



UiT The Arctic University of Norway

Faculty of Humanities, Social Sciences, and Education

Looking sharp

A web-based eye-tracking study of the role of L2 English in L1 Romanian morphosyntactic attrition

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Most research is me-search

-Beatrice Beebe

Deconstruction

*I think the sirens in The Odyssey sang The Odyssey
for there is nothing more seductive, more terrible,
than the story of our own life, the one we do not
want to hear and will do anything to listen to.*

Mary Ruefle

Acknowledgements

It turns out writing a thesis is rather like tidying up a room– you have a vague idea that it should only take you so long, before you realise that drawer you opened contains all manner of assorted things, and by the time that’s sorted you’ve somehow accumulated even *more things*, so long story short several hours later you’ve got one sorted drawer and various miscellany everywhere else, and the room is very much worse off than when you started.

Much like that proverbial messy room, this thesis came together in snatched sleepless hours, in idle hours, in frantic, panicked, inconsolable, dreadful hours, and not least in last-minute hours. Those hours would of course not have resulted in anything much at all were it not for the help and guidance of many different people, but first and foremost my supervisors Fatih Bayram and Anamaria Bentea, who listened to my musings about how I was losing my first language and still believed somehow that I was qualified to write about it with any authority whatsoever. Their dedication to seeing my small idea grow into an actual researchable hypothesis carried me on, even when I thought I had lost any sense of what it was that I wanted to achieve in the first place.

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Abstract

This project investigated language change in Romanian-English speakers who live and work in countries where the dominant spoken language is English. The participants consisted of native, first language (L1) adult speakers of Romanian, who had emigrated to, and been primarily domiciled in, English-speaking countries for at least 10 years, and for whom English is their second language (L2). The study aimed to combine the research and methodology currently undertaken in the field of first language attrition, with web-based experimental tools. A mixed-method approach was utilised, involving an online eye-tracking task set in the Visual World Paradigm, followed by the collection of relevant language background and history information via an online questionnaire, as well as the remote completion of additional tasks complementary to the scope of the project. Within this experiment, participants were evaluated on their responsiveness to an auditory cue inferring grammatical gender in a picture-selection task. Two conditions were tested, (i) constructions where the Romanian possessive article *al/a/il/ale* was present, and (ii) constructions employing superlative adjectives of the form *cel/cea/cel/cele mai [adjective]*. The participants' sensitivity to gender agreement cues in online processing, as well as any significant differences between the two conditions formed the basis of the analysis undertaken by this thesis. No significant attrition effects of Romanian grammatical gender were found in either of the conditions tested, supporting previous findings that reduced frequency of use and competition from an equivalent competing structure in the L2 are more likely to affect L1 attrition outcomes over reduced frequency of use alone.

Keywords: multilingualism, language attrition, grammatical gender, eye-tracking, online processing, Romanian, English.

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List of Abbreviations

ATH	Activation Threshold Hypothesis
BH	Bottleneck Hypothesis
CEFR	Common European Framework of Reference for Languages
CDST	Complex Dynamic Systems Theory
CLI	Cross Linguistic Influence
D/P	Declarative/Procedural Memory Model
DP	Determiner Phrase
DOM	Differential Object-Marking
EEG	Electroencephalography
ERP	Event-Related Potential
EU	European Union
FRH	Feature Reassembly Hypothesis
GDPR	General Data Protection Rights
HL	Heritage Language
IELTS	International English Language Testing System
IH	Interface Hypothesis
L1	First Language/Native Language
L2	Second Language
Ln	Third/Subsequent Language(s)
MOGUL	Modular Online Growth and Use of Language
NSD	Norsk Senter for forskningsData
RIF	Retrieval Induced Forgetting
SVO	Subject-Verb-Object
TOEFL	Test of English as a Foreign Language

Chapter 1

Introduction

This thesis is concerned with the multilingual dynamics involved in the potential pressures exerted by the grammatical system of one language (in this case, English) on another (Romanian). The focus as it pertains to investigating issues of linguistic competition is on the phenomenon of language attrition; specifically, to what degree will a predominant use of English as a second language (L2) affect a speaker's native (L1) Romanian, with regards to grammatical gender processing.

Since this work is concerned with bi(multi)lingualism more broadly, it therefore follows that the reality of speaking multiple languages and inhabiting an increasingly globalised world is of great relevance to this thesis. One such reality of navigating multiple languages and social environments which necessitate effective communication is that of population migration.

It has long been the purview of the field of sociolinguistics to consider the intricate interconnections of language with various aspects of sociology; perhaps at no other point in time has a social issue been as broadly discussed, criticised, championed, or indeed touted as the root of many a great deal of policy dissatisfaction, as migration. Outside of the mass displacement caused by war, it is a combination of economic stability, increase in overall quality of life, better healthcare prospects, and more lucrative opportunities, among other factors, that contributes to an individual's choice to relocate to a different country. However, proximity and linguistic similarities are also crucial in determining which country to move to.

