, Gnanadesikan 2004) and the relative prominence of the syllable (Rose 2000). Concerning the segmental make-up of the consonant sequence, Fikkert (1994, 2010) observes for L1 learners of Dutch that ObsLiq-clusters first reduce to the least sonorous segment (/bl/ → [b]); then, at a subsequent stage, they are optionally subject to various modifications, e.g. /bl/ → [l], [bj], [bʊ], and [bəl], before they are produced in a target-like manner. The second major cluster type, i.e. [s]+C-clusters, is also shown to reduce to the least sonorous segment of the cluster in the first stage (Fikkert 1994). Thus, while an [s]+Obs-cluster typically reduces to Obs, typically, an [s]+Son-cluster reduces to [s], e.g. *star* [dɑ] vs. *sleep* [sip] (English examples taken from Gnanadesikan 2004:78).[345] According to Fikkert (2010), the most common pattern in Dutch seems to be acquisition of ObsLiq-clusters prior to acquisition of [s]+C-clusters, although both paths are attested.

[343] As mentioned in Section 3.2.2.1, prominence is in target French assigned to word-final syllables. However, recall from Section 2.5.2.2 that optional prominence in target Swiss French is assigned to the penultimate syllable, which manifests in the signal as a rise in the intonation contour.
[344] Parts of Section 7.4.1 are published in Andreassen (2013).
[345] Note that in Dutch child language, the nasal is preserved at the expense of [s] as long as the sibilant is not part of the child’s system, e.g. *snoep* ‘candy’ [snuːp] → [muːn] (Fikkert 1994:93). When [s] is in place, [s]+Nas is reduced to the sibilant.

An effect of relative syllable prominence on complex onsets is observed in a longitudinal study of L1 learners of Quebec French by Rose (2000). In the first stage, complex onsets are reduced in both prominent and non-prominent syllables, e.g. *train* 'train' [tʁɛ̃] → [kɛ], *brisé* 'broken$_{\text{MASC}}$' [bʁize] → [pɪˈz̥e]. In the second stage, complex onsets are only faithfully produced in the prominent syllables, e.g. *glisse* 'slip$_{\text{3-SG-PRE}}$' [glɪs] → [klɪs], *brûlé* 'burned$_{\text{MASC}}$' [bʁyle] → [biˈle]. Only in the third stage are complex onsets faithfully licenced in both positions, e.g. *plancher* 'floor' [plɑ̃ˈʃe] (examples taken from Rose 2000:132-135). According to Rose, who assumes that underlying representations contain prosodic structure, the relative prominence of the syllable does not play any role when it comes to consonant clusters comprising a consonant and the glide component of a following rising diphthong (henceforth C+Glide-clusters), e.g. target *poisson* 'fish' [pwaˈsɔ̃]. These are fully mastered in non-prominent syllables far earlier than branching onsets in this position are.[346] Rose (2000) does not discuss other types of modifications besides segment deletion. Kehoe et al. (2008), on the other hand, in their study of 14 children acquiring European French, reveal that ObsLiq-clusters and C+Glide-clusters behave differently. They observe that ObsLiq and C+[w] typically reduce to C_1, e.g. *bras* 'arm' [bʁa] → [ba], *pois* 'pea' [pwa] → [pa], while C+[j] typically reduces to the glide, e.g. *camion* 'truck' [kaˈmjõ] → [kaˈjõ]. Further, within the set of ObsLiq-clusters, only Obs+[l] is observed with an epenthetic vowel. Kehoe et al. (2008) also observe an occasional substitution of glides by liquids, and vice versa, with Obs+[l] being the preferred output structure, e.g. *viande* 'meat' [vjɑ̃d] → [plɑ̃], *trompette* 'trumpet' [tʁɔ̃pɛt] → [tlɔ̃pɛt]. Finally, deletion of the entire onset is also attested, although less frequently, e.g. *brosse* 'brush' [bʁɔs] → [ɔs].

The above-mentioned findings have several implications for secondary clusters and schwa alternation in French child language. First, we reflect on secondary clusters in light of Rose's (2000) observation of prosodic faithfulness. When schwa is absent in the output, the two consonants, C_1 and C_2, are adjacent and form a cluster in the prominent syllable, e.g. *demande* 'ask$_{\text{3-SG-PRE}}$' [dœ.ˈmɑ̃d] ~ [ˈdmɑ̃d], *secoue* 'shake$_{\text{3-SG-PRE}}$' [sœ.ˈku] ~ [ˈsku], and *semaine* 'week' [sœ.ˈmɛn] ~ [ˈsmɛn]. In contrast to primary clusters, however, only the second consonant in the secondary cluster would in Rose's analysis be prosodified in the prominent syllable underlyingly. If we interpret Rose correctly, faithfulness to the consonant(s) part of the prominent syllable, i.e. C_2, in the underlying form is stronger than faithfulness to the consonant(s) part of the non-prominent syllable, i.e. C_1, which would imply that in the case of schwa absence and cluster simplification, C_2 would be maintained at the expense of C_1, e.g. hypothetical *demande* [mɑ̃d], *secoue* [ku], and *semaine* [mɛn].

For Fikkert (1994, 2010) and Kehoe et al. (2008), on the other hand, primary clusters are shown to be subject to various modifications, which depend on the nature of the different segments. In the case of schwa absence, we would expect modifications of C_1 and C_2 to occur as a means to circumvent the creation of a cluster that is not authorised in the child's current grammar: reduction to C_1 or C_2, and modification of C_1 or C_2. In the case of reduction of clusters of increasing sonority (≠ [s]+C-clusters), C_1 would be maintained at the expense of C_2, e.g. hypothetical *demande* [dɑ̃d], whereas reduction of [s]+C-clusters would lead to the hypothetical outputs *secoue* [ku] and *semaine* [sɛn]. Regarding segmental substitution, gliding would be expected, but also other segmental substitutions yielding a consonant sequence that is licit under the phonotactic constraints actively operating on the child's output: local cluster metathesis, e.g. from Polish child language *nudno* → [jundɔ] (Łukaszewicz 2007:65) or within-cluster assimilation, e.g. from English child language *skunk* → [stʌk] (Kirk 2008:41).

[346] The small number of examples that Rose (2000) provides for rising diphthongs in non-prominent positions makes us question the strength of this claim. See Kehoe et al. (2008) for a different result than Rose (2000).

Further, a possible modification constitutes the realisation of an interconsonantal vowel, which can either bear on the phonological level of analysis, e.g. epenthesis (cf. Fikkert 1994) or the phonetic level of analysis, e.g. excrescence (cf. Levin 1987, Hall 2006).[347] To the best of our knowledge, there is no discussion in the literature on the distinction between epenthetic and excrescent vowels in child language. On the other hand, Goetry et al. (2001, cited by Hall 2006), in a perception study on Dutch children, reports that 50% do not perceive the excrescent schwa as syllabic, in contrast to the underlying schwa for which they do; this finding indicates the non-phonological nature of the former. We return to the implications of this latter finding for French schwa in Section 7.4.2.5.

As already observed by Bazylko (1976) and Spinelli and Gros-Balthazard (2007), among others, there is a near-complementary distribution of primary and secondary clusters in target French. For instance, Spinelli and Gros-Balthazard (2007) conclude, on the basis of a count made in the Brulex database (Content et al. 1990), that schwa absence leads to the production of secondary clusters that are also attested as primary clusters in fewer than 15% of the cases. The examination of schwa distribution in Swiss French, presented in Section 3.3.3, confirms the small number of overlapping clusters. For instance, secondary clusters with a liquid C_1 do not overlap with any primary ones. Concerning secondary clusters with a nasal C_1, the sole overlap is found with [mn], which is considered to be a deviant primary cluster. In fact, setting aside all deviant primary clusters, the distribution of primary and secondary clusters is near-complementary. The only combinations found in both cases are [pl], e.g. *plus* ‘more’ [plys] vs. *peluche* ‘teddy bear’ [pœlyʃ] ~ [plyʃ], [sk], e.g. *ski* [ski] vs. *secoue* ‘shake$_{3\text{-SG-PRE}}$’ [sœku] ~ [sku], and [fʁ], e.g. *frais* ‘fresh$_{\text{MASC}}$’ [fʁɛ] vs. *fera* ‘do$_{3\text{-SG-FUT}}$’ [fœʁa] ~ [fʁa]. For convenience, Table 7.14 summarises the findings from Section 3.3.3.

[347] Excrescence is reported for French varieties with apical [r] (cf. Klingler & Lyche 2012). Phonetically reduced, with a phonetic schwa quality and not attested as a docking site for prominence, the schwa vowel that occurs between the two elements of a primary cluster is considered to be a matter of gestural timing and, thus, a phonetic, not a phonological, phenomenon.

<table>
<tr><th>C_2 / C_1</th><th></th><th colspan="2">Plosive</th><th colspan="2">Fricative</th><th colspan="2">Nasal</th><th colspan="2">Liquid</th><th colspan="2">Glide</th></tr>
<tr><td rowspan="2">Plo.</td><td>P</td><td></td><td>(pt kt)</td><td></td><td>(pf ps pʃ ts tz tʃ dʒ ks gz)</td><td></td><td>(pn kn km gn)</td><td rowspan="2">pl</td><td>pʁ bʁ bl tʁ dʁ kʁ kl gʁ gl</td><td></td><td>pj/ɥ/w bj/ɥ/w tj/ɥ/w dj/ɥ/w kj/ɥ/w gw</td></tr>
<tr><td>S</td><td></td><td>pt dp db? dd dg</td><td></td><td>pz bz ds dv</td><td></td><td>tn dm</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Fri.</td><td>P</td><td rowspan="2">sk</td><td>ft sp st (sb ʃp ʃt)</td><td></td><td>(sf sv ʃv)</td><td></td><td>(sm sn ʃm ʃn)</td><td rowspan="2">fʁ</td><td>fl vʁ (vl sl zl ʃʁ ʃl)</td><td></td><td>fj/ɥ/w vj/w sj/ɥ/w zj ʃj/ɥ/w ʒɥ/w</td></tr>
<tr><td>S</td><td>sp? sg ʒt</td><td></td><td>fz ss? ʃv</td><td></td><td>fm fn vn sm ʃm ʃn ʒn</td><td>vl sʁ sl? ʒl</td><td></td><td></td></tr>
<tr><td rowspan="2">Nas.</td><td>P</td><td></td><td></td><td></td><td></td><td></td><td>(mn)</td><td></td><td></td><td></td><td>mj/ɥ/w nj/ɥ/w</td></tr>
<tr><td>S</td><td></td><td></td><td></td><td>ms mz nv</td><td></td><td>mn</td><td></td><td>mʁ ml</td><td></td><td></td></tr>
<tr><td rowspan="2">Liq.</td><td>P</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>lj/ɥ/w ʁj/ɥ/w</td></tr>
<tr><td>S</td><td></td><td>ʁp ʁb ʁt ʁd ʁk ʁg lk?</td><td></td><td>ʁf ʁv ʁs ʁʃ ʁʒ lv ls</td><td></td><td>ʁm ʁn</td><td></td><td>ʁl</td><td></td><td></td></tr>
<tr><td rowspan="2">Gli.</td><td>P</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>S</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Table 7.14: Primary (P) and secondary (S) clusters in Swiss French[348]

One difference between the primary and secondary clusters is that the secondary clusters are more heterogenous with regard to their segments' sonority profile and manner combinations. By definition, a second difference between the two is that secondary clusters can be avoided via the realisation of schwa. Although the realisation of the schwa syllable is costly in that it adds a syllable to the syllable count, it is economic in that it circumvents the necessity in child language of modifying the underlying consonants. On the basis of the results presented in Sections 7.3, where schwa presence is by far the preferred output variant across the child language corpus, we claim that preservation of the schwa syllable is less costly than modification of the secondary cluster. Further, throughout this section, we defend the claim that target schwa alternation is dependent on the development of independent phenomena residing elsewhere in the system. The first argument we present to support this claim is that target schwa alternation is dependent on the mastery of consonant sequencing. Two hypotheses emerge from the theoretical discussion above and we use them to guide the remainder of the section, see Example (21).

(21) Hypothesis C1
If primary clusters are not mastered, secondary clusters are not mastered.

[348] Primary clusters in parentheses are judged as "deviant" by Dell (1995). Secondary clusters are shaded in bright grey. Clusters shaded in dark grey are attested as both primary and secondary clusters. Question marks refer to the lack of judgement data indicating whether or not [œ] in the segmental context in question is alternating, e.g. [db] in *debout* 'standing' [dœbu] ~ ?[dbu]. We refer to Section 3.3.3 for a detailed analysis of the distribution of clusters.

Hypothesis C2
If secondary clusters are not mastered, schwa alternation is blocked.

The first hypothesis concerns the different nature of the two types of clusters. Primary clusters are mainly ObsLiq-clusters, which in light of the sonority scale and the principle of Sonority Dispersion form optimal complex onsets with a maximally increasing sonority profile (Clements 1990, 2009).[349] Secondary clusters compete with schwa presence and in the majority of cases, do not occur outside the set of schwa-items. Further, secondary clusters come in many configurations with regard to sonority profile and manner combinations. Finally, when we take into account the fact that primary [s]+C-clusters are generally acquired later than ObsLiq-clusters and that the secondary clusters in many cases contain a sibilant C_1, we conclude that the secondary clusters should emerge later than the primary ones. The second hypothesis concerns the relationship between the two phonological variants available for each schwa-item. Consonantal faithfulness takes precedence over schwa alternation, and the selection of the variant with schwa, e.g. *cheval* 'horse' [ʃœval], is preferred over the schwa-less variant, e.g. target [ʃval], if secondary clusters are not authorised.

7.4.1.3 Primary consonant clusters

Table 7.15 displays the numbers of analysable target ObsLiq-clusters and target [s]+C-clusters attested for each child across the corpus.[350] Table 7.15 also displays the number of analysable target C+Glide-sequences, where Glide is one of [j, ɥ, w], which, according to Kaye and Lowenstamm (1984), are prosodified as part of a complex onset in the majority of cases.[351] This claim is strengthened in part by the French child language data in Kehoe et al. (2008), where glides and liquids are found to be mutually substitutable at an intermediate stage in development, e.g. *viande* 'meat' [vjɑ̃d] → [plɑ̃] and *poire* 'pear' [pwaʁ] → [pla].[352] The reason for extracting the C+Glide-clusters is primarily that we expect gliding to be a repair strategy for the target primary clusters, as well as possibly for the target secondary clusters.[353] An examination of target C+Glide-clusters, thus, prepares us to better understand the repair strategies applied to the various clusters. Before we turn to the data, however, recall from Section 2.5.3.1 that one of the main characteristics of the Swiss French varieties is that they have a stronger presence of diaeresis after simplex onsets compared to Reference French, e.g. *bouée* 'buoy' [bue] ≻ [bwe]. This fact is important for determining what constitutes an erroneous production of a C+Glide-sequence. Whereas Kehoe et al. (2008:43) treat diaeresis as an epenthesis error in French, e.g. *lion* 'lion' [li.ɑ̃], it constitutes a target-like production in the Swiss French child language data.

[349] Glides are the highest elements on the sonority scale for non-syllabic elements discussed by Clements (1990).
[350] Recall that eight children were recorded in a naturalistic setting alongside the semi-controlled one. The primary clusters produced by Fabienne, Henri, Lucas, Adèle, and Armand that are presented in Table 7.15, thus, comprise data from both settings. The primary ObsLiq- and C+Glide-clusters produced by Janice, Tom, and Guy have not been extracted from the naturalistic setting. The transcription of these clusters in the semi-controlled setting reveals a rate of accuracy around 90%, and, therefore, we judge it unnecessary to transcribe and extract these clusters from their spontaneous speech data. The repeated auditory inspection of these latter data confirms the validity of this methodological choice. [s]+C-clusters, on the other hand, are extracted due to the scarce amount of data retrieved from the test sessions. Further, we mention that although Armand produces a high rate of target-like clusters in the test sessions, the ObsLiq- and C+Glide-clusters produced in the naturalistic setting are transcribed due to the fact that he deviates from the other children in his age group with regard to schwa alternation.
[351] For further discussion regarding glides in French, we refer to Durand and Lyche (1999).
[352] Unfortunately, only examples from Spanish are provided for the substitution of a liquid by a glide, e.g. *dragon* [dɾaˈɣon] → [djaˈgon] (Kehoe et al. 2008:38).
[353] Recall from Table 7.14 that schwa never occurs in a C+Glide-environment, i.e. [CœG] ~ *[CG].

Child	ObsLiq		[s]+C		ObsGli		SonGli		Total
	PL	FL	[s]+Obs	[s]+Son	PG	FG	NG	LG	
Fabienne	42	21			29	56	32	3	183
Henri	197	18			40	63	31		349
Lucas	391	61	6	2	349	272	222	11	1314
Adèle	387	51	4	1	231	139	952	49	1814
Janice	103	20	2	2	43	43	35	5	253
Kim	50	19			56	28	11		164
Théa	71	17	3		102	56	23	16	288
Armand	709	74	1		131	179	163	28	1285
Lambert	57	24			4	19	18		122
Eric	91	12		2	70	22	25	2	224
Albert	54	17			14	30	25	6	146
Tom	109	34	2	2	80	54	33	11	325
Guy	158	40	2		78	107	62	11	458
Total	2419	408	20	9	1227	1068	1632	142	6925

Table 7.15: Target complex onsets per child, by count[354]

In what follows, we first look at ObsLiq-clusters before we turn our attention to C+Glide-clusters. Thereafter, we examine [s]+C-clusters, whose sibilant element is analysed as extrasyllabic by Rialland (1994). Note that in the presentation of the data we partly follow the methodology by Kehoe et al. (2008), which is intended to reveal the structure of target branching onsets and C+Glide-clusters in French and Spanish child language; consonant deletion and insertion of an interconsonantal vowel are classified as errors. We also consider that any substitution of a liquid by a glide, or vice versa, constitutes an error. Modifications in place of articulation, e.g. *tracteur* 'tractor' [tʁaktœʁ] → [kʁaktœʁ], and modifications in manner within the class of obstruents, *fleur* 'flower' [flœʁ] → [klɔ], are not counted as errors. Differences in voicing are also not counted as errors because young children are reported to display difficulties tuning in the phonetic correlates of the already acquired phonological voicing contrast, e.g. *bleu* 'blue$_{\text{masc}}$' [blø] → [plø] (cf. Macken and Barton 1980, and, for older (French) children, Watson 1990, and references cited therein). For the sake of consistency, but in contrast to Kehoe et al. (2008), we do not consider within-class substitutions in the second element to be errors, e.g. *crayon* 'pencil' [kʁɛjɔ̃] → [klea].

7.4.1.3.1 ObsLiq-clusters

The acquisition of ObsLiq-clusters in French receives attention in the literature, for instance by Demuth and Kehoe (2006) and Demuth and McCullough (2009b), who observe that word-initial ObsLiq-clusters are acquired earlier than word-final ones. The error patterns between the two positions are similar, i.e. retention of the obstruent is preferred over retention of the liquid and better performance with Obs+/l/-clusters than with Obs+/ʁ/-clusters. As word-final ObsLiq-clusters are subject to grammatical deletion in the adult language, e.g. *table* 'table' [tabl] ~ [tab], and are, thus, less comparable with secondary clusters, they do not receive any attention in the present work. Figure 7.26 presents the target word-initial and word-medial ObsLiq-clusters

[354] ObsLiq- and C+Glide-clusters are retrieved from the initial and medial positions in the word. [s]+C-clusters are retrieved from the initial position only because the word-medial sibilant is syllabified in the preceding coda (cf. Dell 1995).

retrieved from our corpus. The data are sorted by individual in order to reveal potential developmental tendencies across children.

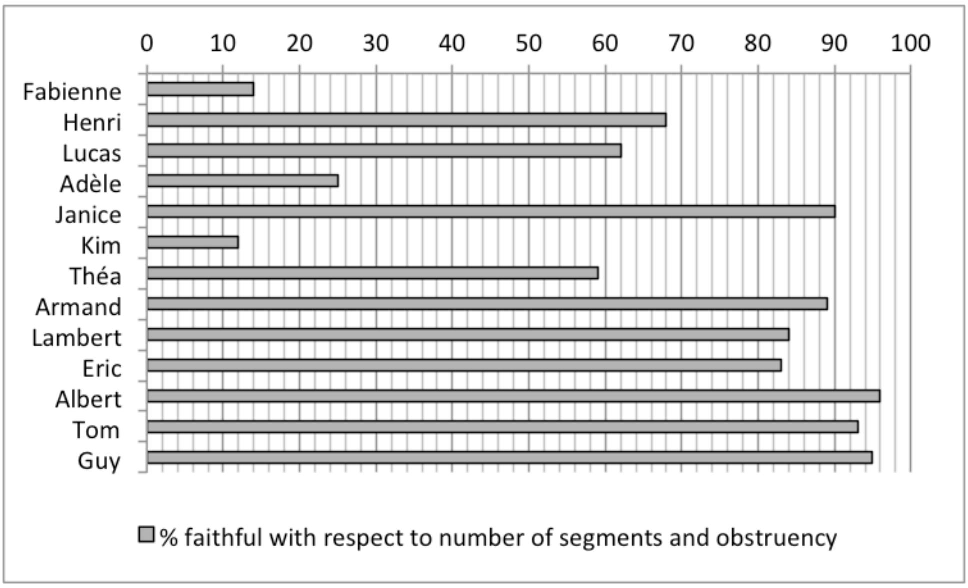

Figure 7.26: Faithfulness to target ObsLiq-clusters, per child, by percentage[355]

A detailed examination shows that about half of the children, i.e. Janice, age group 2, Armand, Lambert, Eric, Albert, Tom, and Guy, age group 3, demonstrate mastery of ObsLiq-clusters (75% accuracy or higher, cf. Fikkert 2010), with regard to number, manner, as well as place of articulation of the segments (cf. Example (22-a)). Note that Armand is unique in that he alone in age group 3 occasionally replaces the alveolar plosive with a velar in front of [ʁ]. At an intermediate level we find Henri, age group 1, and Lucas and Théa, age group 2, ranging between 50-70% rate of accuracy (cf. Example (22-b)). The remaining three children, Fabienne, age group 1, and Adèle and Kim, age group 2, display less than 30% accuracy (cf. Example (22-c)).

(22) Faithful production of ObsLiq-clusters

a. Children with 75% accuracy or higher

prends	[pʁɑ̃]	→ [pʁɑ̃]	‘take$_{\text{2-SG-PRE}}$’	Guy 3;02.22
pleure	[plœʁ]	→ [plœ̝ʁ]	‘cry$_{\text{3-SG-PRE}}$’	Guy 3;02.22
brun	[bʁœ̃]	→ [bxœ̃]	‘brown$_{\text{MASC}}$’	Eric 2;11.16
bleu	[blø]	→ [bly]	‘blue$_{\text{MASC}}$’	Eric 2;11.16
fraises	[fʁɛz]	→ [fʀ̥ɛθ]	‘strawberry$_{\text{PL}}$’	Tom 3;01.22
fleurs	[flœʁ]	→ [flœʀ]	‘flower$_{\text{PL}}$’	Tom 3;01.22
train	[tʁɛ̃]	→ [tʀ̥ɛ̃]	‘train’	Lambert 2;11.13
tracteur	[tʁaktœʁ]	→ [kʀ̥atœ]	‘tractor’	Armand 3;02.13
drôle	[dʁol]	→ [dʕol]	‘funny’	Janice 2;11.02
dragon	[dʁagɔ̃]	→ [gʁɛ̃gɔ̃]	‘dragon’	Armand 3;00.20
crache	[kʁaʃ]	→ [kχaʃ]	‘spit$_{\text{3SG-PRE}}$’	Albert 3;01.11

[355] The individual results, by percentage and count: Fabienne 14% (9/63), Henri 68% (147/215), Lucas 62% (278/452), Adèle 25% (109/438), Janice 90% (111/123), Kim 12% (8/69), Théa 59% (52/88), Armand 89% (693/783), Lambert 84% (68/81), Eric 83% (85/103), Albert 96% (68/71), Tom 93% (133/143), and Guy 95% (189/198).

Claudine	[klodin]	→ [klɔdin]	proper name	Albert 3;03.06

b. Children with 50-70% accuracy

près	[pʁɛ]	→ [pʁɛ]	‘near’	Lucas 2;09.10
pleure	[plœʁ]	→ [plɐʁ]	‘cry$_{\text{3-SG-PRE}}$’	Théa 3;00.22
brun	[bʁœ̃]	→ [bʁœ̃]	‘brown$_{\text{MASC}}$’	Théa 2;09.29
blanc	[blɑ̃]	→ [blɑ̃]	‘white$_{\text{MASC}}$’	Théa 2;09.29
fleurs	[flœʁ]	→ [flʌʀ]	‘flower$_{\text{PL}}$’	Lucas 2;07.13
fraises	[fʁɛz]	→ [fʀ̥ɛð]	‘strawberry$_{\text{PL}}$’	Lucas 2;10.19
train	[tʁɛ̃]	→ [tʀ̥æ]	‘train’	Lucas 2;10.19
trompe	[tʁɔ̃p]	→ [kxɔ̃p]	‘trunc’	Henri 2;07.01
drapeaux	[dʁapo]	→ [kʁapo]	‘flag$_{\text{PL}}$’	Henri 2;06.04
crayons	[kʁɛjɔ̃]	→ [kχɛjɔ̃]	‘pencil$_{\text{PL}}$’	Théa 3;01.12
Claudine	[klodin]	→ [klədi]	proper name	Lucas 2;09.29
grenouille	[gʁœnuj]	→ [kʀ̥ujd]	‘frog’	Henri 2;04.01
glace	[glas]	→ [glas]	‘ice cream’	Lucas 2;07.18

c. Children with 30% accuracy or lower

prêt	[pʁɛ]	→ [pʰʁ̥ɛ]	‘ready$_{\text{MASC}}$’	Kim 3;00.05
pleure	[plœʁ]	→ [plʌ]	‘pleure$_{\text{3-SG-PRE}}$’	Adèle 2;08.29
bleu	[blø]	→ [plœ]	‘blue$_{\text{MASC}}$’	Kim 2;11.15
fleur	[flœʁ]	→ [plɔ̞][klɜ]	‘flower’	Adèle 2;08.29
		→ [flɔ̞]		
fraises	[fʁɛz]	→ [klɛθ]	‘strawberry$_{\text{PL}}$’	Adèle 2;09.15
train	[tʁɛ̃]	→ [kʀ̥ɛ̃]	‘train’	Fabienne 2;05.21
crayon	[kʁɛjɔ̃]	→ [klea]	‘pencil$_{\text{SG}}$’	Adèle 2;08.09
clown	[klun]	→ [klu]	‘clown’	Adèle 2;10.13
grenouille	[gʁœnuj]	→ [gʁɔlud]	‘frog’	Adèle 2;09.24
glace	[glas]	→ [glas]	‘ice cream’	Adèle 2;10.04

Before examining the types of errors attested, we bring attention to the fact that all target initial ObsLiq-clusters, whether they occur in a prominent or a non-prominent syllable, are collapsed into one group. Recall that according to Rose (2000), mastery of branching onsets in prominent syllables precedes mastery of branching onsets in non-prominent ones (cf. Section 7.4.1.2). As for the children observed with less than 30% accuracy in our corpus, Adèle is the only child for whom we have an amount of data that is sufficiently large enough to allow us to make claims about cluster mastery in the various positions (cf. Table 7.16). The results are in line with the finding in Rose (2000); while faithful production of target ObsLiq-clusters in the non-prominent position amounts to a scarce 6% (6/101) of the occurrences, clusters in the prominent position are faithfully produced in 36% (103/283) of the occurrences. However, the observed positional asymmetry in French child language does not seriously affect our analysis of schwa alternation. According to the traditional analysis, schwa absence reduces the syllable count by one, and for disyllables, this means that, in the case of schwa absence, the consonant sequence is potentially prosodified as the complex onset of a prominent monosyllable, which is the prosodic position in which clusters first are acquired.[356]

[356] Recall from Chapter 3.3.2.4 that there are trisyllabic (and larger) schwa-items in which the secondary cluster occurs in a non-prominent position. Although less frequent, we do find schwa-items with three syllables or more, for instance, in disyllabic verbs preceded by the prefix <re>, e.g. *repartir* ‘leave again$_{\text{INF}}$’.

While prosodic salience, as observed by Rose (2000), may contribute to an asymmetry, there are also constraints that operate on the segmental structure. As mentioned earlier, Kehoe et al. (2008) observe an asymmetrical acquisition of ObsLiq-clusters with /l/ and /ʁ/ such that the former is acquired prior to the latter. In fact, liquid /ʁ/ is the subject of a large number of analyses of adult and child phonology that show that /ʁ/ is a phonetically and phonologically more complex segment than /l/. For a discussion on /ʁ/ in French adult phonology, see Russell Webb (2009) and references cited therein; for a discussion on /ʁ/ in French child phonology, see Rose (2000, 2002), Kehoe et al. (2008), and Demuth and McCullough (2009b). The claim that /ʁ/ is acquired late for articulatory or structural reasons seems to be supported by the data from Adèle; whereas underlying /l/ is produced as a liquid in 75% of the occurrences in a prominent position, the underlying /ʁ/ is produced as a liquid in merely 5% of the occurrences in this position. Note, however, that the results from the non-prominent position are not sufficiently balanced to allow a comparison.

Cluster type	**Prominent position**		**Non-prominent position**	
	% faithfulness	**Occurrences**	**% faithfulness**	**Occurrences**
Target Obs+/l/	75	95/126	0	0/5
Target Obs+/ʁ/	5	8/157	6	6/96

Table 7.16: Faithfulness to onset complexity in light of position and type of liquid, data from Adèle, by percentage and count

A third factor that potentially explains the asymmetry between target Obs+/l/ and Obs+/ʁ/ is consonant coalescence, i.e. the strategy of preserving features of two underlying segments in a single output segment (Gnanadesikan 2004). This is a grammatical win-win situation in the sense that neither *COMPLEX nor segment-preserving MAX are violated.[357]

(23) Coalescence and preservation of SON's place features (Gnanadesikan 2004:90-91)

IDENT[lab] >> IDENT[cor]	$t_1\ r^w{}_2 i_3$	→	$p_{12}i_3 \succ t_{12}i_3$	*tree*
IDENT[lab] >> IDENT[dor]	$g_1 r^w{}_2 i_3 n_4$	→	$b_{12}i_3n_4 \succ g_{12}i_3n_4$	*green*

In the English data in Example (23), the labial feature of /r/ shows up in the coalesced segment. In French, where /ʁ/ is analysed as being minimally specified for place (Russell Webb 2009), one should expect the [dorsal] feature to emerge in the coalesced segment, and, in fact, an examination of Adèle's data reveals numerous instances where target Obs+[ʁ] surfaces as [k], cf. Example (24).

[357] MAX, on the other hand, is violated in the case of feature spreading combined with the deletion of the sonorant.

(24) Coalescence to velar [k] of underlying Obs+[ʁ] in data from Adèle[358]

prendre	[pʁɑ̃dʁ]	→ [kɔ]	‘prendre$_{\text{INF}}$’	Adèle 2;09.29
fromage	[fʁɔmaʒ]	→ [kemat]	‘cheese’	Adèle 2;08.22
fraise	[fʁɛz]	→ [kɛθ]	‘strawberry’	Adèle 2;09.15
trottinette	[tʁɔtinɛt]	→ [kotinɛt]	‘scooter’	Adèle 2;10.04
drôle	[dʁol]	→ [kɔj]	‘funny’	Adèle 2;09.15
entrer	[ɑ̃tʁe]	→ [ake]	‘enter$_{\text{INF}}$’	Adèle 2;08.05

We now turn to our entire corpus and the non-faithful productions of target ObsLiq. The three main modifications that we expect from the literature are observed, i.e. reduction, substitution, and realisation of an interconsonantal vowel. We underline that the nature of the interconsonantal vowel is yet to be determined, i.e. whether it constitutes true epenthesis or excrescence. Finally, deletion of the entire cluster is sporadically observed across the corpus, most notably in the productions of Fabienne, age group 1, Adèle, age group 2, and Armand, age group 3, e.g. *bracelet* [bʁaslɛ] → [atle] (Adèle 2;09.15), *tracteur* ‘tractor’ [tʁaktœʁ] → [atɶ̜ʁ] (Fabienne 2;03.19), *trouver* ‘find$_{\text{inf}}$’ [tʁuve] → [ue] (Fabienne 2;03.19), *drapeau* ‘flag’ [dʁapo] → [apo] (Adèle 2;10.04), *Grosminet*[359] ‘Sylvester the Cat’ [ominɛ] (Adèle 2;10.07), and *Grégoire* proper name [gʁegwaʁ] → [egʁuwa] (Armand 2;11.13). Note that total cluster deletion is only attested in non-prominent syllables, which accords with Rose’s (2000) claim that there is less faithfulness to non-prominent syllables compared to prominent syllables.

[358] The data also contain several occurrences where initial [tʁ] in the verb *trouver* ‘find$_{\text{INF}}$’ [tʁuve] is realised as [p], e.g. [puve] (Adèle 2;09.23). Labiality is generally not considered a feature of [ʁ] in French (in contrast to English), which would have explained this phenomenon. A plausible explanation for this realisation of target [tʁ] as [p] is that it assimilates with the following vowel [u], which is labial. An alternative explanation, however, is based on the fact that underlying /ʁ/ has two surface variants, [ʁ] and labial [w], in Haitian and Mauritian, two languages closely related to French (Russell Webb 2009:110). As we discuss later in this section, target [ʁ] is frequently replaced by [w] in child language. The labiality associated with underlying /ʁ/ could, thus, account for the output [p] in *trouver*. As the featural composition of consonants is beyond the scope of the thesis, we abstain from elaborating any further on this issue.

[359] The production of *Grosminet* ’Sylvester the Cat’ is repeatedly triggered in the test sessions by the presence of the stuffed version of Sylvester’s friend, Tweety Bird, *Titi* in French.

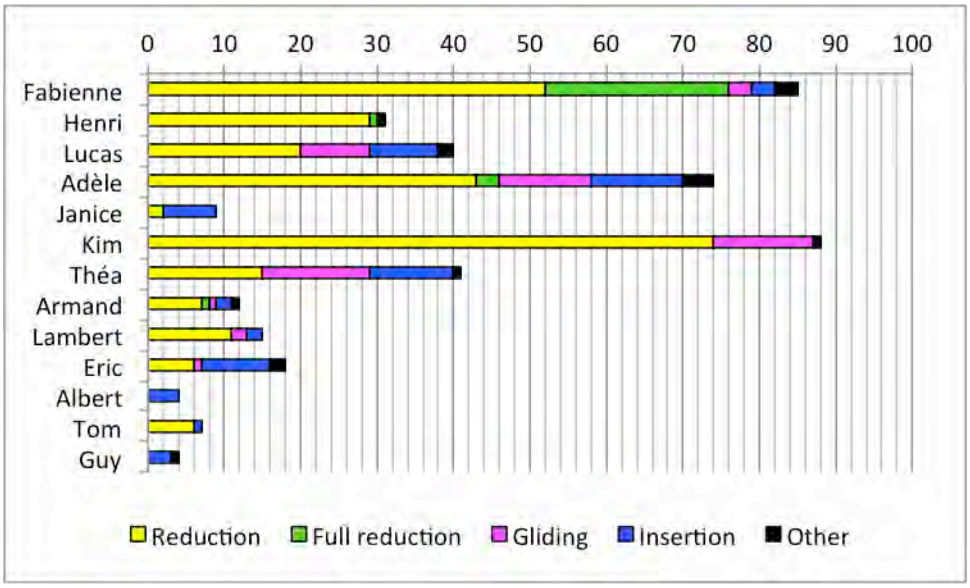

Figure 7.27: Repair strategies for target ObsLiq-clusters, per child, by percentage[360]

As predicted, in the case of cluster reduction, liquid deletion is more frequent than obstruent deletion. However, some variation emerges when we concentrate on the younger children Fabienne and Henri, age group 1, and Kim and Adèle, age group 2. Whereas Kim invariably deletes the liquid, e.g. *grand* [gʁɑ̃] → [gɔ] (2;09.26), Adèle and Henri display several productions of obstruent deletion. However, their obstruent deletion is primarily restricted to the target combination of a velar plosive and a uvular [ʁ], or phonetic variants thereof; in these cases, the liquid competes with the obstruent and the full cluster, e.g. *grand* [gʁɑ̃] → [ʀɔ̃] ~ [kʀ̥ɔ̃] (Henri 2;04.01) ~ [ku̥] (Henri 2;04.29). Fabienne also produces several variants for target Obs+[ʁ]: deletion of the plosive, deletion of the entire cluster, e.g. *tracteur* 'tractor' [tʁaktœʁ] → [atɶ̜ʁ] (2;03.19), and faithful production, e.g. *grand* [gʁɑ̃] → [gʀɔ] (2;04.03). We mention an idiosyncrasy in Fabienne's data, whereby consonant harmony affects the ObsLiq-cluster [gʁ] in *grenouille* [gʁœnuj] → [nœnɔj] (Fabienne 2;03.12). In Example (25) we present examples of reduction of ObsLiq-clusters. Note that we only include reductions observed in the data from the children with a level of accuracy lower than 30%; we additionally include Henri's data because an inspection of the target clusters that he attempts reveals that he only masters Obs+[ʁ]. Note that his data show that an alveolar C_1 is subject to place assimilation and replaced by [k] in *train* 'train', *trop* 'too much', *trou* 'hole', etc. As for the few instances of word with target Obs+[l] in his data, the cluster is reduced to the plosive.

(25) Reduction of ObsLiq-clusters

a. Liquid deletion

prend	[pʁɑ̃]	→ [bɔ]	'take$_{3\text{-SG-PRE}}$'	Fabienne 2;05.21
prends	[pʁɑ̃]	→ [kɔ]	'take$_{1\text{-SG-PRE}}$'	Adèle 2;10.07
pris	[pʁi]	→ [pi]	'take$_{\text{PAST-PART}}$'	Kim 3;0.05
plier	[plije]	→ [pije]	'fold$_{\text{INF}}$'	Adèle 2;09.29

[360] The results by count are: Fabienne 33 (reduction, henceforth R) vs. 15 (gliding, henceforth G) vs. 2 (insertion, henceforth I) vs. 2 (other, henceforth O); Henri 63 (R) vs. 1 (full reduction, henceforth FR) vs. 1 (G) vs. 3 (O); Lucas 92 (R) vs. 41 (G) vs. 31 (I) vs. 3 (O); Adèle 190 (R) vs. 15 (FR) vs. 53 (G) vs. 54 (I) vs. 18 (O); Janice 3 (R) vs. 9 (I); Kim 51 (R) vs. 9 (G) vs. 1 (O); Théa 13 (R) vs. 12 (G) vs. 10 (I) vs. 1 (O); Armand 51 (R) vs. 6 (FR) vs. 7 (G) vs. 17 (I) vs. 9 (O); Lambert 9 (R) vs. 2 (G) vs. 2 (I); Eric 6 (R) vs. 1 (G) vs. 9 (I) vs. 2 (O); Albert 3 (I); Tom 8 (R) vs. 2 (I); Guy 1 (R) vs. 1 (G) vs. 5 (I) vs. 2 (O).

bras	[bʁa]	→ [ba]	‘arm$_{\text{PL}}$’	Adèle 2;08.09
bleu	[blø]	→ [bɞ]	‘blue$_{\text{MASC}}$’	Henri 2;06.18
fraises	[fʁɛz]	→ [fɛt]	‘strawberry$_{\text{PL}}$’	Kim 3;00.05
fraises	[fʁɛz]	→ [kɛθ]	‘strawberry$_{\text{PL}}$’	Adèle 2;09.16
fleur	[flœʁ]	→ [fɛ]	‘flower’	Fabienne 2;04.03
fleur	[flœʁ]	→ [fœχ]	‘flower’	Henri 2;04.01
train	[tʁɛ̃]	→ [tæ]	‘train’	Kim 3;00.05
trouvé	[tʁuve]	→ [puve]	‘find$_{\text{PAST-PART}}$’	Adèle 2;09.24
drôle	[dʁol]	→ [kɔj]	‘funny’	Adèle 2;09.15
crayon	[kʁɛjɔ̃]	→ [gejɔ̃]	‘pencil’	Kim 3;00.05
Claudine	[klodin]	→ [kɔjdi]	proper name	Adèle 2;07.08
grenouille	[gʁœnuj]	→ [gənyj]	‘frog’	Kim 2;08.27
griffer	[gʁife]	→ [gife]	‘scratch$_{\text{INF}}$’	Adèle 2;09.24
glace	[glas]	→ [gaç]	‘ice cream’	Henri 2;06.04

b. Obstruent deletion

blanc	[blɑ̃]	→ [la]	‘white$_{\text{MASC}}$’	Adèle 2;08.05
train	[tʁɛ̃]	→ [xa]	‘train’	Fabienne 2;03.19
drôle	[dʁol]	→ [ʕɔj]	‘funny’	Adèle 2;09.29
clown	[klun]	→ [χunə]	‘clown’	Fabienne 2;04.17
grand	[gʁɑ̃]	→ [ʀ̥ɔ̃]	‘big$_{\text{MASC}}$’	Henri 2;06.18

c. Other

grenouille	[gʁœnuj]	→ [nœnɔj]	‘frog’	Fabienne 2;03.12

As regards substitutions, we present in Example (22-c), above, some examples of the substitution of liquid [ʁ] by liquid [l], e.g. *fraises* ‘strawberry$_{\text{PL}}$’ [fʁɛz] → [klɛθ] (Adèle 2;09.15). However, the more frequent substitution of liquids by glides leads to the production of an ObsGli-cluster, where the degree of increase in sonority is maximal (cf. Clements 1990, 2009). Most children who exhibit a certain degree of cluster reduction also adopt this second strategy, with the one exception of Henri, for whom we observe only one single occurrence of gliding, *glace* ‘ice cream’ [glas] → [gjaç] (2;06.10). Note that the gliding strategy is also observed for Lucas and Théa, which partly accounts for their rather low rates of ObsLiq-cluster accuracy (cf. Figure 7.26).

(26) Substitution in ObsLiq-clusters

a. Substitution of [ʁ]

près	[pʁɛ]	→ [kwɛ]	‘near’	Adèle 2;10.07
prépare	[pʁepaʁ]	→ [pjepa]	‘prepare$_{\text{3-SG-PRE}}$’	Kim 3;00.05
pris	[pʁi]	→ [pwi]	‘take$_{\text{PAST-PART}}$’	Théa 3;00.22
fraise	[fʁɛz]	→ [kweθ]	‘strawberry’	Adèle 2;10.07
train	[tʁɛ̃]	→ [kwɛ̃]	‘train’	Lucas 2;07.08
train	[tʁɛ̃]	→ [tjæn]	‘train’	Kim 3;00.05

b. Substitution of [l]

pleure	[plœʁ]	→ [pjœx]	‘cry$_{\text{3-SG-PRE}}$’	Kim 2;11.15
bleu	[blø]	→ [βjẹ]	‘blue$_{\text{MASC}}$’	Fabienne 2;05.00
blanc	[blɑ̃]	→ [djɑ̃]	‘white$_{\text{MASC}}$’	Fabienne 2;05.00

blanc	[blɑ̃]	→ [bjʌ]	‘white$_{\text{MASC}}$’	Adèle 2:09.24
blanc	[blɑ̃]	→ [βjɑ̃]	‘white$_{\text{MASC}}$’	Théa 2;11.03
fleur	[flœʁ]	→ [fɥɛː]	‘flower’	Fabienne 2;03.12
fleur	[flœʁ]	→ [fjɛʁ]	‘flower’	Fabienne 2;04.00
fleur	[flœʁ]	→ [ɸjœʀ̥]	‘flower’	Fabienne 2;04.00
fleur	[flœʁ]	→ [fɥɛx]	‘flower’	Fabienne 2;05.00
fleur	[flœʁ]	→ [pjɔχ]	‘flower’	Fabienne 2;05.21
fleur	[flœʁ]	→ [kja]	‘flower’	Adèle 2;07.08
fleur	[flœʁ]	→ [pjɑ]	‘flower’	Adèle 2;08.29
fleur	[flœʁ]	→ [fɥəʁ̥]	‘flower’	Kim 2;09.27
fleur	[flœʁ]	→ [fjœ̣x]	‘flower’	Kim 2;11.15
fleur	[flœʁ]	→ [fjɜʁ]	‘flower’	Théa 2;09.27
clown	[klun]	→ [kjun]	‘clown’	Fabienne 2;04.17
		→ [djuj]		

The realisation of an interconsonantal vowel constitutes the third major type of modification observed in the data for ObsLiq-clusters. These vowels are generally shorter in duration than stable vowels in non-prominent positions, and are therefore transcribed with a breve. We observe the application of this repair strategy sporadically throughout the corpus.[361] The vowel is observed with a very low frequency in the data from Lambert, Albert, Tom, and Guy, who have some of the highest rates of accuracy for ObsLiq-clusters. It is also observed with a very low frequency in the data from Fabienne and Kim, who have the lowest rates of accuracy for ObsLiq-clusters. This vowel is most frequently occurring in the data from Lucas, Adèle, Janice, Théa, Armand, and Eric, whose rates of accuracy for ObsLiq-clusters vary greatly. These observations indicate that the realisation of an interconsonantal vowel is a strategy that is available at the intermediate stage of cluster development (cf. Fikkert 1994, 2010). It is interesting to note that for Lucas, Adèle, and Théa, who have not acquired ObsLiq-clusters and have accuracy rates below 75% for these clusters, the interconsonantal vowel occurs most frequently before [l]; meanwhile, for Janice and Armand, who have acquired ObsLiq-clusters and have accuracy rates above 75% for these clusters, it occurs more frequently before [ʁ]. As for Eric, vowel insertion is attested in both types of ObsLiq-clusters. The asymmetrical distribution of the interconsonantal vowel in the data from Lucas, Adèle, and Théa accords with the fact that Obs+[ʁ]-clusters are more frequently subject to other modifications, liquid deletion or gliding, in their production, than Obs+[l]-clusters are. The asymmetrical distribution of the interconsonantal vowel in the data from Janice, Armand, and Eric, on the other hand, is more difficult to explain as manifestation of a phonological operation aiming to avoid ObsLiq-clusters, since these children master this cluster. Taking into account both their levels of accuracy for ObsLiq-clusters, and the finding in Kehoe et al. (2008) that only Obs+[l]-clusters are subject to epenthesis in French-learning children, it may be the case that the realisations of an interconsonantal vowel by these three children are merely excrescent vowels and, thus, a matter of gestural timing. Regarding the data from Lucas, Adèle, and Théa, on the other hand, it may be the case that the interconsonantal vowel fills a syllable nucleus that serves to break up the consonant sequence. A finer acoustic study of these data is required to confirm or disconfirm this claim, and we leave such an investigation to future research.