Limiting the scope of this conversation to just the remit of countries in Europe, migration statistics increasingly show a trend of skilled European Union (EU) migrants residing in their host country for longer, compared to similar statistics collected between a period of 6-12 years ago. If previously migrants were spending on average fewer than 10 years in their host country, they are now electing to stay for longer than 10 years (European Commission and Directorate-General for Employment, Social Affairs and Inclusion, 2018). Narrowing the conversation further to just a linguistic perspective, these trends have allowed research into the

rise of multilingualism and relatively novel fields such as third language acquisition to prosper; comparatively less work has been carried out investigating changes in the native grammars of speakers' L1, under the pressure of a competing, dominant one. Such changes, be they in syntax, morphology, or lexicon, are of interest to the field of language attrition.

Case study evidence gathered by the European Commission estimates the total number of Romanians currently living and working abroad to be over 3 million, as of its latest report dated 2018. Romania, alongside Bulgaria, has some of the highest rates of highly skilled and educated citizens to have immigrated to another country over the past ten years (European Commission and Directorate-General for Employment, Social Affairs and Inclusion, 2018, p. 329). Viewed in relation to the EU-28 member states, Romania is in fact one of the largest outgoing countries, with the highest negative net migration¹ (averaged between 2013-2016); 14% of its citizens who are resident in the EU-28 are living in countries other than Romania², the highest proportion across the EU (European Commission and Directorate-General for Employment, Social Affairs and Inclusion, 2018, p.59). These numbers are even more significant when one also considers that Romania is the seventh largest EU member state, with a population of 19.5 million. While the two highest countries of choice for Romanian immigrants are linguistically related (Italy and Spain, with a 5.1% and 3% proportion, respectively), the next two most sought-after destinations are not (Germany and the United Kingdom, 2.2% and 1.5%, respectively).

In light of these statistics, interesting questions naturally arise regarding the state of the native L1 of Romanian immigrants who reside in a country where the dominant language is different, particularly when the language pairs are less linguistically related (so as in the case of Romanians living in the latter countries mentioned above). This is of particular relevance to English, both in that it is a language in which the feature of grammatical gender has been lost, and in that it has global reach; therefore, the implications of any effect of English on Romanian could then be extrapolated in a larger sense as potentially relevant to the dynamic between English and other L1s as well.

The rise of English as a *lingua franca* has certainly led to countless benefits in terms of population migration, access to work and travel, and immeasurably broadened our exposure to and interaction with cultures and ways of life the world over. The technological advances that have made the Internet possible have almost certainly given English an unparalleled edge as the *de facto* global language. This comparatively unrivalled spread of the English language has not, however, been without its caveats.

Across the world, the reality of language competition fostered by the perceived benefits of English language hegemony is not to be dismissed. This phenomenon is at its most dangerous where it affects indigenous people's attitudes to their native language, with English proficiency

¹Negative net migration refers to a higher number of people immigrating from the country, compared to the numbers attracted to migrate to it.

²According to a UN estimate that puts the total number of Romanians living abroad at around 3.4 million.

a bridge towards what are often times considered better prospects. From a long history of contact between endangered languages with few remaining speakers, we know language death is a very real threat to these indigenous communities and speakers³. While Romanian in no way faces the same kind of pressures or scarcity of speakers, the way even more "secure" languages grapple with the effects of a stronger, globally-dominant language is a worthwhile matter to engage with when investigating linguistic experiences more broadly.

In the context of multilingualism studies, therefore, it is paramount that we consider the potential effects of English on a speaker's native language just as much as we document the (not inconsiderable) benefits of learning multiple languages. Within the expanding linguistic study of the interaction between two or more languages in the mind of a speaker, relatively little research has been focusing on the effects of a second (or third etc.), now dominant language, on the first. This is one of the motivations underlying this research.

Furthermore, the study of language attrition offers additional opportunities to research the interaction between language at an internal, psycholinguistic level, and the complex sociolinguistic aspect of speaker attitudes to both their native language, as well as the now dominant language. Since we know from studies into second and third language acquisition that learners' attitudes to the languages they are learning impacts their outcomes in attaining greater or lower proficiency in those languages (Gardner, 2010; Marton et al., 2021), would it not therefore be interesting to see whether a stronger identification with a new language and way of life as demanded by successful immigration and resettlement to a different country can also (negatively, this time) impact the engagement a speaker maintains with their native language? Existing evidence leads to the assumption that such dynamics are at the core of how attrited a speaker's first language may become- not least owing to the perceived prestige and value attributed by multilinguals to English over other languages (Busse, 2017).

All of these complex, interconnected aspects of multiple language interaction with respect to Romanian, English, and language attrition, form the basis of the empirical review undertaken in chapter 2. There, gender in Romanian is explained, alongside what little evidence of it remains in English. Subsequently, I turn to introducing the topic of language attrition, and the relevant theoretical frameworks under which this study operates. An overview of the different types of attrition with respect to language domains and extra-linguistic factors will conclude that chapter.