[361] A comparison of the duration of the inserted vowels and the underlying vowels in the non-prominent position is based on an auditory and visual inspection of the signal in Praat.

(27) Repair strategy: Realisation of an interconsonantal vowel

a. Before [ʁ]

brosse	[bʁɔs]	→ [bʌ̆ʁɔs]	‘brush$_{\text{3-SG-PR}}$’	Armand 3;02.16
brun	[bʁœ̃]	→ [bə̆ʁœ̃]	‘brown$_{\text{MASC}}$’	Eric 2;11.16
truc	[tʁyk]	→ [tʏ̆ʁʏk]	‘thing’	Janice 2;11.15
drapeau	[dʁapo]	→ [dăʕapo]	‘flag’	Théa 3;00.21
crayons	[kʁɛjɔ̃]	→ [kɛ̆ʁɛjɔ̃]	‘pencil$_{\text{PL}}$’	Lucas 2;10.19
griffes	[gʁif]	→ [gə̆ʁif]	‘claw$_{\text{PL}}$’	Janice 2;10.08
graines	[gʁɛn]	→ [gɛ̆ʁɛn]	‘grain$_{\text{PL}}$’	Armand 3;03.04
griffe	[gʁif]	→ [gĕʁif]	‘scratch$_{\text{3-SG-PRE}}$’	Eric 3;02.01

b. Before [l]

plus	[plys]	→ [pʏ̆lys]	‘more’	Lucas 2;09.21
plus	[ply]	→ [py̆ly]	negation	Eric 3;02.15
blanc	[blɑ̃]	→ [pə̆la]	‘white$_{\text{MASC}}$’	Adèle 2;07.08
bleu	[blø]	→ [pə̆le]	‘blue$_{\text{MASC}}$’	Adèle 2;07.08
blanc	[blɑ̃]	→ [bĭla]	‘white$_{\text{MASC}}$’	Adèle 2;08.29
blanc	[blɑ̃]	→ [bĭlɑ̃]	‘white$_{\text{MASC}}$’	Théa 2;09.29
bleu	[blø]	→ [bĭlø]	‘blue$_{\text{MASC}}$’	Théa 2;09.29
fleurs	[flœːʁ]	→ [fɛ̆lʌʀ̥]	‘flower$_{\text{PL}}$’	Lucas 2;07.13
clown	[klun]	→ [kʏ̆lut]	‘clown’	Adèle 2;08.29
glace	[glas]	→ [gălaθ]	‘ice cream’	Adèle 2;08.22
glace	[glas]	→ [gĕlas]	‘ice cream’	Lucas 2;09.21

Realisation of the interconsonantal vowel, to a large extent, seems to co-occur with emerging target-like clusters, which is illustrated by Adèle who in her first session (age 2;07.08) faithfully produces one single Plo+[l]-cluster, i.e. *clown* ‘clown’ [klun] → [klu]. The other occurrences of target-like Plo+[l] attested at this age are produced with an interconsonantal vowel. By her third session (age 2;08.29), however, the interconsonantal vowel coexists with the target-like cluster; see the spectrograms of *blanc* ‘white$_{\text{MASC}}$’ in Figures 7.28 to 7.30.

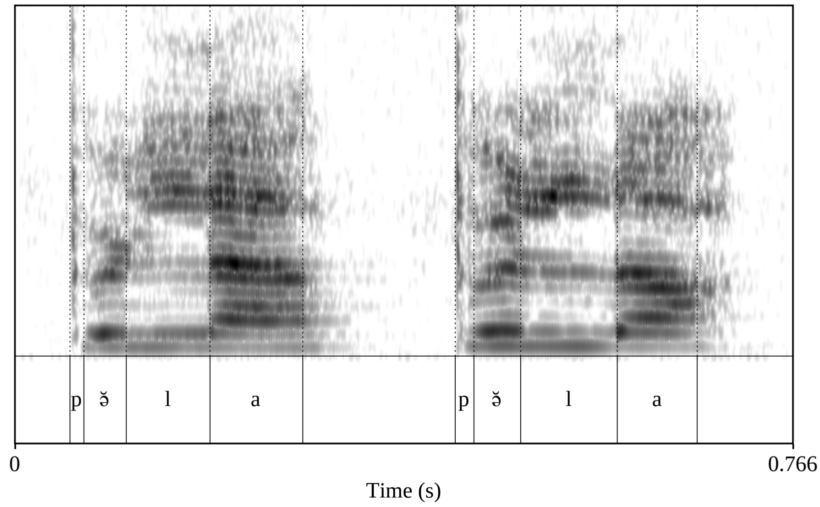

Figure 7.28: Interconsonantal vowel in ObsLiq-cluster, two repetitions of *blanc* [blɑ̃] → [pə̆la], data from Adèle (2;07.08)

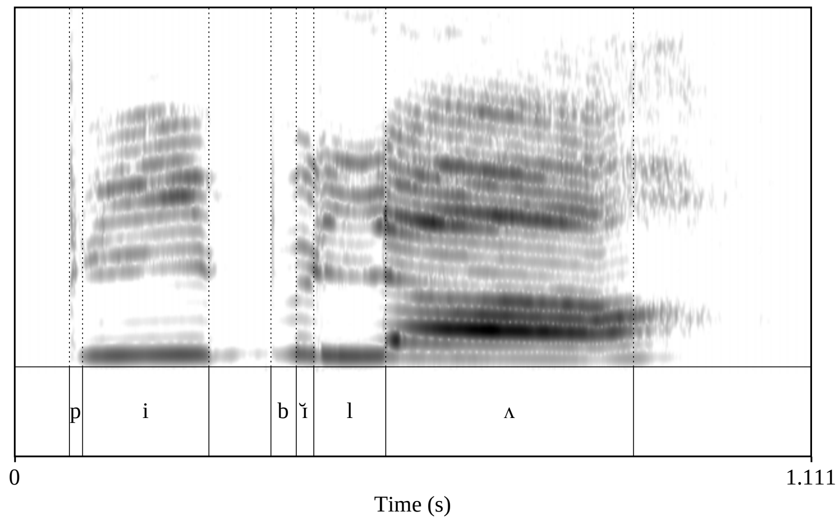

Figure 7.29: Interconsonantal vowel in ObsLiq-cluster, *puis blanc* [blɑ̃] → [bĭlʌ], data from Adèle (2;08.29)

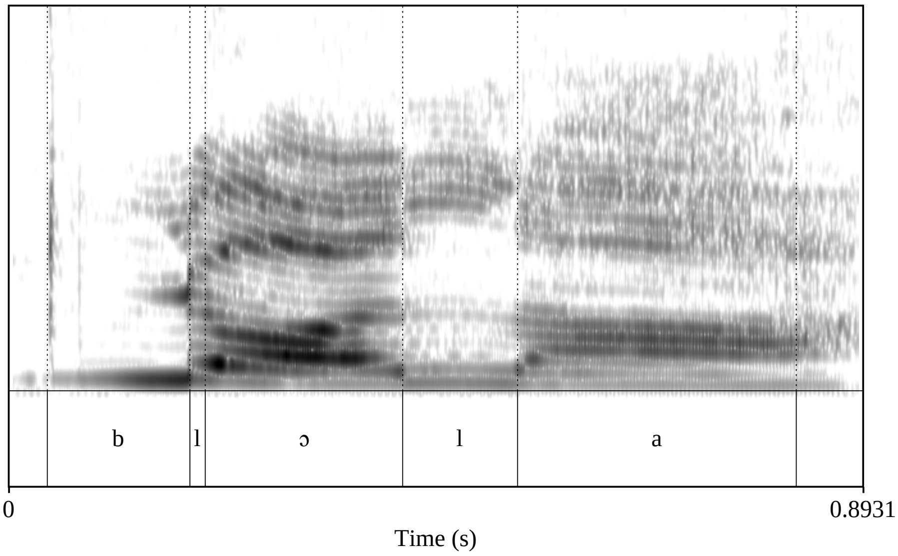

Figure 7.30: Target-like ObsLiq-cluster, *blanc* [blɑ̃] *là* → [blɔ], data from Adèle (2;08.29)

In sum, the behaviour of primary ObsLiq-clusters in our corpus patterns with previous findings. First, although there are exceptions, in particular Janice, who has a higher level of mastery than the other children in her age group, the rate of target-like production increases with age. Second, three repair strategies are attested in the data, i.e. reduction, gliding, and realisation of an interconsonantal vowel. Third, the selection of repair strategies varies among the children; whereas reduction is mainly observed in the data from the youngest children, age groups 1 and 2, gliding is almost exclusively observed in the data from the children in age group 2. Finally, realisation of an interconsonantal vowel is attested in age groups 2 and 3. Note that the status of the interconsonantal vowel is yet to be determined, and this because of a lack of a fine-grained acoustic analysis of the vowels' segmental properties as well as their level of prosodic prominence (pitch contour, length), across occurrences. Regardless of these phonetic details, we claim that the interconsonantal vowel represents an epenthesised vowel for the children who do not master ObsLiq-clusters, e.g. Adèle, Lucas, and Théa in Age group 2, and an excrescent vowel without a phonological function, for the children who do master ObsLiq-clusters, like Janice in age group 2 and Armand in age group 3.

We now turn to sequences comprising a consonant followed by a glide.

7.4.1.3.2 C+Glide-clusters

Like ObsLiq-clusters, C+Glide-clusters receive a substantial amount of attention in the literature. In this literature scholars are mainly concerned with the prosodification of glides, i.e. whether they are prosodified as the second element in a complex onset, or as the first element in a nuclear rising diphthong. A third option, put forth for the child's grammar, is that glides, as well as liquids, pass through a stage at which these segments are linked to a floating timing unit (Goad 2006). Since the prosodification of glides is beyond the scope of this thesis, we do not go further into the debate on this issue. Rather, we maintain the rather general claim that, at some point during acquisition, glides and liquids are prosodified in a similar fashion.[362]

Figure 7.31 depicts the percentage of target-like C+Glide-sequences realised by the individual children; the results show an overall rate of accuracy that is lower than the rate for ObsLiq-clusters. However, we underline the fact that forms that deviate from the format C+Glide do not necessarily represent non-target-like forms. First, for a word like *puis* 'then' in adult French, the variant without glide, [pi], is largely preferred to the variant with the glide, [pɥi]. In our data, all children produce the reduced variant, except for Tom and Guy, age group 3, who produce both variants. Second, recall that a glide is generally analysed as the non-syllabic counterpart of a vowel, and that the glide and the vowel freely alternate when preceded by one single consonant (cf. Section 2.5.3.1 on diaeresis vs. syneresis in Swiss French). Although outputs like *jouer* 'play$_{\text{INF}}$' [ʒue] (Lucas 2;08.19), instead of [ʒwe], do not constitute errors per se, we exclude them from Figure 7.31 in order to isolate the cases in which there is target-like syllable-initial complexity.

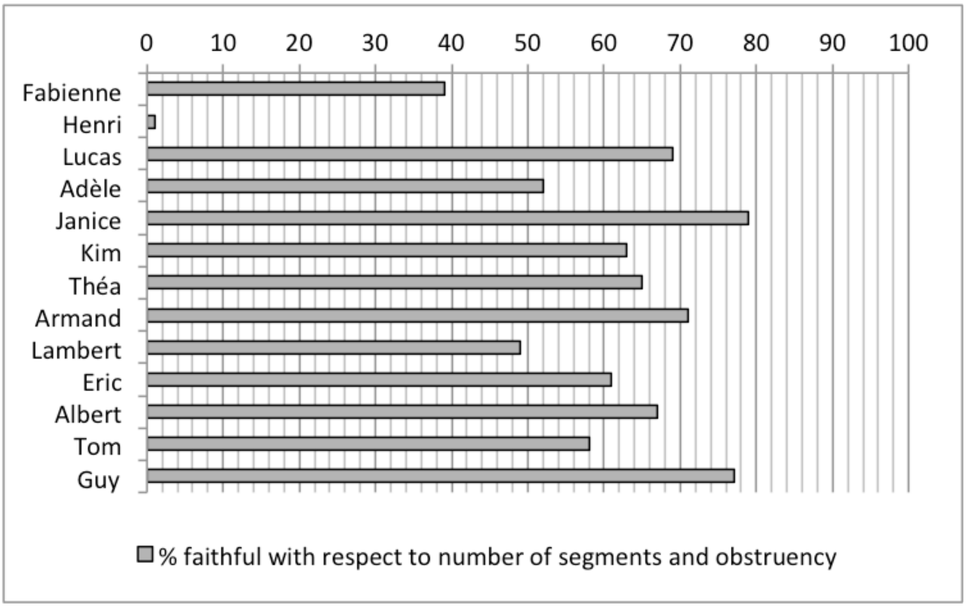

Figure 7.31: Faithfulness to C+Glide-sequences, per child, by percentage[363]

The results in Figure 7.31 show that there is no clear relationship between target-like production and age. Further, if we take the limit of 75% to be an indication of cluster mastery, the only children who surpass this threshold are Janice and Guy, who also display a high rate of accuracy with ObsLiq-clusters. Henri is unique in his near-absence of target-like productions; he realises one single C+Glide-sequence in the word *chien*, age 2.04.01. Additionally note that Adèle and Kim, who have low rates of accuracy with ObsLiq-clusters, they produce target-like C+Glide-sequences in around half of the occurrences.

[362] For a discussion on glides in child grammar, see Rose (2000), Goad (2006), and Kehoe et al. (2008).
[363] The results listed by percentage and count: Fabienne 39% (47/120), Henri 1% (1/135), Lucas 69% (591/854), Adèle 52% (710/1371), Janice 79% (99/126), Kim 63% (60/95), Théa 65% (129/197), Armand 71% (355/501), Lambert 49% (20/41), Eric 61% (72/119), Albert 67% (50/75), Tom 58% (103/178), and Guy 77% (198/258).

(28) Faithful production of C+Glide-clusters

a. Children with 75% accuracy or higher

Pierre	[pjɛʁ]	→ [pjɛʁ]	proper name	Guy 3;07.06
Antoine	[ɑ̃twan]	→ [ɑ̃twan]	proper name	Janice 2;10.11
cuire	[kɥiʁ]	→ [kɥiʁ]	‘cook$_{\text{INF}}$’	Guy 3;02.22
violet	[vjɔlɛ]	→ [vjylɛ]	‘violet’	Janice 2;09.07
moi	[mwa]	→ [mwa]	‘me$_{\text{DISJ}}$’	Janice 2;08.07
noir	[nwaʁ]	→ [nwaʁ]	‘black$_{\text{MASC}}$’	Guy 3;05.16
lumières	[lymjɛʁ]	→ [lymje̞ʀ]	‘light$_{\text{PL}}$’	Guy 3;02.22
lui	[lɥi]	→ [lɥi]	‘him$_{\text{DISJ}}$’	Janice 2;10.11

b. Children with 40-70% accuracy

pompier	[pɔ̃pje]	→ [pɔ̃pje]	‘fireman’	Armand 3;01.21
bien	[bjɛ̃]	→ [bjɛ̃]	‘well’	Albert 3;03.06
toi	[twa]	→ [fwa]	‘you$_{\text{DISJ}}$’	Adèle 2;09.15
toit	[twa]	→ [twa]	‘roof’	Théa 3;00.21
étoiles	[etwal]	→ [epwal]	‘star$_{\text{PL}}$’	Adèle 2;10.04
sandwich	[sɑ̃dwitʃ]	→ [sɑ̃dɥitʃ]	‘sandwich’	Eric 3;02.01
coiffe	[kwaf]	→ [kwaf]	‘brush (hair)’	Tom 3;02.22
pingouin	[pɛ̃gwɛ̃]	→ [pa̞gwa]	‘penguin’	Kim 2;08.29
fois	[fwa]	→ [fwa]	‘time’	Albert 3;02.22
avion	[avjɔ̃]	→ [avjɔ̃]	‘air plane’	Lucas 2;10.21
voyait	[vwajɛ]	→ [vwajɛ]	‘see$_{\text{3-SG-IMPER}}$’	Théa 3;01.12
monsieur	[m(œ)sjø]	→ [œθjø]	‘mister’	Adèle 2;10.04
sieste	[sjɛst]	→ [sjɛst]	‘nap’	Tom 3;04.19
chien	[ʃjɛ̃]	→ [θja]	‘dog’	Kim 2;09.26
chien	[ʃjɛ̃]	→ [ɕjɛ̃]	‘dog’	Lambert 3;00.13
t’assois	[taswa]	→ [taswa]	‘sit$_{\text{2-SG-REF-PRE}}$’	Lucas 2;08.12
arrosoir	[aʁozwaʁ]	→ [aʒwax]	‘watering can’	Armand 3;01.21
chewing-gum	[ʃwiŋgɔm]	→ [ʃɥiŋgɔm]	‘chewing-gum’	Eric 3;02.15
Begnins	[b(œ)njɛ̃][364]	→ [b̥ø̞njɛ̃]	toponym	Kim 2;10.17
grenier	[gʁœnje]	→ [gʁʌ̃nje]	‘attic’	Armand 2;11.28
panier	[panje]	→ [panje]	‘basket’	Eric 3;01.07
dernière	[dɛʁnjɛʁ]	→ [dɛnjɛʁ]	‘last$_{\text{FEM}}$’	Lucas 2;07.01
pirouette	[piʁwɛt]	→ [pliʁwɛt]	‘pirouette’	Armand 3;01.00
lion	[ljɔ̃]	→ [ljɔ̃]	‘lion’	Albert 3;04.03
lièvre	[ljɛvʁ]	→ [ljɛvʁ]	‘hare’	Tom 3;04.19
lui	[lɥi]	→ [lwi]	‘him$_{\text{DISJ}}$’	Eric 2;11.16

c. Children with less than 40% accuracy

deuxième	[døzjɛm]	→ [fafjɛm]	‘second’	Fabienne 2;04.03
pieds	[pje]	→ [ʈje]	‘foot$_{\text{PL}}$’	Fabienne 2;05.21
noir	[nwaʁ]	→ [nwaʁ]	‘black’	Fabienne 2;03.12
chien	[ʃjɛ̃]	→ [ṣjɛ̃]	‘dog’	Henri 2;04.01

[364] The Nyon PFC data confirm that *Begnins* is alternatively realised as [b(œ)ɲɛ̃], with a palatal nasal.

We now turn to the outputs of a form other than C+Glide. As noted earlier, the low rate of accuracy in Figure 7.31 does not necessarily indicate a high number of errors; both diaeresis and glide reduction in *puis*, [pi], is grammatical in target Swiss French.

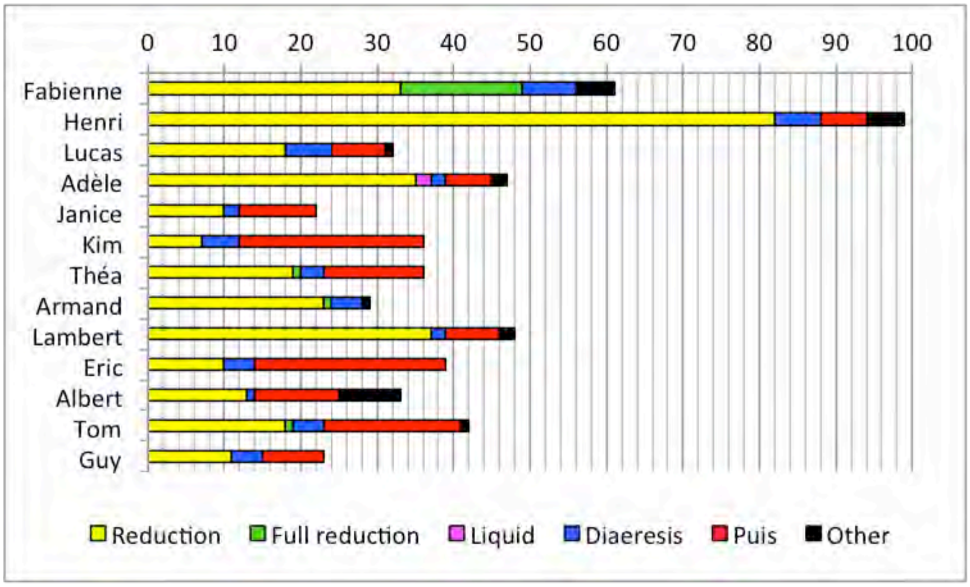

Figure 7.32: Repair strategies and alternative forms for target C+Glide, per child, by percentage[365]

First, we observe that reduction is responsible for the majority of non-target forms in the data from Fabienne and Henri, age group 1, Lucas, Adèle, and Théa, age group 2, and Armand and Lambert, age group 3. Second, absence of the entire C+Glide-sequence is primarily observed in the data from Fabienne. As to the reduction strategies used, the individual children represent various steps on the developmental path. Beginning with the most sonorous combination, i.e. LiqGli, Fabienne and Adèle categorically reduce the cluster to the glide.[366] Lucas also categorically reduces the cluster, but he alternates which segment is deleted. Additionally, Armand most frequently reduces the cluster to the glide, while Théa realises a target-like sequence in about half the cases. Sporadic occurrences of reduction are also observed in the data from the remaining children, and these occurrences show a clear preference for liquid deletion as opposed to glide deletion. As for NasGli-clusters, Henri categorically reduces to the glide, with the sole exception of the onomatopoeic *miaou*, realised [mau] (2;04.29). In contrast, Fabienne most frequently deletes the glide. In Age group 2, the item *moi* is subject to variation. Whereas Lucas reduces to the nasal, Adèle realises either a nasal or a glide. Armand generally shows a tendency to delete the nasal, but for the pronoun *moi* he deletes the glide. As in the case of LiqGli-sequences, the other sporadic occurrences of NasGli-reduction show a preference for nasal deletion as opposed to glide deletion.

[365] The results by count: Fabienne 40 (reduction, henceforth R) vs. 19 (full reduction, henceforth FR) vs. 8 (dieresis, henceforth D) vs. 6 (other, henceforth O); Henri 111 (R) vs. 8 (D) vs. 8 (*puis*, henceforth P) vs. 7 (O); Lucas 150 (R) vs. 1 (FR) vs. 1 (liquid, henceforth L) vs. 48 (D) vs. 58 (P) vs. 5 (O); Adèle 486 (R) vs. 4 (TR) vs. 22 (L) vs. 31 (D) vs. 89 (P) vs. 29 (O); Janice 12 (R) vs. 2 (D) vs. 13 (P); Kim 7 (R) vs. 5 (D) vs. 23 (P); Théa 37 (R) vs. 1 (TR) vs. 5 (D) vs. 25 (P); Armand 113 (R) vs. 7 (TR) vs. 19 (D) vs. 7 (O); Lambert 15 (R) vs. 1 (D) vs. 3 (P) vs. 1 (O); Eric 12 (R) vs. 5 (D) vs. 30 (P); Albert 10 (R) vs. 1 (D) vs. 8 (P) vs. 6 (O); Tom 32 (R) vs. 1 (TR) vs. 8 (D) vs. 32 (P) vs. 2 (O); Guy 28 (R) vs. 11 (D) vs. 21 (P).

[366] No item with target LiqGli is attested in the data from Henri.

The children from age group 3, with the exception of Armand, and Janice from age group 2, produce the PloGli-sequences in a target-like manner. Armand realises a faithful sequence in prominent syllables, while he reduces clusters to the plosive in non-prominent syllables. All children in age group 2, Lucas, Adèle, Kim, and Théa, except for Janice, reduce clusters to the plosive. Lucas shows a similar behaviour to Armand in that he deletes glides primarily in non-prominent syllables. Adèle provides the sole exception to categorical plosive retention in the target site; she produces two instances of the word *radio* 'radio' with displacement of the plosive word-initially, e.g. [ʁadjo] → [dajio] (2;07.10). In age group 1, Henri categorically reduces to the plosive, whereas Fabienne displays a positionally defined pattern wherein she fully reduces clusters in non-prominent syllables and produces either target-like or reduced clusters in prominent syllables. In prominent syllables, the various glides are seemingly subject to different constraints. Whereas a combination of a labial plosive and the glide [w] is reduced to the glide, a combination of a labial plosive and the glide [j] is reduced to the plosive. Finally, with a fricative C_1, the sequence [vw] is subject to various degrees of reduction across the corpus, but with a tendency to delete the fricative and preserve the glide. However, in the case of a sibilant C_1, it is the glide that is deleted and the sibilant that is preserved. The sole exception seems to be Adèle, who, in the rare cases of reduction of the combination Sibilant + [w], preserves the glide, e.g. *assiette* 'plate' [asjɛt] → [θaθɛt] (2;07.10). The last combination in the corpus that is frequently subject to reduction is [vj]; whereas Lucas and Armand preserve the glide, Henri preserves the fricative, or, in the case of *avion*, he moves a copy of the fricative to the word-initial position.

(29) Reduction of C+Glide-sequences

a. Children with 75% accuracy or higher

<u>Liquid C_1</u>

lui	[lɥi]	→ [ɥi]	'him_{DISJ}'	Guy 3;03.22

<u>Nasal C_1</u>

noir	[nwaʁ]	→ [waʁ]	'black'	Janice 2;11.02
lumières	[lymjɛʁ]	→ [lynɛʁə]	'light_{PL}'	Janice 2;11.29

<u>Fricative C_1</u>

voir	[vwaʁ]	→ [waʁ]	'see_{INF}'	Guy 3;04.26
chien	[ʃjɛ̃]	→ [çɛ̃]	'dog'	Janice 2;08.07

b. Children with 40-70% accuracy

<u>Liquid C_1</u>

rien	[ʁjɛ̃]	→ [jɛ̃]	'nothing'	Lucas 2;10.21
rien	[ʁjɛ̃]	→ [ɛ̃]	'nothing'	Armand 2;11.28
barrières	[baʁjɛʁ]	→ [pajɛ]	'barriers'	Adèle 2;09.02
lion	[ljɔ̃]	→ [jɔ̃]	'lion'	Armand 3;02.00
lui	[lɥi]	→ [wi]	'him_{DISJ}'	Adèle 2;09.02
lui	[lɥi]	→ [li]	'him_{DISJ}'	Théa 3;01.12
lui	[lɥi]	→ [ɥi]	'him_{DISJ}'	Albert 3;01.11
lui	[lɥi]	→ [ɥi]	'him_{DISJ}'	Tom 3;05.17
escalier	[ɛskalje]	→ [ɛskaje]	'stair'	Lucas 2;09.20
souliers	[sulje]	→ [tuje]	'shoe_{PL}'	Adèle 2;09.23

<u>Nasal C_1</u>

moi	[mwa]	→ [mɑ]	'me$_{\text{DISJ}}$'	Lucas 2;09.28
moissonneuse	[mwazɔnœz]	→ [j̃aj̃iz]	'reaper'	Armand 3;01.21
panier	[panje]	→ [pajej]	'basket'	Armand 3;00.13
noir	[nwaʁ]	→ [wa]	'black'	Lambert 2;11.21
noir	[nwaʁ]	→ [w̥͡wwaʁ]	'black'	Eric 3;01.07
noir	[nwaʁ]	→ [wa]	'black'	Albert 3;02.22
noir	[nwaʁ]	→ [waʁ]	'black'	Tom 3;01.22

<u>Plosive C_1</u>

pieds	[pje]	→ [pe]	'feet'	Lucas 2;09.10
pièce	[pjɛs]	→ [pɛθ]	'piece'	Adèle 2;08.16
Pierre	[pjɛʁ]	→ [pɛ]	proper name	Kim 3;00.05
Poilu	[pwaly]	→ [paly]	proper name	Lucas 2;07.12
poissons	[pwasɔ̃]	→ [pasɔ̃]	'fish$_{\text{pl}}$'	Armand 2;11.13
dois	[dwa]	→ [da]	'must$_{\text{1-SG-PRE}}$'	Adèle 2;08.22
dois	[dwa]	→ [da]	'must$_{\text{1-SG-PRE}}$'	Théa 2;09.29

<u>Fricative C_1</u>

viande	[vjɑ̃d]	→ [jɑ̃d]	'meat'	Lucas 2;07.18
vient	[vjɛ̃]	→ [jɛ̃]	'come$_{\text{3-SG-PRE}}$'	Armand 3;00.21
voir	[vwaʁ]	→ [waʁ]	'see$_{\text{INF}}$'	Lucas 2;07.08
monsieur	[m(œ)sjø]	→ [møʃø]	'mister'	Armand 3;04.00

c. Children with less than 40% accuracy

<u>Liquid C_1</u>

lion	[ljɔ̃]	→ [jɔ̃]	'lion'	Fabienne 2;03.26

<u>Nasal C_1</u>

camion	[kamjɔ̃]	→ [bajɔ]	'truck'	Henri 2;05.13
noir	[nwaʁ]	→ [nʌx]	'black'	Fabienne 2;04.03
dernier	[deʁnje]	→ [ɲeje]	'last$_{\text{MASC}}$'	Fabienne 2;03.26

<u>Plosive C_1</u>

pompier	[pɔ̃pje]	→ [pɔ̃pe]	'fireman'	Henri 2;07.08
pièce	[pjɛs]	→ [pes]	'piece'	Fabienne 2;03.26
poisson	[pwasɔ̃]	→ [aɕɑ̃]	'fish'	Fabienne 2;03.26
boire	[bwaʁ]	→ [bax]	'drink$_{\text{INF}}$'	Henri 2;05.13
boîte	[bwat]	→ [wat]	'box'	Fabienne 2;04.17
étoile	[etwal]	→ [epaj]	'star'	Henri 2;06.10

<u>Fricative C_1</u>

avion	[avjɔ̃]	→ [vavɔ̃]	'airplane'	Henri 2;05.13
voiture	[vwatyʁ]	→ [atyʁ]	'car'	Fabienne 2;04.23
voiture	[vwatyʁ]	→ [vatu]	'car'	Henri 2;07.01
monsieur	[m(œ)sjø]	→ [mœse]	'mister'	Fabienne 2;05.16
chien	[ʃjɛ̃]	→ [ɕæ]	'dog'	Henri 2;05.06

The second interesting repair strategy is substitution of the glide by a liquid, which indicates that the two segment types have similar prosodification. This behaviour is only observed in the data from Adèle, and is restricted to the target PloGli-sequence [pj]; glide substitution is observed in the following three words:

(30) Liquid substitution for target [pj] in the data from Adèle, distributed according to age[367]

pièce	[p] (2;08.16-2;09.02)	[pl/kl] (2;09.16-2;09.30)	[ɟ/kʲ] ~ [pl/kl] ~ [pj] (2;10.13)
pieds	[pV̆l] (2;08.22)	[pl] (2;08.29-2;10.04)	
pierre	[pV̆l] ~ [pl] (2;09.24)	[pl] (2;10.07)	

We end the presentation of primary clusters with an examination of the target [s]+C-clusters.

7.4.1.3.3 [s]+C-clusters

To the best of our knowledge, there is no study that focuses on the acquisition of [s]+C-clusters in French. However, information on the acquisition of these clusters is found in a study by Goad and Rose (2004) on English, German, and Dutch. They observe two different patterns, which they claim represent two stages in development. In the first stage, the child is guided by relative prominence in his selection of the head segment, which leads to the retention of the least sonorous segment, i.e. retention of the plosive in [s]+Plo-clusters and the sibilant in [s]+Son-clusters. In the second stage, when inputs are elaborated and contain more prosodic structure, the dependent sibilant is deleted in both types of clusters.[368]

In our corpus, the number of occurrences of [s]+C-clusters is, unfortunately, too low across both recording settings to reveal any pattern. The few examples that are found are, nevertheless, in line with the previous research; in most cases, [s] is deleted and the following obstruent is preserved. The retention of the nasal in the word *Smarties*, realised by Lucas, indicates that [s]+Obs- and [s]+Son-clusters are treated similarly, counter to the main pattern observed by Fikkert (1994). In the data from Lucas we further observe that the one occurrence of a well-formed [s]+C-cluster is found in the monosyllabic word *stop*, which indicates that his grammar authorises these clusters in the prominent syllable only.

(31) [s]+C-clusters

a. [s]+Obstruent

sparadrap	[spaʁadʁa]	→ [badəʁa]	‘adhesive plaster’	Théa 2;09.27
spectacle	[spɛktakl]	→ [pθpɛtɛtaklœ̩]	‘spectacle’	Janice 2;10.08
stylo	[stilo]	→ [tilo]	‘pen’	Adèle 2;07.11
stop	[stɔp]	→ [stɔp]	‘stop’	Lucas 2;09.21
Scoubidou	[skubidu]	→ [s̠ubidu]	‘Scooby-Doo’	Lucas 2;09.14
scotch	[skɔtʃ]	→ [gɔθ]	‘self-adhesive tape’	Adèle 2;09.30
ski	[ski]	→ [ki]	‘ski’	Armand 2;11.13
ski	[ski]	→ [θ.ti]	‘ski’	Guy 3;05.23
skier	[skije]	→ [θkije]	‘go skiing’	Janice 2;08.28
scarabée	[skaʁabe]	→ [kaʁabe]	‘beetle’	Tom 3;02.17
squelette	[skœlɛt]	→ [skœlɛt]	‘skeleton’	Tom 3;04.05
scorpion	[skɔʁpjɔ̃]	→ [skɔʁpjɔ̃]	‘scorpion’	Guy 3;03.13

[367] <V̆> represents a short, interconsonantal vowel.
[368] Like Rose (2000), Goad and Rose (2004) consider input forms to be fully prosodified.

b. [s]+Sonorant

Smarties	[smaʁtiz]	→ [matiz]	'Smarties'	Lucas 2;10.21
Smarties	[smaʁtiz]	→ [smaʁtiz]	'Smarties'	Eric 3;02.01

While the reductions observed in the data from the children with a low rate of accuracy for ObsLiq-clusters are unsurprising, we notice, with interest, that there are occasional errors by Janice, Armand, Guy, and Tom, each of whom has high accuracy for ObsLiq-clusters; these errors, albeit rare, reveal the articulatory difficulty of this primary, albeit rare, cluster type.

7.4.1.3.4 Summary

In this section we have presented the target primary clusters as they are produced in our child language data. As predicted by earlier works, there is a gradual increase in accuracy for ObsLiq-clusters that corresponds with age. Although, we observe some exceptions; while Janice, age group 2, patterns with the children in age group 3, Henri, age group 1, patterns with two of the children from age group 2. An examination of the individual results has, nevertheless, revealed that clusters are not all equally well-mastered by all children. For instance, Henri's high level of accuracy for ObsLiq-clusters hides the fact that Obs+[l]-clusters are subject to modification in his output. The repair strategies that we have observed, cluster simplification, substitution of liquids by glides, and the realisation of interconsonantal vowels, are all in line with findings in previous research. Other modifications, such as deletion of the entire cluster and substitution of glides by liquids, are only attested in a few children. As regards [s]+C-clusters, the few items attested in our corpus strengthen earlier findings.

We had two goals for examining primary clusters in addition to clusters consisting of a consonant followed by a glide. First, the examination provides a basis for testing our hypothesis that the mastery of primary clusters is a prerequisite for the mastery of secondary clusters. Second, it provides an overview of the segmental combinations that are authorised in the outputs of the individual children, which is useful for the discussion in the next section where we examine the outputs of underlying secondary clusters.

7.4.1.4 Secondary consonant clusters

In the previous section, the 13 children have been placed into three groups on the basis of their relative accuracy for ObsLiq-clusters, i.e. the degree to which the output constitutes a two-element structure with a liquid in the second position. Several of the children who display non-faithfulness to the liquid still produce a two-element structure by substituting the liquid with a more sonorous glide. Other children display a restriction against target two-element structures, which also affects target C+Glide-sequences. In what follows, we examine the schwa-items realised by the 13 children in our corpus. We sort these items according to their type of secondary cluster; ObsSon-clusters, with rising sonority, ObsObs-clusters, with level sonority, and Son-initial clusters, comprising SonObs-clusters, with falling sonority and SonSon-clusters, with level sonority.

7.4.1.4.1 ObsSon-clusters

An examination of target secondary ObsSon-clusters reveals that all six children who produce primary ObsLiq-clusters with 75%+ accuracy produce schwa alternation in the former context, even though schwa presence is generally preferred to schwa absence. Further, we observe a high rate of accuracy on secondary ObsSon-clusters, regardless of whether the initial element is a plosive or a fricative. However, we call attention to three recurring errors in the data set: First, plosive C_1 deletion in heterorganic [d(œ)m] (see *demander* and *demi*) is observed in the data from Guy and Janice, which contrasts with plosive C_1 retention in the homorganic cluster [t(œ)n] (see *tenir*). Second, for items with a fricative C_1 followed by a nasal C_2, the fricative is assimilated with the nasal at several occasions (see *fenêtre, fenasse, Genève*), which yields the output [n̥n] with a devoiced nasal, which is more homogeneous with regard to place and manner. We underline that in some, but not all, cases of assimilation of the fricative, the schwa-item occurs in a post-nasal context, e.g. *une fenasse aussi* 'also a fenasse' [n̩ n̥naθ osi] (Tom 3;04.19) vs. *part à Genève avec le train* 'go$_{3\text{-SG-PRE}}$ to Geneva by train' [paʁ a ñ̥nɛv avɛk lə tʁɛ̃] (Tom 3;06.01). Finally, Armand is unique in his non-target-like realisations of *fenêtre* and *fenasse*; he shows variation with regard to word-medial [n] in the variant with schwa, and the schwa-less variant is produced with retention of C_1 or C_2 (see *fenêtre*), or with gliding (see *fenasse*). Thus, for Armand, even though he realises a target-like production of primary ObsLiq-clusters and C+Glide-sequences, albeit with some adjustments to place of articulation (cf. Example (22a)), the production of the target alternation [fœn] ~ [fn] constitutes a challenge. If we look at Armand's production of the target *grenouille* 'frog' [gʁœnuj], which has medial [n], a range of variants are attested throughout the recording period. For instance, while he faithfully produces [gʁɔ̩nuj] at the age of 2;11.21, he realises three different variants during one single session (2;11.28); target-like [n] in [kʁɔnum], substitution of [n] by [h] in [kʁɵhuj], and movement of medial [n] to a word-final position in [kʁuun]. Further, at the age of 3;00.21, we attest gliding and [n]-movement in [ʁɔjũn]. In sum, although Armand realises several target-like [n] during the recording period, we claim that his non-target-like productions of *fenêtre* and *fenasse* are, at least in part, due to restrictions on [n] in his grammar.

(32) Target secondary ObsSon-clusters attested alongside a variant with schwa: children with 75% accuracy or higher for ObsLiq-clusters[369]

tenir	[tœ̩niʁ] 3;07.04	[tniʁ] 3;03.22	Guy
demander	[dœ̩mɑ̃de] 2;08.28	[dmɑ̃de] 2;11.22	Janice
demander	[dœmɑ̃de] 3;06.14	[mɑ̃də] 3;06.06	Guy
demi	[dɪmi] 2;10.08	[dmi] 2;10.08 [m̃i] 2;09.14	Janice
fenêtre	[fœ̩nɛ.tʀ̥] 2;09.07	[fnɛtʀœ] 2;09.07	Janice
fenêtre	[fɔ̩a̯lɛːt][fʏnɛt] 3;01.21	[vɛt] 3;00.21 [nɛ] 3;01.00	Armand
fenêtre	[fœ̯ɛ̩nætʀ] 3;03.02	[f.ñ̥͡nnæ.tʀ] 3;03.02	Lambert
fenêtre	[f͡hə̯œnɛ̥tʀ̥] 3;01.11	[f.nɛtχ] 3;01.11	Albert
fenêtre	[fe̩nɛtʀ] 3;04.19	[f.ñ̥͡nnɛtʀ] 3;04.19 [ñ̥.nɛ.tʁ] 3;05.17	Tom
fenêtre	[fɶ̩nɛtʀ] 3;03.22	[n̥nɛtʀ][f.nɛtʁ] 3;03.22	Guy
fenasse	[fɛ̩ñ̃aθ] 2;09.07	[fn̄̃.naθ][f.naθ] 2;09.07	Janice
fenasse	[vieða̰aṣ] 3;02.13	[fjas] (3;02.13)	Armand
fenasse	[fœ̯œ̩naθ] 3;02.12	[f͡ñ̥naṣ] 3;02.12	Lambert

[369] Target transcription of schwa-items attested with alternation in (32): *tenir* 'hold$_{\text{INF}}$' [t(œ)niʁ], *demander* 'ask$_{\text{INF}}$' [d(œ)mɑ̃de], *demi* 'half' [d(œ)mi], *fenêtre* 'window' [f(œ)nɛtʁ], *fenasse* nonsense word [f(œ)nas], *venir/venu* 'come$_{\text{INF/PAST-PART}}$' [v(œ)niʁ/v(œ)ny], *Genève* toponym [ʒ(œ)nɛv], *cerises* 'cherry$_{\text{PL}}$' [s(œ)ʁiz].

fenasse	[fœ̣nas][s̩ynas] 3;04.19	[n̥.naθ][f͡n̥naθ] 3;04.19	Tom
fenasse	[fʏ̩naθ] 3;05.16	[f͡nnas] 3;05.16	Guy
venu/venir	[vːø̜ny] 2;09.14	[vniʁ] 2;11.02	Janice
venu	[vœny] 3;02.28	[vny] 3;02.17	Tom
venir	[vʏ̯niʁ] 3;03.05	[vniʁ] 3;03.05	Guy
Genève	[zənɛv] 3;06.11	[n̥͡nɛv] 3;06.01	Tom
Genève	[ʒœnɛv] 3;02.22	[ʒnɛv] 3;02.22	Guy
cerises	[sœʁið] 3;02.15	[sʁɪz] 3;02.15	Eric

Recall that there is only a small amount of data on primary [s]+Son-clusters. However, the secondary clusters that are attempted with an initial sibilant do establish a certain level of mastery among the children; although, again, the variant with schwa is preferred in most words. Janice and Guy produce *ser-* 'be$_{\text{FUT/COND}}$' accurately in the majority of cases, e.g. [s(œ)ʁa] → [θʀa] (Janice 2;09.14) and [sʀ̥a][sʁa][ʀ̥a] (Guy 3;07.04). In the data from Guy, we also find target-like *chenit* 'mess (reg.)' [ʃ(œ)ni] → [ʃni] (3;02.14) and two consecutive, non-target-like occurrences of *semaine* 'week' [s(œ)mɛn] → [m̥mɛnə] (3;03.13), with assimilation of the fricative.

Three children, Henri, Lucas, and Théa, are observed with an accuracy of between 50 and 70% for primary ObsLiq-clusters. Among them, Henri is singled out from the group because he only performs in a target-like manner for items with liquid [ʁ], in which labial and alveolar plosives are subject to modification with regard to place of articulation, e.g. *trouvé* 'find$_{\text{PAST-PART}}$' [tʁuve] → [kʁuve] (2;06.24). Henri, Lucas, and Théa display schwa alternation, although to a lesser extent than the older children presented above do, both with regard to frequency of alternation and number of items in which alternation takes place. Three observations in the data set, in particular, merit a comment. First, Théa produces target-like schwa-less variants for *fenêtre* and *fenasse*. Second, Lucas also produces target-like schwa-less variants for these words, but we further observe one instance of gliding in a schwa-less variant of *fenêtre*, which is a repair strategy that he uses for primary ObsLiq-clusters. Third, Henri realises schwa-less variants in which the second, more sonorous, consonant is deleted, i.e. the [n] in *fenêtre* and *fenasse*, and the liquid in *cerises*. The lack of gliding in the data from Henri is unsurprising given the fact that he does not display mastery for target glides and thereby cannot select gliding as a repair strategy.

(33) Target secondary ObsSon-clusters attested alongside a variant with schwa: children with 50-70% accuracy for ObsLiq-clusters

fenêtre	[vɔvɛc] 2;04.29 [fənɛk] 2;05.06	[fɛː.t] 2;04.29	Henri
fenêtre	[fœnɛk] 2;08.10	[fnɛk] 2;08.10 [fwɛnt] 2;09.3	Lucas
fenêtre	[fœ̰nɛ̰tʁ] 3;00.21	[fn̰ɛtʁ] 3;00.21	Théa
fenasse	[fay̥aç̣] 2;06.17	[fa̤ç] 2;06.17	Henri
fenasse	[fɛnaθ̠][tœ̜naθ] 2;09.28	[vœ̰a̰s] 2;09.28	Lucas
fenasse	[fɶ̜mas][f̰ə̰.nas] 3;00.21	[f͡θʷnas] 3;00.21	Théa
Genève	[ʒɵʒɛv][ʒə̜nɛv] 2;09.14	[ʒnɛv] 2;09.14	Lucas
cerises	[hajiç] 2;05.06	[ɕi] 2;05.27	Henri
cerises	[sœʁiθ] 2;10.19	[hʀijĕ] 2;09.28	Lucas

Further, we observe 100% schwa absence for *demi* 'half' and *venir* 'come$_{\text{INF}}$' in the data from Lucas, but not in a target-like manner, e.g. [d(œ)mi] → [mi] (2;07.18) vs. [n̩mi] (2;09.10) and [v(œ)niʁ] → [niʁ] (2;09.10). The data from Lucas contrast with the data from the older children in that his data do not display schwa alternation in these words. The schwa-less variant of *demi*, with deletion of word-initial [d], is nevertheless similar across both groups of children. For Lucas, the additional absence of the obstruent C_1 in *venir* indicates that he has a restriction on which consonant to delete in this combination. In passing, we also note that Lucas conforms to the patterns displayed by the older children in that he contrasts *venir* and *tenir*; whereas *tenir* is realised with schwa, *venir* is not.

Before turning to the last group of children, we illustrate the availability of the two schwa-variants in Lucas' spontaneous speech. In the following excerpt, Lucas (2;10.11) and a friend are playing with a puzzle illustrating a house. The researcher is present, points at the window in the puzzle, and asks the two boys what it is. Lucas' friend answers first, and produces a form with the entire syllable deleted, *fenêtre* 'window' [f(œ)nɛtʁ] → [nɛtʁ]. Lucas considers this answer to be wrong and corrects his friend by producing two of the variants available for the schwa-item, i.e. the full and the reduced vowel. He further stresses the importance of the initial syllable by making it prominent in the last occurrence.[370]

(34) Lucas' (2;10.11) reaction to his friend's realisation of *fenêtre* [nɛtʁ]

C'est pas une [fʁɛd]
C'est pas une [nɛ], [fʏ̆ˈnɛt]
C'est une [fʏˈnɛt]
C'est [fĭˈnɛt]
C'est une [ˈfynɛt], tu vois?

What characterises the schwa-items with a secondary ObsSon-cluster in the data from the last three children, Fabienne, Adèle, and Kim, who display 30% or lower accuracy with ObsLiq-clusters, is the complete absence of target-like forms (cf. Example (35)). However, we are able to collect a short list of alternations between the two variants with and without schwa. Once more, we observe a mismatch between the segmental make-up of the two variants. Like the other children examined above, the consonant that deletes in *demi* is the plosive C_1. When C_1 is present, Kim replaces target [d] with [j] in the variant with and without schwa, and one can, thereby, conclude that the alternation between [jim̩i] and [jm̩i] is, in one respect, target-like because the sole element that differentiates the two forms is the presence or absence of the vowel. Assimilation of a fricative adjacent to a nasal is observed in the data from Adèle, who selects this strategy for both *fenêtre* and *fenasse*. We mention that she normally replaces the word-initial [f] with a plosive in the full form, e.g. *fenêtre* [tʌ̹nɛt] (2;08.29), which would imply the production of a secondary cluster [tn] in the case segmental identity between the variant with schwa and the one without prevails. She displays a tendency towards this structure in her production of *fenasse*, in which the target nasal is preceded by an audible plosion. Another interesting observation is that Adèle realises [kl] in one of the schwa-less variants of *fenêtre*. Although [kl] is a segmental make-up that crucially differs from the variant with schwa, where [t] and [n] surround schwa, she produces an ObsSon-cluster in conformity with her production grammar, and thereby, assures prosodic, but not segmental, faithfulness to the secondary cluster, e.g. primary clusters *clés* 'key$_{\text{PL}}$' [kle] → [kle] (2;07.10) and *fleur* 'flower' [flœʁ] → [klɜː] (2;08.29). Finally, we wish to comment on the reduction of the entire syllable with schwa. In the data from Adèle, absence of the schwa syllable is attested in the nonsense word *fenasse*, for which she also has a non-target-like segmental make-up in the variant with schwa, i.e. word-

[370] Note that it is impossible to know whether Lucas stresses the importance of [f], schwa, or the entire CV syllable.

initial [f] is replaced by [m]. Both consonants being equally sonorous, she retains the initial consonant in the schwa-less variant [maːθ]. Regarding syllable deletion for *fenêtre*, from the data from Fabienne, it is not entirely clear which consonant is retained and substituted by [j]. While she produces both [f] and [n] word-initially, e.g. *fleur* 'flower' [flœʁ] → [fɵʁ] and *noir* 'black' [nwaʁ] → [nwaʁ] (2;03.12), her realisations of *fenasse*, which are not attested as alternating, seem to indicate the retention of the second element [n] at the expense of [f], e.g. gliding in [ˈjazœ] (2;03.12) and [jaθ̠] (2;05.00) vs. faithful production in [naθ̠] (2;05.00).

(35) Target secondary ObsSon-clusters attested alongside a variant with schwa: children with 30% accuracy or lower for ObsLiq-clusters

demi	[jim̩i] 2;08.29	[jm̩i][mi] 2;08.29	Kim
fenêtre	[h̤e̤n̤ɛ̤t] 2;03.12	[jɛt] 2;03.12	Fabienne
fenêtre	[tʌ̩nɛt] 2;08.29	[klæt][ñ̥nætɔ] 2;08.29	Adèle
fenasse	[mα̩nas] 2;09.23	[maθ][n̥na] 2;09.23 [ñ̃na.t][ñ̃nas] 2;09.23	Adèle
venir	[əni] 2;08.02	[ni] 2;08.02	Adèle

The behaviour of secondary clusters in the items *venir, tenir, demi*, and *demander* is similar to the one observed for the other two groups of children. Adèle realises *tenir* with schwa and *venir* without, and the latter item is also subject to deletion of the fricative C_1, e.g. *tenir* [teje][tɵni] (2;09.23) vs. *venu* [ni] (2;08.09). In items with target [d(œ)m], the schwa-less variant and deletion of the plosive C_1 is categorically selected.

In sum, target-like production of secondary ObsSon-clusters increases alongside target-like production of primary ObsLiq-clusters; the children who master primary ObsLiq-clusters are also observed with the highest rate of accuracy for secondary ObsSon-clusters, with the exception of Armand, who employs a series of modifications for the schwa-less variants. The repair strategies that are applied to secondary clusters across the corpus are partly in line with the repair strategies selected by the individual children for the primary clusters in Section 7.4.1.3, i.e. segment deletion and gliding. In some cases, however, it is the least sonorous segment that is subject to deletion, e.g. the obstruent in *venir, demi*, and *demander*. Other types of modifications are also attested, i.e. assimilation triggered by the nasal and full substitution of the cluster (e.g. [tVn] ~ [ñ̥n] and [kl] in *fenêtre*). While the former repair strategy is not attested outside the set of schwa-items, the latter strategy yields a secondary cluster that is already acquired as a primary cluster.

In what follows, we turn to the realisation of target secondary ObsObs-clusters.

7.4.1.4.2 ObsObs-clusters

An examination of the children who master ObsLiq-clusters reveals a substantial amount of schwa alternation in items with secondary ObsObs-clusters for all six children. Further, as is the case with secondary ObsSon-clusters, we observe a high frequency of target-like productions of this second type of secondary clusters, whether the initial segment consists of a plosive or a fricative. The data in Examples (36) to (38) list some attested alternations between the two variants of schwa-items for the individual children. There are four strategies used by the children that merit attention. First, there is an important variability in the articulation of sibilants; for instance, Lambert and Tom fail to produce [ʃ] and instead, realise [θ] and [s], respectively. Guy, on the other hand, demonstrates articulatory mastery and realises [ʃ] in both variants of *cheval* and *chevir*, and he realises a target-like production of the schwa-less variant of *cheveux*: [ʃfʏ] (3;03.19). However, Guy does display phonetic variation in his production of *secoue*, where target [s] is realised as [θ] in the schwa-less variant. Intra- and inter-speaker variability is also found for *petit*; the majority of children vary between three forms, target [pti], the form [mti] assimilated with the preceding determiner *un* MASC:SG, and the reduced form [ti]. Armand is the sole child for whom we do not attest target [pti]; in the case of schwa absence he either selects [ti] or [pi]. Another strategy is gliding of [v] in *cheval* and *chevir*. Although they realise a target-like [v] in the variant with schwa, Armand, Lambert, and Guy replace the fricative C_2 by a labial glide [w] or [ɥ], which forms a consonant sequence of increasing sonority. Another strategy, observed in the data from Lambert, Tom, and Albert, is to turn [v] into a stop, which creates a consonant sequence that is somewhat similar to the primary [s]+Obs-clusters. The final strategy that merits attention comes from the data from Armand. Armand resorts to several repair strategies to circumvent the realisation of the fricative cluster [ʃv] in the case of schwa absence, e.g. deletion of consonant, C_1 in *cheval* and C_2 in *chevir*, and assimilation plus gliding to [fw] in *cheval*. The secondary cluster seems even more challenging with schwa present; in these cases he produces the initial [ʃ] as [s] or [ç], or alternatively, he moves the labiodental fricative to an initial position.

(36) Secondary ObsObs-clusters attested alongside a variant with schwa: children with 75% accuracy or higher for ObsLiq-clusters[371]

besoin	[bœʒɛ] 3;04.00	[βɥɛ̃] 3;04.00	Armand
besoin	[bœzwɛ̃] 3;02.28	[bzwɛ̃] 3;04.19	Tom
besoin	[ʋœɛ̃n] 3;02.14	[bzwɛ̃] 3;02.19	Guy
	[bʏzwɛ̃] 3;02.19	[zɛ̃] 3;05.10	
dedans	[de̝dɔ̃] 2;11.22	[ddɑ̃] 2;11.26	Janice
dedans	[dødɑ̃] 3;06.00	[ddɑ̃] 3;02.28	Tom
dedans	[dədɑ̃] 3;03.13	[dːɑ̃] 3;03.13	Guy
devant	[dʏvɑ̃] 3;05.23	[ðʋɑ̃] 3;05.23	Guy
dessous	[dȩsuɛ] 2;09.14	[θu] 2;11.02	Janice
dessous	[dœsu] 3;03.05	[dsu] 3;04.18	Guy
dessus	[døsy] 2;11.29	[dsy] 2;11.02	Janice
	[θɛθy] 2;11.15	[θ̝y] 2;10.25	
dessus	[dʏ̥ɸy] 3;03.4 [desy] 3;01.21	[dsy] 3;00.20	Armand
dessus	[døsy] 3;02.28	[dsy] 3;02.28	Tom
dessus	[døsy] 3;05.23	[dsy] 3;04.18	Guy
petit	[pøti] 2;07.27	[pti][p^{h}ti][ti] 2;08.04	Janice
petit	[pyti] 3;01.21	[ti] 3;01.21	Armand
	[vʏti] 3;02.26	[pi] 3;02.00	
petit	[pœ̜ti] 2;11.16	[pti][pti] 2;11.16	Eric
petit	[pʌtitə] 3;00.13	[pti] 3;01.14	Lambert
petit	[pœ̜ti][pɜki] 3;04.03	[mti][pti][tɪ] 3;02.22	Albert
petit	[pœti] 3;02.07	[tit][pti] 3;02.07	Tom
		[pi] 3;02.24	
petit	[pœ̝ti̥] 3;02.22	[pti] 3;02.22 [mti] 3;03.13	Guy
		[tit] 3;04.25	
secoue	[sɪku] 3;04.26	[θ̠ku] 3;06.14	Guy

371 Target transcription of the schwa-items attested with alternation in (36): *besoin* 'need' [b(œ)zwɛ̃], *dedans* 'in here/there' [d(œ)dɑ̃], *devant* 'in front of' [d(œ)vɑ̃], *dessous* 'under' [d(œ)su], *dessus* 'on' [d(œ)sy], *petit* 'small$_{\text{MASC}}$' [p(œ)ti], *secoue* 'shake$_{\text{3-SG-PRE}}$' [s(œ)ku], *cheval* 'horse' [ʃ(œ)val], *chevir* nonsense word [ʃ(œ)viʁ], *cheveux* 'hair$_{\text{PL}}$' [ʃ(œ)vø], and *jeter* 'throw$_{\text{INF}}$' [ʒ(œ)te].

cheval	[ʃɘval] 2;09.07	[ʃalɛ] 2;09.07 [ʃval] 2;00.25 [fval] 2;10.11	Janice
cheval	[s̠œv̥al] 3;00.20 [ɕyval] 3;03.10 [vi̯ejal] 3;00.21 [faã̯ð̞ɛʁ] 3;02.13	[v̥aj][fal] 2;11.28 [fʊal] 3;00.21 [fwɑl] 3;03.17	Armand
cheval	[həvalɛ̹][θœ̞valɛ̹] 2;11.13	[θ͡fː.p͡fwal] 2;11.13 [θ̠w̥͡wavɛ̥̹][θ̺ta] 3;00.13	Lambert
cheval	[ʃœ̞val] 2;11.16	[ʃʷ.mal] 3;2.1 [s̠ʷ.val] 2;11.16	Eric
cheval	[ʃœ̞val] 3;01.00	[ʃʊaj] 3;1.0 [s̻alʏ] 3;03.06	Albert
cheval	[sœval] 3;02.22 [ɕəvo] 3;02.28	[θ̠tal][svalə] 3;02.22	Tom
cheval/-aux	[ʃːœ̞val] 3;04.26	[ʃval] 3;04.26 [ʃfo̞] 3;03.22	Guy
chevir	[fɔ̯angi] 2;11.21 [ɕupi] 3;01.22	[ʃiʁ] 3;03.10 [ʃʀigə] 3;02.13	Armand
chevir	[θe̹̥ʏvi] 3;03.02	[ð̥viʀ][θv͡wiʁ] 3;03.02	Lambert
chevir	[ʃe̹ɥiʁ] 2;11.16	[seʀ] 2;11.16	Eric
chevir	[ʃ.œvivʁ] 3;01.00	[θt̥ǃ.li] 3;01.00 [ʒvi] 3;03.06 [ʃfiʁ] 3;04.03	Albert
chevir	[sœvij̥] 3;05.17	[sfiʁ] 3;04.19 [θ͡ṣ.v̥ij̊] 3;05.17	Tom
chevir	[ʃɛ̹viʁ] 3;06.14	[ʃ͡f̺viʁ] 3;06.14 [ʃɥiʁ] 3;06.14	Guy
cheveux	[ʀ̥y̆vɛ̹][tuʊœ̞] 2;10.29 [ʃɛvø] 2;11.15	[ʃvø][ʒvø̞] 2;11.15	Janice
cheveux	[ɕʏvø̜] 3;03.10	[fvø] 3;00.20	Armand
cheveux	[seve̹] 3;05.23	[svø] 3;04.05	Tom
jeter	[ʒøte] 3;07.04	[ʃte] 3;05.02	Guy

Some items for some children do not exhibit alternation in our data, but they are included because they reveal various degrees of mastery of Sibilant+C-clusters. For instance Eric, for whom we observe target-like [s]+Obs-clusters, realises a target-like consonant sequence with regressive assimilation in *seconde*, [zgɔ̃d] (3;02.15). Further, like Guy, Janice replaces the sibilant [s] with [θ] in three consecutive occurrences of *secoue*, [θku] (2;10.11); additionally, Janice replaces [s] with [θ] in the pre-vocalic position, *secret* [θœkʁɛ] (3;00.10). Finally, we mention that Guy realises [dp] in the preposition *depuis*, at the age of 3;05.23, which demonstrates his mastery of ObsObs-sequences of equal sonority and manner.

The children who exhibit 50-70% accuracy for ObsLiq-clusters, in general, display less schwa-alternation than children with greater accuracy, both in terms of frequency of alternation and number of schwa-items in which alternation is attested. All three children in this accuracy range do produce variants with and without schwa for *petit*, but, in contrast to the older children, they do not produce many occurrences of target [pti]; in fact, Théa is the only one who produces this form. As regards target secondary cluster [ʃv], we first observe that Henri does not master the sibilant, and replaces it with a copy of word-medial [v]. We also observe that there is some variability in the data from Théa, but a sibilant is always produced. In the case of schwa absence in these schwa-items, both Lucas and Théa realise target-like forms, although some gliding is also attested. This is consistent with their behaviour regarding primary ObsLiq-clusters, for which gliding is an attested repair strategy. As for Henri, we have seen that he does not authorise glides, neither as part of C+Glide-clusters nor as a substitution for liquids in ObsLiq-clusters. Therefore, unsurprisingly, he does not prefer gliding as a repair for [ʃv], although on one single occurrence he produces slight diphthongisation.

(37) Secondary ObsObs-clusters attested alongside a variant with schwa: children with 50-70% accuracy for ObsLiq-clusters

petit	[pi̱ti] 2;04.29	[ci] 2;04.29	Henri
petit	[pɵti] 2;10.07	[ti][ki] 2;09.20	Lucas
petit	[pəa̯ti] 2;09.29	[p.tit][ti] 2;09.29	Théa
cheval	[vɔva̰ˑj][fɔ̝jaˑj][fɔ̰̝vaj] 2;04.01	[fal] 2;04.29 [fwaj] 2;05.20	Henri
cheval	[ʃuv̥ală] 2;07.01	[faj] 2;07.01 [ʃval] 2;09.01	Lucas
cheval	[ç̹ə̰va̰ʎ][ʃəva] 2;09.29 [sɜval] 3;00.21	[ʃʊal][ʃval] 2;09.29 [ʧw̥wal] 3.00.21	Théa
chevir	[sɵvḭʁg] 2;11.24	[ʃ.vi͡ḭʁ] 2;11.24	Théa

Lucas' ability to produce target [ʃv] in *cheval* is confirmed by his realisation of the schwa-less variant of *cheveux*, [ʃvø̹] (2;08.12). He also produces the schwa-less variant in *besoin*, but the productions are not target-like in that the plosive assimilates or coalesces with the fricative, [dzwa] and [dːwɛ̃] (2;08.26).

Finally, the small amount of schwa alternation attested for Fabienne, Adèle, and Kim is characterised by a mismatch in segmental make-up between the variants with and without schwa. Therefore, it is less clear whether there are child-specific alternation patterns for these children, compared to the other groups of children. First, *cheval* behaves differently across the three children. Fabienne exhibits two widely different forms for the singular and the plural form (the latter attested only once), without and with vowel, respectively. The schwa-less variant is characterised by an initial [j], which is sometimes preceded by a fricative [θ]. Recall from Section 7.4.1.4.1 on secondary ObsSon-clusters that word-initial [j] is attested in Fabienne's production of the schwa-less variants of *fenêtre* and *fenasse*, which seems to indicate that she can apply the gliding solution rather widely. Adèle, on the other hand, replaces target [ʃ] with an alveolar plosive or, in her last recording session, an alveolar sibilant. The few attested examples of the schwa-less variant show assimilation and gliding, or realisation of only [θ]. Additionally, in Adèle's data, *chevir* patterns with *cheval* regarding the use of the alveolar plosive in the variant with schwa. The variant of *chevir* without schwa is subject to a variety of modifications, e.g. substitution of [ʃ] by [θ] and substitution of [v] by [t] to yield a cluster similar to primary target [st], reduction to a single plosive [k] or a single fricative [f], and gliding. Returning to *cheval*, Kim displays a similar behaviour to Adèle in that he generally produces the variant with schwa in a near target-like fashion, although with near-target-like initial [θ] or [ç̹]. However, the two schwa-less variants attested in his data are realised with an initial obstruent, [f] or [p], whose labiality seems to be indicating that features of target [v] are retained. Finally, we mention that Adèle treats *cheval* and *cheveux* differently; whereas she prefers the variant with schwa of *cheval*, by far, the reverse is true for *cheveux*, for which she prefers the schwa-less variant. In addition, although the clusters have the same segmental make-up in the target language, Adèle realises them differently in the output; *cheval* is realised with an alveolar stop and a target labiodental fricative, whereas *cheveux* is realised with a fricative, either [θ] or [s], followed by a glide. Although the contrasting behaviour of the two items must be explained, we confirm that [θj], in *cheveux*, is consistent with Adèle's grammar because she also produces *ciel* 'sky' [sjɛl] → [θje] (2;08.05).

(38) Secondary ObsObs-clusters attested alongside a variant with schwa: children with 30% accuracy or lower for ObsLiq-clusters

petit	[ʁɔte] 2;04.03	[ti] 2;04.23	Fabienne
	[ʔœ̜θ̠i] 2;05.00		
petit	[v̥ɪ.t̪it][pɪθtit] 2;07.08	[ti] 2;07.08 [ʋti] 2;08.02	Adèle
petit	[pʏ̝ti] 2;09.26	[ptit] 2;09.26	Kim
	[pi.ci] 3;00.05	[tɪ][p̝i] 3;00.05	
cheval/-aux	[ɹɛan] 2;04.03	[θjan̍] 2;05.00 [jan] 2;02.15	Fabienne
	[ṣɑɔ̯ːv̥o] 2;05.00		
cheval	[dawaj][tav̥aj] 2;07.08	[fwat][θa] 2;08.29	Adèle
	[sʌ̃val] 2;10.13		
cheval	[θœvaj][ç̹ø̜ʏ̯.vaj] 2;11.14	[fã][pa] 2;11.14	Kim
cheveux	[θijɛ] 2;08.09	[θje] 2;08.09 [sjø] 2;08.22	Adèle
		[çʊ][θvɜ] 2;09.15	
		[tjœ] 2;10.13	
chevir	[tɛ̯ɵvɪ] 2;07.08	[θtiː][fiː][fːɥiː][kɪːç̹]	Adèle
		[fxi] 2;08.29	

The simplification of target secondary clusters is further exemplified by the two schwa-less forms of *deviens* 'become$_{\text{1-SG-PRE}}$' [d(œ)vjɛ̃], in which target [dvj] is reduced to the glide [j], and produced as [ja] by Adèle (2;07.10).

To summarise, like the secondary ObsSon-clusters, the secondary ObsObs-clusters are realised with the greatest accuracy by the children who master primary ObsLiq-clusters. However, and in line with the errors observed for the primary [s]+Obs-clusters, the implementation of the secondary ObsObs-clusters is somewhat problematic for the older children. Further, Armand is, again, unique in his significant modifications of the schwa-less variant. As for the younger children, Fabienne, Henri, Adèle, and Kim, in particular, the realisation of the schwa-less variant is accompanied by a series of modifications, e.g. deletion and gliding.

We now turn to the last group of secondary clusters, in which a sonorant forms the first element.

7.4.1.4.3 SonObs- and SonSon-clusters

An examination of the children with 75% accuracy for ObsLiq-clusters reveals far less schwa alternation in schwa-items with secondary Son+C-clusters when compared to the other secondary clusters we examine. Although the number of schwa-items is relatively high across this sub-group, rate of alternation is low. In fact, we only observe regular schwa alternation in Janice, Tom, and Guy; note that we set aside the highly frequently occurring word *regarder*. For this word, we observe alternation in the data from all children except for Albert, for whom we observe only one occurrence of the verb, with schwa presence. Tom and Guy have two forms available for the schwa-less variant, i.e. with and without initial [ʁ]. On the other hand, Janice, Armand, and Eric only have the variant with the entire initial syllable deleted. Finally, we observe two atypical occurrences in the data from Guy, i.e. initial syllable deletion in one occurrence of *monsieur* and absence of schwa and of the following nasal in *remonte*.

(39) Target secondary SonObs- and SonSon-clusters attested with a variant with schwa: children with 75% accuracy or higher for ObsLiq-clusters[372]

monsieur	[mɪsjɔ] 3;03.19	[sjɛ̹] 3;03.19	Guy
lequel	[lʏ.kɛlœ̹] 2;09.14	[l.kɛlœ] 2;09.14	Janice
lever	[lʏ̝ve] 3;05.30	[lve] 3;06.14	Guy
repartir	[ʁʌpaʁtiʁ] 3;06.06	[ʁ.paxtiʁ] 3;02.14	Guy
recommencer	[ʁɘ.komɑ̃s] 3;05.02	[ʀ.komɑ̃se] 3;03.27	Guy
regarde	[hagad] 3;01.21 [tɛʁat] 2;11.28 [dega] 3;02.26	[daj] 3;02.26 [gaç̹] 3;00.27	Armand
regarder	[ʁe̹gaʁ.dɛ̹] 2;11.26	[gaʁdɛ] 2;11.26	Janice
regarde/-r	[ʁøga̹ʁd] 3;02.15	[gaʁd] 3;02.15	Eric
regarder	[ʁɵgaʁd] 3;02.02	[gad] 3;01.24 [ʁgaʁd] 3;02.17	Tom
regarde/-r	[ʁɪgaʁde] 3;03.19	[ʀ.gaʁde] 3;03.19 [gaʁde] 3;04.18	Guy
refaire	[ʁɔfɛʁ] 2;09.14	[ʀ̥v͡fɛʁ] 2;09.14	Janice
refaire	[ʁɔfɛʁ] 3;01.24	[ʁfɛʁ] 3;02.24	Tom
refait	[ʁɑfɛ] 3;02.22	[ʀfɛ] 3;03.19	Guy
remonter	[ʁəmɔ̃t] 3;04.25	[ʀɔ̃t] 3;05.30	Guy
remettre	[ʁɜmɛ] 3;06.05	[ʁ̥.ʁ̥m.ɛ] 3;04.19	Tom
requin	[ʁɔkɛ̃] 3;02.17	[ʁːkɛ̃] 3;02.17	Tom

An examination of the data in which no alternation is attested confirms the observation that Armand has restrictions on schwa alternation in a Son+C-environment. In his data, no example of a schwa-less variant is observed. On the other hand, the data from Guy and Tom support the observation that they have emerging mastery of schwa alternation. In the data from Guy, schwa-less variants are observed in *reconnu* ‘recognise$_{\text{PAST-PART}}$ [ʁkɔny] → [ʀ̥.kony] (3;06.06) and *refiler* ‘pass$_{\text{INF}}$’ [ʁfile] → [ʁ.file] (3;03.19). In the data from Tom, we observe *reperdre* ‘lose again$_{\text{INF}}$’ [ʁpɛdʁ] → [ʁpɛdʁ] (3;04.23) and *ressorti* ‘come out$_{\text{PAST-PART}}$’ [ʁsɔʁti] → [ʁsɔʁti] (3;04.23). In the data from Tom we observe schwa absence in both SonObs- and SonSon-clusters, but, interestingly, in the data from Guy, the sole example of schwa absence in a SonSon-cluster is the realisation of *remonte*, with deletion of the nasal (cf. Example (39)). However, additional data are necessary before we can conclude that Guy does not master secondary SonSon-clusters. Janice also exhibits schwa alternation in both contexts by realising *reçu* ‘receive$_{\text{PASTPART}}$’ [ʁsy] → [ʀθy] (2;11.26) and *relèves* ‘stand up$_{\text{2-SG-PRE}}$’ [ʁlɛv] → [ʕlɛv] (2;08.17). The sole occurrence of a verb with a sibilant C_2 in the data from Janice is, however, interesting, given the fact that she is on the verge of mastering [s]+C-sequences. She produces *ressemble* ‘resemble$_{\text{3-SG-PRE}}$’ [ʁsɑ̃bl] → [θʀɑ̃mb] (2;10.29), using metathesis as a repair strategy. The final occurrence of schwa absence in a SonSon-cluster is target-like and observed in the data from Eric, *retard* ‘late’ [ʁtaʁ] → [ʀ̥.taʁ̥] (3;02.01).

The children with an accuracy rate of 50-70% for primary ObsLiq-clusters only display schwa alternation in *regarder*, and similar to Janice, Eric, and Armand, the schwa-less variant is produced without target [ʁ]. However, there are two observable differences between the two groups. First, regarding the variant with schwa, Janice and Eric realise the word-initial [ʁ], whereas Henri and Lucas substitute [h] or [w] for the liquid. Recall that Armand does not realise

[372] Target transcription of the schwa-items attested with alternation in (39): *monsieur* ‘mister’ [m(œ)sjø], *lequel* ‘which$_{\text{MASC}}$’ [l(œ)kɛl], *lever* ‘rise$_{\text{INF}}$’ [l(œ)ve], *repartir* ‘leave again$_{\text{INF}}$’ [ʁ(œ)paʁtiʁ], *recommencer* ‘start again$_{\text{INF}}$’ [ʁ(œ)kɔmɑ̃se], *regarder* ‘look$_{\text{INF}}$’ [ʁ(œ)gaʁde], *refaire* ‘do again$_{\text{INF}}$’ [ʁ(œ)fɛʁ], *remonter* ‘go up again$_{\text{INF}}$’ [ʁ(œ)mɔ̃te], *remettre* ‘put again$_{\text{INF}}$’ [ʁ(œ)mɛtʁ], and *requin* ‘shark’ [ʁ(œ)kɛ̃].

the word-initial liquid, either, and instead, replaces it with an alveolar plosive or [h], which places him somewhere between the two groups. Second, Lucas (2;09.03) realises the form [n̩gaj] by replacing the liquid with a nasal, which does not correspond to any segment observed in the variant with schwa.[373]

(40) Target secondary SonObs- and SonSon-clusters attested with a variant with schwa: children with 50-70% accuracy for ObsLiq-clusters

regarde	[hɛ̃gad] 2;04.29	[gad] 2;04.29	Henri
regarde	[hœgajɛ̆] 2;07.13	[n̩gaj] 2;09.03	Lucas
	[wɵgaj] 2;08.12	[gajɛ̆] 2;07.12	

In the remaining data set from these children, no schwa absence is attested in the other items of this segmental make-up.

The children with a 30% or lower accuracy for primary ObsLiq-clusters, also only display schwa absence in *regarder*, with the noted exception of Kim, who only produces the variant with schwa. Like the other children, there is a mismatch in the segmental make-up between the two alternating forms; the full form is realised with either initial [h] or without a consonant, while the schwa-less is realised with deletion of the entire schwa syllable.

(41) Target secondary SonObs- and SonSon-clusters attested with a variant with schwa: children with 30% accuracy or lower for ObsLiq-clusters

regarder	[həga] 2;07.25	[ga] 2;07.25	Adèle
regarde(r)	[ɛɛðe] 2:05.21	[gatɑ̃] 2;04.23	Fabienne
	[ɣgad] 2;05.00		

In sum, the realisation of secondary SonObs- and SonSon-clusters seems to be more challenging given that initial [ʁ] is not yet mastered by many of the children. Additionally, for the children who have acquired [ʁ], the rate of schwa alternation is quite low, at least when compared to the other groups of secondary clusters.

7.4.1.5 Linking mastery of consonant sequencing and schwa alternation

We set out this section with the aim of understanding the acquisition of schwa alternation in light of the general acquisition of phonology, and the following argument has been presented: Target schwa alternation is dependent on the mastery of consonant sequencing. Building on literature that shows that target cluster sequencing is avoided in the early grammar, we have put forward two hypotheses that claim that (i) primary ObsLiq-clusters are acquired prior to secondary clusters, and that (ii) schwa alternation is blocked as long as secondary clusters are not authorised. A competing hypothesis claims that schwa alternation is possible even if primary, and secondary, clusters are not in place; in the case of absence of the schwa vowel, modifications of the secondary cluster, conforming to the current grammar, yield a grammatical output that is free to alternate with the variant containing the schwa vowel. The relevant hypotheses are repeated in Example (42).

(42) Hypothesis C1 (repeated from (21))
If primary clusters are not mastered, secondary clusters are not mastered.

[373] We return to the syllabicity of the nasal in Section 7.4.2.5.

> Hypothesis C2 (repeated from (21))
> If secondary clusters are not mastered, schwa alternation is blocked.
>
> Hypothesis B2 (repeated from (4))
> Exposed to variation in the input, two variants of a given schwa-item are available to the child. The dispreferred variant is modified to conform with production constraints that operate on his spontaneous speech.

Although we have observed counter-examples, the results from the spontaneous and the semi-controlled settings have revealed a strong, general preference for the variant with schwa across all children.

Hypothesis C1 claims that mastery of primary clusters is a prerequisite for the mastery of secondary clusters. The comparison of the two types of clusters has overwhelmingly validated this hypothesis; the spontaneous realisation of secondary clusters, although rare, is generally restricted to children who master ObsLiq-clusters. However, there are some exceptions. Armand, age group 3, is unique in that he does not realise target-like secondary clusters, while he performs well on primary clusters. On the other hand, Lucas, age group 2, is on the verge of mastering primary ObsLiq-clusters, and he spontaneously produces secondary clusters. The comparison has also revealed that the production of secondary clusters in the semi-controlled setting is more frequent for the children who master ObsLiq-clusters, which indicates that the secondary clusters are available to them, although not preferred.

Hypothesis C2 claims that schwa alternation is blocked as long as secondary clusters are not mastered. This hypothesis is supported by the observation that only the children who do not master primary or secondary clusters, i.e. Fabienne, Henri, Adèle and Kim, lack overt sensitivity to the schwa-less variant in the immediate input in the semi-controlled setting. Note however, that in the data from the three latter children, some very rare instances of a non-preferred, schwa-less variant are produced as a linguistic reaction to schwa absence. The prosodic and segmental structure of the schwa-less variant in the data from these children, however, is greatly modified to conform to the general constraints on initial consonant sequences; deletion, gliding, assimilation, and other substitutions are all attested as strategies to avoid the creation of a secondary cluster in the case of schwa absence. This finding is in line with Hypothesis B2, which claims that a second, albeit dispreferred, variant is available for production, although subject to modification and restricted to cases in which the same variant is present in the immediate input.[374]

Regarding the order of acquisition of intra- and extra-grammatical constraints, the results for the clusters presented in this section seem to indicate that the acquisition paths of the two types of constraints are intertwined. Although the production patterns in spontaneous speech, and the linguistic behaviour observed during the test recordings, both indicate that a certain level of structural complexity in phonology needs to be in place before extra-linguistic constraints become visibly active, the sensitivity to variation in the input, which is increasingly present as the child grows older, nevertheless, shows that outside factors do play a role even if the grammar is not sufficiently developed to produce the target structure. This yields the occasional

[374] At this point it is important to recall that several of the non-target-like output structures are observed for the nonsense words *chevir* and *fenasse*. These newly introduced items are less anchored in the lexicon and are possibly not subject to the same constraints as the other items that are well-established. In fact, Guy once labels the *fenasse* a *femir,* combination of *chevir* and *fenasse,* which illustrates well that the realisation of these words is not intuitive.

"dispreferred" outputs that are neither faithful to the input, nor faithful to the second variant which constitutes the child's default form.

In the next section, we discuss the argument that target schwa alternation is dependent on the mastery of syllable deletion.

7.4.2 Syllable deletion

7.4.2.1 Introduction

In a generative framework, besides consonant sequencing in the case of schwa absence, schwa alternation is assumed to imply the deletion of a non-prominent syllable. It is well known that children initially delete non-prominent syllables, and, thus, in the case of schwa, the schwa syllable needs to be accurately parsed while it is simultaneously subject to deletion. Another factor that challenges the parsing of the schwa syllable is the fact that it is frequently absent in the input, which means that the children have less input from which they can infer the storage of the schwa syllable. Thus, both perception and production constitute hinderances with regard to the acquisition of target-like prosodification of schwa.

7.4.2.2 Theoretical preliminaries

It is well-attested that children omit non-prominent syllables when they begin to produce polysyllabic words, e.g. English *banana* [ˈnænə] or [ˈbænə]. This was initially argued to reflect a bias towards trochaic footing, known as the *trochaic bias*. Allen and Hawkins (1978, 1979, 1980) propose this approach on the basis of English child language data. Fikkert (1994) observes a similar deletion pattern for Dutch, but she nevertheless stresses the importance of also examining children who are exposed to a language with a iambic rhythm, e.g. French. While the discussion on the mere presence of a formally defined foot in French is well-established (cf. Montreuil 2002), there is still an on-going debate in the acquisition literature about whether or not the French child's early productions are best analysed with or without reference to an iamb (cf. Demuth & Johnson 2003, Goad & Prévost 2008), see Andreassen and Eychenne (in press) for a short review of the literature. One phenomenon in the centre of this debate is the effect of word minimality on the child's early productions, i.e. whether lexical words are minimally bimoraic or whether they can be monomoraic, i.e. subminimal, and also, whether the infrequency of initial syllable deletion in disyllables in French child language data reflects a bimoraicity constraint. A discussion of feet in French is beyond the scope of the thesis. However, the phenomenon of syllable reduction is important for our study because without taking it into consideration we run the risk of wrongly interpreting the schwa-less variants in our data. Without independent evidence, we cannot know whether schwa absence in the child's production reflects phonological schwa alternation or an upper bound on the prosodic structure.

Many works on syllable deletion in child language assume that structure deletion occurs at the level of phonology. A. Carter and Gerken (2004), on the other hand, carry out a study of L1 learners of English with the aim of determining whether an unfooted syllable, e.g. *Lu* in *Lucinda*, whose segmental content is deleted, nevertheless, leaves traces in the signal. Their Trace Hypothesis draws on Autosegmental theory (Goldsmith 1976), in which syllables and segments are analysed on separate tiers, allowing for the possibility to delete segmental content while retaining the syllable structure. A. Carter and Gerken compare the children's production of trisyllabic names, *Lucinda* and *Cassandra*, which are frequently reduced to *_cinda* and *_sandra*, with disyllabic names *Cindy* and *Sandy*. They couch the names within the phrase *He* + *verb* + *proper name*. They observe a significant difference in verb-to-name duration, i.e. verb onset to name onset duration, between the target trisyllabic and target disyllabic proper names, which suggests that the omission of unstressed material leaves a phonetic trace in the signal. Further, no difference in verb-to-name duration is observed between the *Lucinda* and the *Cassandra* test-condition, which suggests that the phonetic trace is generic and does not reflect the length of the omitted material. As the results reflect a high level of inter-speaker variability, they are unable to identify the domain in which the trace is produced, i.e. whether it is the preceding word, the preceding foot, or a pause between the verb and the name. The authors further observe that *Lucinda* is less frequently reduced than *Cassandra*. They suggest that this difference resides in a stress shift that is more frequently applied to the tense vowel in *Lucinda* than compared to the lax schwa vowel in *Cassandra*, and that “[t]aken together, these data suggest that one developmental path for children attempting to master the production of weak initial syllables is to give them some acoustic properties of stressed syllables” (A. Carter & Gerken 2004:583).

The work by A. Carter and Gerken (2004) is interesting with regard to schwa alternation in that syllable deletion in the case of schwa absence is a grammatical process that is acquired, i.e. the children must eventually master the alternation between realising a syllable with vocalic content and deleting this content as well as the syllabic position with which it is associated. The possibility that vocalic content is deleted while the syllabic node is retained opens the way for other material to fill this position, whether it is the surrounding segments or a pause. Another type of material that may also fill this position is the reduced vowel, which is inserted into primary clusters and associated or not with a syllable nucleus depending on the child’s level of phonotactic competence (cf. Section 7.4.1.3.1). The observation that stress shift provides the target non-prominent syllable with acoustic salience is also interesting to the study of schwa. Recall from Section 7.3.3.2 that a large number of schwa occurrences in our corpus are full vowels associated with a high tone, which indicates prominence. Although we do not claim that schwa syllables behave differently from other non-prominent syllables regarding the assignment of non-target prominence, we believe that the spreading of prominence to the initial syllable hinders the child’s acquisition of schwa alternation; to authorise schwa absence, the child has to master deletion of the vowel as well as prosodic reduction.

We claim in Section 7.2.2 that target schwa alternation is dependent on the development of independent phenomena that reside elsewhere in the system. Our first argument to support this claim concerns the importance of consonant sequencing, extensively discussed in Section 7.4.1. In this section, we present our second argument, which is that target schwa alternation is dependent on the mastery of syllable deletion. Two hypotheses emerge from the theoretical discussion above and we use them to guide the remainder of the section, see Example (43).

(43) Hypothesis D1
Faithfulness to the syllable count in the underlying representation prevents the deletion of the schwa vowel.

Hypothesis D2
Faithfulness to the syllable count in the underlying representation does not prevent the deletion of the schwa vowel.

The first hypothesis claims that there is an unbreakable relationship between the syllable node and the vocalic features that are associated with it; in the case that syllable deletion is not authorised, it predicts that the syllable will be realised through the target schwa vowel. The second hypothesis claims that the syllabic and the segmental tier are autonomous; it predicts that the schwa syllable can be filled with material other than a full, target-like vowel.

In what follows, we reintroduce the different types of output structures laid out in Section 7.3.1 and present the various syllable shapes associated with the schwa-items attested in the spontaneous and semi-controlled corpus of child language data.

7.4.2.3 Shape of target disyllables with a non-schwa vowel

While non-prominent initial syllables are subject to deletion in languages with a trochaic rhythm (Allen & Hawkins 1979, Fikkert 1994), according to the literature they are frequently preserved in French child language. For instance, Goad and Buckley (2006) argue for a binary iamb at the moraic level based on the fact that monosyllabic targets are extended, either by realising a long vowel or by adding material; see however Demuth and Johnson (2003) for examples of subminimal, i.e. monomoraic, output forms in French child language. Further, Goad and Buckley observe that disyllabic targets are infrequently reduced and that trisyllabic lexical targets are reduced at the expense of the initial syllable. Although the majority of schwa-items in our child language corpus are disyllables (cf. however the trisyllabic words *cheminée, regarder*), and therefore, should not be subject to non-prominent syllable deletion, we find it necessary examine disyllables and trisyllables with a non-schwa vowel in the initial syllable. If the non-prominent syllables with a non-schwa vowel are preserved, we can rule out the possibility that schwa absence is an effect of a general production constraint.

An examination of the data from the children who show the highest level of non-target-like behaviour for primary clusters or secondary clusters reveals, first, categorical faithfulness to disyllables. Second, regarding trisyllables, more variability emerges; while Adèle shows no sign of reduction, the other children vary as to whether all three syllables are realised. Further, in the case of reduction of trisyllables, the data seem to indicate deletion of the medial vowel, e.g. *kangourou* [kɑ̃guʁu] → [ˈjɑ̃ʀu] by Fabienne (2;03.26). Other cases again indicate retention of the medial vowel in combination with the initial consonant, e.g. *dinosaure* [dinɔzɔʁ] → [daʒʌʁ] by Armand (3;00.20). For the sake of completeness, we include tetrasyllables in (44-b) alongside the trisyllables.