Curious to investigate domains of grammar in the L1 that have no correspondent in the dominant L2 language, this thesis set out to address the following questions:

³This is not to suggest in any way that the complex and multiple threats faces by indigenous communities are solely down to the widespread use of English; of the myriad ways in which these communities are impacted, the climate crisis is undoubtedly one of the biggest threats. Language death more broadly is an interesting topic; I refer the reader to Crystal (2002), who offers a considerate discussion on language death.

1. *Does English as an L2 affect L1 Romanian attriters' sensitivity to grammatical gender agreement cues in online processing? If so, how?*
2. *Is there a significant difference between the possessive article condition and the superlative adjective condition with respect to eye movement onset?*
3. *What factors modulate the similarities/differences observed at an individual level, both from a linguistic internal, as well as linguistic external perspective?*

These questions were intended as a means to tease out some insights into the dynamics at play in circumstances with potential for L1 attrition, such as those experienced by migrants. The broader scope of what this research hopes to achieve, as well as a more in-depth justification for these questions informs chapter 3 of this thesis.

The research into multilingualism, aided in part by English's rise as a necessary second or third language for so many speakers, has been generating consistent academic output in the field of linguistics. Moreover, vastly improved online methodologies have meant that researchers have access to potentially a much broader sample size of participants, in addition to a wider range of opportunities to collaborate internationally with fellow researchers on projects without the inconvenience or expense of frequent travel. To that end, this study embraced the availability of such remote data-gathering tools both in conception and execution, by building a web-based eye-tracking experiment, available online to participants. Chapter 4 comprises a comprehensive review of the methodology employed by this study.

What emerged from the experiment was that there was minimal evidence of change in the processing of grammatical gender due to attrition effects, albeit based on a small sample of participants. These findings are presented in chapter 5, alongside additional results gathered from the complementary lexical and gender tasks. A more detailed analysis and discussion is undertaken in chapter 6, with reference to the concepts introduced in chapter 2; this discussion also includes a section addressing the limitations of this study.

Finally, the future directions this research could take are explored in chapter 7, before chapter 8 offers some concluding remarks.

Chapter 2

Literature Review

2.1 Gender

Grammatical gender is a feature specific to some languages¹, whereby noun classes (i.e. their gender) impact the behaviour of words associated with them (Hockett, 1958). That is to say, nouns and words associated with them (such as determiners, articles, adjectives) must agree in this gender feature (Corbett, 1991; Hockett, 1958; Kramer, 2015). Gender classification is a particularly interesting linguistic phenomenon in that it straddles various areas of interest, such as syntax, morphology, and phonology; therefore, understanding a given language's gender categorisation system presents researchers with an opportunity to discover new insights into several levels of linguistic representation².

There is a certain complexity involved in determining which nouns belong to which grammatical gender across all the different languages that recognise this feature³, but what has been perhaps less well-established in the traditional definition of grammatical gender is the cross-linguistic reality that all languages which recognise this feature have at least a subset of nouns where the gender is established on the basis of "animacy, humanness, and/or social gender for humans/biological sex for animals" (Kramer, 2020, p. 47). This fact can be observed to hold true even for languages which no longer categorise nouns by grammatical gender, but which maintain a dichotomy between masculine(male)/feminine(female) on certain nouns or pronouns, as will be discussed further with regards to English in section 2.1.2.

While a lot more could be said on the topic of gender assignment, for the purposes of this study the relevant aspect to note is that gender assignment is relevant to lexical access as well as

¹Such as Italian, Dutch, Arabic, Hebrew, Punjabi, to name only a very few. See Corbett (2013) for an overview of the geographical distribution of languages with and without grammatical gender.

²See Corbett (2014, 1991), Hellinger and Bußmann (2001), Kramer (2015, 2020), Mathieu et al. (2018) and Schiller (2014) for discussions of grammatical gender aspects relating to typology, sociolinguistics, morphosyntax, theoretical topics, and psycholinguistics, respectively.

³See Corbett (2014) and Kramer (2015).

morphosyntactic integration, so that knowledge of the gender of a noun aids the speaker’s ability to identify and track relevant references to it (Bateman and Polinsky, 2010). This is particularly salient to the design of the experiment employed by this study: by presenting certain gender agreeing parts of speech as stimuli, the aim is to track the participants’ affinity towards the target noun as implied by these referents.

2.1.1 Gender in Romanian

The notion of grammatical gender is relevant to the features under investigation in this experiment, hence its introduction here as it pertains to Romanian. Romanian is the official language of Romania, as well as that of the neighbouring Republic of Moldova; it is classified as a Romance language, a subgroup of the Indo-European language family which also includes Spanish, French, Italian, and Portuguese⁴(Alkire and Rosen, 2010).

Although most Romance languages have a two-gender system (distinguishing between *masculine* and *feminine*), Romanian is "the only major Romance language⁵ for which the architecture of the gender system is controversial" (Loporcaro, 2016, p. 928). Traditional analyses of the gender system in Romanian recognise three distinct categories: masculine, feminine, and neuter (Chitoran, 2002; Corbett, 1991; Graur et al., 1966; Rosetti, 1965, 1973). However, there is still a lot of debate with respect to the nature of the neuter gender as it pertains to Romanian (Farkas, 1990; Hall, 1965; Jakobson, 1971; Matasović, 2004), which will be discussed further as it relates to this study.

Gender agreement is expressed between nouns and demonstratives, articles, determiners, attributive adjectives, predicate adjectives, and the numerals “one” and “two” (as well as higher numerals containing these, such as “eleven” and “twelve”, for instance). For the sake of simplicity, Table 2.1 illustrates the agreement pattern only in the numerals “one” and “two”, the definite article, and adjectives (gender agreement marked in bold).

Gender	Word	English	SG-indef.	SG-def.	PL-indef.	PL-def.	SG-adj.	PL-adj.
Masculine	pantof	shoe	un pantof a shoe	pantof ul the shoe	doi pantofi two shoes	pantofi the shoes	pantof bun good shoe	pantofi buni good shoes
Feminine	riglă	ruler	o riglă a ruler	rigl a the ruler	două rigle two rulers	rigle le the rulers	riglă bună good ruler	rigle bune good rulers
Neuter	creion	pencil	un creion one pencil	creion ul the pencil	două creioane two pencils	creioane le the pencils	creion bun good pencil	creioane bune good pencils

Table 2.1: Gender in Romanian

There is still ongoing debate among linguists whether this three-gender system is a result of a

⁴Though, in addition to these five, the Romance family also includes various related dialects, such as Catalan, Dalmatian, Sardinian, to name just a few.

⁵Various other dialects belonging to the Romance language family, such as Verbicaro (a northern Calabrian dialect) and central-southern dialects of Italian, also differ from the more conventional two-way gender system (Ledgeway and Maiden, 2016).

rigid upholding of the original Latin three-gender system (Petrucci, 1993), or a more innovative inclusion of a third gender under historical Slavic influence (Rosetti, 1965). However, as illustrated in the table above, there is noticeable syncretism in both agreement and number: masculine and neuter nouns take the same forms in singular, while feminine and neuter nouns correspond in the plural. This pattern is consistent across cases as well⁶ (Table 2.1 above exemplified the nominative singular and plural definite forms). A more recent analysis by Bateman and Polinsky (2010) offers a compelling argument that Romanian can be classified as a more traditionally Romance two-gender system, and it is within this framework that the current thesis will operate with regards to the selection of the experimental items; it is therefore necessary to explain the arguments they present further.

Their argument can be synthesised around this syncretism between gender agreement and the number paradigm; namely, there are three main plural markers (-i, -e, and -uri; see Table 2.2), with an additional marker -le occurring on a small subset of feminine nouns (those ending in stressed -á or -eá, as seen in Table 2.2), making it fully predictable. Therefore, the three main plural markers are shared between the genders. Under this analysis, the Romanian gender system can be interpreted as having "two sets of *targets*, but three *controller* genders" (Loporcaro, 2016, p. 928, emphasis in original).

Gender	Singular	Plural	IPA	Gloss
Masculine	codru	codr-i	[kodri]	woods
	colac	colac-i	[kolatʃ ⁱ]	bread rolls
	copac	copac-i	[kopatʃ ⁱ]	tree
	sabot	sabot-i	[sabots ⁱ]	clog (shoe)
	blana	blan-uri	[blɔnur ⁱ]	pelt
Feminine	casa	cas-e	[kase]	house
	inima	inim-i	[inim ⁱ]	heart
	para	para-le	[parále]	money
	acvariu	acvari-i	[akvari ⁱ]	aquarium
Neuter	clopot	clopot-e	[klopote]	bell
	dulap	dulap-uri	[dulapur ⁱ]	closet/cabinet
	teatru	teatr-e	[teatre]	theatre

Table 2.2: Plural forms syncretism, from Bateman and Polinsky (2010, p. 43)

Therefore, according to the analysis as undertaken by Bateman and Polinsky (2010), Romanian allows for a superficial, surface-level appearance of three distinct genders in the lexicon (masculine, feminine, and neuter), with an underlying two agreement patterns in the singular and plural (masculine and feminine only). Because neuter does not have its own dedicated marking or agreement pattern, and because the mapping from singular to plural for neuter always follows the masculine pattern in singular and the feminine in plural (Bateman and Polinsky, 2010), we can treat Romanian as a two-gender language system, in so far as “gender

⁶It is worth briefly mentioning, with regards to cases, that although morphological case is not present in nouns and adjectives, there is a "productive opposition between nominative/accusative and genitive/dative case" on determiners and the definite article (D’Hulst et al., 2000, p. 140).

agreement provides the basis for defining gender and establishing the number of genders in a given language” (Corbett, 1991, p. 105). Corollary to this is the characterisation of neuter nouns in Romanian as “heteroclite”, according to Hall (1965), meaning that their chief characteristic is that they belong to different inflectional classes in singular and plural, rather than to a different grammatical gender.