(44) (Non-) faithfulness to initial non-prominent syllables

a. Target disyllables

avion	[avjɔ̃]	→ [aˈjɔ̃]	‘airplane’	Fabienne 2;03.26
oiseau	[wazo]	→ [aˈj̥o]	‘bird’	Fabienne 2;02.15
maison	[mɛzɔ̃]	→ [ˈɛð̣ɔ̃]	‘maison’	Fabienne 2;04.03
avion	[avjɔ̃]	→ [vaˈvɔ̃]	‘airplane’	Henri 2;07.08
oiseau	[wazo]	→ [ˈjaɟ̥͡jo]	‘bird’	Henri 2;04.29
maison	[mɛzɔ̃]	→ [ˈmeɕɔ̃]	‘house’	Henri 2:04.29
encore	[ɑ̃kɔʁ]	→ [naka]	‘another’	Adèle 2;07.08
oiseau	[wazo]	→ [ˈðaðo]	‘bird’	Adèle 2;07.08
maison	[mɛzɔ̃]	→ [ˈnɛa]	‘house’	Adèle 2;07.10
encore	[ɑ̃kɔʁ]	→ [ʌka]	‘another’	Kim 2;08.29
oiseau	[wazo]	→ [ˈθaɕo]	‘bird’	Kim 2;09.26
maison	[mɛzɔ̃]	→ [ˈmɛðɔ]	‘house’	Kim 2;08.29

avion	[avjɔ̃]	→ [vajɔ̃]	‘airplane’	Armand 3;02.08
oiseau	[wazo]	→ [z̠aʝo]	‘bird’	Armand 3;01.22
maison	[mɛzɔ̃]	→ [meʝɔ̃]	‘house’	Armand 3;00.21

b. Target trisyllables and tetrasyllables

escargot	[ɛskaʁgo]	→ [ˈgɔgɔ]	‘snail’	Fabienne 2;02.15
escargot	[ɛskaʁgo]	→ [ˈəagɔ]	‘snail’	Fabienne 2;04.03
escargot	[ɛskaʁgo]	→ [ˈwakɔ]	‘snail’	Fabienne 2;05.16
éléphant	[elefɑ̃]	→ [ˈɛɛfɑ̃]	‘elephant’	Fabienne 2;03.12
répéter	[ʁepete]	→ [ɛɛˈte]	‘repeat$_{\text{INF}}$’	Fabienne 2;02.15
kangourou	[kɑ̃guʁu]	→ [ˈjɑ̃ʀu]	‘kangaroo’	Fabienne 2;03.26
escargot	[ɛskaʁgo]	→ [ˈjɛ.ç̠adu]	‘snail’	Henri 2;04.29
éléphant	[elefɑ̃]	→ [ˈḛ͡efːɑ̃ˑ][ˈe.he.fɑ̃]	‘elephant’	Henri 2;04.01
animal	[animal]	→ [maˈmimaj]	‘animal’	Henri 2;04.29
réveillé	[ʁevɛje]	→ [ʁævæje]	‘awake’	Henri 2;06.17
hélicoptère	[elikɔptɛʁ]	→ [gagaʁ]	‘helicopter’	Henri 2;05.13
caravane	[kaʁavan]	→ [kaˈvanɛ̆][ˈkaabʁ]	‘trailer’	Henri 2;07.01
escargot	[ɛskaʁgo]	→ [ˈɛ.ka.gɔ̝]	‘snail’	Kim 2;10.17
éléphant	[elefɑ̃]	→ [ˈefɑ̝̃][e̞jfɑ̃]	‘elephant’	Kim 2;08.29
éléphant	[elefɑ̃]	→ [ɛ̞ɛfɑ̃]	‘elephant’	Kim 2;11.14
animaux	[animo]	→ [ajˈmo]	‘animal$_{\text{PL}}$’	Kim 2;09.26
pantalon	[pɑ̃talɔ̃]	→ [ˈpɑ̃bajɔ̃]	‘pants’	Kim 3;00.05
kangourou	[kɑ̃guʁu]	→ [gɑ̃guu]	‘kangaroo’	Kim 3;00.05
escargot	[ɛskaʁgo]	→ [taˈkago]	‘snail’	Adèle 2;07.08
éléphant	[elefɑ̃]	→ [pelefa]	‘elephant’	Adèle 2;08.05
ordinateur	[ɔʁdinatœʁ]	→ [anyjata]	‘computer’	Adèle 2;10.07
animal	[animal]	→ [animat]	‘animal’	Adèle 2;07.08
Grosminet	[gʁominɛ]	→ [ɔminæ]	proper name	Adèle 2;08.05
parapluie	[paʁaplɥi]	→ [paˈapi]	‘umbrella’	Adèle 2;08.02
telescope	[teleskɔp]	→ [keeklʌk]	‘telescope’	Adèle 2;07.10
crocodile	[kʁɔkɔdil]	→ [kɔɔdit]	‘crocodile’	Adèle 2;08.02
hirondelle	[iʁɔ̃dɛl]	→ [jeʁindɛl]	‘swallow’	Armand 3;01.21
escargot	[ɛskaʁgo]	→ [wɛgago]	‘snail’	Armand 2;11,21
éléphant	[elefɑ̃]	→ [ɑ̃fɑ̃]	‘elephant’	Armand 2;11.21
éléphant	[elefɑ̃]	→ [ejefɑ̃]	‘elephant’	Armand 3;02.13
helicoptère	[elikɔptɛʁ]	→ [əətɵʁ]	‘helicopter’	Armand 3;00.03
excavatrice	[ɛkskavatʁis]	→ [aatxiç]	‘mech. cutter’	Armand 3;01.21
attraper	[atʁape]	→ [ekʁape]	‘catch$_{\text{INF}}$’	Armand 2;11.13
bulldozer	[byldɔzɛʁ]	→ [byejɛʁ]	‘bulldozer’	Armand 2:11.13
balançoire	[balɑ̃swaʁ]	→ [aaθwaʁ]	‘swing’	Armand 3;02.16
dinosaure	[dinosoʁ]	→ [daʒʌʁ]	‘dinosaur’	Armand 3;00.20
crocodile	[kʁɔkɔdil]	→ [kui][kukui]	‘crocodile’	Armand 2;11.28
crocodile	[kʁɔkɔdil]	→ [kʁokoil]	‘crocodile’	Armand 3:02.08

céréales	[seʁeal]	→ [çejal]	‘cereals’	Armand 3;01.21
chocolat	[ʃɔkɔla]	→ [tokola]	‘chocolate’	Armand 3;00.03

In sum, there is a high degree of faithfulness to thle word-initial syllable of disyllables in our data. This finding suggests that schwa absence in target disyllables is not a reflection of a production constraint that targets all non-prominent syllables, but rather is a phenomenon restricted to this vowel in particular, a situation similar to the one in target French.

7.4.2.4 Shape of variants with a full vowel in the schwa syllable

Recall from Section 7.3.3.2 that the most frequent output structure attested for schwa-items in our semi-controlled corpus is the realisation of a CV_1CV_2 structure, with a full, distinct vowel in the first nuclear position, which is preceded and followed by a consonant. As already mentioned, the younger children have a lower degree of consonant faithfulness, and, as the data from three representative children, Tom, Adèle, and Henri, in Example (45) indicate, the lower level of faithfulness also concerns vowel quality.[375]

(45) CV_1CV_2 structure with level or falling intonation (ˈ indicates a high tone)

petite	[p(œ)tit]	→ [ˈpɛ̜ˈtit]	‘small’	Tom 3;01.22
petite	[p(œ)tit]	→ [ˈpœ̞titɛ̥]	‘small’	Tom 3;02.22
petite	[p(œ)tit]	→ [ˈv̥ɪ.t̝it]	‘small’	Adèle 2;07.08
petite	[p(œ)tit]	→ [ˈpɔ̜tit˺]	‘small’	Adèle 2;08.29
petit	[p(œ)ti]	→ [ˈpiˈt̠i]	‘small’	Henri 2;04.01
petit	[p(œ)ti]	→ [ˈpaki]	‘small’	Henri 2;06.24
cheval	[ʃ(œ)val]	→ [ˈṣœˈval]	‘horse’	Tom 3;01.22
cheval	[ʃ(œ)val]	→ [ˈtʌvad̥]	‘horse’	Adèle 2;07.08
cheval	[ʃ(œ)val]	→ [ˈv̥ɵ̝v̥a̰j][ˈvɔva̰ˑj]	‘horse’	Henri 2;04.01
fenêtre	[f(œ)nɛtʁ]	→ [ˈfynɛtʀ̥][ˈfœ̝nɛtʀ̥]	‘window’	Tom 3;01.22
fenêtre	[f(œ)nɛtʁ]	→ [ˈtʌnæˑt]	‘window’	Adèle 2;08.05
fenêtre	[f(œ)nɛtʁ]	→ [ˈfʌ̹.nɛt]	‘window’	Henri 2;04.29
renard	[ʁ(œ)naʁ]	→ [ˈʀɵnaʀ]	‘fox’	Tom 3;01.24
renard	[ʁ(œ)naʁ]	→ [ˈkona]	‘fox’	Adèle 2;07.25
remorque	[ʁ(œ)mɔʁk]	→ [ˈkxɔˈmɔt][ˈmɔˈmɔt]	‘trailer’	Henri 2;05.27

In the data from Henri, age group 1, and Adèle, age group 2, the quality of schwa is not the target-like [œ]. First, this is unsurprising given that Davis and MacNeilage (1990) reveal the child’s difficulty with producing a target-like vowel quality in non-prominent positions in English child language; this finding also patterns with Rose’s (2000) observation of an asymmetrical faithfulness to prominent vs. non-prominent syllables in Quebec French child language. Second, mid front rounded vowels are acquired late, after the two other series of mid vowels (Jakobson 1968); further, words containing vowels not categorised by the child are either avoided or produced with a high error rate (C. C. Levelt 1994). *A priori*, given the near-complementary distribution of schwa and /œ/ (cf. Section 3.3.2), the categorisation of schwa cannot occur prior to the categorisation of /œ/. One possible outcome is that one expects that children who do not have /œ/ in place produce target schwa with an elevated error rate. While Henri and Tom have stable /œ/ in place from the initial recording sessions, e.g. *bleu* ‘blue$_{\text{MASC}}$’

[375] An initial analysis of the vowel quality of schwa in Swiss French children is presented in Andreassen (2012).

[blø] → [bø] (Henri, 2;05.06), Adèle realises an unrounded vowel in the first recording sessions, e.g. *bleu* ‘blue$_{\text{MASC}}$’ [blø] → [pɘ̆le] (2;07.08). Nevertheless, none of the younger children master the target-like schwa quality in the non-prominent position; instead, schwa is subject to assimilatory effects, either triggered by a following [i] or [a], or by a velar or uvular context, e.g. an adjacent [ʁ].[376] Also, as is illustrated by Adèle’s (2;08.05) production of *fenêtre* (cf. Example (45)), schwa can be realised as a back vowel even in a non-velar and non-uvular context.[377] A second alternative production that avoids the production of [œ], would be the selection of the schwa-less variant of the schwa-item. The elevated rate of schwa presence in our data shows that the latter alternative is not the preferred option.

Another characteristic of the schwa-items present in our child language corpus is their tendency to associate a high tone with the word-initial schwa syllable, which we interpret as an acoustic correlate of prominence. As exemplified in Figures 7.33 and 7.34, and as is attested by Allen (1983), this melodic contour is not restricted to schwa-items, nor to syllables of an apparent emphatic character.

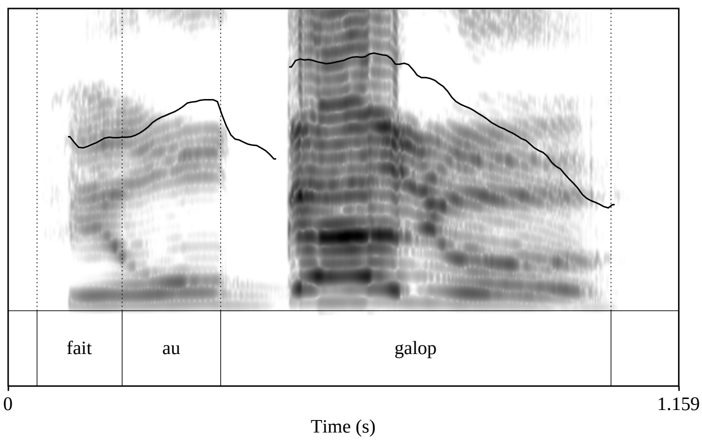

Figure 7.33: Word-initial prominence in *fait au* ***ga****lop*, data from Kim (2;08.29)

[376] Interestingly, note that the different qualities attested for schwa in our child language data are also observed in Louisiana French. In this variety, although the qualities [œ] and [ø] are attested, schwa can also be realised as [i] and [ɪ] as a result of assimilation (Lyche 1996). It can also be realised [ɛ] and [a], which according to Blainey (2009) may be restricted to the prefix <re>. Klingler and Lyche (2012) claim that the assimilation applies when schwa is assigned stress, e.g. *chemise* ’shirt’ [ʃimiz], *petit* ’small’ [piti], *venir* ’come$_{\text{INF}}$’ [vinir], and *venait* ’come$_{\text{3-SG-IMPERF}}$’ [vene] (Klingler & Lyche 2012:42).

[377] Replacement of [œ] by a back vowel is reported by Lléo (1995) for a three-year-old Spanish-speaking child acquiring German. However, Lléo does not indicate the segmental context in which the non-target-like vowel occurs.

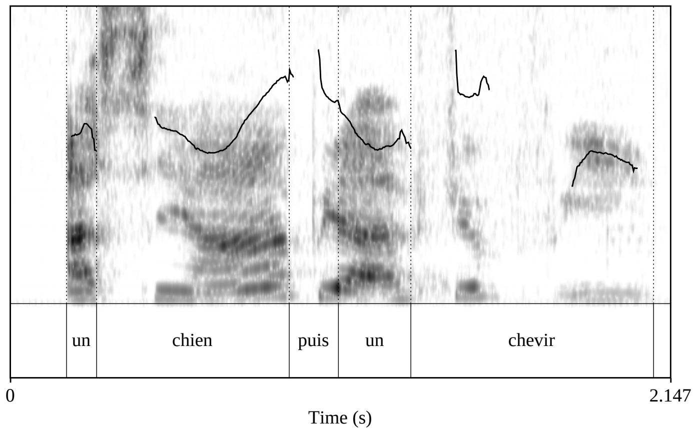

Figure 7.34: Word-initial prominence in *un chien puis un* ***<u>che</u>****vir*, data from Kim (2;10.17)

Our data also contain occurrences of schwa-items in which the medial consonant is absent, thus, yielding a CV_1V_2 surface structure. While one occurrence of an absent medial consonant is found in the data from Lucas (age group 2, see *Genève* in Example (46)), it is primarily observed in the data from Fabienne and Henri, age group 1, and Armand, age group 3. We only attest deletion of word-medial fricative [v], nasal [n], and liquid [ʁ]. One observation to be made with regard to these occurrences is that there is a wide array of output qualities for target schwa: high [i, u], mid [ɛ, ɞ, ʌ, ɔ], low [a], and nasal [ɛ̃ ã]. There are several instances where target schwa fully assimilates with the final vowel, e.g. *fenêtre* [ˈtɛɛk] realised by Fabienne (2;05.00) and *chevir* [ˈɕiiʁ] realised by Armand 3;03.10). Additionally, in the data from Armand there is variation as to whether it is the first or the second consonant that is retained; while medial [v] is retained in *cheval* [ˈvaal] (2;11.21), word-initial target [f] is retained, in a voiced approximant variant, in *fenêtre* [ˈʋɛɛ̥t] (2;11.21). Further variability is attested in the data from Armand, e.g. in *cheval* [ˈʃɛal] (3;02.13) vs. [ˈfɔal] (3;00.21), where the schwa vowel is clearly distinct from the second vowel, but where the initial consonant is either target [ʃ] or the devoiced version of target word-medial [v].

The absence of the word-medial consonant is not a categorical process; for instance, Lucas (2;09.14), although he deletes [n] in *Genève*, produces in the very same session target [n], e.g. [ˈʒɔ̥nɛv], or assimilates the nasal with one of the other consonants, e.g. [ˈʒɞʒɛv] and [ˈʒɔvɛv].

(46) CV_1V_2 structure (ˈ indicates a high tone)

cheval	[ʃ(œ)val]	→ [ˈɹɛan]	'horse'	Fabienne 2;04.03
cheval	[ʃ(œ)val]	→ [ˈɲɛan]	'horse'	Fabienne 2;03.12
cheval	[ʃ(œ)val]	→ [ˈfaal][ˈvaal]	'horse'	Armand 2;11.21
cheval	[ʃ(œ)val]	→ [ˈfɔal]	'horse'	Armand 3;00.21
cheval	[ʃ(œ)val]	→ [ˈʃɛal]	'horse	Armand 3;02.13
chevir	[ʃ(œ)viʁ]	→ [ˈŋaiːʀ]	'chevir'	Fabienne 2;02.15
chevir	[ʃ(œ)viʁ]	→ [ˈfui][ˈfɔ̰oiː]	'chevir'	Henri 2;04.01
chevir	[ʃ(œ)viʁ]	→ [ˈɕiiʁ]	'chevir'	Armand 3;03.10
fenêtre	[f(œ)nɛtʁ]	→ [ˈtɛɛk]	'window'	Fabienne 2;05.00
fenêtre	[f(œ)nɛtʁ]	→ [ˈfːɔɛː]	'window'	Henri 2;04.29
fenêtre	[f(œ)nɛtʁ]	→ [ˈʋɛɛ̥t]	'window'	Armand 2;11.21
fenêtre	[f(œ)nɛtʁ]	→ [fãɛt]	'window'	Armand 3;00.21

fenêtre	[f(œ)nɛtʁ]	→ [ˈʋãˈɛt]	‘window’	Armand 3;03.04
fenasse	[f(œ)nas]	→ [ˈfɦʌaç]	‘fenasse’	Henri 2;04.29
fenasse	[f(œ)nas]	→ [ça̠ˈaç][ˈhɛaṣ][ˈʂ̥ɔa̰ʂ̥]	‘fenasse’	Armand 3;02.13
cerises	[s(œ)ʁiz]	→ [ˈsaiç]	‘cherry$_{\text{PL}}$’	Henri 2;05.06
Genève	[ʒ(œ)nɛv]	→ [ˈʒɵˈɛv]	toponym	Lucas 2;09.14
renard	[ʁ(œ)naʁ]	→ [ˈʁ̩ɛ̃aʁ]	‘fox’	Armand 2;11.28

In Section 7.4.1.4.1, where the secondary ObsSon-clusters are examined, we observe that Armand replaces a large number of medial [n] with other consonants. The near-ungrammaticality of [n] in this position is reconfirmed by the present data. To resolve the problem, he resorts to other strategies like substitution or syllable deletion, e.g. *fenêtre* [vɛt] or [nɛ]. A third option, thus, is to preserve both nuclei, without an intervening consonant. For Fabienne, medial sonorants do not seem to constitute a problem, e.g. *nounours* ‘teddy bear’ [nunuʁs] → [ˈnunuθ] (2;04.23), *Genève* [ʒ(œ)nɛv] → [inɛf] (2;05.21), *oreille* ‘ear’ [ɔʁɛj] → [ˈʏɣæj] (2;04.17), and *soleil* ‘sun’ [sɔlɛj] → [ˈlølaj] (2;03.26). The data from Henri, on the other hand, show that he does not fully master this group of consonants; he produces medial nasals with variable faithfulness, e.g. *fini* ‘finish$_{\text{PAST-PART}}$’ [fini] → [ˈfini] (2;05.13) and *fenêtre* ‘window’ [f(œ)nɛtʁ] → [ˈfə̹ʊɛk] [ˈfʌ̹.nɛk] (2;04.29). Additionally, Henri deletes the liquid in *cerises* [ˈsaiç] which merely strengthens the observation that none of the liquids are mastered word-internally, e.g. *tomates carottes* ‘tomatoes carrots’ [tɔmat kaʁɔt] → [ˈpomat ˈkajak] (2;05.27), *courir* ‘run$_{\text{INF}}$’ [kuʁiʁ] → [ˈtuiχ] (2;05.13) and *police* [pɔlis] → [ˈpɔiç] (2;06.10).

Our data, additionally, contain occurrences of schwa-items in which the initial consonant is absent, thus, yielding a V_1CV_2 structure on the surface. Although several children sporadically delete the initial consonant, Fabienne and Armand are, once again, among the children who most frequently modify their output; additionally, in this case, Fabienne and Armand are joined by Adèle, age group 2. Deletion occurs for all major places of articulation, and for obstruents as well as sonorants. However, three tendencies in the data are shown in Example (47). First, the bilabial nasal in *monsieur* is deleted by all three children, whereas the bilabial plosive in *petit* is only deleted by Fabienne. Second, Armand, in particular, deletes the alveolar plosive [d] in the adverbs *debout*, *dedans*, and *dessus*. Finally, there are several instances in which a word-initial liquid [ʁ] is absent from the output; in these cases we also attest consonant deletion by Lucas, for whom we also attest deletion of word-medial [n].

(47) V_1CV_2 structure (ˈ indicates a high tone)

petit	[p(œ)ti]	→ [ˈaˈt̠i]	‘small’	Fabienne 2;03.19
petit	[p(œ)ti]	→ [ɔti]	‘small’	Fabienne 2;04.03
debout	[d(œ)bu]	→ [œbu]	‘standing’	Adèle 2;10.07
debout	[d(œ)bu]	→ [œbu]	‘standing’	Armand 3;04.00
dedans	[d(œ)dɑ̃]	→ [ɛdɑ̃]	‘in here/there’	Armand 3;02.16
dessus	[d(œ)sy]	→ [ĕ̥ʃi]	‘on’	Armand 3;03.04
fenêtre	[f(œ)nɛtʁ]	→ [ʏmɛːt]	‘fenêtre’	Armand 3;03.17
venir	[v(œ)niʁ]	→ [əni]	‘venir$_{\text{INF}}$’	Adèle 2;08.02
cheval	[ʃ(œ)val]	→ [ɛval]	‘horse’	Armand 3;00.20
chevir	[ʃ(œ)viʁ]	→ [ˈejeh]	‘chevir’	Fabienne 2;04.03
Genève	[ʒ(œ)nɛv]	→ [ˈinɛf]	toponym	Fabienne 2;05.21
monsieur	[m(œ)sjø]	→ [ˈɛsjø][ˈøˈçjø̨]	‘mister’	Fabienne 2;03.26
monsieur	[m(œ)sjø]	→ [ˈœθjø]	‘mister’	Adèle 2;10.04

monsieur	[m(œ)sjø]	→ [ˈɛçjø][ˈɔsjø]	‘mister’	Armand 3;00.13
monsieur	[m(œ)sjø]	→ [ˈø̜sjʏ̠]	‘mister’	Guy 3;06.14
retour	[ʁ(œ)tuʁ]	→ [ʏtuʁ]	‘return’	Armand 3;02.00
retourné	[ʁ(œ)tuʁne]	→ [œtuˈne]	‘return$_{\text{PAST-PART}}$’	Guy 3;05.30
redonner	[ʁ(œ)dɔne]	→ [ɔˈdone]	‘give back$_{\text{INF}}$’	Janice 2;07.27
regarde	[ʁ(œ)gaʁd]	→ [ˈɔgaj]	‘look$_{\text{2-SG-IMP}}$’	Lucas 2;09.03
regarde	[ʁ(œ)gaʁd]	→ [aˈgad]	‘look$_{\text{2-SG-IMP}}$’	Adèle 2;10.13
regarde	[ʁ(œ)gaʁd]	→ [œ.ˈgaʁd]	‘look$_{\text{2-SG-IMP}}$’	Janice 2;11.26
regarde	[ʁ(œ)gaʁd]	→ [ɛgad]	‘look$_{\text{2-SG-IMP}}$’	Kim 3;00.05
regarde	[ʁ(œ)gaʁd]	→ [ɛˈdaj]	‘look$_{\text{2-SG-IMP}}$’	Armand 3;03.20
regarde	[ʁ(œ)gaʁd]	→ [ˈugaʁd]	‘look$_{\text{2-SG-IMP}}$’	Tom 3;05.16
regarde	[ʁ(œ)gaʁd]	→ [œ̝ˈgaʁd]	‘look$_{\text{2-SG-IMP}}$’	Guy 3;02.14
regardé	[ʁ(œ)gaʁde]	→ [œ̜dadə]	‘look$_{\text{PAST-PART}}$’	Fabienne 2;04.03
regarder	[ʁ(œ)gaʁde]	→ [œdade̝]	‘look$_{\text{INF}}$’	Henri 2;04.29
refais	[ʁ(œ)fɛ]	→ [ˈɔfɛ]	‘do again$_{\text{1-SG-PRE}}$’	Adèle 2;09.23
refaire	[ʁ(œ)fɛ]	→ [ˈɜfɛ][ˈœfɛʁ]	‘do again$_{\text{1-SG-PRE}}$	Fabienne 2;03.26
refermer	[ʁ(œ)fɛʁme]	→ [ˈʌtame]	‘close again$_{\text{INF}}$’	Adèle 2;09.29
reviens	[ʁ(œ)vjɛ̃]	→ [ˈʌnja]	‘come back$_{\text{1-SG-PRE}}$’	Adèle 2;08.02
reçu	[ʁ(œ)sy]	→ [ˈəsy]	‘receive$_{\text{PAST-PART}}$’	Adèle 2;10.07
remet	[ʁ(œ)mɛ]	→ [ˈɔmɛ]	‘put back on$_{\text{3-SG-PRE}}$’	Adèle 2;09.02
remettre	[ʁ(œ)mɛtʁ]	→ [ˈãmːɛ.t]	‘put back on$_{\text{INF}}$’	Lucas 2;07.13
remorque	[ʁ(œ)mɔʁk]	→ [aˈmɔk]	‘trailer’	Armand 3;02.00
lequel	[l(œ)kɛl]	→ [ɛˈkɛl][əˈkɛl]	‘which$_{\text{MASC}}$’	Armand 3;04.00

The deletion of the bilabials [m] and [p] in *monsieur* and *petit*, respectively, constitutes an example of a general ban on initial bilabials in polysyllabic words; for instance, Armand, in the beginning of the recording period, not only deletes [m] in *monsieur* [ˈɔsjø] (3;00.13), but also in *mouton* ‘sheep’ [mutɔ̃] → [etɔ̃] (2;11.28). He also deletes the bilabial plosive [p] in *pompier* ‘fireman’ [pɔ̃pje] → [ɔ̃pje] (2;11.13). No deletion of [p] in *petit* is attested during these early recordings, however, except for in combination with schwa absence. Toward the middle of the recording period, Armand generally produces target-like bilabials also in the non-prominent syllable: *monsieur* [m(œ)sjø] → [myçjø] (3;02.08), *malade* ‘sick’ [malad] → [maɲa] and *pompier* [pɔ̃pje] (3;01.21). Deletion of [d], primarily attested in the data from Armand, e.g. *dedans* ‘in here’ [d(œ)dɑ̃] → [ɛdɑ̃] (3;02.16), is by far less favoured in his production than retention of the plosive, e.g. *debout* [d(œ)bu] → [dʏbu] (3;04.00) and *dedans* [d(œ)dɑ̃] → [dœdɔ] (3;00.03). We also attest more sporadic deletion of word-initial fricatives in the data from Armand, e.g. *chercher* ‘search$_{\text{INF}}$’ [ʃɛʁʃe] → [ɛçe] (2;11.13) and *Jérôme* proper name [ʒeʁɔm] → [ˈeʁɔm] (3;00.13), which supports the claim that also the fricative deletion in (47) is part of a more general pattern. As regards Fabienne, the deletion of [p] in *petit* is merely a part of a general deletion pattern that applies to obstruents and sonorants in the initial position of polysyllables, e.g. at the age of 2;03.19, she produces *poussin* ‘chick’ [pusɛ̃] → [ˈɛʃa], *tourner* ‘turn$_{\text{INF}}$’ [tuʁne] → [ˈʌɳe], *cochon* ‘pig’ [kɔʃɔ̃] → [ˈɔʃɔ], *garcon* ‘boy’ [gaʁsɔ̃] → [ˈasɔ̃], *serpent* ‘snake’ [sɛʁpɑ̃] → [ˈɛpɑ̃], *maison* ‘house’ [mɛzɔ̃] → [ˈɛðə]. Note that some variation emerges in her data toward the end of the recording period.

The deletion of [ʁ] in the data from Adèle is of particular interest and constitutes one of her solutions for avoiding this word-initial liquid. While the liquid emerges in the monosyllabic prominent syllable quite early in the recording period, e.g. *rouge* ‘red’ [ʁuʒ] → [gus] (2;07.10) vs. *rose* 'pink' [ʁoz] → [ʁoθ] (2;08.02), target [ʁ] in the non-prominent syllable is either replaced by a velar plosive, e.g. *roulette* 'small wheel' [ʁulɛt] → [gulɛt] (2;08.16), or by [j] in the context of [i], e.g. *rigole* 'laugh$_{\text{3-SG-PRE}}$' [ʁigɔl] → [ˈjigat] (2;07.25), or deleted, e.g. *rappelle* 'remember$_{\text{1-SG-PRE}}$' [ʁapɛl] → [apɛt] (2;08.05) and *rideaux* 'curtain$_{\text{PL}}$' [ʁido] → [ˈido] (2;9.15). All verbal schwa-items with initial [ʁ], in which schwa is present, are realised with consonant deletion. The only schwa-item for which we observe substitution by a velar plosive is *renard* 'fox', e.g. [ʁ(œ)naʁ] → [ˈkona] (2;07.25).

The data contain a small number of occurrences of schwa-items in which both C_1 and C_2 are deleted. These are found in the data from Fabienne and Armand and display several of the modifications commented upon earlier. First, like many of the older children, Fabienne deletes word-initial [ʁ]. Additionally, in the majority of cases of an attempted trisyllable, when it is not reduced to a disyllable, e.g. *kangourou* 'kangaroo' [kɑ̃guʁu] → [jɑ̃ʀu] (2;03.26), the consonant between the first and second vowel is deleted, e.g. *éléphant* 'elephant' [elefɑ̃] → [eefɑ̃] (2;02.15) and *raconter* 'tell$_{\text{INF}}$' [ʁakɔ̃te] → [ʌɔ̃te] (2;04.03). Concerning Armand, he deletes both initial [ʁ] and word-medial [n], which yields an output with two onsetless syllables.

(48) V_1V_2 structure (ˈ indicates a high tone)

cheval	[ʃ(œ)val]	→ [ˈe̜an]	'horse'	Fabienne 2;02.15
regarder	[ʁ(œ)gaʁde]	→ [ˈɛˈɛðe]	'look$_{\text{INF}}$'	Fabienne 2;05.21
renard	[ʁ(œ)naʁ]	→ [œaʁ][eaʁ]	'fox'	Armand 2;11.28
renard	[ʁ(œ)naʁ]	→ [ɛ̃aʁ]	'fox'	Armand 3;00.03

In sum, schwa-items that contain a full vowel in the schwa syllable are subject to modification at two levels. First, for children who do not fully master the target vowel quality [œ], the schwa vowel assimilates with C_1 or C_2, or with V_2. In some cases, the schwa vowel takes on a back, non-target-like quality, which cannot be explained as vowel assimilation. Second, the realisation of schwa that co-occurs with consonant deletion establishes that there are factors other than the non-mastery of consonant sequencing that hinders the acquisition of target-like schwa alternation.

In what follows, we turn to variants of schwa-items in which a segment other than a full vowel is realised in the schwa position.

7.4.7.5 Shape of variants without a full vowel in the schwa syllable

Section 7.3.1 presents a series of output structures for schwa that are attested in our corpus. One of the variants classified as schwa presence is the reduced vowel (Output structure D), which is defined as "a voiced portion and a formant structure" (Bürki et al. 2007:1027). The reduced schwa is primarily observed in the data from the children in age groups 2 and 3, with the noted exceptions of Kim and Armand, for whom we do not attest this output structure. The data in Example (49) indicate that there is no restriction on the segmental context in which the reduced schwa may occur. Interestingly, however, the sole case in which there is a plosive C_1 is the non-target-like realisation of *fenasse* [pə̆las], realised by Adèle (2;08.05). Recall from Section 7.4.1.3.1 that Adèle does not master primary PloLiq-clusters and that a short vowel is frequently inserted between a plosive and an [l]. Lucas, Janice, Théa, Armand, and Eric also use the strategy of inserting an intervocalic vowel in primary ObsLiq-clusters. Whereas there are no examples of a reduced schwa in the schwa-items produced by Armand, several examples are found in the data from Lucas, Janice, and Eric. Further, a reduced schwa is observed in the remaining children from age group 3, Lambert, Albert, Tom, and Guy, who realise intervocalic vowels at a very low rate in primary PloLiq-clusters.

(49) Reduced schwa

cheval	[ʃ(œ)val]	→ [θə̆wal]	‘horse’	Lambert 3;01.14
cheval	[ʃ(œ)val]	→ [ʃy̰̆val]	‘horse’	Albert 3;01.00
chevir	[ʃ(œ)viʁ]	→ [ṣə̆v̥ij̥]	nonsense	Tom 3;05.17
fenêtre	[f(œ)nɛtʁ]	→ [fə̆nɛːtʁ]	‘window’	Janice 2;11.02
fenêtre	[f(œ)nɛtʁ]	→ [fĭnɛ.k]	‘window’	Lucas 2;08.10
fenêtre	[f(œ)nɛtʁ]	→ [fə̰̆nɛtx]	‘window’	Théa 2;09.29
fenasse	[f(œ)nas]	→ [pə̆las]	nonsense	Adèle 2;08.05
fenasse	[f(œ)nas]	→ [fə̆nas]	nonsense	Eric 3;02.01
repart	[ʁ(œ)paʁ]	→ [ʁɔ̆paʁ]	‘leave again$_{\text{3-SG-PRE}}$’	Guy 3;05.30

Bürki et al. (2011) carry out an acoustic and perceptual analysis of spontaneously produced schwa vowels and, thereby, introduce the important discussion of the categorisation of full schwas, reduced schwas, and excrescent vowels. They raise the question, on which basis do we categorise a schwa vowel as phonetically and phonologically present or absent? We find it important to mention this study because there are instances in our data in which the reduced schwa is associated with a high tone, which we interpret as an acoustic correlate of syllabic prominence, cf. Figure 7.35. If we consider the high tone to be associated with the word-initial syllable and that the high tone can be associated with a reduced schwa, it implies that the reduced schwa is phonologically present. Further, in Section 7.3.3.2 we reveal that the reduction of word-initial prominence, Output structure B, is primarily attested in the data from the older children, who are also responsible for the majority of the reduced schwas in the semi-controlled corpus. In this regard, the many examples of a reduced schwa *without* an associated high tone do not necessarily imply that this vowel is a phonetic excrescence and, thus, that it is phonologically irrelevant. For this reason, and until other data provide convincing counter-evidence, we claim that the reduced schwa, as opposed to the excrescent vowel attested in primary ObsLiq-clusters, represents an underlying vowel. This is in line with the finding in Goetry et al. (2001, cited by Hall 2006), who propose that excrescent schwas, as opposed to lexical schwas, have no phonological relevance. Although phonetically similar to excrescent schwas, the reduced schwa in French child language differs from the former in that it fills a syllable nucleus.

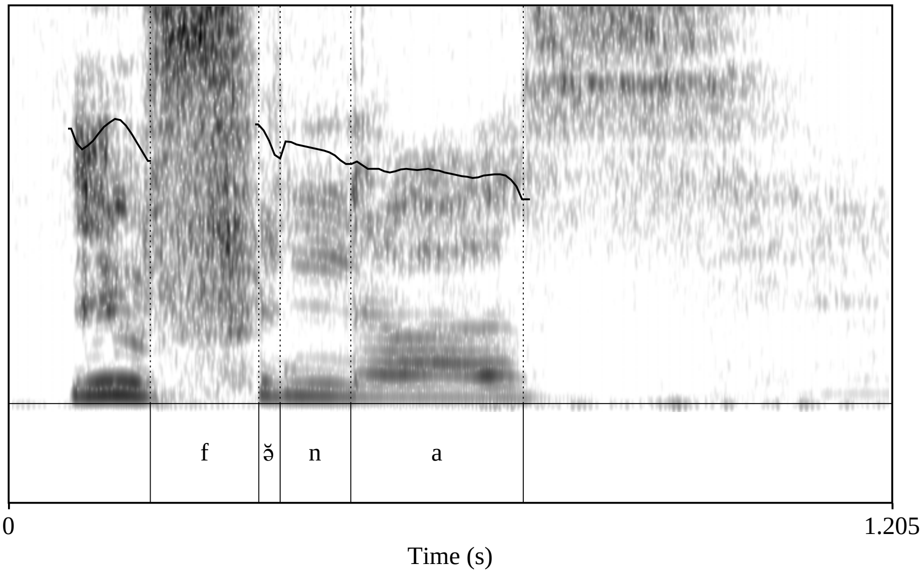

Figure 7.35: Reduced schwa in *des fenasses* [fə̆nas], data from Eric (3;02.01)

A second output structure, presented in Section 7.3.1, consists of the lengthening of one of the surrounding consonants. Segmental duration is not categorically measured in the transcriptions; however, another way of determining whether we are looking at random phonetic lengthening or compensatory lengthening, which would have implications for a phonological analysis, is to examine the melodic contour of the schwa-less item. Recall, again, the falling intonation pattern attested for disyllables by Allen (1983), and further, the fact that this melodic fall is also observed in many of our schwa-items with full or reduced schwas. The following examples, presented in Figures 7.36 to 7.39, are selected because the schwa-item is preceded by material that is associated with a low tone; in this way, the falling contour observed in the schwa-item cannot constitute a mere fall commencing in the preceding segment and descending through the schwa-item. Note that Figures 7.38 and 7.39 present schwa-items in which the descent in the falling contour is moderate compared to Figures 7.36 and 7.37.

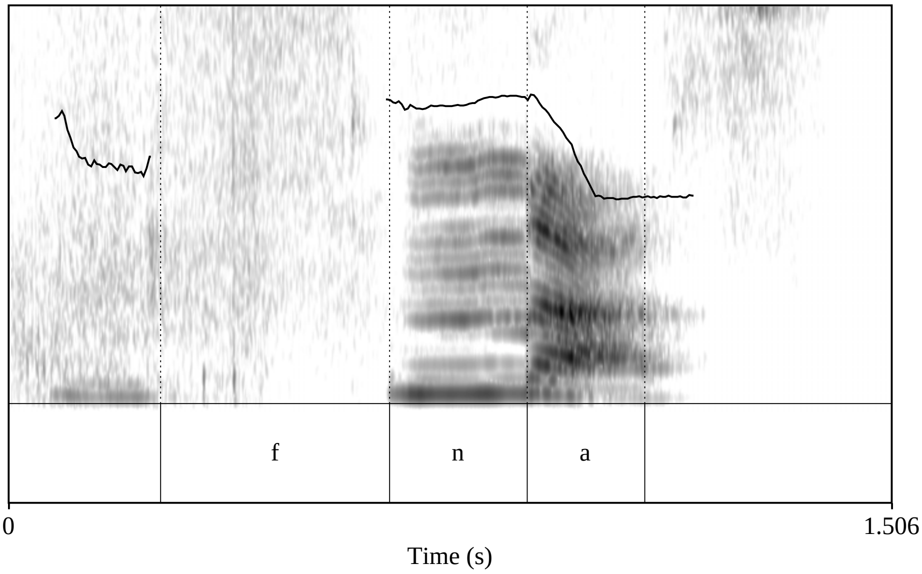

Figure 7.36: Lengthened [n] with high tone in *une fenasse* [fn͌nːas], data from Guy (3;05.16)

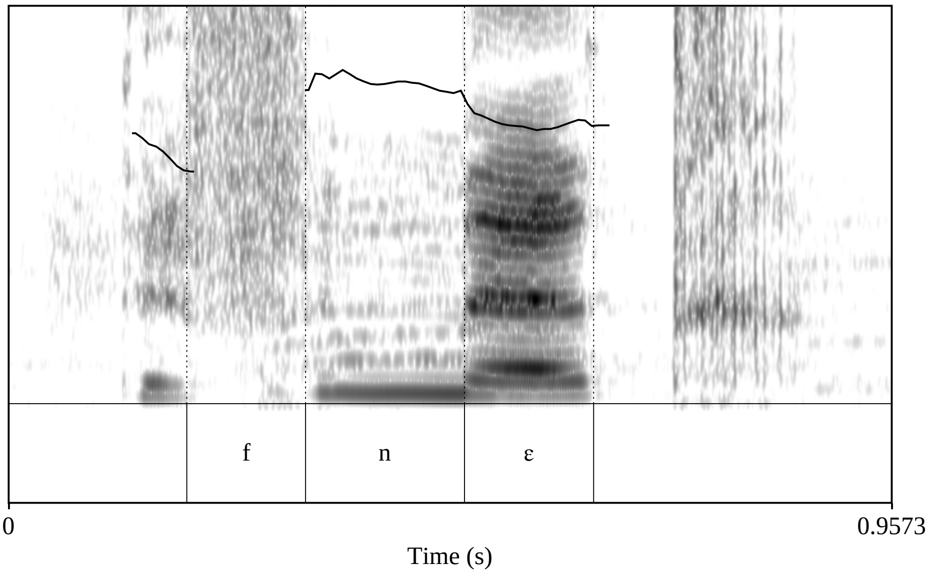

Figure 7.37: Lengthened [n] with high tone in *des fenêtres* [fnːɛtʀ̥], data from Tom (3;03.29)

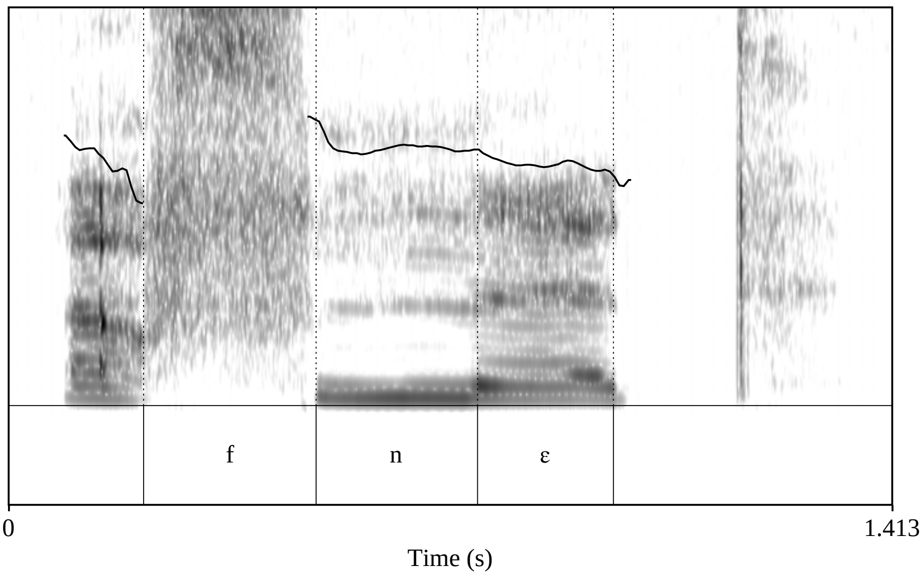

Figure 7.38: Lengthened [n] with high tone in *la fenêtre* [fnːɛt], data from Lucas (2;07.13)

The examples presented above are from Guy and Tom, age group 3, and Lucas, age group 2; these children show mastery, or near-mastery in Lucas' case, of primary ObsLiq-clusters. The most likely reason that there is only a limited number of examples of this output structure is that it is restricted to secondary clusters with a nasal C_2. Therefore, compensatory lengthening is not an available strategy for children who do not master the faithful production the nasal C_2 when schwa is absent. However, faithfulness to both C_1 and C_2 is not a prerequisite; for example, Guy realises secondary clusters with a high tone on the nasal in *fenêtre* and *semaine,* albeit with a fricative assimilated with the nasal, [n̥nɛtʁ] and [m̥mɛn].[378] Note that in Figure 7.39, the preceding material has a slightly higher tone than the syllabic nasal.

[378] Another example of a syllable-bearing consonant, found in the data from Lucas (2;09.03), is *regarde* 'look$_{2\text{-SG-IMP}}$' [n̩gaj], where the initial liquid is replaced by a nasal.

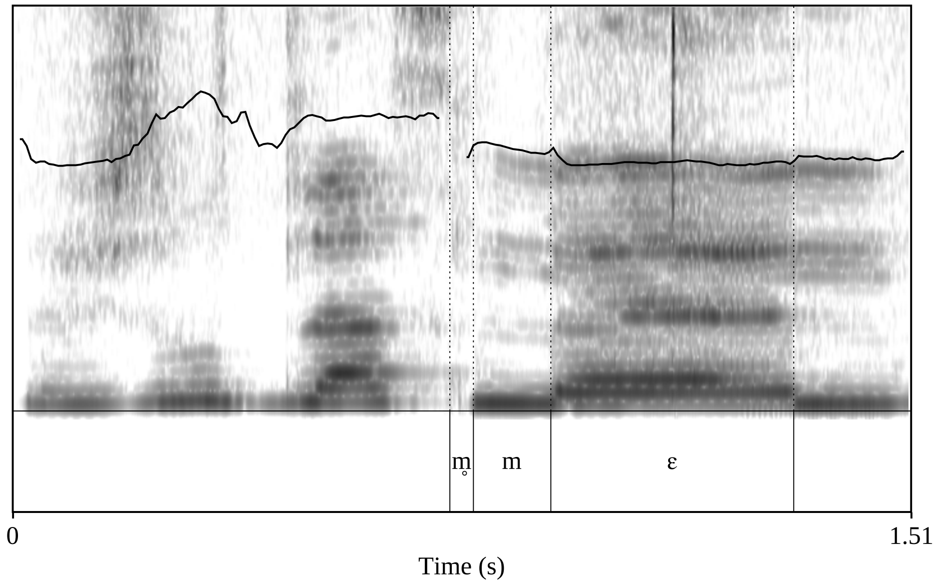

Figure 7.39: Lengthened [m] with high tone in *un jour de la semaine* [m̥mɛn], data from Guy (3;03.13)

A third output structure, presented in Section 7.3.1, is the split consonant sequence, illustrated in Figures 7.40 and 7.41. The phonological nature of these consonant sequences remains unknown for two reasons. On the one hand, the children display difficulties in phonetically implementing clusters with an initial sibilant, whether they are primary or secondary clusters. This is an argument for an analysis whereby the inter-consonantal pause reflects a transition between the two obstruents, i.e. the inter-consonantal pause is a mere phonetic effect of the production of the secondary cluster. On the other hand, according to Bürki et al. (2011), reduced schwas can be voiceless. This is an argument for an analysis whereby the inter-consonantal pause reflects an underlying schwa syllable. A future, finer-grained acoustic analysis will allow a more conclusive discussion on these observations.