This analysis of Romanian as a two-gender system is relevant to the scope of this research, as the experiment design by nature will not overtly present participants with the target noun, only with cues as represented by referents to it which agree in gender and number. As we have seen, this agreement pattern follows only the masculine and the feminine; this means that in so far as the items selected for this experiment are concerned, whenever neuter nouns are presented as stimuli, they will be classified as either following a masculine pattern (if they are in singular), or a feminine one (if they are in plural), against a competitor of the opposite gender. However, in the interest of reinforcing that this agreement patterning is always the case with neuter nouns, whenever Romanian examples of gender agreement are used to illustrate a point throughout this thesis (via tables and figures), neuter nouns will always be included.

2.1.2 Gender in English

The grammatical gender feature has no counterpart in English, having been lost over a period of approximately three hundred years between Old and Middle English (Curzan, 2003; Jones, 1988). Modern English no longer distinguishes for gender through morphological agreement (which other Germanic languages like Dutch and German continue to do), so it no longer can be said to have grammatical gender; instead, gender is a primarily semantic category in English (Hellinger, 2001).

To that effect, gender remains expressed in English in certain nouns (*mother, father, daughter, son, aunt, uncle*) and pronouns (*he, she*) in relation to natural gender; however, with respect to some examples (such as gendered profession titles- *waiter/waitress, author/authoress*, as well as the default generic use of masculine), there has been an increasing shift towards gender-neutrality; in practice, this means abandoning gendered profession titles in favour of the traditionally masculine form being applied in a gender-neutral fashion across the board⁷ (Romaine, 2001), as well as the singular use of the pronoun *they*, in neutral, non-specific contexts (Hellinger, 2001).

Additionally, gender can also be applied to certain nouns in English in a metaphorical sense, and this can vary regionally, as well as dialectally. This is evidenced in certain cases relating to inanimate objects such as ships, boats, cars, and countries, whereby these objects will be referenced using the feminine pronoun *she*. In these instances, the inanimate objects being referred to take on the role of grammatical subject, by way of a mental process that uses

⁷Or finding a gender-neutral alternative, e.g. *chairman* to *chairperson* or simply *chair*.

metaphorisation to convey an affinity to the object that is based on affective, rather than definitional associations (Velasco-Sacristán and Fuertes-Olivera, 2006).

Given the very restricted application of gender in English, and crucially its absence as a proper grammatical feature of all nouns, there is no gender agreement present on the words associated with nouns, such as adjectives, as would be the case otherwise, with very slight exceptions (*blond/blonde, handsome/beautiful*⁸).

All this is to say that a lot of recent research focusing on gender in English has therefore been carried out in the field of socio- and psycholinguistics, with particular emphasis on feminist theory and reforming rhetoric and discourse. As the focus of this thesis is investigating the potential effects of the absence of grammatical gender in English on a language with a productive opposition at the level of this feature, no further analysis of the social aspect of semantic gender in English will be pursued here⁹.

With respect to the population that is of interest to this research, certain notions can be formulated with regards to how this dynamic may come into effect, if at all. Specifically, it could be the case for the potential L1 attriters that their representation of gender may restructure under increasing pressure from a language where this feature is not present. Having introduced gender and gender agreement, this is now a good time to discuss gender acquisition.

2.1.3 Gender Acquisition

Although Romanian remains relatively under-researched as a language, a considerable body of work has been carried out on other Romance languages, and where data is lacking for Romanian specifically, reference will be made to these related languages; there is no *a priori* reason why Romanian acquisition should deviate from gender acquisition observations as they pertain to these related languages.

Previous research on grammatical gender found that it is acquired early, with children as young as 3-4 years old showing high proficiency in correct gender-attribution tasks in French (Clark, 1985; Karmiloff-Smith, 1979), as well as Spanish (Pérez-Pereira, 1991). Furthermore, it is one of the first grammatical features to emerge in the L1, and in many cases to be mastered, depending on the language being acquired, with higher rates of early gender acquisition in Romance languages versus Germanic, for instance (Franceschina, 2005). This acquisition not only happens early, but in a relatively error-free manner, at least for monolinguals; in the case of L2 learners, as well as heritage language (HL) speakers, grammatical gender can be a persistent problem (Franceschina, 2005).

⁸Though it is worth noting that this last pair has increasingly lost its original gender connotations, partly because English overall has lost grammatical gender, and partly because of natural language use change over time.

⁹For those interested, Hellinger and Bußmann (2001) offer an interesting collection of sociolinguistic gender considerations, with examples both from languages with grammatical gender, and without.