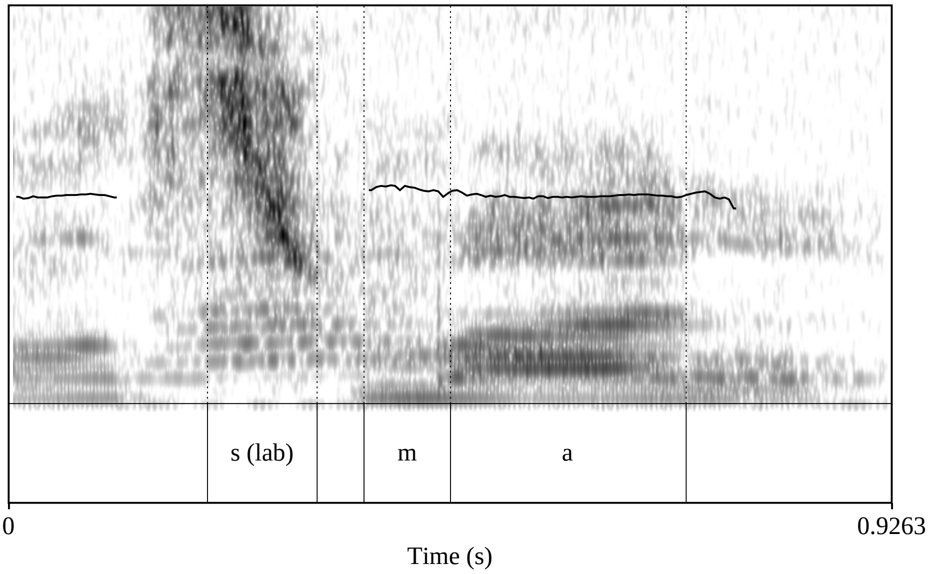

Figure 7.40: Split consonant sequence in *un chien puis un cheval* [s̠ʷ.mal], data from Eric (3;02.01)

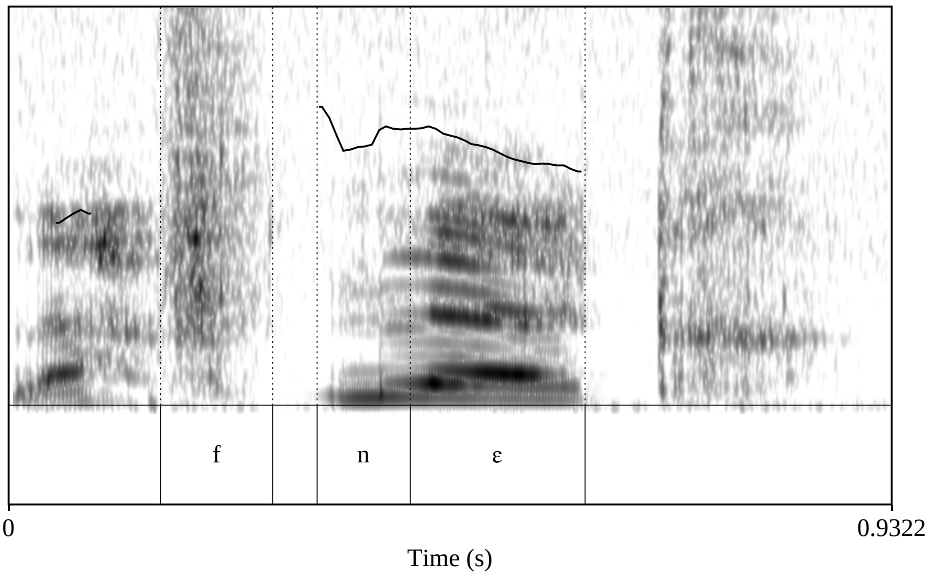

Figure 7.41: Split consonant sequence in *la fenêtre* [f.nɛtχ], data from Albert (3;01.11)

In sum, the schwa-items without a full vowel in the schwa syllable, realised with a reduced schwa, a lengthened consonant, or an inter-consonantal pause, can be argued to maintain the syllable in the phonological structure. These structures are only attested in the data from children who master primary, and, to some extent, also secondary clusters. This finding shows that also at an advanced stage in phonological development do children have strategies available to circumvent deletion of the schwa syllable while simultaneously producing an alternation between a full schwa syllable and a reduced one.

7.4.2.6 A note on faithfulness to the syllable, consonantal support, and input frequency

Until this point we have provided evidence in favour of the hypothesis that schwa presence is a a reflection of prosodic faithfulness, i.e. that schwa is realised independently of the consonants surrounding it. This claim is counter to observations made for the adult language; schwa in target French is different from other vowels because it cannot occur word-initially. This fact is proven to be important in several theoretical analyses of schwa, e.g. Martinet (1972) considers schwa to be part of a consonantal allophone, which makes its role "de soutien et non d'information" (1972:394). The inexistence of word-initial schwa is also important for Anderson (1982), who treats schwa as an empty syllabic node that is deleted in the case that the onset consonant is moved into the preceding syllable. However, in our child language data, the role of schwa seems to be similar to the role of the other vowels. Although its presence is not crucial for correct interpretation of the lexeme, its presence, nevertheless, seems to be important at the abstract level of syllable structure. Alongside the data presented in the previous section with consonant deletion, i.e. structures CV_1V_2, V_1CV_2, and V_1V_2, there are three findings, presented in what follows, that suggest that the realisation of schwa in the initial syllable is a reflection of a prosodic faithfulness constraint.

First, schwa-items with a secondary cluster [pl] are categorically realised with schwa in our data. This cluster is attested in the data from four children, Kim, Janice, Tom, and Guy; from this group, the latter three master PloLiq-clusters. Recall that according to our Hypothesis C1, the mastery of primary clusters precedes the mastery of secondary clusters, which implies that once the primary PloLiq-clusters are in place, schwa alternation in this context should be authorised. Schwa presence in the context [pl] is expected in the case of Kim because he does not master ObsLiq-clusters. As for Janice, Tom, and Guy, the presence of schwa in their data, presented in Example (50), does not support Hypothesis C1; the mastery of primary clusters does not automatically lead to schwa alternation in schwa-items whose secondary cluster is similar to the primary ones. However, note in the data from Janice that *pelouse* is attested with a reduced schwa in a situational context where the researcher previously realises the schwa-item with reduced schwa; this indicates that alternation, however not 100% target-like, is available in this context in her grammar – this in line with Hypothesis C1.

(50)	*peluche*	[p(œ)lyʃ]	→ [pølyθ]	'teddy bear'	Kim 2;08.29
	peluche	[p(œ)lyʃ]	→ [pɛ̧lyʃə̆]	'teddy bear'	Janice 2;08.04
	peluche	[p(œ)lyʃ]	→ [pølyʃ]	'teddy bear'	Tom 3;05.16
	peluche	[p(œ)lyʃ]	→ [pɵlyʃ]	'teddy bear'	Guy 3;04.26
	pelouse	[p(œ)luz]	→ [pə̆luz]	'lawn'	Janice 3;00.10
	pelouse	[p(œ)luz]	→ [pøluz]	'lawn'	Guy 3;05.02

Second, the independence of word-initial schwa with regard to the surrounding consonants is further supported when we compare word-initial and word-final schwas; Côté (2000) consider these word-final schwas to be epenthetic. The data from Adèle reveal an abrupt increase in word-final schwas between two recording sessions at home. From the recording session at the age of 2;09.02 and onwards, she produces a large number of word-final schwas, see Example (51). In the large majority of cases, the inserted schwa appears after an output plosive, regardless of its target correspondent. The reason for pointing out these productions is the difference in behaviour between schwa in the word-initial syllable and schwa in the word-final syllable; the latter appears abruptly, and this across the board in one given segmental context. Whether the reason behind the emergence of word-final schwa is to satisfy a constraint targeting the coda consonant or whether it is an *e d'appui* (cf. Candea 2002, and references cited therein), it is clear that schwa in the word-initial syllable does not evolve in a similar manner; schwa in the initial syllable varies from one lexical item to another, and is categorically present in some items, e.g. *cheval*, while being categorically absent in others, e.g. *cheveux*.

(51) Word-final epenthetic schwas realised by Adèle[379]

jambe	[ʒãb]	→ [zɜtə]	'leg'	2;09.02
tête	[tɛt]	→ [tɛtə]	'head'	2;09.02
lunettes	[lynɛt]	→ [nʏnɛtɜ]	'glasses'	2;09.15
sac	[sak]	→ [satə]	'bag'	2;09.02
sac	[sak]	→ [sakɔ]	'bag'	2;09.15
livre	[livʁ]	→ [litə]	'book'	2;09.02
douche	[duʃ]	→ [duθa]	'shower'	2;09.02
seule	[sœl]	→ [θɔtɞ]	'alone'	2;09.02
piles	[pil]	→ [pila]	'batteries'	2;09.29
cheval	[ʃ(œ)val]	→ [tɔvatə]	'horse'	2;09.02
oreilles	[ɔʁɛj]	→ [tɔɣɛdə]	'ear$_{PL}$'	2;09.15

Third, the importance of preserving the schwa syllable is exemplified by the schwa-item *petit*. As repeatedly mentioned throughout this thesis, *petit* is highly frequently subject to schwa absence in adult French, and an strict input-driven approach to the acquisition of schwa where the frequencies of variants in the input are primoridial would predict that a low degree of schwa presence should be observed in the children's output.

Context	**PFC**		**CDS**		**Child language**		**Total**	
##C<e>C	67%	6/9	71%	5/7	76%	87/114	75%	98/130
C#C<e>C	48%	13/27	28%	15/54	43%	26/61	38%	54/142
V#C<e>C	11%	28/252	19%	72/370	52%	356/385	35%	456/1307
Total	16%	47/288	21%	92/431	55%	469/860	39%	608/1579

Table 7.17: Schwa presence in schwa-item *petit* in three corpora, by percentage and count

The child language data in Table 7.17 are interesting on many levels. First, the high frequency of schwa presence indicates a high degree of faithfulness to a syllable that is of low frequency in the input; this finding strengthens the claim that children do not blindly copy the alternation patterns in the input, but rather, are guided by structural demands in their grammar. Second, the rate of schwa presence is lower in a post-vocalic context than in a post-pausal context, which is the same as the distribution pattern observed in adult speech; this finding indicates that the child's grammar is sensitive to the leftward context. Note that the lower rate of schwa presence in this context also is a result of the categorical schwa absence in the expression *un petit peu* 'a little bit'. Third, all children realise variants with and without schwa for *petit*, which is not the case for the other schwa-items, except for highly frequent *regarder*; this finding suggests that *petit* is unique at some level. The more frequent schwa presence in other schwa-items with a secondary PloPlo-cluster rules out the possibility that the nature of the cluster favours alternation. Further, we have seen that highly frequent schwa absence in the input does not necessarily imply schwa absence in the child's output, e.g. *cheval*. Therefore, the frequencies of

[379] The fact that word-final schwa can be inserted in cases where there is no graphic correspondent <e> clearly shows that Adèle does not restrict her distribution of word-final schwa to the words in which this type of schwa occurs in songs and rhymes (cf. Morin 2003).

variants seemingly cannot account for alternation in *petit* either. Rather, we suggest that lexical frequency plays a role. Recall that *petit* and *regarder* are two of the most highly frequent items in our CDS and child language corpora, and constitute the two schwa-items in which we observe a certain level of alternation, both target-like and non-target-like, in the children's data. This finding is in line with Racine and Grosjean (2002), who conclude that lexical frequency is one of the top three factors contributing to schwa absence.[380]

7.4.2.7 Linking syllable deletion and schwa alternation

We began this section with the goal of understanding the acquisition of schwa alternation in light of the general acquisition of phonology, and the following argument was presented: Target schwa alternation is dependent on storage and deletability of the schwa syllable. Proposing that faithfulness to the non-prominent syllable is dominant in the early grammar, one hypothesis put forth claims that the absence of the schwa vowel is prevented until syllable deletion is authorised. An alternative hypothesis claims that schwa alternation is possible even if syllable deletion is not allowed; in the case of the absence of the schwa vowel, modifications to the association lines between the syllabic and the segmental tier yield a grammatical output that is free to alternate with the full schwa vowel. The relevant hypotheses are repeated in Example (52).

(52) Hypothesis D1, repeated from Example (43)
Faithfulness to the syllable count in the underlying representation prevents the deletion of the schwa vowel.

Hypothesis D2, repeated from Example (43)
Faithfulness to the syllable count in the underlying representation does not prevent the deletion of the schwa vowel.

Hypothesis B2, repeated from Example (4)
Exposed to variation in the input, two variants of a given schwa-item are available to the child. The dispreferred variant is modified to conform with production constraints that operate on his spontaneous speech.

Hypothesis D1 claims that syllable faithfulness prevents the schwa vowel from being deleted, and the examination of the data supports this hypothesis. Not only do all children use the variant with schwa far more frequently than the variant without schwa, but also, the presence of the schwa vowel seems to be independent of the surrounding consonants. Fabienne and Henri, age group 1, and Lucas, Adèle, and Kim, age group 2, occasionally delete the first, the second, or both consonants in the secondary cluster while maintaining the vowel. This finding suggests that schwa presence at some stage in child language development primarily reflects a satisfaction of constraints on syllable faithfulness, not constraints on phonotactic well-formedness. As is the case with the examination of secondary cluster accuracy in Section 7.4.1, Armand is once again unique among those in age group 3 because he deletes surrounding consonants in a manner similar to the younger children.

[380] Racine and Grosjean (2002) put forth the hypothesis that there is a link between lexical frequency and schwa absence on the basis of observations made by Dell (1985).

Hypothesis D2 claims that syllable faithfulness does not prevent the schwa vowel from being deleted. One observation that supports this hypothesis is that there is a preference for a phonological variant with non-target-like melodic content in the schwa site over the vowel-less variant. The complete assimilation to context seems to be restricted to specific items as produced by children who do not have the front round vowel [œ] fully in place, at least not in the non-prominent position in the prosodic structure, i.e. children from age groups 1 and 2, and Armand from age group 3. There are three output structures that also lend support to the hypothesis on syllable faithfulness, i.e. reduced schwa, compensatory lengthening of a sonorant C_2, and a split consonant sequence. We observe these structures in the data from the children who show a (near-) mastery of primary and secondary clusters, i.e. the children from age group 3, excluding Armand, and Lucas, Janice, and Théa from age group 2. We claim that the reduced schwa, the syllabic sonorant, and the inter-consonantal pause fill a syllabic nucleus that represents an underlying schwa.

Regarding the order of intra- and extra-grammatical constraints, the results presented in this section support our claim that the acquisition of the two types of constraints is intertwined. The three output structures without a full vowel in the schwa syllable are primarily attested as reactions to schwa absence in the immediate input. This finding indicates that even for older children, who have a relative mastery of clusters, there are repair strategies that produce a syllabically faithful alternation between two variants of a schwa-item.

7.4.3 Concluding remarks

This section has been structured around the idea that the behaviour of schwa in child language is intimately linked to the status of the developing grammar. We have sought to determine this link by testing the data against challenges in the acquisition of phonology that have been emphasised in previous works. Given that schwa alternation implies cluster creation through vowel absence, we have approached the child language data from the perspective that target schwa alternation is dependent on the complete acquisition of consonant sequencing and syllable deletion. First, by including data on primary consonant clusters, we have shown that target-like schwa alternation occurs more spontaneously for the children who have acquired primary clusters. Also, the data have revealed that the dispreferred variant of a schwa-item is, in many cases, marginally present and is triggered by the immediate input; note, however, that the secondary clusters in these cases are subject in the output to a series of modifications. Second, by including data on other vowels associated with non-prominent syllable nuclei, we have shown that the occasional absence of schwa is not a reflection of the well-known, general production constraint that targets non-prominent syllables; the target stable vowels are faithfully produced. Further, the occasional absence of C_1 or C_2 combined with schwa presence, which is attested in the data from several of the less advanced children, indicates that the presence of schwa reflects faithfulness to the syllable rather than a means to avoid a complex phonotactic structure. Additionally supporting schwa faithfulness, the data have revealed a series of marginal output structures, i.e. a reduced vowel, a syllabic sonorant and a split consonant sequence, which the more advanced children have available for use when confronted with schwa absence in the immediate input.

7.5 Schwa behaviour in child language: summary

This chapter has focused on the behaviour of schwa in our child language data, and has revealed several findings that are interesting at the level of both intra-grammatical and extra-grammatical analysis. First, in the examination of the data obtained in a naturalistic setting, we set out to determine the preferential patterns of schwa behaviour in the individual grammars. Generally, our child subjects display a high degree of schwa presence, which contrasts with inter-adult speech; the types of schwa-items used by the children are subject to highly frequent schwa alternation in the target language. Further, the spontaneous data have revealed an important level of lexeme-specific behaviour; within the production of the same child, schwa may be categorically or near-categorically present or absent, depending on the schwa-item in question. One prime example of this observation is the differentiated behaviour of schwa between *cheval*, which generally is produced with schwa, and *cheveux*, which generally is produced without schwa. Additionally, not all schwa-items display similar behaviour across children. Further, and as expected, target schwa alternation is attested in some schwa-items in the data from the children who are phonologically more advanced, which indicates the gradual emergence and spread of schwa alternation in the lexicon.

Second, in the examination of the data obtained in the semi-controlled setting, we set out to identify the child's linguistic reactions to variation in the input. Recall that we have structured the experiment such that the child is exposed to his dispreferred variant, with or without schwa depending on the child. Our intent with the experiment is to determine whether the intra-grammatical constraints prevail, i.e. with the preferential patterns observed in spontaneous speech, or alternatively, whether extra-grammatical constraints are visibly active through target-like or non-target-like imitation of the immediate input, and this at the expense of the child's phonological grammar. First, the semi-controlled data confirm the finding from the spontaneous speech data that the large majority of the children prefer the variant with schwa. As in the spontaneous speech data, some lexeme-specific variation is observed. Second, and as expected, the more phonologically advanced children, i.e. Janice from age group 2 and all children from age group 3, except for Armand, display a somewhat higher degree of sensitivity to the input by their production of a target-like, or near-target-like, albeit non-preferred, variant of the schwa-item. The occasional production of the non-preferred variant in the data from some of the less advanced children, which in the large majority of cases is heavily modified at the segmental level, indicates that a second variant *is* available for production for these children despite the fact that the required phonological complexity is not acquired. This observation, again, raises the question regarding when exactly in the child's phonological development do extra-grammatical constraints on schwa alternation become visibly active.

Third, as mentioned in the paragraph above, the absence of schwa alternation in the children's spontaneous production clearly suggests that intra-grammatical constraints on both consonant sequencing and syllable faithfulness take precedence over the frequency of variants in the input. First, the relative mastery of structural complexity that is required for primary clusters indicates that the prosodic structure to which the secondary cluster can be associated has not yet been built in all of the children's grammars. The order of acquisition of the two types of clusters is, thus, in line with the structural model proposed by Rialland (1994); she proposes that for the various types of primary and secondary clusters in target French, the first element of primary [s]+C-clusters and all types of secondary clusters are attached directly to the word node. Also, the types of modifications selected by the children in order to produce a grammatical output seem to pattern with Rose (2000) in that C_2, which according to Rose is underlyingly prosodified in the prominent position, is typically preserved when one of the consonants is deleted, even though it may constitute the most sonorous element of the cluster, e.g. *fenêtre* [f(œ)nɛtʁ] → [nɛt] (Armand 3;01.10). In fact, this is also true for some of the cases in which one of the consonants is deleted and schwa is retained; for instance, [v] moves to the word-initial position both in *cheval* [ʃ(œ)val] → [faal] (Armand 2;11.21) and in *reviens* 'come back$_{1\text{-}}$

SG-PRE' [ʁ(œ)vjɛ̃] → [vœjɛ̃] (Lucas 2;09.03). However, some occurrences with schwa absence go against Rose's claim, e.g. *fenêtre* [f(œ)nɛtʁ] → [fɛt] (Henri 2;04.29), where the least sonorous C_1 is retained. This behaviour is however expected on the basis of the findings by Fikkert (1994, 2010) and Kehoe et al. (2008) on primary clusters. In fact, we attest several modifications of secondary clusters that are similar to the modifications found with primary clusters, i.e. reduction, gliding, and short interconsonantal vowels. What remains to be explained is cluster reduction and the retention of the most sonorous element of a sequence: for instance, see retention of the nasal in Armand's (3;01.00) production of *fenêtre* [f(œ)nɛtʁ] → [nɛ] 3;01.00, and in Adèle's (2;08.22) production *demander* [d(œ)mɑde] → [mɑde]. One theoretical possibility is that in cases of categorical syllable absence, the schwa-item is stored without the schwa syllable, and therefore, there is no competition between consonants in the output. The future collection of a wider range of spontaneously produced schwa-items should contribute to solve this conundrum.

Second, the highly frequent accentuation of the word-initial syllable, whether the nucleus is filled by a target schwa or another vowel, indicates that syllable deletion, entailed by schwa absence, is also hindered by supra-segmental constraints. Previous work on the acquisition of French phonology reveals that in general, children in the early stage do not delete the initial, target non-prominent syllable of disyllables (cf. Goad & Buckley 2006). Whether this is a reflection of constraints on foot structure, constraints on rhythm, salience of the initial syllable, or other constraints, faithfulness to the syllable count seemingly targets schwa syllables as well, and this effect lasts until later stages of development. In addition to word-initial accentuation, there are several output structures that indicate that the child is faithful to the formal syllable[381]: the deletion of a consonant that yields a CV_1V_2 or a V_1CV_2 structure shows that phonotactic requirements on structural complexity are not single-handedly responsible for schwa retention. Further, assimilation with V_2 shows the relatively low importance of segmental faithfulness to the underlying vowel (whatever its featural composition). Finally, as the child grows to be more phonologically advanced, the gradual reduction of prominence on the schwa syllable concurs with the emergence of target-like schwa alternation, which, yet again, indicates the early importance of the schwa syllable for supra-segmental reasons.

Thus, to summarise the findings in this chapter, target schwa alternation seems to be both phonotactically and structurally blocked in the grammar of the children until the point at which the necessary prosodic structure is in place and the word-initial syllable can be disposed of. This identifies schwa alternation as a phenomenon acting as and interacting with other challenges in acquisition, which develop in their own way, regardless of the frequency of structures in the input.

[381] Let us recall that the more advanced children who produce target-like secondary clusters occasionally delete schwa and assign word-initial prominence to the sonorant C1 – thus retaining a disyllabic structure.

8. Discussion

Janice	J'aurai combien quand, quand j'aurai mon gâteau?
Nina	Ben, trois.
Janice	Trois!
Researcher	Et maintenant tu as quel âge?
Janice	[dømi]
Researcher	Deux ans et demi?
Janice	Deux ans et [dmi] et puis [dʏmi] j'aurai aussi.
Researcher	Tu as bientôt trois ans?
Janice	Ouais. Trois ans! Quand ça [sʁa] mon anniversaire avec trois bougies puis mon gâteau!

Janice (2;09.14) talks about when she will start attending school and asks her mother Nina about her next birthday.

This thesis has revolved around the distribution, categorisation, and acquisition of schwa. We have set out two main hypotheses based on Swiss French judgement, perception, and production data: (1) schwa does not constitute a separate category in early child language, and (2) the acquisition of schwa alternation, consonantal sequencing, and the reduction of non-prominent syllables are intertwined.

8.1 Summary of the thesis

To identify the language to be acquired by the children in this thesis, in Chapter 2 we have presented the linguistic characteristics of the Swiss French varieties. These varieties are subject of a series of studies carried out, in particular, by researchers affiliated with the international PFC community. These studies show that the Swiss French varieties are still distinct from *français de reference*; although, the extent of any dissimilarities depends on the linguistic level of analysis, i.e. lexicon, syntax, morphology, prosody, phonology, or phonetics. Swiss French is also characterised by a certain amount of diatopic variation, and speakers of the variety examined in this study, i.e. the Swiss French spoken in Nyon on the shores of Lac Léman in the Vaud Canton, display contrastive vowel length, numerous violations of the Positional Law, an important level of diaeresis, slow speaking rate, and optional non-final prominence, among other things. The fact that the Swiss French variety spoken in Nyon is slightly less conservative than other Swiss French regional varieties in Romandy is unsurprising given that Nyon is close to Geneva where a more standard variety is spoken. Further, psycholinguistic research reveals that schwa absence is more easily accepted by Swiss French speakers than by French speakers from North-Western France. Finally, sociolinguistic research shows that there is a certain level of linguistic insecurity and inferiority among Vaudois speakers, which may manifest itself in production through the suppression of regional features during conversation with a speaker of Hexagonal French.

To emphasise the importance of methodological choices in studies on phonological variables, in Chapter 4 we have presented and discussed in detail our selection of informants, sampling density, sampling strategy, and data treatment. In the absence of previous studies on schwa in child language, we base our selection of informants on results obtained in acquisition studies that focus on the vowel system, weak syllable deletion, consonant clusters and multiword utterances – four of the aspects that are relevant for the acquisition of schwa alternation in French. As for the sampling density, we conduct weekly 30-minute recordings of the spontaneous speech of eight children. For six of the children, we also record the caregivers. This decision enables us to examine children with different levels of mastery for consonantal sequencing and to also capture possible developmental phenomena. While these recordings provide us with data that reveal the children's preferred output variants of schwa-items, there are drawbacks to this sampling density; in particular, we are able to gather only a rather low number of occurrences of only a small set schwa-items per child. However, this drawback is partially counterbalanced by our sampling strategy, which includes monthly recordings of semi-controlled speech of 13 children to complement the spontaneous data. In the semi-controlled setting, our goal is both to obtain comparable data across children, and also to trigger the available, but non-preferred, output variants of schwa-items. Further, the repeated use of the same test provides several occurrences of the different schwa-items per child; multiple productions of a given item per child are crucial in a study on phonological variables. While these recordings provide us with data that reveal children's linguistic and extra-linguistic reactions to schwa variation in the input, a drawback of this sampling strategy is that we are only able to test a very limited number of schwa-items. Finally, to prepare the data for analysis, we narrowly transcribe all occurrences of schwa-items and code them in the Phon software; when necessary, we also acoustically analyse these data in Praat. The decision to perform a narrow phonetic transcription allows us to detect any subtle articulatory strategy that the child may select in order to avoid difficult output structures.

To establish what constitutes the input to the child, in Chapter 6 we have examined the behaviour of schwa in the child-directed speech (CDS) from the six caregivers recorded at home in conversation with their children. In line with previous literature on CDS, the data reveal an overall higher rate of schwa presence in CDS when compared with inter-adult speech – although some lexical exceptions are observed. The high presence of schwa has been argued to reflect a strategy of providing phonological clarity, whereby the full form with schwa provides the child with the variant that is closer to both the orthographic and the phonological representations. From the child's perspective, this strategy provides the opposite of phonological clarity because it distorts the target-like distribution of alternating and non-alternating [œ]. This distortion could delay the categorisation of schwa and /œ/ in a two-category approach. A comparison of the two adult corpora, the CDS data and the inter-adult PFC data, has further established that, despite the somewhat stricter constraint on secondary clustering in CDS, all cluster types that are subject to schwa alternation in the inter-adult PFC data are also subject to schwa alternation in CDS, which reflects the gradient nature of the alternation phenomenon. The subsequent in-depth study of two mothers whose children are at two different levels of phonological development reveals that there is no necessary link between the mother's rate of schwa alternation and the child's phonological competence. Alice, the mother of highly proficient Guy, displays a higher level of schwa presence than Valentine, the mother of less proficient Adèle. With reference to previous work on schwa in adult speech, we have suggested that this finding could be related to socio-economic conditions and a higher degree of mastery of linguistic registers by speakers with a higher level of educational attainment. Further, an examination of schwa alternation in the data from the two mothers, analysed in light of situational context, lends support to earlier work in which the full variant has been shown to be more frequent in more formal contexts. Although the data set is small and the results are inconclusive, the higher presence of schwa in a disciplinary or educational context, compared to a play or routine context, indicates that the schwa variable can be manipulated by the caregivers to serve a purpose that is outside of grammar.

To determine the salience of acoustic properties for the categorisation of schwa, in Chapter 5 we have focused on the quality of schwa vs. stable /œ/ in production and perception for adult speakers. The production data, i.e. read speech from our six mothers, are examined at the level of the individual systems and show that the difference between schwa and stable /œ/ is near-neutralised in the non-prominent position. We only observe the full range of vowel qualities taken on by /œ/ in the prominent word-final position, including the more extreme values, which in the majority of cases are less subject to overlap with non-prominent schwa. This finding suggests that prosodic position is the driving force behind the acoustic differences between schwa and stable /œ/, and not categorisation. While these observations are in line with previous literature that states that mid vowels show less dispersion in non-prominent positions, they also challenge phonetic studies that claim that schwa constitutes a phonetically autonomous vowel. These phonetic studies recognise a large degree of overlap in that schwa and stable /œ/ do not necessarily differ in all formant dimensions, but they fail to show whether the fine acoustic differences are perceived, and further, whether they serve to establish two distinct vowel categories. The collection of perception data, which we have obtained on the basis of a discrimination test containing near-minimal pairs, is intended to determine whether identification of schwa vs. stable /œ/ in adult speakers is based on acoustic properties or some other properties. We have presented the participants with pairs of phrases, which are segmentally differentiated by the presence of schwa vs. stable /œ/; the participants show a lower error rate when the two vowels in question are positioned differently in the prosodic structure. Even though the error rate is rather low across the board, including the cases of pitch manipulation, the perception data clearly indicate that prosody, while not a crucial factor to categorisation, at least facilitates lexical retrieval. Thus, when taken together, the production and perception data show that the vowel qualities found in the child's input are ambiguous for the establishment of phonological categories.

To determine whether a vowel inventory with a separate schwa category best accounts for the data, in Chapter 3 we have tested the strength of two alternative approaches to the underlying status of schwa, both of which have been traditionally discarded in the schwa literature. We reintroduce the one-category approach, in which schwa is a variant of /œ/, and the epenthesis approach, in which schwa is an optionally inserted [œ]. These approaches have been argued to be less costly, representationally and phonetically; they imply fewer vowel categories, i.e. there is no need for an abstract category /∅/, and a more transparent mapping between the phonology and the phonetics, i.e. there is no need for a phonetic merger between /∅/ and /œ/. Aware of potential diatopic and diachronic variation, in this chapter the data consist of recent Swiss French judgement and production data, which have been collected among adult informants. Note that the judgement data are collected and presented in detail by Racine (2008). First, we discuss the one-category approach in light of the phonotactic, morphological, and lexical properties of words with alternating [œ], i.e. schwa, or non-alternating [œ]. Although we do not observe any complementary distribution, we do observe a number of regularities within the three domains, which jointly account for a large part of the data set. Second, we discuss the epenthesis approach in light of the nature of the primary and secondary clusters. Again, the data fail to reveal any complementary distribution, but a number of regularities are found in the clusters that are attested as not overlapping. Thus, we conclude the fine-grained examination of the data with the claim that the scarcity of actual counter-evidence prevents us from definitively rejecting the alternative approaches. However, there are data that are problematic for both alternatives, which may ultimately turn out to be decisive for the retention of the traditional two-category approach. On the other hand, in developing grammars, in which negative evidence has yet to be included, the one-category and the epenthesis approaches are both viable analyses.

To reveal the behaviour of schwa in the course of acquisition, in Chapter 7 we have presented spontaneous and semi-controlled child production data, which are examined in light of intra-grammatical as well as extra-grammatical factors. Generally, the variant with schwa is preferred by children in all age groups, regardless of the phonotactic make-up of the secondary cluster and the frequency of variants in the input. However, lexical exceptions are attested, which indicate that schwa does not evolve identically across the board. First, lexical exceptions contribute to inter-speaker variability because a given schwa-item may behave differently across children. Second, lexical exceptions contribute to intra-speaker variability because schwa-items with similar phonotactic make-up may behave differently within an individual child. In general, the individual children are very consistent in their selection of variant, but the older children do, nevertheless, spontaneously produce a certain degree of target-like schwa alternation; this finding indicates that the use of two variants gradually emerges. In addition, all children exhibit a certain level of sensitivity to schwa alternation in the immediate input, at least in a semi-controlled setting. Faced with their non-default variant in the input, the children in many cases adapt to the input by producing the second, albeit dispreferred, form. This finding suggests that two variants are available to the child even though the grammar strongly favours the production of one of them. We emphasise that the child's default choice of variant does not necessarily correspond to the one favoured by the linguistic community. However, the level of sensitivity to the input varies across children; the older children are attested to have a higher production rate of non-preferred variants and target-like alternation. As for the younger children, they are attested to have a lower level of non-preferred variants in the output, often with a non-target-like production, which suggests that a certain level of phonological complexity needs to be in place before both variants are available for the child's free use.

We have examined two phenomena to account for the correspondence between schwa alternation and level of phonological complexity. Both phenomena have been previously reported as representing challenges for the acquisition of phonology, i.e. consonantal sequencing and non-prominent syllable deletion. The intimate link between primary and secondary clusters is made clear in the data that show that similar strategies are selected to repair the clusters. Further, the higher frequency of secondary clustering observed in the data from the children who master primary clusters shows that the mastery of the prosodic structure onto which the primary clusters are mapped is a prerequisite for the building of the prosodic structure required for the secondary clusters. The intimate link between schwa stability and faithfulness to the syllable count is made clear in the data that show that the non-final schwa syllable is highly frequently assigned prominence. Further, schwa presence as a means for syllable preservation as opposed to cluster avoidance is revealed in the fact that C_1 or C_2 is occasionally absent in the data from the phonologically less proficient children. Additionally, we observe in the data from these children that they prefer to produce a non-target-like vowel quality over omitting the complex [œ]-sound, which shows that faithfulness to the syllable takes precedence over segmental faithfulness. In the older children, who have some mastery of secondary clustering, we observe a series of marginal output structures that consist of phonetically reduced vowels, syllabic sonorants, and inter-consonantal pauses. This finding suggests that syllabic faithfulness can be fulfilled independently of the full phonetic schwa vowel. Finally, the categorical stability of other non-prominent vowels establishes that the occasional absence of schwa does not reflect a general ban on weak syllables; at an early stage the child identifies the schwa syllable as the one that is subject to deletion.

8.2 Schwa and developmental path: model

In Section 7.2.2, we propose a developmental path for acquiring schwa alternation, repeated in Figure 8.1. In what follows, we test the various hypothetical steps in light of the data presented throughout the thesis. The discussion of the data takes into account previous works that are relevant to the discussion on the acquisition of schwa and phonological variables, as well as previous works on schwa behaviour in adult speech that are relevant to the present case. Collectively, the data and the literature may shed light on the phonological status of schwa and the intra-grammatical and extra-grammatical forces that visibly operate on schwa throughout acquisition.

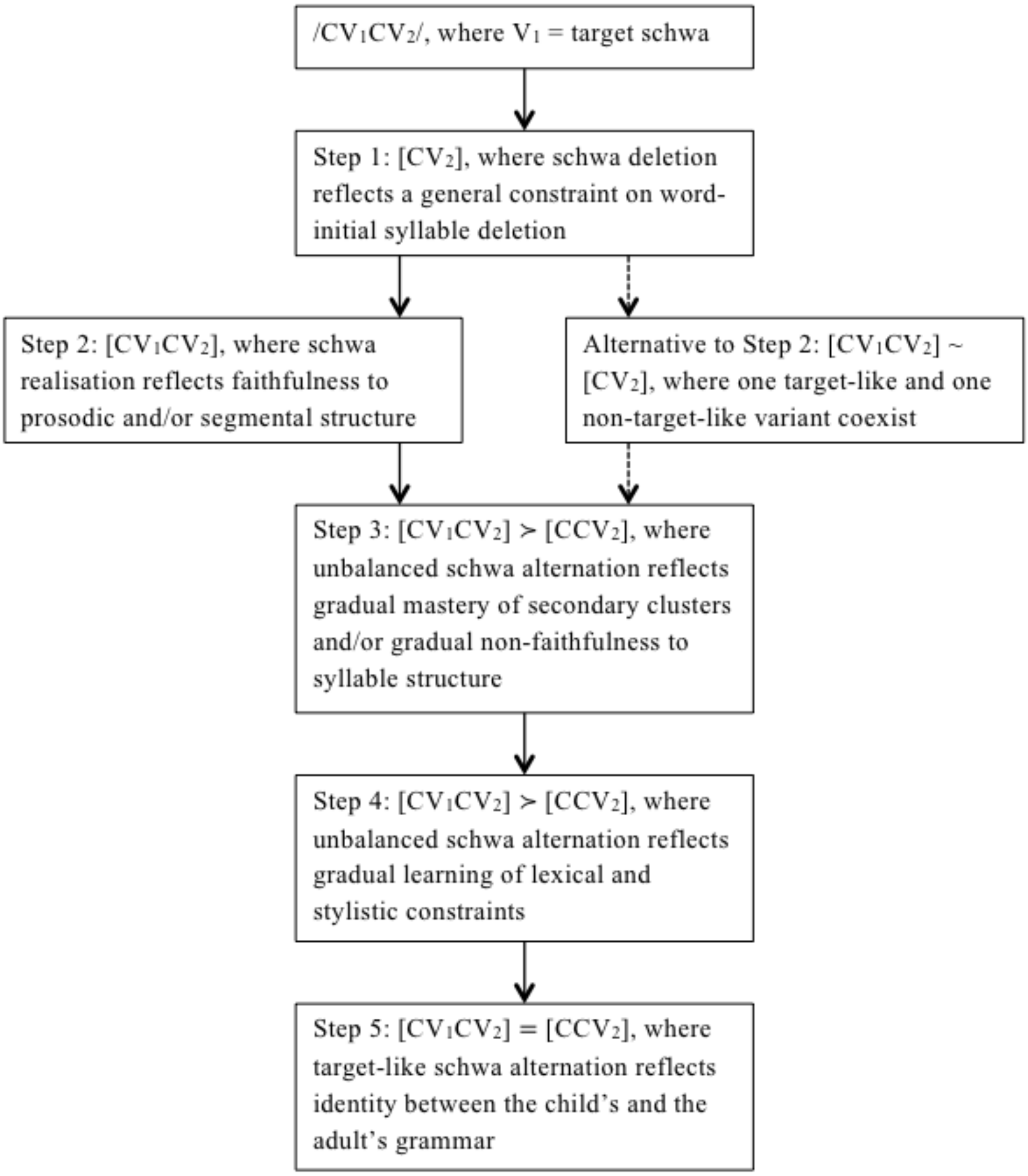

Figure 8.1: Hypothetical steps on the developmental path toward target schwa alternation, repeated from Figure 7.1

Step 1 /CV_1CV_2/ → [CV_2]

Placed in a non-prominent position in the prosodic structure, we expect the word-initial syllables to be subject to a deletion constraint that yields the cross-linguistically preferred child output CV (cf. Jakobson 1968, Ingram 1978, Fikkert 1994), regardless of type of vowel, i.e schwa or other. However, previous work has shown that children acquiring French preserve prosodically weak syllables in disyllables from the beginning; for instance, see the data from Clara presented by Goad and Buckley (2006). Although our child language corpus does not include children as young as Clara, who was recorded between the ages of 1;00.28 and 1;10.10, the data we have collected further support this finding. Target stable vowels in the non-prominent position are realised by our least advanced informants. On the other hand, in some cases schwa syllables are subject to full absence in the output, which suggests that underlying schwa is singled out as a vowel that is subject to deletion. Because the presence of schwa yields an optimal CVCV structure, and as such should *not* be disfavoured as output in the early stages, the observed weakness of the vowel must be related to the segment itself and its phonological representation. Recall that in the one-category approach, schwa represents the featurally specified /œ/; thus, *a priori*, it is as capable as the other vowels of surfacing as the head of a syllable. In the two-category approach, on the other hand, where schwa's phonological representation is characterised by minimal specification, schwa's presence in the output requires the insertion of vocalic features. An alternative to insert vocalic features is to delete the deviant segment altogether, and thereby, avoid violation of the DEP-constraint, which penalises inserted material. Deletion has been reported in the early phase of acquisition of schwa in German, e.g. *Socke* 'sock' [ˈzɔkə] → [dak], data from Marion (1;07.01). Note that all German examples in these paragraphs are taken from Kehoe and Lléo (2003).

The analysis that we propose is challenged by the fact that absence of the schwa syllable only occurs in some schwa-items. Nevertheless, the data from German show that there are two output options for schwa, deletion or reduplication of the stressed syllable; the latter option is greatly favoured, e.g. *Jacke* 'jacket' [ˈjakə] → [ˈjaja] (Marion 1;06.07). In a later phase of acquisition, deletion is no longer an option in German child language, and schwa is replaced by a non-reduplicated, full vowel, e.g. *Tasche* 'bag' [ˈtaʃə] → [ˈtasæː] (Thomas 1;09.00). For our analysis, under a two-category approach with schwa in the linguistic representation, these observations from German suggest that French schwa surfaces as a stable vowel, recognising some idiosyncratic exceptions. Before we decide on this analysis, note that the lexeme-specific behaviour could be explained in an alternative analysis whereby the schwa syllable is absent from their underlying form. Subject to frequent alternation in the ambient language, which reduces the acoustic salience of C_1 (Côté 2000), it is possible that the child in some lexical cases fails to perceive the non-prominent schwa syllable and stores a reduced shape, without schwa and C_1. This alternative analysis with some items being stored without schwa supports our idea of an economic vowel inventory; if schwa, when it is stored, is stored as /œ/ in the underlying representation, all vowels in the linguistic representation, with featural specification, surface in the output.

	In the output	**Shape**	**In the grammar (informal)**	**In the input**
Pattern	General faithfulness to σ̆1	[(C)V(C)V]	*CC >> Faith σ̆1 >> *Schwa	I /C∅CV/
				II /CœCV/
Exception	Deletion of σ̆1 in some schwa-items	[(C)V]	I *CC >> *Schwa >> Faith σ̆1	I /C∅CV/
			II *CC ; Faith σ̆1 >> *Schwa	II /CV/

Table 8.1: Summary Step 1

Step 2 /CV_1CV_2/ → [CV_1CV_2]

Whereas in German child language schwa is replaced by a full vowel in order to project a syllable nucleus (Kehoe & Lléo 2003), in Dutch child language schwa is replaced by a full vowel in order to provide support to phonetic phrase-final lengthening (C. Levelt 2008). Further, in English, qualitative and quantitative reduction of vowels in non-prominent positions has been shown to be problematic for children. While Allen and Hawkins (1980) observe that children, ages 2;02-3;09, frequently use peripheral vowels instead of the central schwa, Yuen et al. (2012) compare schwa and full vowels in adults and children, ages 2;00-2;04, and observe that children do not master target-like temporal reduction of schwa. One aspect in which French differs from these three Germanic languages is that the target vowel quality of schwa in French is [œ] or zero, not [ə]. However, all four target languages are similar in that the output quality of the vowel, whether it is faithful production of underlying /ə/, as in German and Dutch, centralisation of an underlyingly peripheral vowel, as in English, or reduction to zero, as in French, is intimately linked to the prosodic properties of the syllable. While in French adult speech schwa is prosodically non-prominent by default, in French child language we have seen that the deletion of schwa is hindered. One plausible explanation for this observataion is that word-initial syllables often receive prominence in child language. Also, previous work has shown that the target non-prominent syllable plays an important role for phonological organisation; the phonetic vowel may be absent all while the syllabic node to which it is associated is retained in the syllable structure (A. Carter & Gerken 2004).

In this work, faithfulness to the word-initial syllable is reflected by the high rate of schwa presence, which, again, is frequently accompanied by high pitch with a subsequent fall. Allen (1983) reports this intonational contour for French child language and claims that it reflects a universal production constraint. In Swiss French adult language, on the other hand, high pitch on non-final syllables is an acoustic correlate to optional non-final prominence (Avanzi et al. 2012); thus a non-final high pitch is present as grammatical, and non-emphatic, in the children's input. If there is a relationship between the word-initial prominence and schwa presence in the child's output, it does not reflect a relationship that is present in the target language; optional non-final prominence does not seem to increase the rate of schwa presence in adult speech. In fact, Swiss French speakers have shown to more readily accept the schwa-less variant than Hexagonal French speakers (Racine 2008), who, let us recall, do not display optional non-final prominence to the same extent as the former. The child language data we have examined in this thesis show that the intonational contour is strong but less stable in the most advanced children compared to the less advanced children, which reveals that the word-initial syllable is gradually de-emphasised, and, thereby, suggests that their prosodic organisation is more in line with the ambient language. The stability of the schwa syllable for prosodic and phonological organisation is further revealed in the data from the children without full mastery of consonantal distribution; the presence of schwa combined with the occasional absence of one or both surrounding consonants suggests that schwa presence, at least in a certain phase of acquisition, reflects syllable faithfulness rather than secondary cluster avoidance. This finding rejects the epenthesis approach to schwa alternation, which is based on the idea that the sole reason for schwa to surface is to avoid certain consonant clusters. Additionally, faithfulness to the syllable takes precedence over adult-like vowel quality in the data from the phonologically less advanced children; schwa may surface as non-target-like, via either centralisation or assimilation with the neighbouring segments. While the stable presence of schwa is consistent with the one-category approach, the absence of data for non-prominent stable [œ] unfortunately prevents us from determining whether the qualitative instability of schwa reflects a categorical property, which would suggest the two-category approach, or a positional property, which would suggest the one-category approach.

This second step reveals two types of exceptions. First, as in Step 1, there is a preference for schwa absence in some items. Second, weakly attested in Step 1, thus not commented upon earlier, children have two forms available, one with schwa and one without, for two highly frequent schwa-items; *petit* ‘small’ and *regarder* ‘look;INF’. These findings are challenging as they necessitate different phonological analyses for various schwa-items. Although the mere presence of schwa in the linguistic representation of *petit* and *regarder* is univocal, it may be the case that the child, having not yet acquired the target alternation between two phonologically similar forms, stores two different versions for these highly frequent words, i.e. one underlying form with schwa and one underlying form without schwa. This analysis is in line with Racine (2008) and Bürki et al. (2010), who claim that schwa-items in general are represented by two underlying forms in the target grammar; their relative strength in the output varies according to usage in the input. The analysis whereby children have two underlying forms for given items is also in line with the one-category approach; the underlying /œ/ is not deleted in this stage that requires syllable faithfulness.

<table>
<tr><th></th><th>In the output</th><th>Shape</th><th>In the grammar (informal)</th><th>In the input</th></tr>
<tr><td rowspan="2">Pattern</td><td rowspan="2">Faithfulness to the schwa syllable</td><td rowspan="2">[(C)V(C)V]</td><td rowspan="2">*CC >> Faith σ̆1 >> *Schwa</td><td>I /C∅CV/</td></tr>
<tr><td>II /CœCV/</td></tr>
<tr><td rowspan="2">Exception</td><td rowspan="2">Deletion of the schwa syllable in some items</td><td rowspan="2">[(C)V]</td><td>I *CC >> *Schwa >> Faith σ̆1</td><td>I /C∅CV/</td></tr>
<tr><td>II *CC ; Faith σ̆1 >> *Schwa</td><td>II /CV/</td></tr>
<tr><td rowspan="2">Exception</td><td rowspan="2">Alternation in highly frequent schwa-items</td><td>[(C)V(C)V]
[(C)V]</td><td>I *CC >> Faith σ̆1 >> *Schwa
II *CC ; Faith σ̆1 >> *Schwa</td><td>I /C∅CV/
I /CV/</td></tr>
<tr><td>[(C)V(C)V]
[(C)V]</td><td>I *CC >> Faith σ̆1 >> *Schwa
II *CC ; Faith σ̆1 >> *Schwa</td><td>II /CœCV/
II /CV/</td></tr>
</table>

Table 8.2: Summary Step 2

Step 3 $/CV_1CV_2/ \rightarrow [CV_1CV_2] \succ [CCV_2]$

Although the importance of the non-prominent syllable gradually reduces, another obstacle to schwa deletion is secondary clustering. Cross-linguistically, branching onsets in child language are subject to repair strategies like deletion, substitution, and epenthesis (cf. Fikkert 1994, Rose 2000, Gnanadesikan 2004, Kehoe et al. 2008). Further, as regards primary ObsLiq-clusters vs. [s]+C-clusters, Fikkert (2010) observes that for Dutch the most common acquisition path is for the child to master ObsLiq-clusters before [s]+C-clusters, although both orders of acquisition are attested. Different accounts of the structure behind secondary clustering are put forth in the literature. While Rialland (1994) proposes the first element of both secondary clusters and primary [s]+C-clusters are attached to the prosodic word, Côté (2000, 2008) rejects extrasyllabicity because it fails to explain why the rate of schwa alternation varies across different segmental contexts; under this view, schwa behaviour is motivated by the relative perceptual salience of the surrounding consonants. While a perceptual account may best account for the child language data, in particular the items with deletion of the schwa syllable attested in Steps 1 and 2, we set aside this debate in the present work. Regardless, the child language data reveal a close connection between the development of primary and secondary clusters. Primary ObsLiq-clusters are initially reduced to the obstruent, and in this stage, secondary clusters are more or less completely blocked. Later, when target primary ObsLiq-clusters surface as a two-element unit, segmentally modified or not, secondary clusters gradually become available. Importantly, however, the schwa-less variant is almost never attempted in spontaneous speech, except in some very rare cases in which a schwa-less variant is categorically selected, with a two-element secondary cluster produced with segmental modifications. In these rare cases, the phonological reality of schwa is hard to assess, but the approach that best accounts for the totality of the data is one in which these given items are not stored with schwa, but with a cluster. Further, for the schwa-items that initially surface with schwa, when the schwa-less variant is encouraged in production, the secondary cluster is modified in accordance with the child's current mastery of onset complexity. Once primary ObsLiq-clusters are in place, secondary clusters start to emerge as target-like in spontaneous speech.

Therefore, in this third step, onset complexity thus emerges and initiates the gradual availability of the schwa-less variant, which is faithful to the number of underlying consonants, and which stands in competition with the far more preferred variant with schwa. If we assume that syllable faithfulness still prevails in the child grammar, then the variant with schwa is less costly than the variant without schwa because the latter requires vowel deletion and cluster repair. Also, the occasional schwa-less variant, triggered by the input, shows that the child's sensitivity to schwa variation in the input starts to emerge at this stage.

	In the output	Shape	In the grammar (informal)	In the input
Pattern	Faithfulness to the schwa syllable	[(C)V(C)V]	Max-C >> *CC-spec >> Faith ǒ1 >> *Schwa >> Ident-C-spec	I /C∅CV/
	Emerging primary onset complexity			II /CœCV/
Exception	Deletion of the schwa syllable in some items	[(C)V]	I *CC-spec >> Max-C >> *Schwa >> Faith ǒ1 >> Ident-C-spec	I /C∅CV/
			II Max-C >> *CC-spec ; Faith ǒ1 >> *Schwa >> Ident-C-spec	II /CV/
Exception	Alternation in highly frequent schwa-items	[(C)V(C)V] [(C)V]	I Max-C >> *CC-spec >> Faith ǒ1 >> *Schwa >> Ident-C-spec II Max-C >> *CC-spec ; Faith ǒ1 >> *Schwa >> Ident-C-spec	I /C∅CV/ II /CV/
		[(C)V(C)V] [(C)V]	I Max-C >> *CC-spec >> Faith ǒ1 >> *Schwa >> Ident-C-spec II Max-C >> *CC-spec ; Faith ǒ1 >> *Schwa >> Ident-C-spec	I /CœCV/ II /CV/
Exception	Emergence of modified secondary cluster; spontaneous or triggered by input	[(C)(C)V]	I Max-C >> *Schwa >> Faith ǒ1 >> *CC-spec >> Ident-C-spec	I /C∅CV/
			II Max-C >> Faith ǒ1 >>*Schwa >> Ident-C >> *CC-spec	II /CCV/

Table 8.3: Summary Step 3

Step 4 /CV_1CV_2/ $\rightarrow$ [CV_1CV_2] $\succ$ [CCV_2]

Once syllable faithfulness is less dominant and onset complexity is in place, the child is linguistically equipped to learn the rate of schwa alternation for the various items. This learning process is dependent on the frequency of use of the variants in the child's linguistic community. According to Racine (2008), the Swiss French linguistic community favours schwa absence to a very large extent in the post-vocalic position. However, if the child pays most attention to child-directed speech, he receives a skewed distribution of the variants; the caregivers realise schwa more frequently than what is observed in inter-adult speech. The stability of schwa in the children's output, which in the majority of cases is still preferred for prosodic and segmental reasons, is thus reinforced by the highly frequent presence of schwa in their input. We leave the discussion of what motivates the caregiver's choice to a more sosiolinguistically-oriented work, and, instead, we confine ourselves to suggest some directions for future research. First, the discrepancy between the rate of schwa alternation in CDS and in inter-adult speech could be accounted for by the caregiver's desire for phonological clarity in the speech she addresses to her child, despite the fact that, as we have seen, the higher presence of schwa actually confuses the distinction between schwa and stable [œ]. Second, the higher rate of schwa presence could be accounted for as a reflection of the suppression of schwa absence as a regional, and perhaps stigmatised, feature in more formal contexts. This analysis is be consistent with the finding in J.

Smith et al. (2007), whereby the female caregivers prefer the “standard” variant in their child-directed speech in the teaching or discipline contexts. This analysis is also in line with the general observation that women tend to use more standard forms than men (cf. Coates 2004, and references cited therein). In this regard, recall from Section 2.4 the sociolinguistic study by Singy (1996), which shows that Vaudois women display stronger socio-spatial class reactions than men. Thus, the higher presence of schwa in our recordings may be yet another example of the Vaudois women materialising their feeling of linguistic insecurity through their sociolinguistic behaviour.

Returning to the discussion of the developmental path toward target schwa alternation, the data reveal an interplay between intra-grammatical and extra-grammatical constraints. The data from the phonologically most advanced children, who master primary consonant clustering, display target schwa alternation to a certain degree, although rate of alternation depends on the nature of the secondary cluster. While secondary clusters with increasing sonority are faithfully produced, clusters with initial [ʁ], subject to frequent deletion in both CDS and inter-adult speech, are present although disfavoured by the children. This finding suggests that learning the rates of schwa alternation is impeded by phonotactic constraints. Also, faithfulness to the syllable is still visibly active at this stage; the full schwa vowel alternates with output structures where the phonetic vowel is absent but the phonological syllable is retained. These marginal output structures, where other material than a full vowel fills the syllable nucleus, come in the form of a reduced schwa, a syllabic sonorant, and, less conclusive, an inter-consonantal pause.

The acquisition of stylistic constraints does not receive any particular focus in this thesis. It is, nevertheless, tempting to suggest that the schwa-items that are categorically produced without schwa by both children and adults are restructured in the child’s grammar on the basis of stylistic constraints in the input. Recall that the two verbal roots <ser> and <fer>, both with a secondary cluster with increasing sonority, are produced without schwa by the caregivers. The one occurrence of schwa presence is attested in a discipline context. The child language data are in line with the caregivers’ data in that schwa is categorically absent. Therefore, it is plausible to assume that the schwa-item is restructured with schwa underlyingly once the child develops a sensitivity toward stylistically defined variation. A third verbal form, the verbal root <fais>, challenges this analysis; it is attested with schwa near-categorically absent in the data from the adults, while it is attested with schwa categorically present in the data from the phonologically more advanced children.

Thus, in this fourth step, the structural properties are in place for target schwa alternation to take place. Syllable deletion and consonant sequencing are generally still avoided, at least in schwa-items in which the sonority profile of the secondary cluster is not optimal.

	In the output	Shape	In the grammar (informal)	In the input
Pattern	Faithfulness to the schwa syllable	[CVCV] ~ [CCV]	Max-C ; Ident-C >> *CC ; *Schwa	I /C∅CV/ II /CœCV/
	Emerging schwa alternation			
	Primary onset complexity			
	Secondary onset complexity			
Exception	Schwa presence to avoid CC with decreasing sonority	[CVCV]	Max-C ; Ident >> *CC-spec >> *Schwa	I /C∅CV/ II /CœCV/
Exception	Secondary cluster with presence of schwa syllable; triggered	[C(nuc)CV]	Max ; Ident >> *CC >> *Schwa >> *Empty-NUC	I /C∅CV/ II /CœCV/

Table 8.4: Summary Step 4

Step 5 /CV$_1$CV$_2$/ → [CV$_1$CV$_2$] = [CCV$_2$]

In a fifth step on the developmental path, we hypothesise that the child masters schwa alternation. None of the children examined in this study have reached this stage. Nevertheless, the overall developmental path reviewed in this section is consistent with the finding in Liégeois et al. (2012), who observe an increase in deletion of schwa in monosyllables as the child grows older.

8.3 Concluding remarks

The phonological status of French schwa has been a challenge to scholars for decades, and the inclusion of child language data makes the picture even more complex. While children to some extent follow the distribution of schwa in the ambient language, there are several child-specific processes that indicate a different categorisation and treatment of schwa in the early phases of language acquisition. The epenthesis approach to schwa has been rejected. The one-category approach, on the other hand, receives empirical support by the fact that target schwa does not alternate in early child language. Recall that alternation is the sole factor that separates schwa from stable [œ]. Additionally, the counter-evidence to the one-category approach, which we have extensively reviewed in this thesis, is nearly non-existent in child language. The majority of items that have a non-alternating [œ] within a structure [CœC(C)V …] are not part of the child's vocabulary. However, the one-category approach is challenged by the fact that only schwa-items are subject to CV deletion, and this at a stage where syllable faithfulness is predominant. Additionally, the quality of the schwa vowel in the younger children is non-target-like. These findings are, at first glance, in line with the two-category approach, whereby schwa forms a separate, featurally reduced vowel category. The occasional schwa absence, which is idiosyncratically restricted to specific items, may, nevertheless, reflect the storage of a reduced form, without schwa. As for the non-target-like quality of schwa, which reflects a maximally economic solution, i.e. assimilation to context, the lack of data on non-alternating [œ] in the non-prominent position prevents us from assessing the driving force behind the modification of vowel quality.

Theoretically, the one-category approach best accounts for the data currently at hand. Alternation between [œ] and zero gradually spreads across the lexicon, and is primarily restricted by intra-grammatical constraints on syllable deletion and consonant sequencing. Notwithstanding, lexical frequency and the frequency of variants in the linguistic community need to be factored into the analysis; highly frequent lexical items are the first items for which the child produces both variants. Other lexical items, counter to expectation, are categorically realised without schwa. These findings suggest that a complete understanding of the acquisition of schwa, a phenomenon that is fully regulated by structural requirements in the course of acquisition, nevertheless, needs to include a wide array of intra- and extra-grammatical factors.

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This thesis has discussed the acquisition of schwa from a variety of angles. Being the first comprehensive study on the subject, there are a large number of questions to be answered in future research. We present some of these questions in the epilogue in Chapter 9.

9. Epilogue: future research on schwa in child language

Petit cheval
[pi̱ti fɔvaj]

Henri (2;04.01) during the PowerPoint test

9.1 Introduction

The study of the acquisition of phonological variables is challenged by the amount of variation in child speech, and one major task for any such study is to disentangle conditioned variation from developmental variation. This concern is well-founded given the fact that "features are variable when they first enter a child's linguistic repertoire" (Roberts 2005:159). Attempts to solve this puzzle directly contribute to the debate on competence vs. performance whose goal is to determine which elements of the child's output reflect grammar and which elements reflect cognitive and articulatory constraints.

It is our belief that any formal analysis of schwa alternation in child language requires data that shed light on the phenomenon from a variety of angles, which jointly determine when schwa alternation is grammatical and no longer developmental. The child language data examined in this thesis exhibit a very low amount of intra-speaker variation in schwa-items, which leads us to claim that in the rare cases of alternation, in some cases spontaneous but in most cases provoked, variation is grammatical, and not developmental. This thesis is a starting point for the future development of a sampling strategy that should yield data that allow an elaboration of the current analysis as well as the study of other aspects of schwa alternation.

In this chapter, we present some of our thoughts on future research.

9.2 Intra-grammatical constraints

This thesis primarily focuses on intra-grammatical constraints that bear on the segmental and syllabic structure of the schwa-item. To further develop this analysis, future research first must construct a data set in which the entirety of secondary clusters are represented, for at least two reasons; one, to identify the developing behaviour of schwa in the various phonotactic contexts, and two, to identify the development of the different secondary clusters themselves. Also, in order to capture and understand the diffusion of schwa alternation in the lexicon, a future data set must contain multiple schwa-items for each given secondary cluster. This data set will indicate whether the explanation behind diffusion of schwa alternation in the lexicon resides in current phonotactic knowledge, or whether the explanation must be sought in the frequency of variants in the child-directed speech (CDS) and in the linguistic community in general. Second, future research must construct a data set that contains the marginal output structures, i.e. reduced schwa, syllabic sonorant, and inter-consonantal pause. In this thesis, we propose these marginal structures represent a phonological schwa syllable that alternates with a schwa syllable associated with a full vowel. However, this analysis remains inconclusive, thus, future research must test the validity of our claim; it is our belief that an initial step in the right direction is to contrast the syllabic analysis with the phonetic analysis in which the three output structures are the result of phonetic implementation of a secondary cluster. Current research on adult phonology emphasises the necessity of establishing criteria for schwa presence vs. absence, on the basis of phonological theory and narrow phonetic analysis (cf. Bürki et al., 2011), and we consider child language data, which show the gradual development of vowel reduction and consonant sequencing, to be a valuable contribution to this research goal.

Additionally, future research needs to look beyond the segmental and syllabic structure of the schwa-item. For example, one such phenomenon to study is the variable behaviour of schwa in light of its preceding context. The development of the phonotactic constraint that requires greater schwa presence in the post-pausal and post-consonantal contexts as opposed to the post-vocalic context, is interesting to look at for at least three reasons; one, developmental data will indicate at which point in development this phonotactic constraint is activated; its activation may co-occur or follow the development of secondary clusters. Two, these data will indicate the relative strength of a syllabic approach or a perceptual approach to schwa alternation, which are defended by Rialland (1994) and Côté (2000), respectively. Three, the examination of schwa alternation in light of preceding context will indicate in what direction C_1 is resyllabified in the case of schwa absence in a post-vocalic context. Racine and Grosjean (2000) show, by means of a production test and an acceptability judgement test, that direction of resyllabification depends on the nature of the consonant; some consonants, like the sonorants [l, ʁ, n], are resyllabified to the left, other consonants, like the plosives [p, b], are resyllabified to the right, while other consonants again, like the sibilants [s, ʃ, ʒ], can be resyllabified in both directions. In this regard, we mention a study by Stemberger (1988); he analyses his English-learning daughter's speech and observes that at the earliest stages of speech production, she does not resyllabify the word-final consonant into the onset position of the vowel-initial following word; instead, she maintains the word boundary and inserts a glottal stop in the onset position. This observation combined with the observation that child phonology, in general, and adult French phonology, in particular, are characterised by a preference for open syllables, leads to the assumption that, in the case of resyllabification of a word-initial consonant, leftward resyllabification is acquired later than rightward resyllabification. For schwa behaviour, this assumption leads to the hypothesis that in contrast to secondary clusters with a plosive or a sibilant C_1, secondary clusters with a sonorant C_1 are produced with schwa presence for a longer period of time. In addition to this sonority-driven hypothesis on schwa alternation, there are at least two additional hypotheses that should be tested; first, schwa absence and faithfulness to the word boundary could co-occur if the secondary cluster is modified to be a grammatical onset; second, schwa absence and faithfulness to the word boundary could co-occur if the formal schwa syllable is not deleted, but is realised without a full vowel.

A second phenomenon to study is the relationship between schwa behaviour and supra-segmental prominence. This thesis presents results in which schwa stability and non-final prominence are simultaneously present; future research must determine whether the phonological and prosodic levels of analysis are inter-dependent when it comes to schwa alternation, or whether schwa alternation develops independently of the prosodic structure. To determine the nature of the potential relationship, first, acoustic correlates of prominence in French, i.e. pitch and vowel length, should be measured in child language data; second, schwa behaviour in these data should be analysed in light of the acoustic characteristics. A relationship between the phonological and prosodic systems will be apparent if there is a simultaneous decrease in schwa presence and non-final prominence. Different approaches to the relationship between schwa and prominence are taken in the literature. For example, Lacheret and Lyche

(2011) claim that schwa in the initial syllable cannot be prominent in a similar fashion to the other vowels; schwa is either present, but non-prominent, in which case it is the vowel itself that indicates the word boundary, or schwa is absent, in which case it is the remaining initial syllable that receives non-final prominence and thus, indicates the word boundary. A forthcoming grid-based approach to schwa and prominence is presented by Andreassen and Eychenne (in press). They analyse schwa as a defective segment, which is translated in the output as its inability to receive a stress mark at the L1 level; in a constituency-based approach this corresponds to the level of the foot. The effect of the prosodic weakness of schwa on L1 is that it is unable to receive a stress mark at the level of the word, L2. Taking into account potential child-specific prosodic features, e.g. the word-final high pitch with a subsequent fall observed by Allen (1983), future research should test the strength of the alternative prosodic approaches to schwa in light of prosody in child language data.

The prominence assigned to the schwa syllable leads to an increase in duration, which in turn allows the vowel to reach a vocalic target, as opposed to the more or less reduced schwas in adult language. In this thesis, we have not performed an acoustic analysis of schwa in child language because the main objective is to examine the phonological behaviour of schwa, not the corresponding phonetic vowel. However, the assumed phonetic identity with stable [œ], which we extensively discuss and also test in the adult experimental data, must be addressed in future research on child language for at least two reasons. First, while the data in this thesis show that schwa is produced in a non-target-like manner by the youngest children, it remains to be firmly established which vowels are selected as the output of schwa and in which consonantal and vocalic environment the various non-target-like-vowels are selected. Second, this thesis suffers from a lack of child language data on non-prominent stable [œ]. Since /œ/ is the last vowel category to be acquired, an understanding of schwa's output quality requires an acoustic analysis that compares tokens of schwa and stable [œ]; this analysis will determine whether schwa qualitatively develops in tandem with [œ], or whether it develops in an independent fashion. This again, should provide information on the categorisation of schwa and stable [œ]. The current data set contains some instances of the stable vowels [œ] and [ø] in the final prominent position that show absence of rounding. However, research shows that faithfulness to the non-prominent syllable is acquired later than faithfulness to the prominent syllable (Rose 2000), and further, that production of target-like vowel quality in non-prominent syllables is a challenge for children (cf. Davis & MacNeilage, 1990, on English-learning children). Taking these findings into account, we cannot consider the quality of [œ] and [ø] observed in the prominent position to be the same as the currently selected quality of the stable vowel in the non-prominent position.

In order to carry out future research on schwa behaviour in light of phonological constraints and their interaction with prosody and phonetics, a methodological approach must be developed in which data control and corpus balance are given more priority than they are in this work. First, concerning phonological constraints, in order to capture schwa behaviour across various phonotactic contexts as well as across various schwa-items with similar phonotactic structure, it is our belief that a combined sampling strategy is the optimal methodology. A controlled production test, in which a selective number of children at various stages in phonological development are encouraged to produce schwa-items without any auditory stimulus, should provide information about the child's preferred variant of the schwa-item, with or without schwa, as well as the nature of the output consonants, i.e. target-like, reduced, or modified. This test could be complemented by a test that targets nonce words, for which the children have no input frequencies of variants. The use of nonce words in this thesis has proven to be a rather successful methodological strategy; however, future research should strive to improve the procedure for controlling the data. For instance, future research should look at how children react to nonce words with schwa alternation that are initially introduced using the schwa-less variant; how they react to nonce words with schwa presence only or with schwa absence only; and how they react to nonce words with alternation of other vowels. On the basis of the results from the production test(s), an in-depth study of a selective number of children, recorded at home, in a variety of settings and without a researcher present (cf. the sampling strategy used by J. Smith et al., 2007, 2009), should provide information about the types and variants of schwa-items that the child uses in his spontaneous speech. This sampling strategy could also allow for the analysis of resyllabification, although this analysis requires high quality data in order to determine syllabification patterns. Finally, note that production data elicited in controlled and spontaneous settings could be complemented by judgement data from an experiment in which the child judges the relative grammaticality of the two variants; see Racine et al. (accepted for publication) for an example of a procedure used to test children ages 5 years and older.

Regarding future research on schwa and prosody, we suggest an expanded data set that comprises schwa-items within carrier sentences. The semi-controlled data presented in this thesis reveal a large number of isolated schwa-items, which may conceal the prominence patterns used in spontaneous speech. The elicitation of schwa-items in controlled, larger phrases should simultaneously provide approximately default intonational contours as well as high quality data, which a prosodic analysis requires. High quality data are also preponderant in a study on the quality of schwa vs. stable [œ] in non-prominent and prominent positions, which we propose should be carried out in a strictly controlled setting; given the observation in adult language that schwa as well as [œ] and [ø] are subject to coarticulation effects (Fougeron et al. 2007), the consonantal environment of the vowel must be controlled for. In this regard, we repeat that the nature of C_1 and C_2 surrounding schwa is subject to intra-speaker and inter-speaker variation in our child language data. Further, both a study on schwa and prosody and a study on the quality of schwa must take into account the fact that child speech is different from adult speech; not only is it characterised by higher pitch and higher formant frequencies, it is also influenced by the rapid anatomical and physiological changes that the child goes through as he grows older (cf. Lee et al. 1999, Gerosa et al. 2006)

A final project for future research on intra-grammatical constraints on schwa acquisition concerns monosyllables. There are several differences between schwa in the initial syllable of polysyllables and schwa in monosyllables that need to be taken into account; for instance, the late acquisition of functional material implies that there is a period in phonological development in which lexical schwa-items are present where functional schwa-items are not. Also, in contrast to schwa in polysyllables, schwa in monosyllables is never assigned prosodic prominence. During data treatment in this work, we have extracted and classified monosyllabic forms present in the children's speech, but we have not performed any analysis of these forms; however, the data seem promising, even though they require a consideration of the aspects of acquisition that are related to morpho-syntactic information as well as filler strategies.

9.3 Extra-grammatical constraints

This thesis primarily focuses on extra-linguistic constraints that bear on the behaviour of schwa in CDS. To further develop this analysis, future research must construct a data set with three sub-components. First, representative CDS data must contain a wider array of schwa-items, more schwa-items per phonotactic context, and be collected in a broader range of situational contexts than what is presented in this thesis. Also, the CDS data must be collected from mothers who represent a socio-economically balanced sample, and whose children are at different levels in phonological development. For instance, in this thesis the CDS data do not include mothers of children in age group 1. Second, the CDS data must be complemented by inter-adult data from the same set of mothers. The comparison of the CDS data and the inter-adult PFC data in this thesis indicates that schwa presence is stronger in CDS than in inter-adult speech. However, as schwa alternation is well-known to be subject to idiosyncratic variation (cf. Bazylko 1976), it is our belief that data collection from two different registers within the same group of speakers would yield a more reliable picture of register-specific schwa alternation in CDS (cf. Parsons 2000). Third, it would be interesting to include data from the fathers' speech into the CDS data set in order to see whether schwa alternation in their CDS is more in line with schwa alternation used in the linguistic community. Collectively, these three sub-components would allow for a controlled analysis of the characteristics of schwa alternation in CDS. In addition to the linguistically and situationally defined distribution of schwa, of which we present a first analysis in this thesis, future research should focus on the characteristics of schwa alternation in CDS that potentially change as the child grows older. In turn, this would be valuable to a future discussion on the relationship between CDS and child language that explores whether rates of schwa alternation in CDS are reflected in child language. The sociolinguistic work by Liégeois et al. (2012) on schwa alteration in monosyllables heads in this direction, and building on their finding, we propose to extend their analysis by factoring in linguistic variables. If there is a relationship between schwa alternation in CDS and child language, it is important to determine at which point in phonological development it emerges, i.e. at which point in mastery of consonant sequencing and syllable reduction the child becomes overtly sensitive to variation in the input. Thereafter, one should extend the analysis to include the acquisition of stylistic constraints, whereby the child must learn the distribution of variants according to situational context.

Also, a thorough investigation of schwa alternation in CDS would contribute to the debate on the role of CDS for language acquisition. This thesis mentions that the more important level of schwa presence in CDS blurs the distinction between schwa and stable /œ/, which in our view impedes the categorical split between the two vowels. We consider that this issue merits further discussion in future research.

Another issue of importance is lexical frequency and the frequency of variants in the input. The data presented in this thesis show that two variants of a schwa-item, which may not be target-like, first become available in highly frequent words, i.e. *petit* 'small' and *regarder* 'look'. This is unsurprising given the observation by Racine and Grosjean (2000) that there is a significant relationship between the lexical frequency and the frequency of schwa absence for a given word. Also, the data presented in this thesis show that some schwa-items are categorically, or near-categorically, produced without schwa. It is our belief that lexical frequency must be factored in to achieve a complete understanding of schwa alternation. A prime example in this regard is the preference for the schwa-less variant of *cheval* 'horse' in the data from Armand, age group 3, which does not pattern with his overall preference for the variant with schwa. One possible explanation for this fact is that Karoline, the mother of Armand, works with horses and thereby she is likely to talk about horses on a daily basis. Schwa absence in this item is high in the linguistic community (cf. Racine 2008), and without evidence to the contrary, we expect that Karoline patterns with the linguistic community in her inter-adult speech. Thus, it is possible that the idiosyncratic behaviour of a schwa-item in Armand's grammar is the direct reflection of the item's high frequency of occurrence in his input.

Traditionally, lexical frequency and frequency of variants have been factored out of generative analyses, while they are of prime importance to works within usage-based theory (cf. Bybee 2001, J. B. Pierrehumbert 2001, 2003, Bybee 2007). Regarding psycholinguistic work on schwa alternation and frequency, see Racine (2008) and Bürki et al. (2010). However, the data in the schwa literature, as well as the data presented in this work, indicate, at the very least, that lexical frequency cannot be ignored. Future research on the acquisition of schwa should pay more attention to the lexical frequency of schwa-items in the child's input and should establish whether there is a relationship between frequency and the emergence of alternating forms. Future research should also pay attention to the child's intake and should test the claim that the child generalises over his own lexicon; Fikkert et al. (2005) examine children acquiring Dutch and English, and show that the child's lexicon is partly defined by frequencies, partly defined by his own production abilities.

A final extra-grammatical factor that we call attention to is literacy skills. Previous and on-going research, e.g. Goudaillier (1985), Racine (2007), and Racine et al. (accepted for publication), show that the mental storage of a schwa-item is subject to change when the orthographic representation of the word is stored. Racine et al. (accepted for publication) show that while frequency of variants is preponderant in pre-readers, 5 years and older, thus, *a priori*, with the phonological constraints in place, the literacy skills acquired by the children modify the impact of the frequency of variants in the spoken input. This thesis only focuses on the phonologically defined behaviour of schwa in pre-readers; however, a complete understanding of the development of schwa alternation needs to include a discussion of whether there is an interaction between orthographic and phonological constraints on schwa alternation, e.g. whether the acquisition of orthography implies a change across the board, or whether phonotactic constraints take precedence over orthographic constraints and exert an influence on the application of the latter.

9.4 Inter-variety analysis

This thesis has focused on Swiss French data collected among children and adults. The observation of diatopic variation regarding the rates of schwa alternation in adult speech, e.g. Martinet (1971), Walter (1982), and Racine (2008), opens for the possibility that the acquisition of schwa alternation is not identical across French varieties. Although we do expect the phonotactic and syllabic constraints in early child language to be similar across varieties, it would be interesting to examine whether there is variation between varieties regarding the default variants of schwa-items as well as the point of emergence of the second variant; we expect there is variation given the differences in frequencies of variants attested by Racine (2008). Also, the inclusion of Southern French data would complete an inter-variety study. In these varieties schwa is stable while displaying characteristics of a prosodically weak vowel.

9.5 Formal analysis

Once data collection comprehensively provides information about schwa alternation, i.e. includes the considerations presented in Sections 9.2 to 9.4, we should have a data set that allows for a more complete formal analysis of the development of schwa alternation. There are three areas of further investigation that are of prime interest. First, the underlying representation of schwa needs further discussion. An analysis of the child's productive lexicon, the rate of schwa alternation, and the similar or dissimilar development of schwa and stable [œ] are each elements that should contribute to this discussion. Also, the development of vowel categories must be subjected to a more formal analysis because the data in this thesis show that the one-category approach to schwa cannot be rejected; if schwa is a separate category, evidence is needed to show the necessity of the categorical split. If the two-category approach best accounts for the data, then a discussion on the formal status on underlying schwa is called for, i.e. a discussion of the nature of its defective status. As already mentioned, the quality of the two types of vowels throughout acquisition must be examined and analysed; a qualitative difference between schwa and non-prominent stable [œ] would indicate a categorical effect and would suggest the two-category approach, whereas a qualitative difference between schwa and non-prominent stable [œ], on the one hand, and prominent stable [œ], on the other, would indicate a positional effect and would suggest the one-category approach.

Second, a theoretical model of schwa alternation must be developed. Two subcomponents should be addressed; one, the nature of the constraints operating on schwa and their interaction in the course of acquisition, and two, the potential modification that may apply to the underlying structure as development progresses. While the two subcomponents are obviously interconnected, previous work tends to focus either on the nature and interaction of constraints, see for instance Pater (2008) on the learning model in the Harmonic Grammar framework, or on the shape, number, and relative strength of underlying forms for a given schwa-item, see for instance Bürki et al. (2010) and Racine et al. (accepted for publication).

In light of the revived focus on phonological gradience (cf. Cohn 2006), a future formal analysis should pay attention to the development of primary and secondary clusters and the relative grammaticality of the latter across different schwa-items. The child language data presented in this thesis have shown that target schwa alternation emerges late, i.e. in the fourth year. The data have also shown a relation between the emerging target-like schwa alternation and the sonority profile of the secondary cluster. These findings indicate that once both variants are available in the child's grammar, their usage is dependent on the nature of the surrounding consonants, which again implies that target-like gradience develops in tandem with schwa alternation.

Third, a formal analysis of schwa must take into account the relationship between the phonological representation and the phonetic representation. In this thesis, we suggest an analysis whereby in some cases the schwa syllable is present, even when a full vowel is absent from the phonetic signal. This suggestion requires a deeper discussion of the phonology-phonetics interface because we propose the phonological representation authorises a mapping with reduced or zero material in the phonetics. Also, our claim that schwa alternation need not be located within the phonology, e.g. the alternation between a full vowel and a syllabic sonorant which both represent the phonological schwa syllable, allows us to relegate the phonological process, i.e. schwa alternation, to the phonetic component. Future research should determine the implications of this proposal for acquisition theory as well as for phonological theory.

9.6 Concluding remarks

In this chapter we have presented some of our thoughts on future research that have emerged throughout the work on this thesis. There remain numerous methodological and theoretical issues that need to be addressed and, by this thesis, we hope to have provided a few elements on which future research might rest. Given the challenges offered by the combination of schwa, phonological variation, and language acquisition, it is our belief that the acquisition of schwa in French will pique the interest of a number of researchers across subspecialities in a near future.

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APPENDIX

Part I

I-1 Letters to kindergartens and parents

- Letter from Helene N. Andreassen to kindergartens, “Participation au projet *L’acquisition du schwa en français*”
- Letter from Professor Chantal Lyche to kindergartens, “A qui de droit”

I-2 Consent forms

- Consent form, children, “Participation au projet *L’acquisition du schwa en français*”
- Consent form, mothers, “Au sujet de votre participation au projet *L’acquisition du schwa en français*”

I-3 Information on family and (socio)linguistic information on caregivers

- Information on siblings and persons communicating with the child on a daily basis, “La famille – les frères et sœurs”
- (Socio)linguistic information on the child’s caregiver(s)

I-4 PowerPoint test, *chevir*-version

Part II

II-1 Consent form production and perception test, “Participation au test *Le système phonologique de l’adulte*”

II-2 Production test adults, “Prononcez ces phrases de la façon qui vous semble la plus naturelle possible (comme si vous le racontiez à quelqu’un)”

II-3 Production test, basis for perception test, “Liste de mots à lire pour les mamans!”

II-4 Query Phon situational context, “Extraction of schwa alternation in CDS in context”

Votre référence: 000 Notre référence: 000 Date:

PARTICIPATION AU PROJET *L'ACQUISITION DU SCHWA EN FRANÇAIS*

Suite à mon appel téléphonique de ce jour, j'aimerais par la présente vous inviter à participer à une enquête dans le cadre du projet Ph.D. *L'acquisition du schwa en français. Variation phonologique dans la grammaire durant l'acquisition de L1*. Le projet, qui a une durée de quatre ans, est financé par l'Université de Tromsø en Norvège. Il est dirigé par Mme le Professeur Chantal Lyche, phonologue, co-initiatrice et co-ordinatrice de *PFC* (Phonologie du Français Contemporain : usages, variétés et structure), un projet de recherche d'envergure internationale, *cf.* www.projet-pfc.net.

L'objectif principal de mon projet est d'examiner un aspect particulier de l'acquisition de la phonologie du français suisse, plus précisément l'acquisition de la voyelle schwa (e caduc). Dans le français de l'adulte, cette voyelle a un comportement très particulier en ce qu'elle est sujette à la variation (présence ou absence dans la chaîne parlée dépendant des facteurs variés). Par exemple, un locuteur peut dans une même situation prononcer *un chemin* et *un ch'min*, avec et sans schwa prononcé, respectivement. Au cours de l'acquisition du langage, la production et la perception de l'enfant sont contraintes par de divers facteurs. Il existe dans la grammaire enfantine des règles qui influencent le comportement du schwa au niveau de la syllabe, du mot, de l'accent et de la qualité vocalique. L'enfant doit également faire face à la variation de présence du schwa dans la langue ambiante.

Afin d'arriver à observer cet aspect particulier de l'acquisition, le recueil de données enfantines est primordial. Ayant séjourné une année à Gland, je connais cette ville et ses environs. J'ai déjà étudié le français suisse dans mon mémoire de DEA. Cependant, comme je ne réside pas dans la région en ce moment, je ne peux avoir accès aux données et je prévois de ce fait un séjour en Suisse afin de suivre le développement linguistique d'enfants. La participation volontaire d'un jardin d'enfants aiderait infiniment l'avancement de mon projet et j'espère que vous pourrez m'aider à mener à bien mon travail de terrain.

L'acquisition de la phonologie est un domaine de recherche qui a pris une très grande ampleur ces dernières années. L'intérêt de mon projet est majeur, en Norvège de même qu'en Europe francophone. M le Professeur Jacques Durand, Directeur de l'ERSS et co-ordinateur de PFC, souligne dans une lettre de recommandation que l'acquisition du schwa est : «... a fascinating and complex area sadly neglected in the specialized literature. » Si vous acceptez de faire partie de ce projet, votre contribution sera fortement approuvée dans les milieux de recherche.

Sur le plan pratique, je vise à mener à bien mon travail de terrain au printemps 2006 (janvier – juin), pendant mon séjour à l'Université de Genève, où le professeur Jacques Moeschler m'accueillera. Je cherche à construire un corpus qui comprend environ douze enfants monolingues. Ils doivent appartenir à des groupes d'âge différents. J'ai choisi de mettre l'accent sur des enfants qui ont deux à trois ans au début de mon travail de terrain (nés entre janvier 2003 et janvier 2004, environ). Il se pourrait que j'aie besoin de deux ou trois enfants plus âgés. Six parmi les douze enfants seront sélectionnés pour une étude détaillée. Cela implique un enregistrement hebdomadaire, préférablement à domicile. L'objectif principal de cette partie du projet est d'enregistrer le langage spontané de l'enfant, ce qui est plus facilement obtenu dans un cadre familier. Tous les douze enfants seront enregistrés une fois par mois sur place (pour des raisons pratiques, cet enregistrement se ferait préférablement dans l'espace du jardin d'enfants). L'objectif de cette deuxième partie du projet est de faire passer quelques tests aux enfants (avec des images, des jouets). Cela a pour but d'extraire les constructions sous investigation d'une manière plus contrôlée. Il est bien entendu que je me chargerai entièrement de tous les tests, et je serai aidée pour ce travail par un assistant que me fourniront les professeurs Jacques Moeschler et Antoine Auchlin.

Si vous êtes intéressés par ce projet, je vous saurais gré de faire parvenir la lettre ci-jointe aux parents des enfants inscrits dans votre jardin d'enfants. Dans tous les cas de publication, les informations concernant l'enfant seront catégoriquement exploitées de manière anonyme.

Veuillez m'indiquer votre réponse à cette demande à l'adresse suivante :

Helene N. Andreassen
Det humanistiske fakultet
Universitetet i Tromsø
N-9037 Tromsø
Norvège

tél : 0047 776 45735
courriel : helene.nordgard.andreassen@hum.uit.no

En vous remerciant par avance pour toute aide que vous pourrez m'apporter, je vous prie de croire à l'assurance de mes meilleurs sentiments.

Helene N. Andreassen
Doctorante, Département de langues et de linguistique
L'Université de Tromsø, Norvège

Votre référence: 000 Notre référence: 000 Date: 06.08.2005

A qui de droit,

Je soussignée, Chantal Lyche, professeur à l'université d'Oslo et de Tromsø, certifie par la présente que Helene Andreassen, dont je dirige la thèse, a entrepris un travail de doctorat sur l'acquisition du schwa chez des enfants de langue française en Suisse. Ce travail de grande envergure est central pour améliorer notre compréhension du phénomème du 'e caduc' et je vous serais reconnaissante de lui faciliter son enquête de terrain dans la mesure de vos possibilités. Helene dispose d'un temps strictement limité pour mener à bien sa recherche et toute aide que vous pourrez lui apporter lui permettra de respecter ces contraintes temporelles. Helene a déjà acquis une bonne connaissance du français suisse à travers son excellent mémoire de DEA, elle s'est longuement préparée à son travail de terrain de façon à pouvoir progresser de la façon la plus efficace possible et ses qualités personnelles lui seront d'une aide précieuse pour établir un contact rapide avec les enfants.

D'avance je vous remercie de l'accueillir et de lui permettre de soumettre aux enfants de votre établissement un ensemble de tests linguistiques.

Chantal Lyche

FACULTÉ DES SCIENCES HUMAINES
Université de Tromsø, N-9037 Tromsø, Tél. +47 77 64 42 40, Fax +47 77 64 42 39

Cher Monsieur, Chère Madame

Tromsø, le 13 septembre 2005

PARTICIPATION AU PROJET *L'ACQUISITION DU SCHWA EN FRANÇAIS*

J'aimerais par la présente vous inviter à participer à une enquête dans le cadre du projet Ph.D. *L'acquisition du schwa en français. Variation phonologique dans la grammaire durant l'acquisition de L1*. Le projet, qui a une durée de quatre ans, est financé par l'Université de Tromsø en Norvège. L'objectif principal de mon projet est d'examiner un aspect particulier de l'acquisition de la phonologie du français suisse, plus précisément l'acquisition de la voyelle schwa (e muet). Ce projet est intégré dans *PFC* (Phonologie du Français Contemporain : usages, variétés et structure), un grand projet de recherche international sur la phonologie du français, *cf.* www.projet-pfc.net. Afin de pourvoir réaliser une telle étude, le recueil de données enfantines est primordial.

Sur le plan pratique, je vise à mener à bien mon travail de terrain au printemps 2006 (janvier-juin). Je cherche à construire un corpus qui comprend environ douze enfants monolingues. Six parmi les douze enfants seront sélectionnés pour une étude détaillée. Cela implique un enregistrement hebdomadaire, préférablement à domicile. L'objectif principal de cette partie du projet est d'enregistrer le langage spontané de l'enfant, ce qui est plus facilement obtenu dans un cadre familier. Tous les douze enfants seront enregistrés une fois par mois dans l'espace du jardin d'enfants. L'objectif de cette deuxième partie est de faire passer quelques tests aux enfants (avec des images, des jouets). Cela a pour but d'extraire les constructions sous investigation d'une manière plus contrôlée.

Ces enregistrements sont faits dans un but de recherche scientifique. Les résultats (y compris les enregistrements) peuvent être publiés aussi bien dans des revues scientifiques que dans des ouvrages commercialisés (par exemple, manuels pédagogiques). Dans tous les cas de publication, les informations concernant l'enfant seront catégoriquement exploitées de manière anonyme. Vous pourrez par ailleurs avoir accès à toute publication éventuelle si vous en faites la demande.

Votre consentement ne décharge pas l'enquêtrice de sa responsabilité. Vous conservez tous vos droits garantis par la loi.

Si vous acceptez de faire partie de l'étude dans les conditions énoncées ci-dessus, veuillez remplir la fiche d'enquête, signer ce document et le rendre aux responsables du jardin d'enfants.

Signature de parent(s)

Avec mes salutations distinguées

Helene N. Andreassen
Doctorante, Département de langues et de linguistique
L'Université de Tromsø, Norvège

Fiche d'enquête

Projet universitaire *L'acquisition du schwa en français*
Helene N. Andreassen

Enfant
Nom, prénom(s) :____

Date de naissance :____

Lieu de naissance :____

Domicile actuel :____

Domiciles successifs :____

Père de l'enfant
Nom, prénom(s) :____

Date de naissance :____

Lieu de naissance :____

Domicile actuel :____

Domiciles successifs :____

Profession(s) principale(s) :____________________________________

Langues parlées (étrangères ou régionales) :__________________________

Mère de l'enfant
Nom, prénom(s) :____

Date de naissance :____

Lieu de naissance :____

Domicile actuel :____

Domiciles successifs :____

Profession(s) principale(s):____________________________________

Langues parlées (étrangères ou régionales) :__________________________

Renseignements divers
L'enfant, a-t-il/elle eu l'otite ou d'autres problèmes liés à l'ouïe? ________________

____

Langue(s) parlées à la maison (si plusieurs, veuillez spécifier qui parle quelle(s) langues) :

____

____

Chère Madame

Tromsø, le 5 juin 2010

AU SUJET DE VOTRE PARTICIPATION AU PROJET *L'ACQUISITION DU SCHWA EN FRANÇAIS*

Vous avez déjà participé à une enquête dans le cadre de mon projet Ph.D. *L'acquisition du schwa en français. Variation phonologique dans la grammaire durant l'acquisition de L1*. Le projet, qui sera bientôt terminé, est financé par l'Université de Tromsø en Norvège. L'objectif principal du projet a été d'examiner un aspect particulier de l'acquisition de la phonologie du français suisse, plus précisément l'acquisition de la voyelle schwa (le *e muet*). Grâce à votre aide au printemps 2006, le recueil des données nécessaires a été un grand succès.

Vous m'avez permise d'enregistrer le langage spontané de l'enfant à domicile, et la plupart du temps, vous étiez présente lors de l'enregistrement. Cette dernière année, je me suis également intéressée à l'interaction linguistique mère – enfant, et surtout à la façon dont la mère prononce les mots quand elle s'adresse à son enfant. Des travaux antérieurs ont montré que le langage adressé aux enfants est différent du langage inter-adulte, et il semblerait que le taux de présence du *e muet* varie selon que l'on s'adresse à un enfant ou à un adulte. Comme il est très important de déterminer ce qui constitue l'environnement linguistique de l'enfant – c'est-à-dire le taux de présence du *e muet* – je vous demande par cette présente lettre de me permettre d'étudier les phrases produites par vous-même lors des sessions d'enregistrement.

Ces enregistrements ont été faits dans un but de recherche scientifique. Les résultats (y compris les enregistrements) peuvent être publiés aussi bien dans des revues scientifiques que dans des ouvrages commercialisés (par exemple, manuels pédagogiques). Dans tous les cas de publication, les informations vous concernant seront catégoriquement exploitées de manière anonyme. Vous pourrez par ailleurs avoir accès à toute publication éventuelle si vous en faites la demande. Votre consentement ne décharge pas l'enquêtrice de sa responsabilité. Vous conservez tous vos droits garantis par la loi.