Tsimpli (2014) predicts no input-based effects on either monolingual or bilingual understanding of their languages as having grammatical gender or not (i.e., whether the language being spoken to them has this feature); not only that, but both monolingual and bilingual children acquire the distinction between for instance, binary grammatical gender languages and those with a tripartite classification, at the same time as they acquire knowledge of gender as a grammatical feature of that language.

As regards gender agreement at this stage, Liceras et al. (2000) report very low errors between determiner and noun, as well as noun and adjective pairs, in monolingual acquisition between the ages of 1;7-3;11¹⁰ (their research carried out on Spanish). However, in the case of bilingual child learners, robust morphological and lexical knowledge, such as would be amassed through a high-degree of language input, is necessary to consolidate gender agreement (Tsimpli, 2014). This high-input requirement can explain why HL speakers may experience recurring issues with correct gender agreement, given their exposure to the heritage language may have been reduced compared to the language environment of a bilingual child learning two majority languages (Keating, 2022).

These results would all suggest that while differential outcomes with respect to bilinguals and HL speakers can elicit gender agreement production and comprehension errors, grammatical gender and gender agreement are robust features where potential for underlying change is low in those who have acquired it as monolinguals and are only later in life facing competition from another dominant language; this describes the language reality of potential L1 attriters, therefore we could expect a strong sensitivity to gender agreement violations (in this case, in Romanian native speakers), even under the competing pressures of a language without gender (in this case, English).

Several studies (primarily set up using the Visual World Paradigm- more on this in chapter 4) have made productive use of the gender agreement marking on different word categories in order to predict an upcoming noun, suggesting that participants use knowledge of the morphosyntactical relationships involved in gender agreement to limit their noun expectations (see, for instance, Brouwer et al., 2017; Dahan et al., 2000; Dussias et al., 2013; Hopp and Lemmerth, 2018; Lew-Williams and Fernald, 2010); it is within this framework that this study has been approached.

2.2 Language Attrition

Even within the field of language attrition research, a not inconsiderable amount of time is dedicated to explaining, or indeed fine-tuning, exactly what is meant by the term "attrition". This is not only a result of the fact that this is a younger field, compared to other linguistic

¹⁰1 year and 7 months old to 3 years and 11 months old.

research pursuits (Köpke and Schmid, 2004); rather, it is because teasing apart the mechanics of the interaction of multiple languages is a difficult process, which may more often than not open up more questions than it offers answers. What this means in practice is that whether a first language can certainly be said to have undergone significant attrition remains a matter of debate, once a certain degree of proficiency has been attained; this is before researchers can even begin to untangle the issue of what might cause it (Köpke and Schmid, 2004).

It is important to note that language attrition refers only to language change processes as experienced by speakers with an already stable language system in place. Therefore, language attrition is a separate phenomenon to that of incomplete/differential acquisition¹¹, whereby linguistic knowledge restructuring in one language occurs due to the acquisition of another language earlier in life¹² (Schmid, 2013).

A lot of the work on language attrition has been done on migrant populations¹³, because their environment is so rich in navigating the complex reality of bi(multi)lingualism. The way we view attrition is also an extension of the larger discussion on what constitutes a bilingual speaker- for a layperson, the term would signify someone who is able to seamlessly use two languages at the same level of proficiency, across all aspects of life (something that is doubtfully the case, or only representative of a tiny sample of speakers: see Cook, 1991; Grosjean, 1989). However, as linguistic research increasingly employs the term 'bilingualism' to cover all levels of proficiency, attrition can be viewed as the most pronounced effect of the constant negotiation and transfer occurring between a speaker's L1 and L2 (Schmid, 2011b).

2.2.1 Theoretical Frameworks

What might lead a bi(multi)lingual to experience attrition in their L1, then? The field of language attrition has had to rely on different models that explain the management of the two (or more) language systems in the brain, similar to those used in researching L2 or third/subsequent language(s)(Ln) acquisition and neurolinguistics, but with an emphasis on the potential strain on a speaker's L1. This strain comes from the constant state of competition experienced by language users who rely on more than one language to communicate- even in reduced circumstances, one of the speaker's languages is by necessity suppressed while the other one is being used. The following subsections provide an overview of the different models used in language attrition research, and provide the framework to be used in the analysis of the results from this experiment.

¹¹See Kupisch and Rothman (2018) for a discussion on why the term *incomplete acquisition* can be detrimental to research on heritage speakers. See also Kaltsa et al. (2015) and Lohndal et al. (2019) for more on differences and similarities between heritage speakers and L1 attriters.

¹²As would be the case for heritage language speakers; see Montrul (2008).

¹³See Bot and Clyne (1994), Huls and van der Mond (1992), Hulsen (2000), Raidt (1997), Schmid (2002) and Yağmur (1997), to name a few.