Si vous acceptez de faire partie de l'étude dans les conditions énoncées ci-dessus, veuillez signer ce document et l'envoyer à l'adresse suivante :

Helene N. Andreassen
Universitetet i Tromsø
N-9037 Tromsø
Norvège

Signature

Avec mes salutations distinguées

Helene N. Andreassen
Doctorante, Département de langues et de linguistique, l'Université de Tromsø, Norvège

La famille – les frères et sœurs

l'enfant faisant partie du corpus: ....

frères et sœurs:

1. fille ☐ garçon ☐
date de naissance: ....

2. fille ☐ garçon ☐
date de naissance: ....

3. fille ☐ garçon ☐
date de naissance: ....

Personnes principales communicant avec l'enfant au cours d'une journée "normale": ....
....
....
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Helene N. Andreassen
Det humanistiske fakultet
Universitetet i Tromsø
9037 Tromsø
Norvège

Chère _________ Tromsø, le 5 juin 2010

J'espère que vous allez bien. Ça fait longtemps qu'on ne s'est pas vu, mais j'entends régulièrement votre voix dans mon travail sur la thèse. Je suis maintenant en dernière année de thèse et je tâche de la soumettre cette été (début juillet).

Je travaille actuellement sur l'interaction mère-enfant où j'étudie les formes linguistiques utilisées par les mères quand elles interagissent avec l'enfant et l'inverse (la structure des formes utilisées par les enfants dans cette situation). Il y a toute une littérature sur la langue mère-enfant, mais pour faire le lien entre mes données et la littérature, je vois que j'ai besoin de quelques renseignements supplémentaires.

Pour comprendre le développement langagier de l'enfant, S. Kern au Laboratoire Dynamique du Langage à Lyon a développé un questionnaire portant sur le vocabulaire de l'enfant (en fait, c'est une traduction/adaptation d'un questionnaire pour les anglophones). Ce questionnaire inclut une partie sur l'enfant et sa famille, et je vois que les questions qu'elle pose, ce sont des choses qui reviennent dans beaucoup de travaux sur l'acquisition (âge, domicile actuel, sexe, nombre/âge des frères et sœurs etc.). Un autre questionnaire, développé pour le projet « phonologie du français contemporain » (PFC), demande aux locuteurs d'indiquer les domiciles successifs – ceci pour avoir l'histoire linguistique du locuteur. Pour illustrer l'importance de cette information, une personne que je connais et qui habite à Gland depuis 40 ans, il a toujours un système vocalique qui montre qu'il a passé 10 ans de son enfance à Neuchâtel). Pour assurer la qualité de mon travail, j'aimerais suivre ces deux questionnaires, et les seuls renseignements qui me manquent sont les suivants:

- **Mère**
  - o études (préciser jusqu'à quel âge et quel type d'études)

    ____
    ____
    ____
    ____

  - o professions successives (préciser aussi le nombre d'années)

    ____
    ____
    ____
    ____

- domiciles successifs (préciser aussi le nombre d’années)

- **Père**
  - études (préciser jusqu’à quel âge et quel type d’études)

  - professions successives (préciser le nombre d’années)

  - domiciles successifs (en nombre d’années)

Je vous assure que tout va être traité de manière strictement anonyme, et que mon seul intérêt est d’avoir tous les renseignements – indiqués comme pertinents dans la littérature – qui peuvent permettre de mieux comprendre la structure phonologique des formes produites par l’enfant et par la mère.

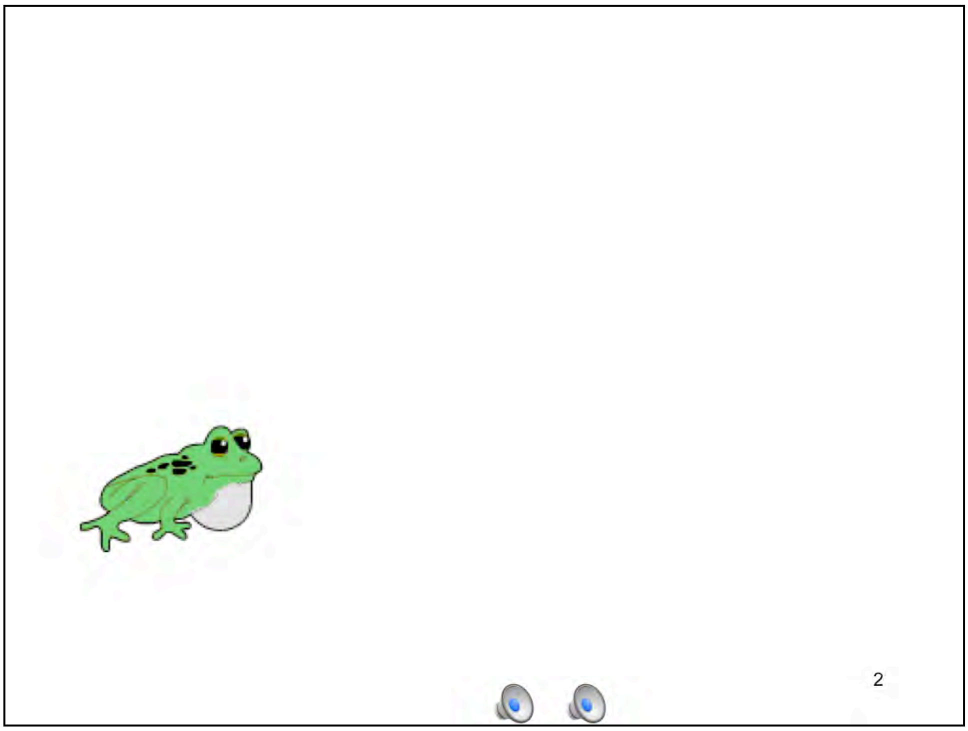
En 2006, je ne savais pas que j’en parlerais autant dans la thèse, voilà pourquoi cette lettre vient 4 ans plus tard. Je suis vraiment désolée de vous déranger, mais si vous pouviez m’envoyer ces renseignements, je vous en serais très reconnaissante.

Merci infiniment d’avance et à une prochaine, j’espère.
Amicalement

Helene

SCHWA

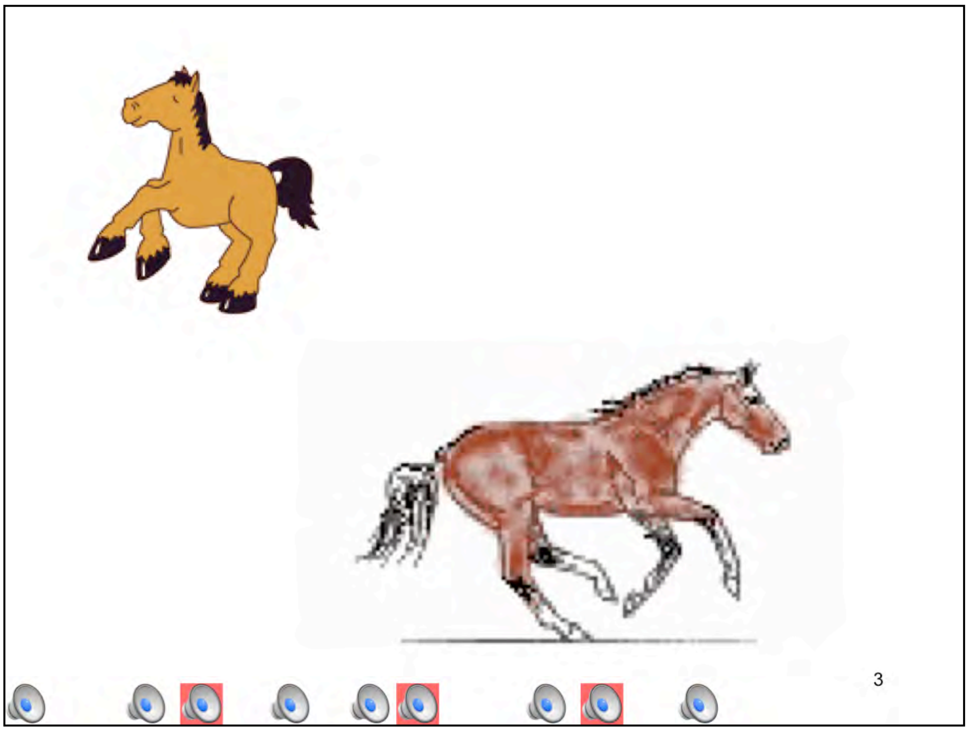
1



Regarde! C'est quoi, ça?

Oui, c'est une grenouille.

But: Commencer le test avec un mot non-variable, avec une seule variante possible. Deuxième avantage: prononciation d'un schwa stable, ou un [œ] sans accent - possible de tester la qualité vocalique.



C’est quel animal ça?

C’est un cheval.

C’est un ch’val

Et puis ça, c’est quoi?

Oui, c’est aussi un cheval.

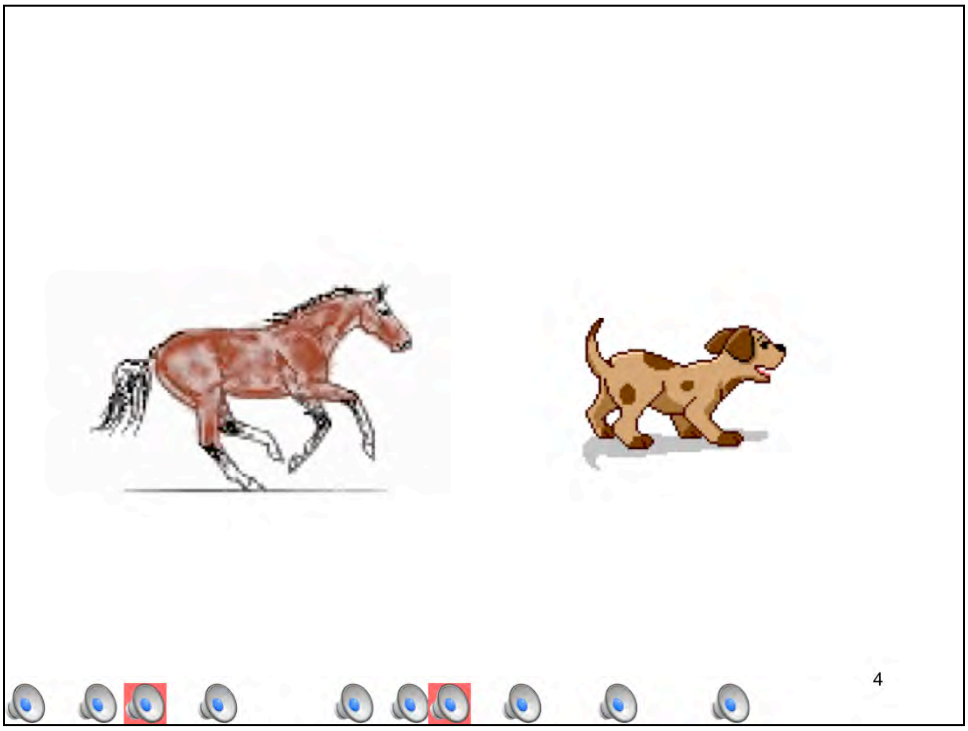
Il fait quoi, le ch’val?

Oui, c’est aussi un ch’val.

Il fait quoi, le cheval?

Il court

But: Introduire le mot ”cheval”, première fois avec schwa, deuxième fois sans - ou première fois sans schwa, deuxiéme fois avec. Voir dans le cas du cheval suivant: quelle prononciation?

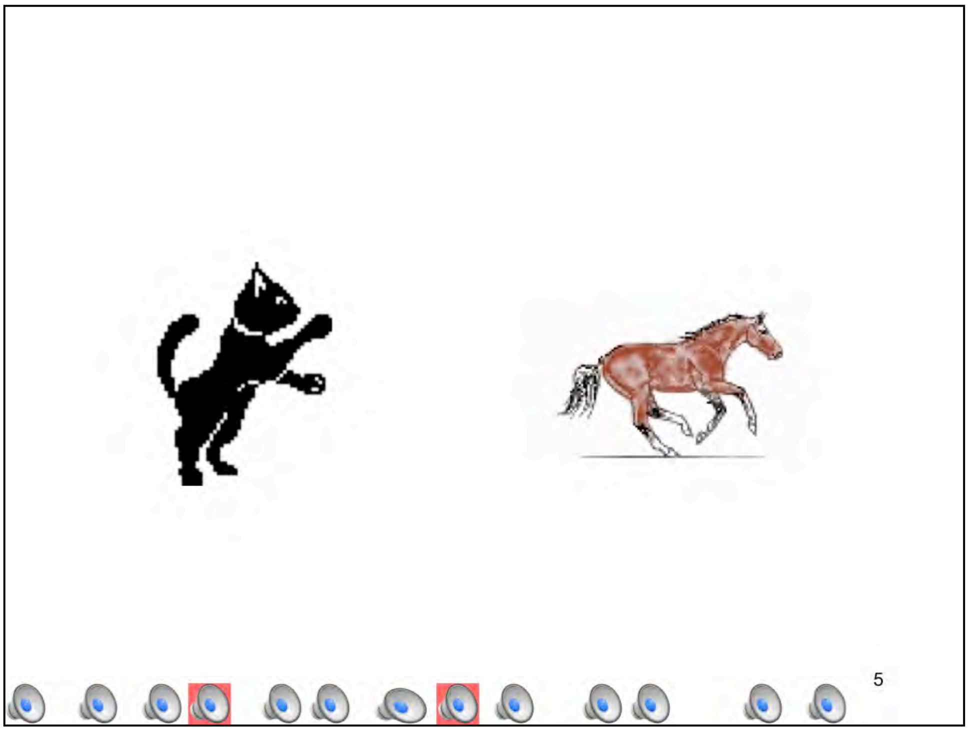


Maintenant il y a deux animaux! Tu peux me raconter ce que c’est?
Ils font quoi, les deux animaux?
Oui, c’est un cheval.
Oui, c’est un ch’val.
Oui, c’est un chien.

Il fait quoi le chien?
Il fait quoi le cheval?
Le ch’val court.
Il fait quoi le ch’val?
Le cheval court.

Tu préfères quel animal?

But: Essayer d’avoir ”cheval” dans une position non-finale, et non accentuée.



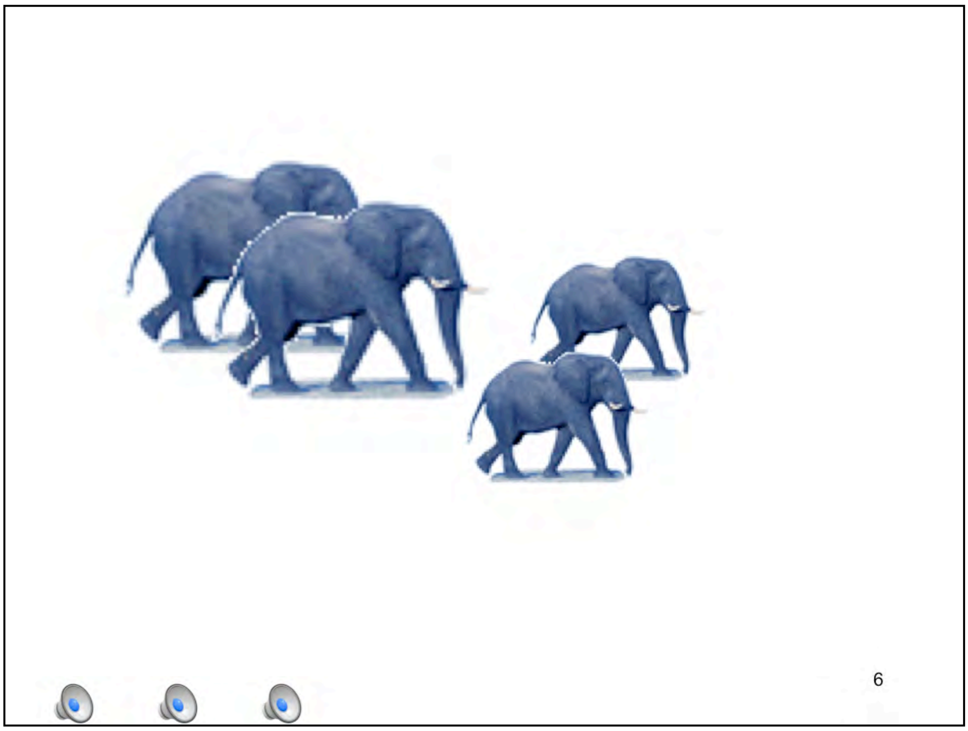
Là aussi il y a deux animaux! Tu peux me raconter ce que c’est?

Oui, c’est un cheval.
Oui, c’est un ch’val.

Oui, c’est un chat.
Il fait quoi, le chat? Il bouge la queue.
Et le cheval, il fait quoi? Il court toujours.
Et le ch’val, il fait quoi?

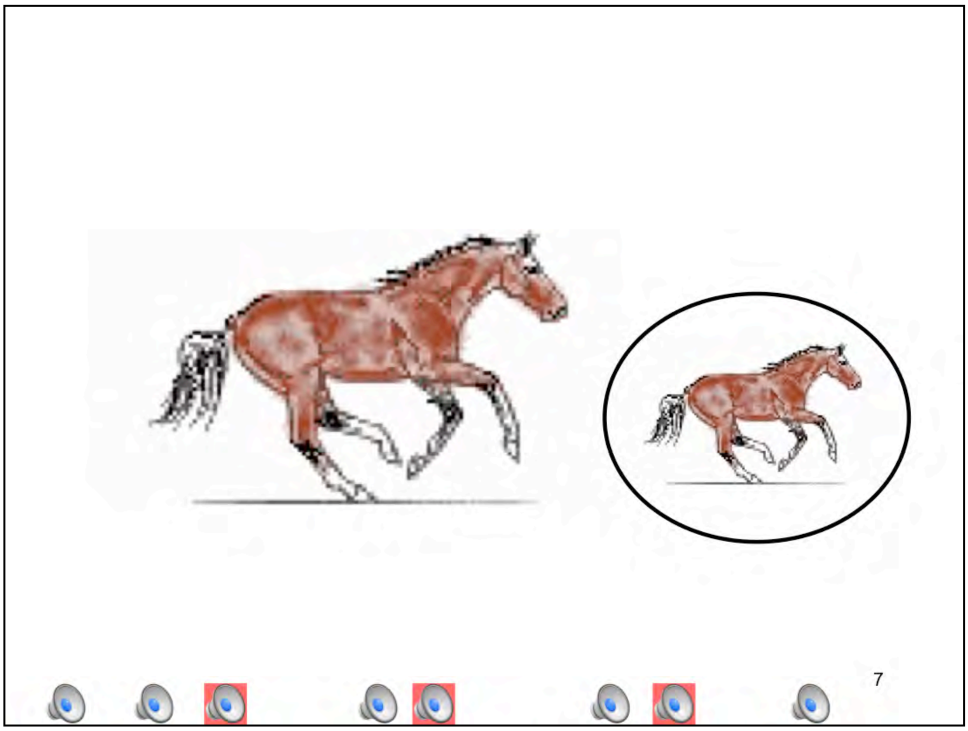
Ils sont de quelle couleur, les deux animaux? Ils ont la même couleur?
Tu préfères quel animal? Pourquoi?

But: Essayer d’avoir ”cheval” dans une position non-finale, et non accentuée.



T’ as vu des animaux comme ça ici? C’ est quoi? Oui, c’ est des éléphants.

But: Eviter mots avec schwa - avoir une pause



Alors cet animal on a déjà vu.

Tu peux me raconter?

Oui, c’est un grand cheval et un petit cheval

Oui, c’est un grand ch’val et un p’tit ch’val

Oui, c’est un grand ch’val et un p’tit cheval

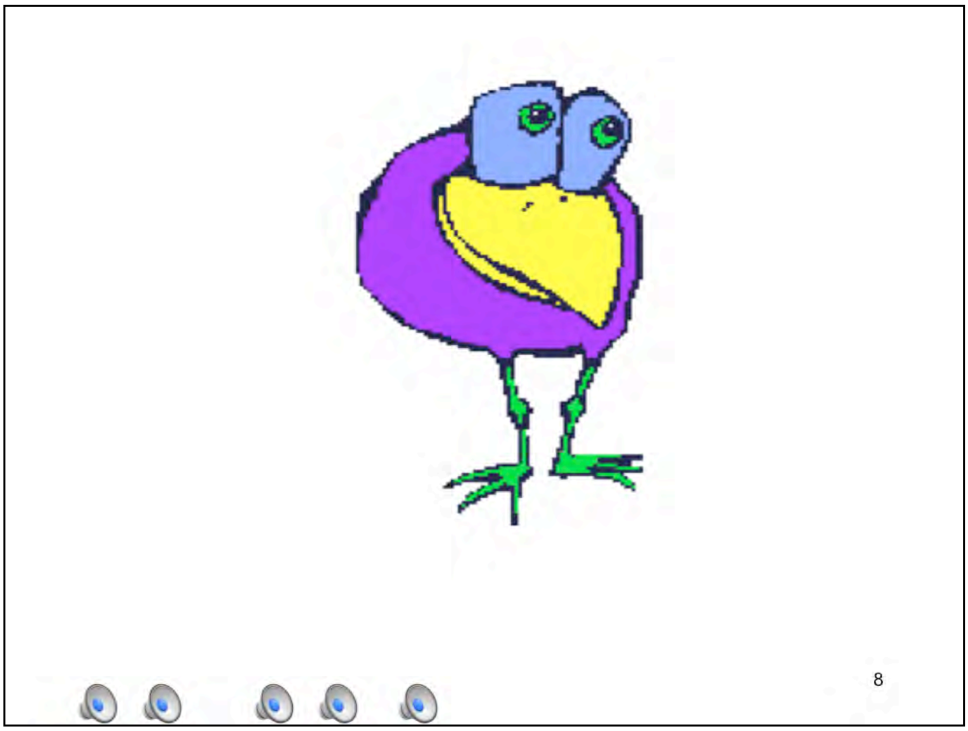
Oui, c’est un grand cheval et un p’tit cheval

Le grand cheval, il est avec qui?

Le grand ch’val, il est avec qui?

Celui-ci, il est grand ou petit? Celui-ci, il est grand ou p’tit? Tu préfères lequel?

But: Avoir ’cheval’ et ’petit’ dans une position non-accentué, précédé de voyelle.

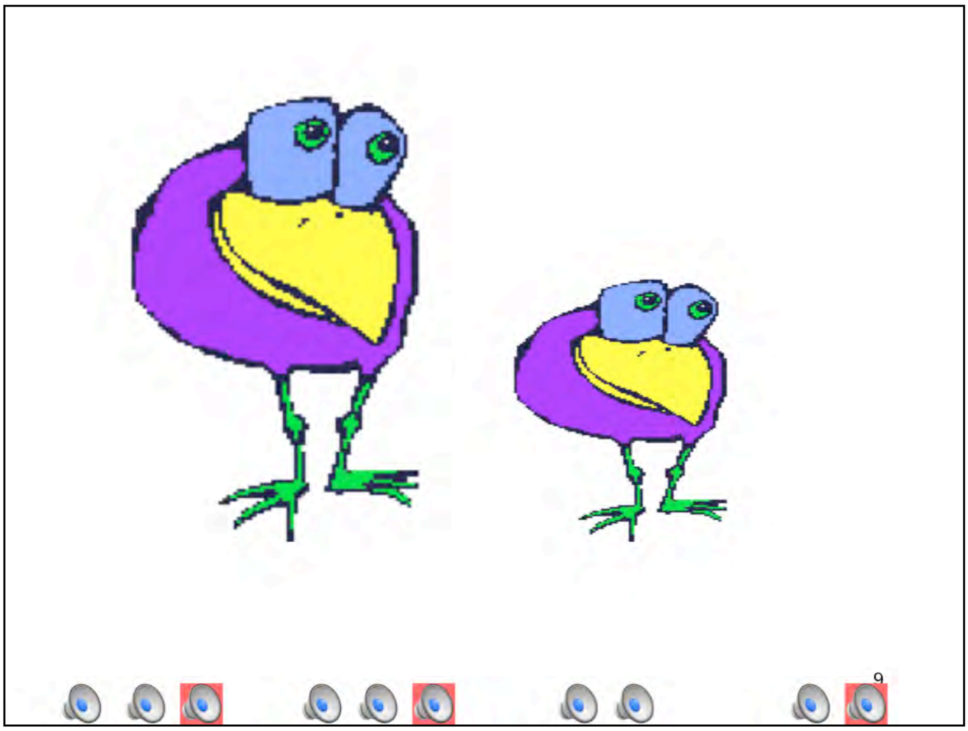


T’ as déjà vu un animal comme ça?

Tu sais comment ça s’appelle?

C’est un chevir. Tu peux répéter? Oui, un chevir.

But: Introduire un mot construit avec schwa variable: même séquence consonantique que ’cheval’.



Ah, encore un animal. Tu te rappelles son nom?

C’était un chevir.

C’était un ch’vir.

Mais, il est avec qui?

C’est son petit ami.

C’est son p’tit ami.

C’est un chat? Non, c’est quoi?

C’est un chevir aussi? C’est un ch’vir aussi?

But: Introduire le mot sans schwa.

10

Il y a quoi sur cette image?

Oui, il y a deux chevirs.

Ils font quoi? Ils sont où?

C’est quoi tout ça?

Il y a plein de fleurs

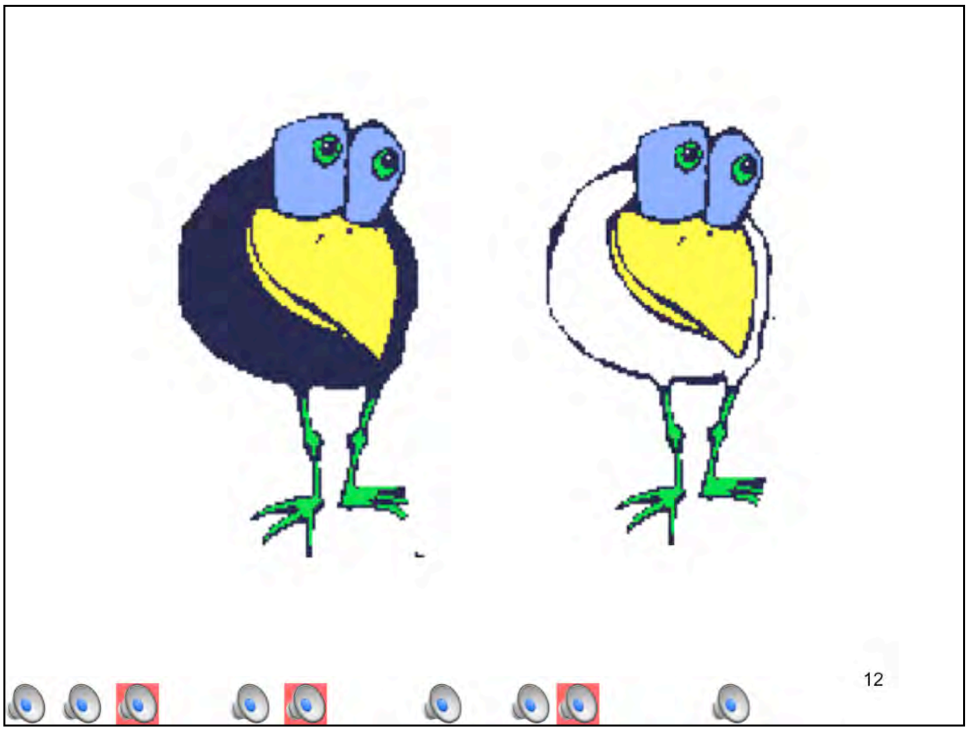
C’est deux grands ch’virs?

C’est un grand chevir et un petit chevir.

C’est un grand ch’vir et un petit ch’vir

C’est un grand ch’vir et un p’tit chevir

But: Avoir ‘chevir’ en position non-accentué, et après voyelles.
Deuxième avantage: Avoir ‘fleur’ pour comparaison de qualité vocalique.



Tu peux me dire ce que c'est?

C'est deux chevirs.

C'est deux ch'virs.

C'est deux chevirs rouges?

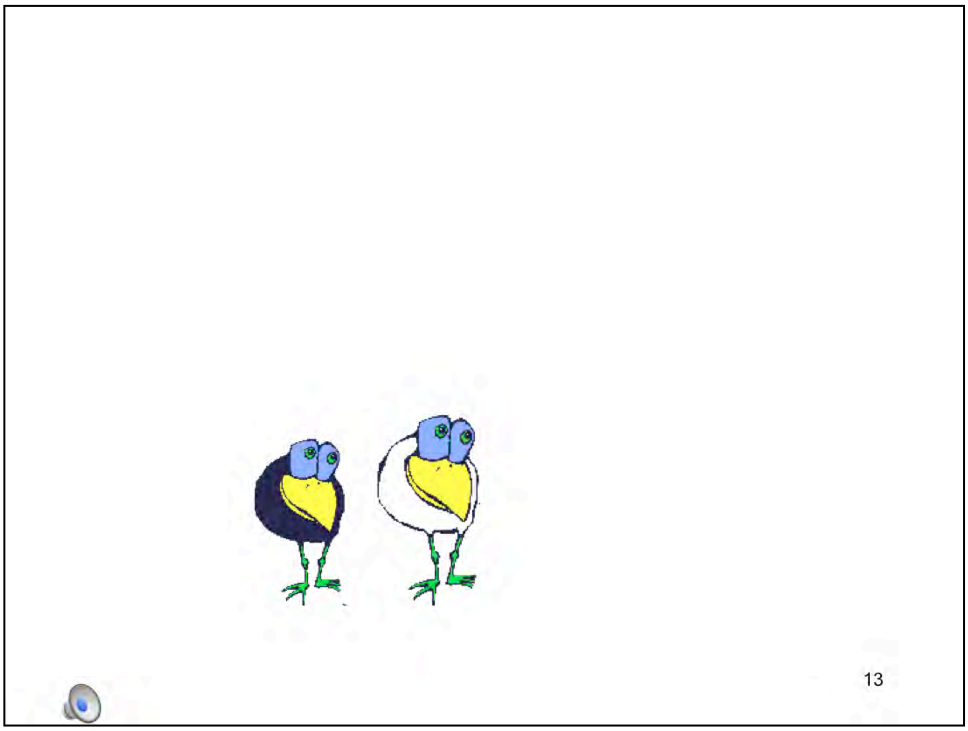
C'est deux ch'virs rouges?

C'est quoi alors? Tu vois quoi?

C'est un chevir noir et un chevir blanc

C'est un ch'vir noir et un ch'vir blanc

Ils sont grands ou petits?



Et ceux-ci? Grands ou petits?

14

Maintenant il y a deux animaux! Tu peux me raconter ce que c’est?

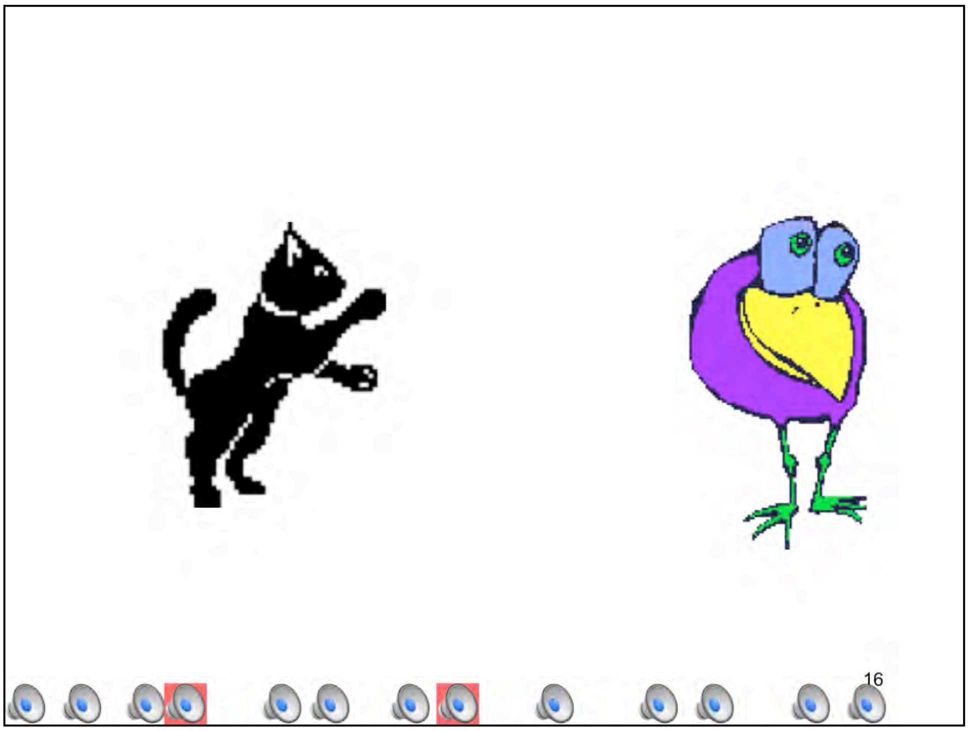
Oui, c’est un chevir.
Oui, c’est un ch’vir.
Oui, c’est un chien.

Ils font quoi, les deux animaux?
Il fait quoi le chien?
Il fait quoi le chevir?
Il fait quoi le ch’vir?

Il secoue la tête
Il s’coue la tête

Tu préfères quel animal?

But: Essayer d’avoir ”chevir” dans une position non-finale, et non accentuée.



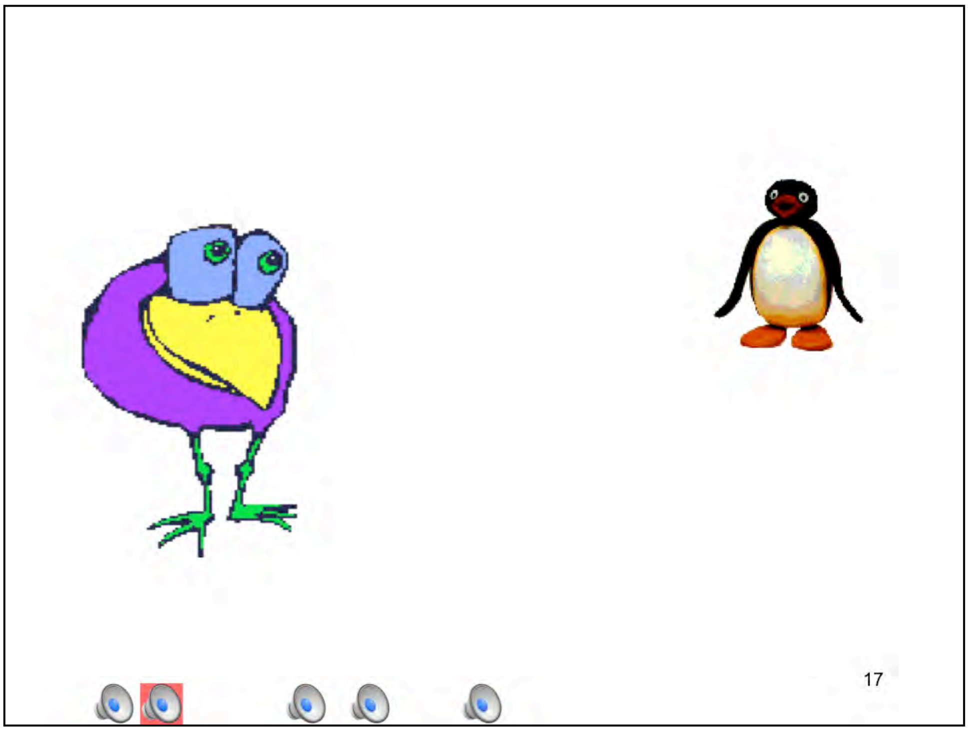
Là aussi il y a deux animaux! Tu peux me raconter ce que c’est?

Oui, c’est un chat.
Oui, c’est un chevir.
Oui, c’est un ch’vir.

Il fait quoi, le chat? Il bouge la queue.
Et le chevir, il fait quoi?
Et le ch’vir, il fait quoi?
Il fait quoi avec la tête?

Ils sont de quelle couleur, les deux animaux? Ils ont la même couleur?
Tu préfères quel animal? Pourquoi?

But: Essayer d’avoir ”chevir” dans une position non-finale, et non accentuée.



Il est où, le chevir?

Il est où le ch’vir?

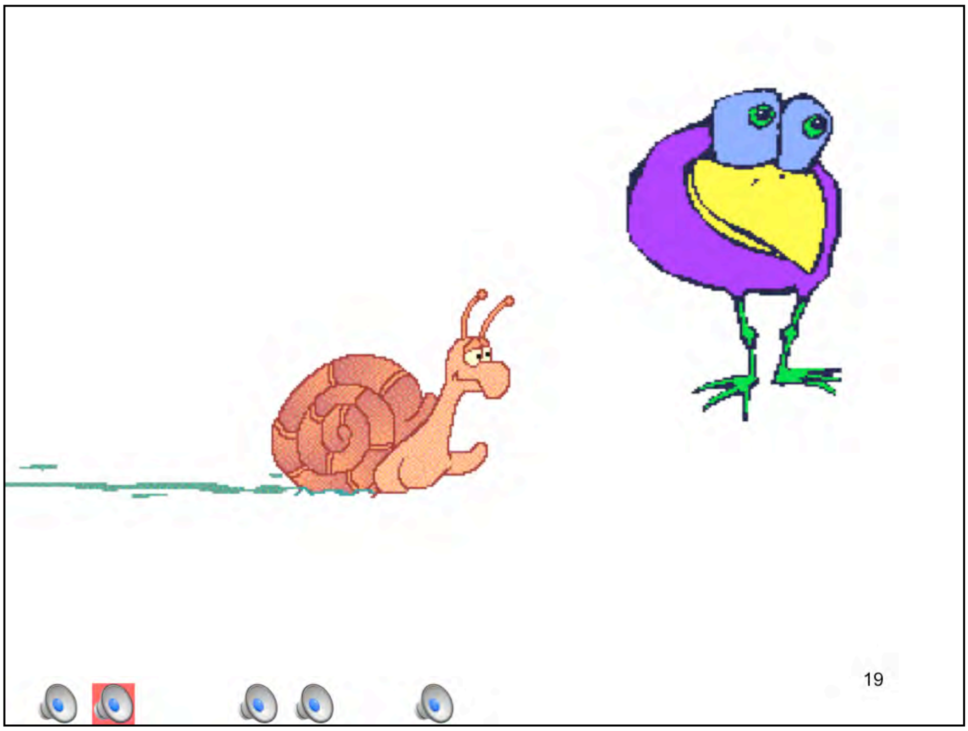
Oui, c’est juste.

Tu est sûr?

C’est qui l’autre?

But: Identification: test perception du mot avec/sans schwa

18



Il est où, le chevir?

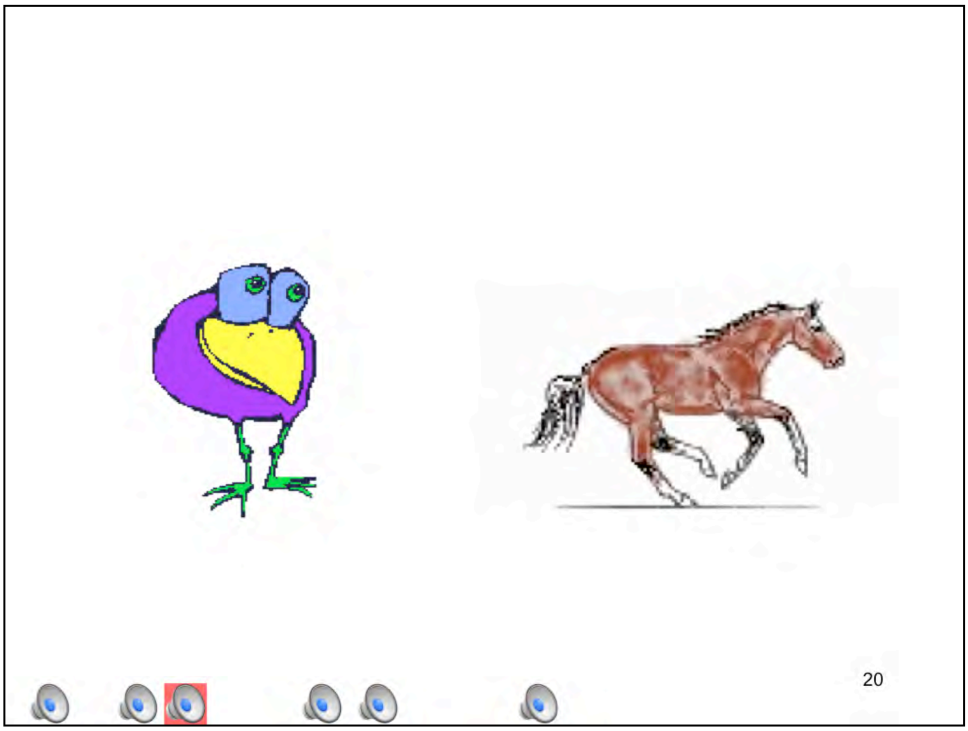
Il est où le ch'vir?

Oui, c'est juste.

Tu est sûr?

C'est qui l'autre?

But: Identification: test perception du mot avec/sans schwa



Il est où, le chevir?

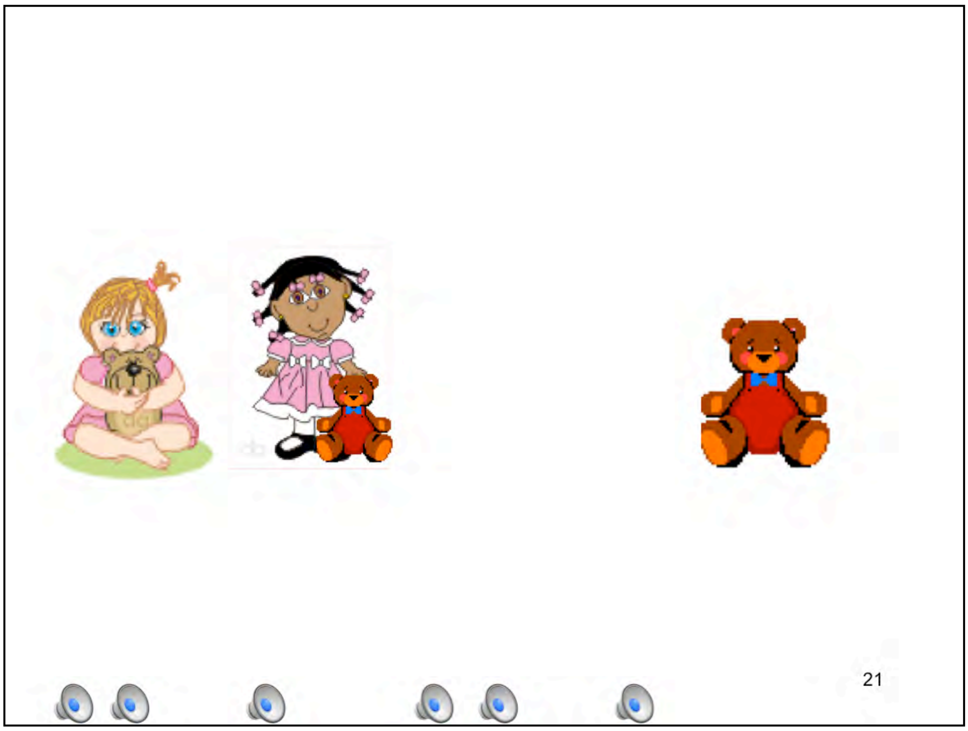
Il est où le ch’vir?

Oui, c’est juste.

Tu est sûr?

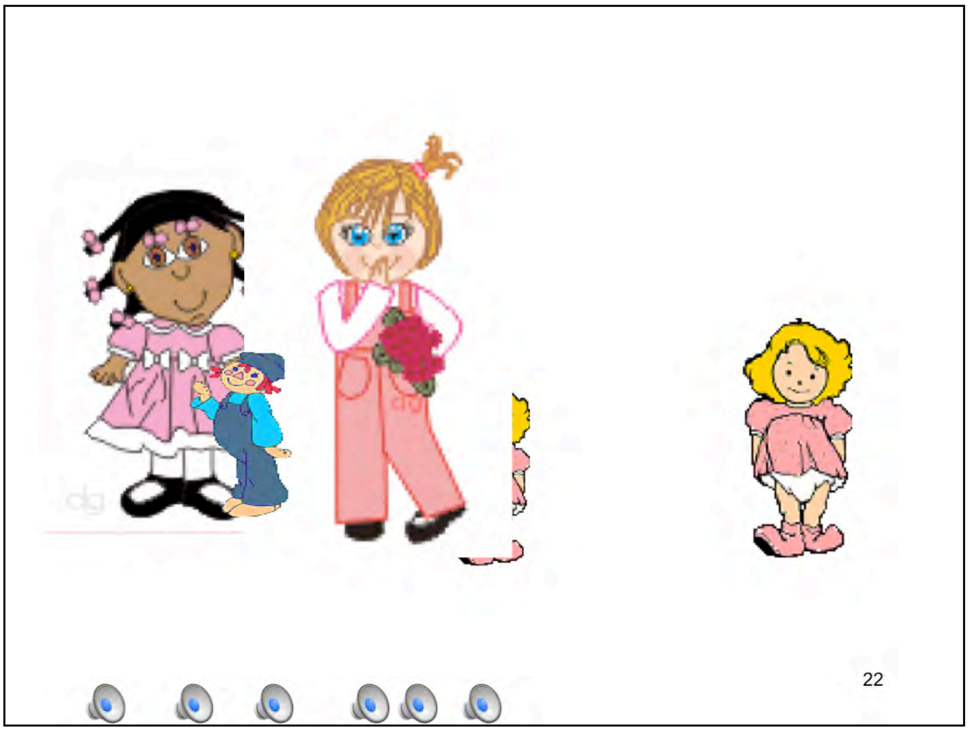
C’est qui l’autre?

But: Identification: test perception du mot avec/sans schwa

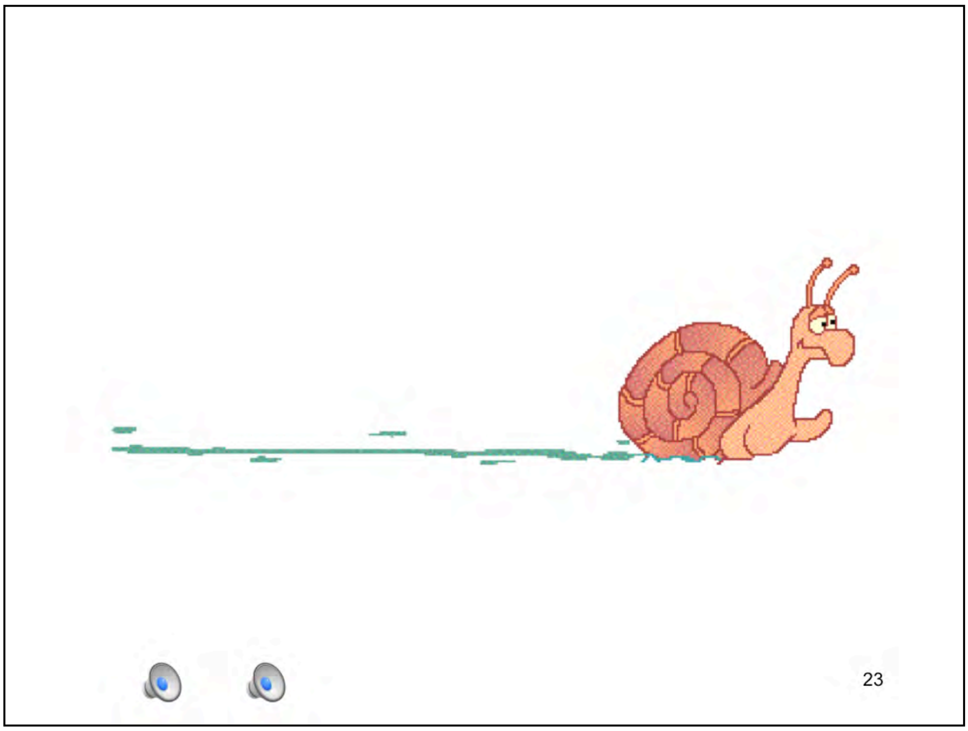


Tu vois ces deux filles? Tu sais comment elles s’appellent? La fille blonde s’appelle Marie et la fille aux cheveux noirs s’appelle Claudine. Tu te rappelles leurs noms? C’était Marie et Claudine. Elles ont chacune un nounours. Tu vois. Mais regarde, là il y a un nounours qui est tout seul. C’était le nounours de qui? C’est qui? C’est le nounours de Claudine.

But: Identifier la réalisation du ’de’ génitif.

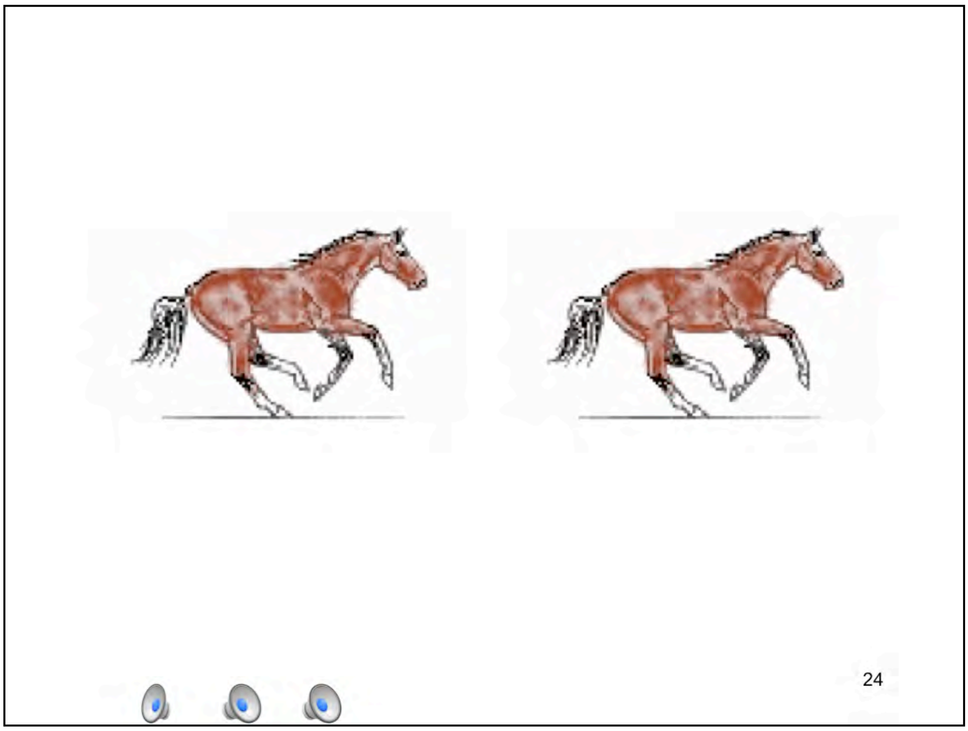


Voici une autre image de Marie et Claudine. Qu’est-ce qu’elles ont maintenant? Elles ont chacune une poupée. Tu vois. Mais regarde, là il y a une poupée qui est toute seule. C’est la poupée de qui? C’est qui? C’est la poupée de Marie.



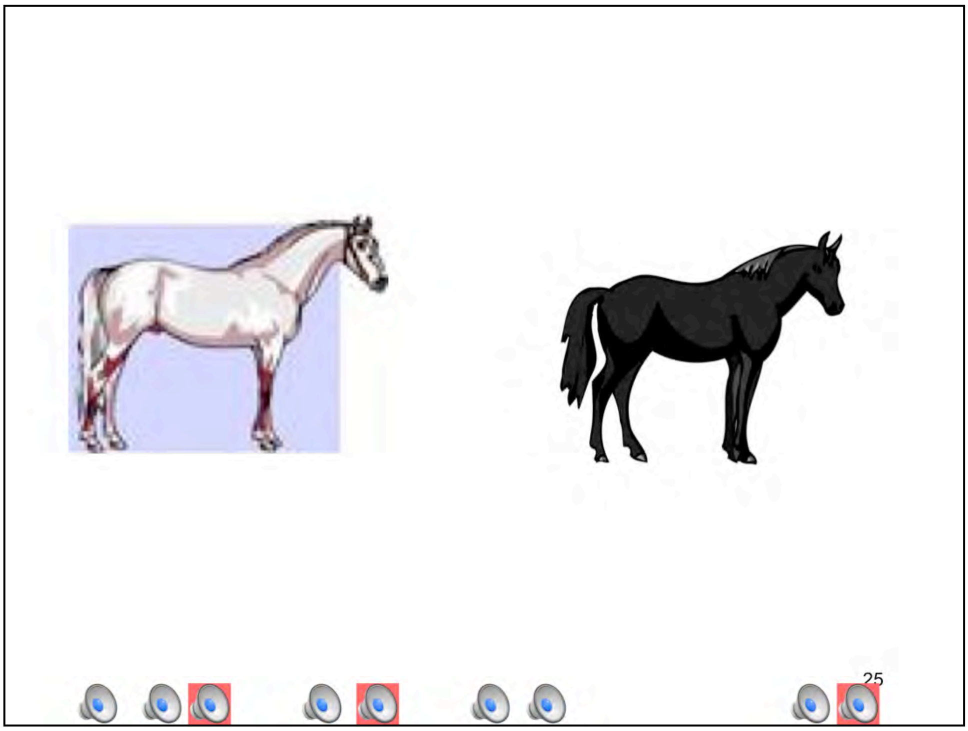
Ah tiens, c’est quoi? C’est un escargot? Tu peux répéter?

But: Avoir un mot n’ayant rien à voir avec le schwa.



tu te rappelles ces animaux?
Tu peux me raconter ce que c’est?
Ils font quoi?

But: Voir la première réaction vocalique après la pause



Tu peux me dire ce que c’est?

C’est deux chevaux.

C’est deux ch’vaux

C’est deux chevaux rouges?

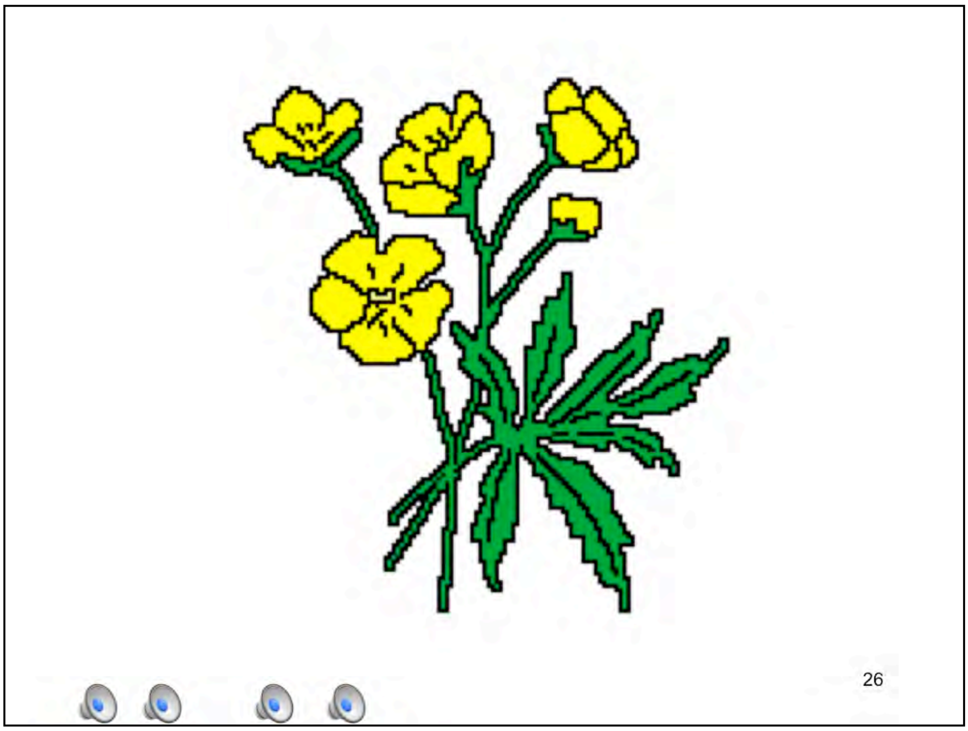
C’est deux ch’vaux rouges?

C’est quoi alors? Tu vois quoi?

Ils sont de quelle couleur?

C’est un cheval noir et un cheval blanc

C’est un ch’val noir et un ch’val blanc



Comme c'est joli!

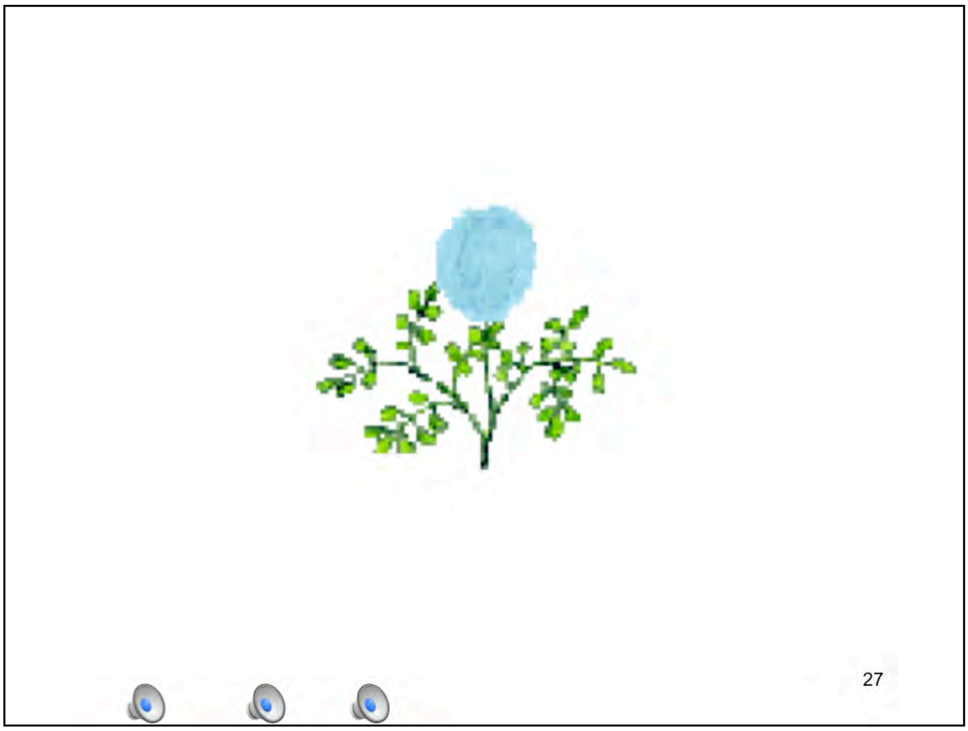
Tu peux me raconter ce que c'est?

C'est des fleurs.

Elles sont de quelle couleur?

C'est des fleurs jaunes

But: avoir la qualité vocalique pour comparaison - préférablement en position non-accentuée



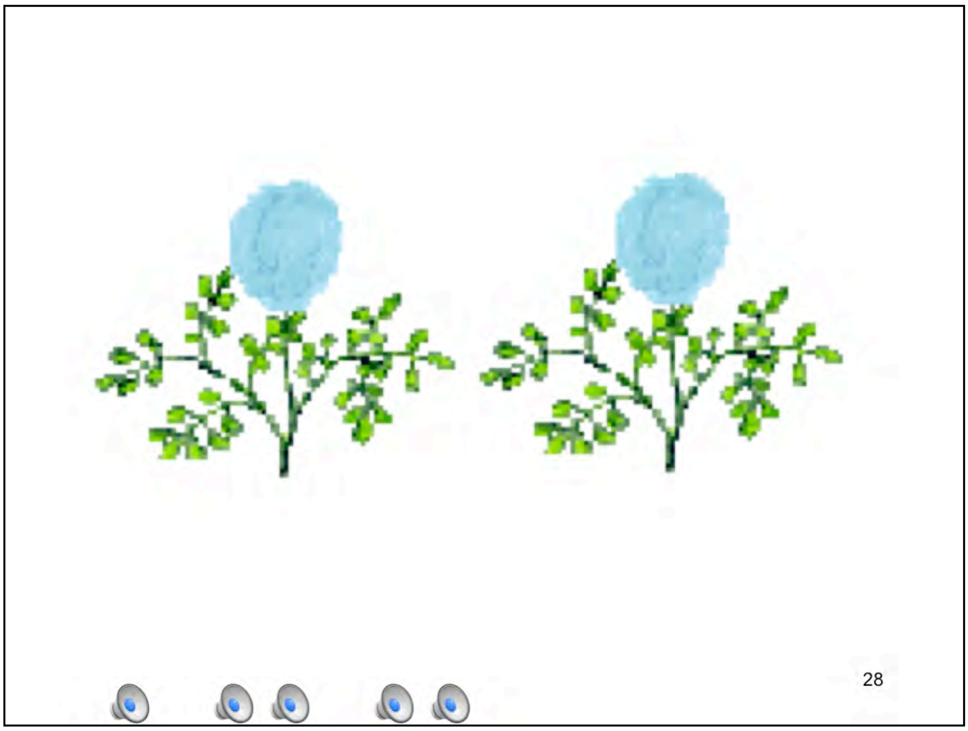
Comme c’est joli. ça aussi!

Tu peux me raconter ce que c’est?

Elle est de quelle couleur, la fleur?

C’est une fleur bleue

But: avoir la qualité vocalique [œ] et [ø] pour comparaison - préférablement en position non-accentuée

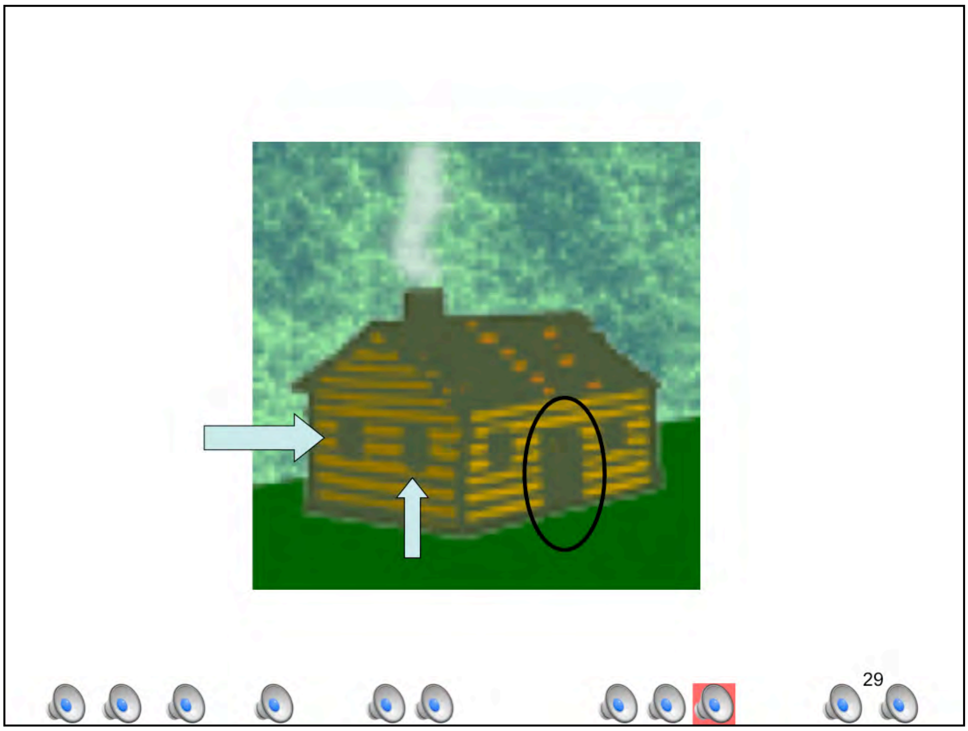


Et puis ça! Tu peux me raconter ce que c’est? C’est une maison? C’est un arbre?

Elles sont de quelle couleur, les fleurs?

C’est des fleurs bleues

But: avoir la qualité vocalique [œ] et [ø] pour comparaison - préférablement en position non-accentuée



Ça, c’est une fleur aussi? Tu peux me raconter ce que tu vois?

Ça c’est quoi (montrer avec des fleches). C’est une porte.

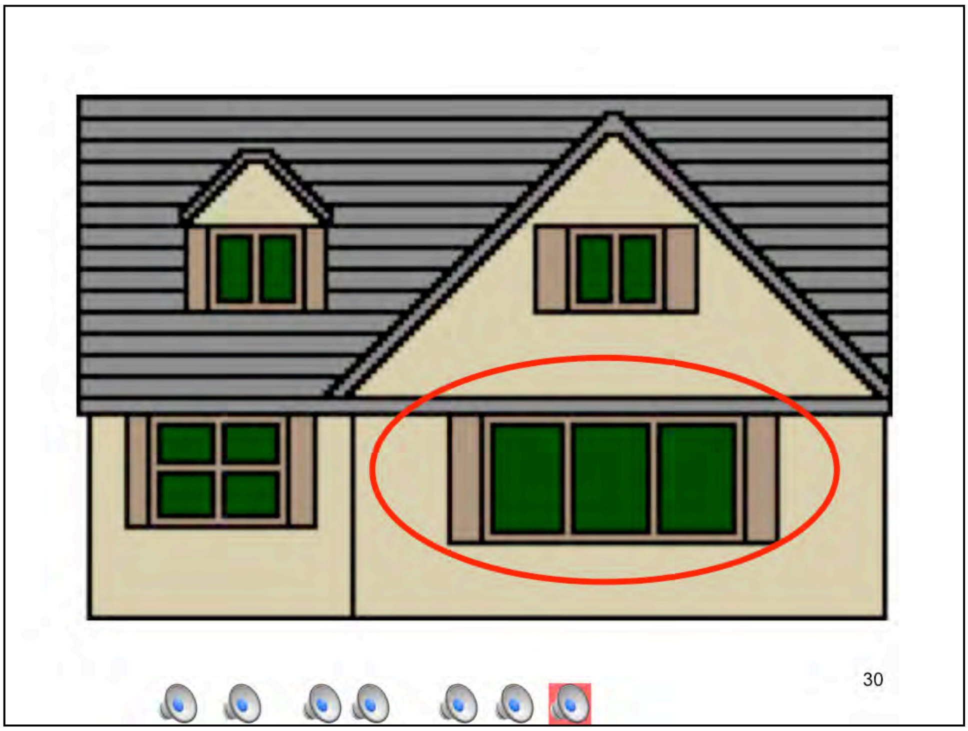
C’est une fenêtre.

C’est les f’nêtres.

C’est les fenêtres

Elle sort d’où la fumée?

Elle est grande ou petite la maison?



Ça, c’est une petite maison aussi? Tu peux me raconter ce que tu vois?

Ça c’est quoi (montrer avec des fleches). C’est une porte.

Où est-ce que tu vois de la lumière?

Dans les fenêtres.

Dans les f’nêtres

C’est une fenêtre.

C’est les f’nêtres.

C’est les fenêtres

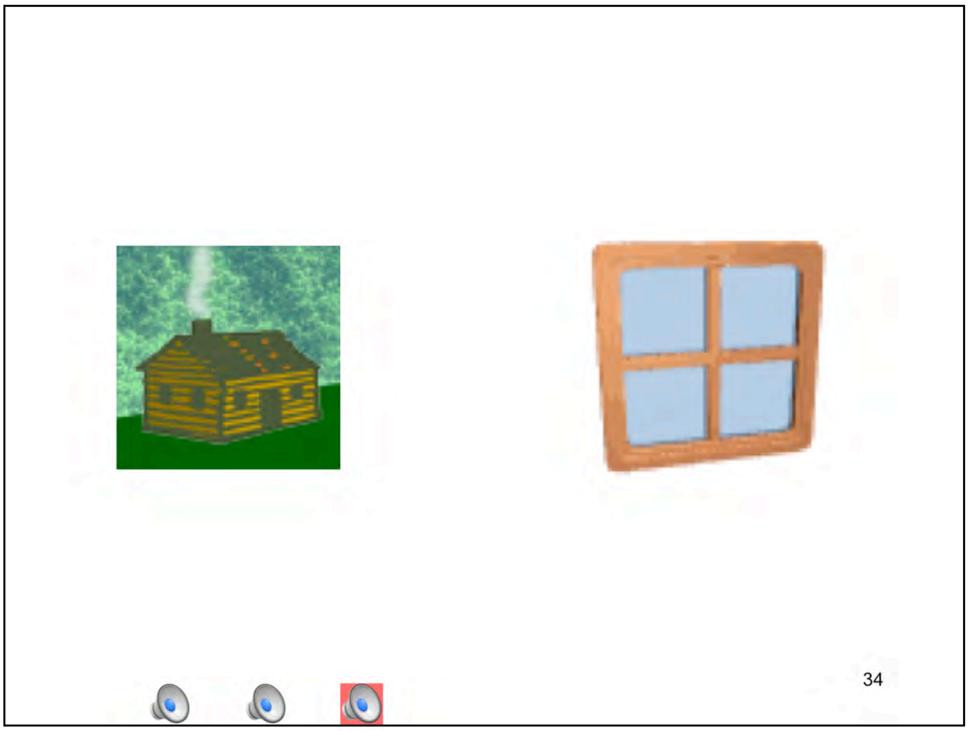
Elle est où la porte?

Tu peux me raconter ce que tu vois? Quelles sont les différences entre les deux maisons?

32

Ça c’est la grande ou la petite maison?

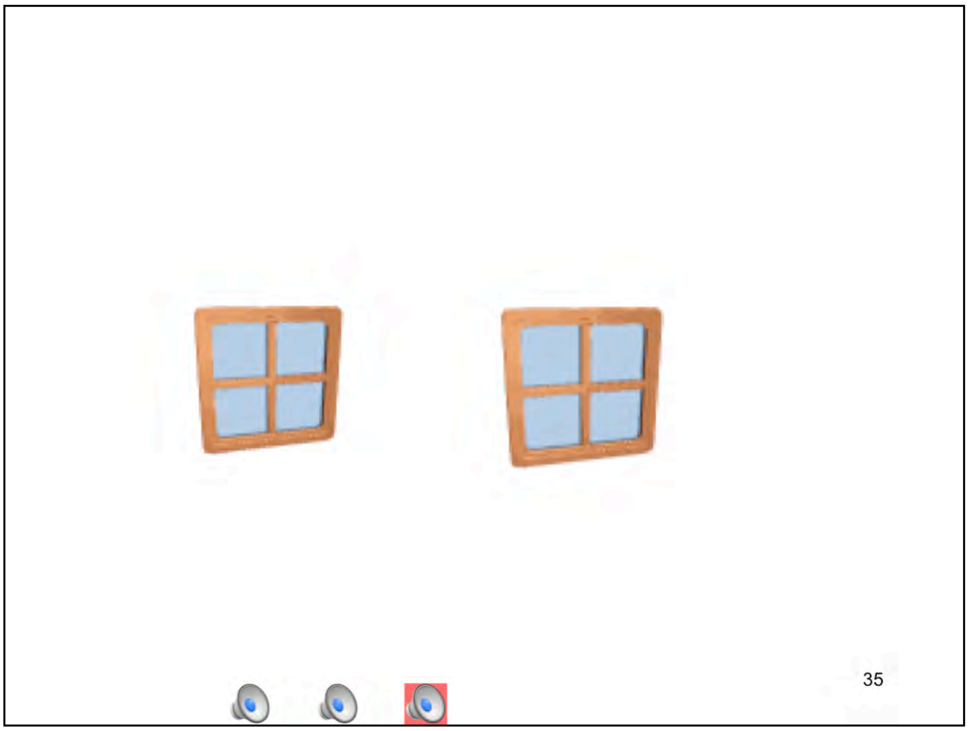
Qu’est-ce qu’on trouve dans une maison? Une porte!



Est-ce qu’on trouve d’autres choses dans une maison?

Une fenêtre!

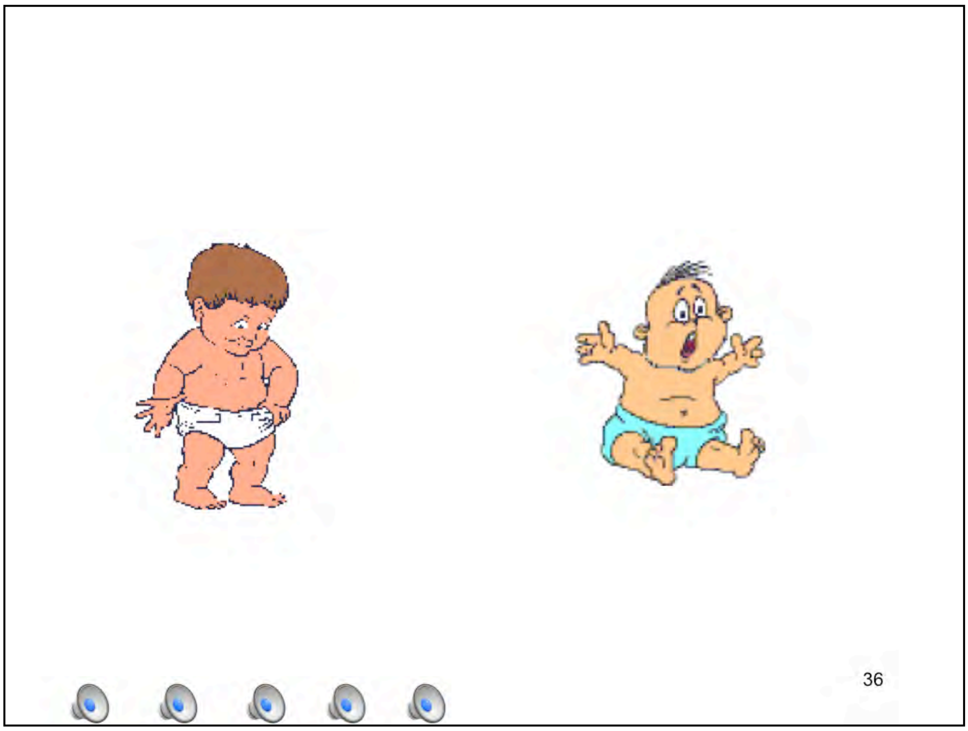
Une f’nêtre!



Et ça c’est quoi?

C’est deux fenêtres!

C’est deux f’nêtres!



ah! C’est quoi? Un bébé! Il fait quoi? Il enlève sa couche!

Regarde, il y a encore un bébé! Il est heureux? Il fait quoi? Il pleure..
"

NOM:
Prénom:

Date: 04.03.07

PARTICIPATION AU TEST ”LE SYSTEME PHONOLOGIQUE DE L'ADULTE”

Nous vous remercions de votre participation au test ”le système phonologique de l'adulte”. Ce test a été construit dans le cadre du projet de recherche ”Acquisition du schwa en français”, dont l'objectif principal est d'étudier l'acquisition d'une partie de la phonologie du français suisse.

Les résultats peuvent être publiés aussi bien dans des revues scientifiques que dans des ouvrages commercialisés. Dans tous les cas de publication, les informations vous concernant seront exploitées de manière anonyme. Vous pourrez par ailleurs avoir accès à toute publication éventuelle si vous en faites la demande.

Votre consentement ne décharge pas l'enquêtrice de sa responsabilité. Vous conservez tous vos droits garantis par la loi. La participation est volontaire et vous pouvez vous retirer du test quand vous voulez.

Si vous acceptez de faire partie de l'étude dans les conditions annoncées ci-dessus, veuillez signer ce document.

__________________________________ ________________

Signature Date

Avec mes salutations distinguées

Helene N. Andreassen

FACULTE DES SCIENCES HUMAINES
Université de Tromsø, N-9037 Tromsø, Tél. +47 77 64 42 40, Fax +47 77 64 42 39

PRONONCEZ CES PHRASES DE LA FAÇON QUI VOUS SEMBLE LA PLUS NATURELLE POSSIBLE (COMME SI VOUS LE RACONTIEZ A QUELQU'UN)

1RE PARTIE

1. Paul habite à Louvain-la-Neuve.
2. Maman t'a dit d'acheter de la viande crue.
3. Mon fils a écrit cette petite histoire.
4. Nous sommes sevrés de plaisirs.
5. J'ai cherché le poids pour peser le poisson. J'ai commencé à peser la morue.

6. Tous les matins, je mange un œuf. Et toi ?

   - Moi ? Jamais quand je suis seule.

   - Martine, par contre, elle ne mange pas d'œufs quand elle jeûne.
7. On ressemble à nos ancêtres.
8. Avec ces deux filles, il y a toujours des grandes querelles.
9. Chaque année, je regarde cette revue.
10. Tu mets ceci à part, et tu verras que ce n'est pas mal.

11. Le pêcheur m'a vendu sept belons.
12. Le nouveau pont à Paris est monumental.
13. Tu peux t'asseoir dessus.
14. Cette histoire est au-delà de tout ce que je pouvais imaginer.
15. Il assiste toujours au festival de Maubeuge. Il y mange des röstis avec du bœuf.

16. Dans la forêt, il y a sept renards. Ils sont toujours debout la nuit.
17. Apparemment, au Japon ils mangent du poisson cru. Pas mon truc, vraiment.
18. Paul venait avec sa famille. Ce type a une sale gueule.
19. On peut dire qu'il est derechef le meilleur skieur du monde.
20. Il a perdu son sac dans une grande crevasse.

21. Cet hiver, je me suis baigné dans le fleuve. Il n'est pas gelé cette année.

22. C’est la même discussion chaque semaine. Je travaille selon les règles.

23. On jetait les sacs sur la table. Je me sentais comme un benêt.

24. Écris *heureuse* sur cette feuille.

25. La biographie d’Edith Piaf est vraie, sauf la partie quand elle est jeune.

26. Le roi ignorait son besoin d’aller en France.

27. Tu vois cette vieille chemise? Elle n’est vraiment pas à la mode!

    J’en ai une autre par contre. C’est la chemise de ma sœur.

28. Il y avait une vieille guenon assise.

29. Tiens, tu as vu mon pantalon ? Il est tout neuf.

30. Ta chaise ressemble à la mienne. Elle appartient à la petite fille à côté.

31. Pour être accepté au Collège de Beaulieu, il faut être bien doué.

32. Ils ont perdu leurs bedons.

33. Chaque fois qu’on gagne, on secoue la bouteille.

34. Tu cherches des meubles? Tu trouves tout chez IKEA.

35. Marie nage dedans.

36. On venait avec le chien. Le tracteur était à côté du grenier.

37. Tu pars en vacances demain?! C’est vrai?

38. Ils ne veulent pas passer leur DEUG.

39. J’habite Gex depuis 10 ans.

40. Cet hiver, le lac est gelé. Il s’est fracturé le deuxième genou.

41. Ta question est vraiment ambiguë. Je préfère ne pas répondre.

42. On s’est dit à demain. Je n’ai pas envie d’y aller tout seul.

43. Marie est une fille penaude.

44. Elle perd un peu du moral à chaque rejet.

45. Le boucher lui a fait des petites quenelles. A cause du bœuf elle sera malade demain.

46. A Paris il y a toujours des émeutes. Jamais à Nyon ou à Neuchâtel.

47. L'adresse est marquée là-dessus.

48. On devine toujours la bonne réponse.

49. Le dernier kilomètre, il a perdu sept secondes.

50. La vendeuse était polie, même quand elle se sentait crevée.

2ME PARTIE

1. Ce chaton est sevré maintenant.

2. Eude vient de s'acheter un super hub pour son WiFi.

3. Mon père a acheté la felouque l'année dernière.

4. On peut lui faire tout ce qu'on veut. Il est trop veule pour se révolter.

5. Ma mère a acheté cette peluche pour ma fille.

   Désormais, ma fille et la peluche sont inséparables.

6. Maintenant je suis sur Begnins. J'ai cherché trois melons.

7. Son fils est poli, mais il parle avec une voix durcie.

8. L'amour se maintient par-delà les temps.

9. Quand il veut bien réfléchir, Claude secoue la tête.

10. Ils ont chassé cette femelle toute la journée.

11. Pierre est mon neveu.

12. Les Ecossais adorent le rugby. Il y a toujours plein de gens aux matches.

13. Jacques fera de son mieux. Toi aussi, tu feras de ton mieux, je suppose.

14. Souvent, les acteurs fréquentaient un beuglant.

    Ils buvaient chaque soirée des litres de gueuze.

15. Après la pluie, le dessin était flou.

16. Jacques faisait de son mieux. Il ne supportait pas toutes ces querelles.
17. Pierre tenait la fille par la main.
18. Le hockey sur glace est plus violent.

    Hier au match, le joueur a jeté le puck à l'entraîneur !
19. Je n'ai jamais vu tout ce chenil!
20. Papi préfère les bretelles. Il n'a jamais mis une ceinture.

21. Leur fils s'appelle Denis. Quel benêt, ce type!
22. Elle a perdu tout son argent en prenant le taxi.
23. En Afrique, ils ont découvert une sorte de souris qui est en famille avec les feunasses.
24. J'ai parlé avec la guenon assise. On dirait qu'elle est la vedette de l'opéra.
25. Pierre n'a jamais compris le nom "neume".

    C'est un groupe de notes émises d'un seul souffle.

26. Son frère est très penaud. Il lui a coupé trois cheveux.
27. Mais entrez, seulement! Maman est à la Migros pour s'acheter un nouveau foehn.
28. Il préfère le tapis en velours.
29. Ton fils est en quel degré cette année?
30. La chèvre est la femelle du bouc.

31. Le chien a effleuré la petite fille. Comme elle a pleuré!
32. Jacques nous a expliqué toutes les règles de la langue hébreue.
33. Ma mère a acheté encore trois meringues.
34. Chaque felouque a deux mâts inclinés sur l'avant.
35. Le comité donnera la réponse pendant la semaine.

36. A Paris, elle est la nouvelle vedette d'opéra. Toi, tu chantes cependant bien.
37. Sur une île en Nouvelle Guinée, 200 personnes parlent la langue chevir.

38. Paul ? C’est un grand rebelle !

39. Avant, on menait le groupe nous-mêmes.

40. Tu es là depuis quand?

41. Ce n’est jamais la femme qui fait des quenelles.

42. Marc a feuilleté le livre de son père. En lisant, il s’est heurté contre la porte.

    L’acteur a poussé une beuglée.

43. Jacques, lui aussi, il est dedans. Tu as vu son bedon?

3ME PARTIE

1. Mon amie Julie est vraiment douée. Elle remarque le froid.
2. On regarde le match. Le joueur a récupéré le ballon au retour.
3. C’est le pire sedan que je n’ai jamais vu.
4. On mesure les bretelles.
5. Mon chef menait le groupe. On a vu un fleuve gelé.

4ME PARTIE

1. Je trouve ce film dégueulasse!

   - Qu’est-ce que tu dis? Tu le trouves vraiment dégueu?!

   - Je ne savais pas que tu étais un grand peureux!

2. Il y avait deux films. Il a vu lequel?

3. Au printemps, maman nettoie chaque fenêtre.

   - Le soir, elle est bien relâchée.

4. Pendant la guerre, la Suède était neutre.

5. Jacques devine la mauvaise réponse.

6. L’explication de sa femme lui semblait assez floue.
7. Mémé adore son cher velours.
8. Le petit prince aime le renard.

9. Martine ne comprendra jamais son comportement ambigu.
10. Ce matin, j'ai mangé sept meringues. A chacun selon ses besoins.

11. Claude jetait son stylo par terre. Il ne comprenait pas leur besoin de partir si loin.
12. Mon père est debout à 7 heures. J'adore le vieux Denis.
13. Après le divorce, Paul était bien malheureux.

    Anne, par contre, était contente d'avoir gardé sa maison fleurie.
14. J'ai oublié la levure! Il faut que tu attendes encore deux secondes.
15. Madame Dupont a de beaux genoux.

16. Claude mesure la tapisserie. Son oncle vient de donner mille francs à chaque neveu.
17. Le ciment devant la maison était finalement durci.
18. En 1945, l'armée a neutralisé l'ennemi.
19. Tu sais ce que c'est, une consonne relâchée ?
20. Monsieur Dupont était un requin. Ils ont été ruinés après le rejet.

21. Moi, je ne voyais cependant rien.
22. Mon mari a acheté quatre melons.
23. Il faut le finir demain.
24. Chopin a écrit une symphonie monumentale.
25. On remarque sa voix tremblante. Elle redoute les fantômes.

26. On faisait tout ce qu'on pouvait.
27. Vous avez déjà vu la revue ?
28. Tu entends le beuglement, chez les voisins? On dirait que ça beutche dans la cuisine. Quel malheur...
29. Paul refait la cuisine.
30. Il a pris environ trente cheveux.

31. Jamais je n’aurais pensé à un tel retour.
32. Il fait six degrés dehors.
33. J’ai mangé toutes les belons. Tout ce qu’on fait pour la recherche.
34. Je donne toujours mon vote à Begnins.
35. On redoute ses fantaisies.

36. J’ai acheté mon sedan en vacances. Tu trouves ceci mieux que cela?
37. La chanteuse fredonne toujours une heure avant le concert.
38. Tu ne comprends pas? C’est un mot hébreu.
39. En nageant, on a vu sept requins.
40. Pour fêter ça, ils font un bon repas.

41. Au grenier, j’ai cinq lebels.
42. L’auteur utilisait toujours le terme *derechef* dans ses romans.
43. Après le travail tu seras à la maison?
44. Claude est un type rebelle.
45. Je pense qu’il faut ajouter cette levure.

46. Ce ne sont pas mes affaires. C’est votre chenil!
47. On tenait des baguettes dans chaque main.
48. Tu me donnes lequel?
49. On refait nos devoirs. C’est de la grande recherche.
50. J’aime aller chneuquer dans les marchés aux puces.

Il y a tellement de monde que je me sens comme un aveugle.

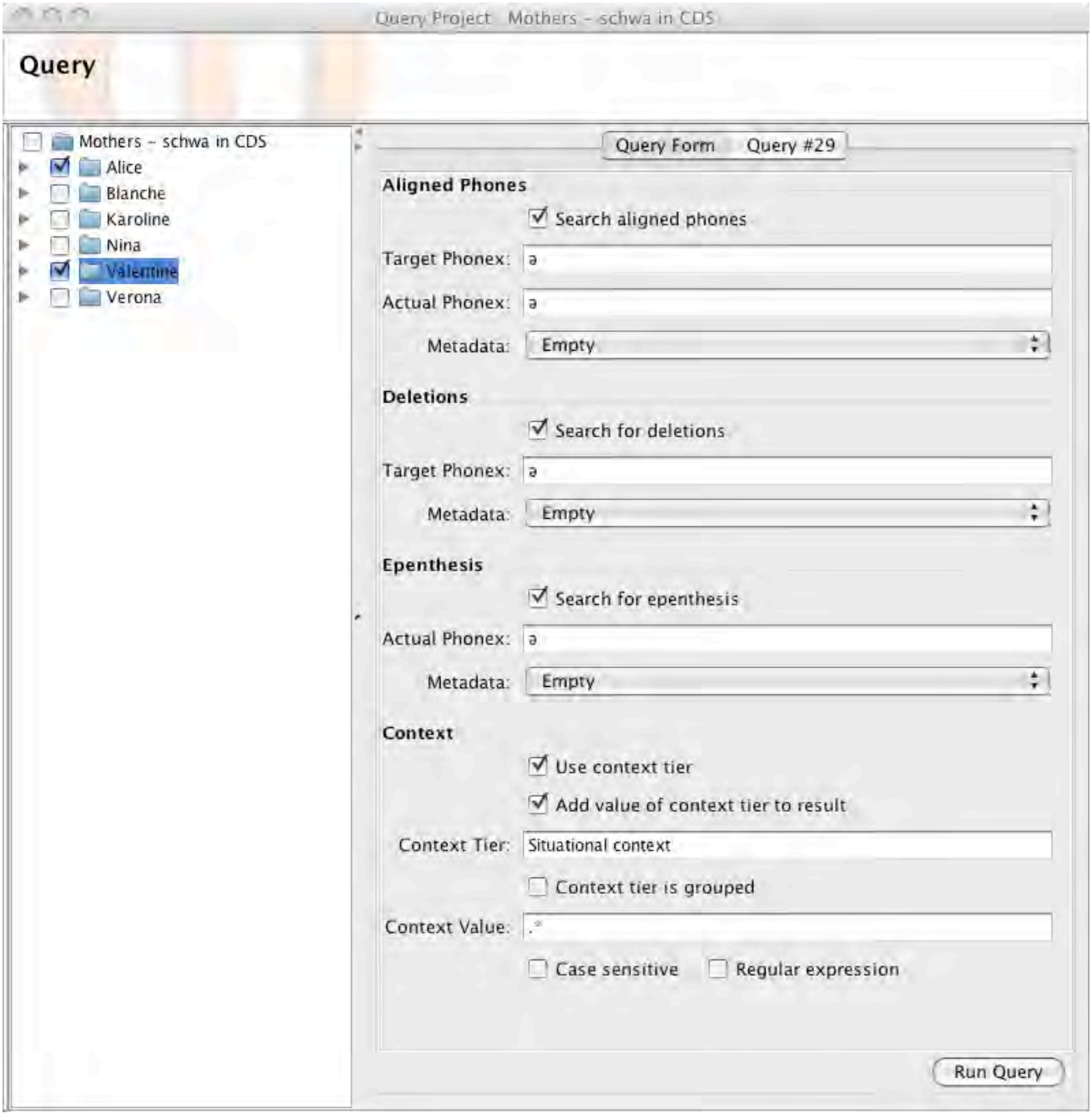
51. Jacques regarde le film. Pendant la guerre ils vendaient des lebels.
52. C’est toujours le même repas.
53. La nuit, il faut fermer les fenêtres.
54. Tu peux m’écrire le mot *fenasse*? Puis après tu peux écrire *cheuvir*.

Liste de mots à lire pour les mamans!

1. ceux que vous dites
2. comme je dis
3. c'était mon ami
4. jeune vaurien
5. le repas
6. le mur est épais
7. le Genevois
8. il reste deux sous
9. Maman est revenue
10. c'est à jeter
11. elle seule demande
12. j'ai un pull bleu
13. il reste debout
14. apporte leur eau
15. elle est nue
16. le ré
17. ils sont abreuvés
18. la boue
19. en pleurant
20. à demain
21. mon fils est sorti
22. déjeuner
23. des genêts
24. je suis partie en fin d'année
25. la jeunesse
26. ce que vous dites

27. l’atelier
28. comme jeudi
29. je ne vaux rien
30. une de mes amies
31. leurs pas
32. la jeune voix
33. elle était déjà sortie
34. il reste dessous
35. c’est acheté
36. une épée
37. elle se le demande
38. il reste deux bouts
39. tu prends ta chemise bleue
40. apporte le rôt
41. leurré
42. le bout
43. ils sont à brevet
44. ample rang
45. Papa était revenu
46. à deux mains
47. dégeler
48. il était nu
49. des jeunets

Extraction of schwa alternation in CDS in context, in Phon (Rose & Hedlund 2006-2013)



ISBN xxx-xx-xxxx-xxx-x