The Competition Model

According to the Competition Model (MacWhinney, 2015, 2018), like many other biological systems, language structure occurs from a system of competition, or more specifically, competing motivations. With respect to language attrition, the key aspects of this model concern risk and protective factors. As suggested by their names, risk factors are forces likely to interfere with the process of language learning and functioning, while protective or supportive factors ease those very same processes. The model identifies four risk factors (entrenchment, transfer, over-analysis, isolation) and four protective factors (resonance, decoupling, chunking, participation). Of these, over-analysis and chunking are primarily relevant to the early stages of language acquisition, so will not be considered further here; the remaining factors are outlined in the following paragraphs as they relate to language attrition.

Entrenchment refers to the basic unit of Competition Model analysis, which is the cue. A cue can be any unit on any level of linguistic structure, be it lexicon, phonology, or grammar. Cues are considered highly reliable if they correctly predict an outcome during comprehension, or if they determine the correct token during production (MacWhinney, 2019). During early stages of language acquisition, cue availability in the input (so, the frequency of occurrence) is more important than its reliability; in time, however, how reliable a cue is (so, how likely it is to facilitate or produce the correct outcome) determines its strength. This cue strength is what ultimately determines the outcome of the continual competition between the cues that is the foundation of the Competition Model (MacWhinney, 2019). Entrenchment occurs when a cue is preferentially used- it is what fundamentally plays a role in language maintenance. That is to say, if a cue is reliable, its strength increases, and the cue becomes effectively entrenched (more difficult to forget and preferentially selected for).

This is a risk factor for the multilingual mind because learning another language presupposes that new cues will become available, which due to limited availability of cortical areas dedicated to new learning, will necessitate the language user to transfer existing L1 forms to the L2. Therefore, entrenchment can disrupt the smooth process of learning a second language (particularly when the forms from the L1 do not map onto the L2), while simultaneously promoting successful L1 maintenance. With respect to how this applies to language attrition, when the L2 becomes the dominant language, and use of the L1 declines, the stronger L2 transfer to the L1 will reduce the supportive benefits of L1 entrenchment (MacWhinney, 2019).

Transfer refers to the negotiation of new forms once a new language is being learned. In initial L2 acquisition stages, the Competition Model predicts that "everything that can transfer will" (MacWhinney, 2019, p. 13). Specifically, the unmarked L1 pattern will transfer to the L2, be it any existing L1 phonemes that can be mapped onto L2 sounds (with small corrections), the meaning of L1 words, or basic word order. This transfer from the L1 to the L2 is well-documented by cross-linguistic influence studies (CLI), but it has also been shown to occur in

language attrition, where transfer from the dominant L2 affects L1 patterns¹⁴.

Resonance is the process by which, in L2 learning, L1 entrenchment effects can be countered. Resonance refers to the connections between the cortical areas and the hippocampus which lead to linkages in the cortex and memory consolidation. With its connections to all cortical areas, the hippocampus can maintain an ongoing interaction between all the cortical subareas whenever a new experience is encountered (MacWhinney, 2019). Not only does this constant activation consolidate new episodes, but it also crucially links them to existing concepts in ever-richer networks (Schlichting et al., 2014; Zeithamova et al., 2012). This is of particular importance in the context of L1 maintenance under L2 pressure, because resonance relies both on continued L1 input (such as from reading and communication), as well as internal use (such as may be experienced by a language user when planning). Additionally, resonance effects can also occur passively, such as during sleep (Lindsay and Gaskell, 2010).

Decoupling refers to the process by which the L1 and the L2 are successfully independent of one another— a very necessary outcome for successful L2 learning. To the degree that resonance can facilitate the representation of each of a speaker’s languages as a (partially) separated neural circuit, transfer between the two (or more) languages can be minimised (MacWhinney, 2019). Decoupling involves the management of inhibition of the L1 during L2 activation. In terms of L1 maintenance to counteract potential attrition, attempting to localise the use of the L1 to contexts with minimal L2 interference aids greater decoupling and ultimate maintenance of the two language systems (MacWhinney, 2019).

Lastly, isolation (a risk factor) and participation (a protective factor) are closely intertwined, as they directly play off one another. With respect to isolation, being unable to engage with L2 communities is a huge risk in L2 learning, as failure to successfully communicate in the L2 effectively isolates you from that community. Conversely, in order to successfully integrate into a new community that speaks another language, being able to fully interact within those social spheres without reliance on the L1 (so, participation) is crucial (MacWhinney, 2019). Especially in the migration context that is of interest to this study, it is essential for the immigrant to interact with and integrate into the new society. Of interest to first language attrition are the scenarios where the integration with the L2 community is successful enough that L1 use ceases, thus exerting pressure on the maintenance of a language system that is not used.

Isolation and participation are heavily influenced by cultural identity and personal affinity towards the languages in competition. In a study conducted by Schmid (2002), attrition effects were studied in Jewish populations who escaped from Germany to Anglophone countries at various times during the Second World War; the age of the participants at the time of their forced relocation ranged from early adolescence to young adulthood. Personal and cultural

¹⁴See Ribbert and Kuiken (2010) and Tóth (2007).

identification played a huge part in the participants' German language use, and was directly tied with the time of their migration– if they had relocated prior to the introduction of the Fascist discrimination laws, they retained high use of German and general acceptance of their German heritage; however, if their escape occurred after the start of the forced deportations to concentration camps, they rejected both German background and language. Schmid's conclusion was that the single highest predictor of the degree to which their first language had attrited was the time of leaving Germany. Although this example is extreme, it still serves to illustrate how relevant identity is as either a protective, or a risk factor for language use and maintenance (MacWhinney, 2019).

The Activation Threshold Hypothesis

The Activation Threshold Hypothesis (ATH; Paradis, 1993) is predicated on the notion that neurological processes suffer decline with reduced use. This comes from an economical view of how the brain is organised and how neural networks are maintained and accessed; brain functions are costly to maintain relative to size and metabolic load, so therefore many aspects of brain organisation have to maximise robustness and efficiency, a constant trade-off between efficiency and adaptability (Bullmore and Sporns, 2012). Purely from this perspective, then, the ATH maintains that parts of a system that are not being used will succumb to a gradual process of atrophy in the absence of repeated activation. The predictions of the ATH are that: "(1) language disuse gradually leads to language loss; (2) the most frequently used elements of L2 will tend to replace their (less used) L1 counterparts; (3) comprehension will be retained longer than production because self-activation requires a lower threshold than comprehension" (Paradis, 2007, p. 125).

Just as in the Competition Model, two (or more) competing languages in the brain are in a constant state of activation. This supposes that there is a more general language mode in the brain, labelled simply as L, onto which the languages learned by a speaker are built into their own subsystems as L1, L2, Ln. After say, L2 competence has been acquired, it forms a new subsystem to the overarching L system, to compete with the subsystem of the L1. Once a new language would be acquired to a sufficient degree, it would also be its own subsystem now in competition with both the L1 and the L2 ones, and so on.

Key to the predictions of the ATH is the concept of the activation threshold. This is a concept by which information retrieval affects its availability to the user in the future. Each piece of information stored in the brain, whether in declarative memory (such as words) or in procedural memory (the underpinnings of syntax, for example), has an activation threshold; the more an item is accessed and retrieved, the lower its activation threshold, i.e., the easier it is to access in the future. This relates to the principle of economy mentioned above, whereby frequently accessed items are easier to retrieve in the future because of the frequency of their necessity (it ultimately reduces cognitive load to make a highly used item more readily available).

Conversely, items which are rarely retrieved gradually end up with a much higher activation threshold compared to their regularly accessed competitors.

What this means concretely in terms of language attrition is that two dynamic subsystems of language are in constant competition with one another, and that frequent preferential activation and retrieval of cognates from one subsystem (the dominant language) over their counterparts in the other, hinders future retrieval of those cognates from the competing, infrequently used subsystem. This is supported by research that finds certain areas of language more susceptible to attrition effects than others, and generally patterns on a reverse of the expected order in language acquisition; that is to say, words are likely to undergo attrition first, with aspects of procedural processes involved in morphology, syntax, phonology, and finally prosody, likely to attrite last (Paradis, 2007). This seems intuitive if we consider that the meaning of a word may be shared across the subsystems, but its two forms in the two languages will be accessed and retrieved as two separate entities that map onto the same concept, therefore preferentially lowering the most used one's activation threshold in favour of its (in this case, L1) competitor, and ultimately leading to significant retrieval issues of that item in the L1. On the other hand, more complex grammatical aspects such as morphology or syntax may not share the same analogous relationship across the two subsystems, therefore making them less likely to be subject to the same kind of competition (particularly in cases where a particular grammatical feature is entirely absent in one of the L subsystems but present in the other).

The Feature Reassembly Hypothesis

The Feature Reassembly Hypothesis (FRH; Lardiere, 1998a, 1998b, 2005, 2009) is firmly rooted in the development of the Minimalist Program (Chomsky, 1995, et seq), whereby linguistic expressions of the language model L "satisfy output conditions at the PF and LF interfaces"¹⁵ (Chomsky, 1995, p. 225). According to this framework, formal features appear as pointers on lexical items and larger syntactic constructions and facilitate the linguistic interpretation of more complex structures generated from these components at external interfaces (the PF and LF). Through the operation of *feature checking*, linguistic expressions are able to be interpreted; more importantly, these formal features are a universal aspect of the way our brains compute language, and therefore at the core of our underlying ability to abstract and interpret particular grammars (I-language) by correctly assigning these features to their corresponding units and determining when they are interpreted at the external interface level (through the operation Spell-Out).

These Minimalist Program assumptions are relevant to the FRH in the context that acquisition of an L1 presupposes the acquisition of the relevant features that are to be indexed to particular lexical items and syntactic objects, as well as the knowledge of when to apply the Spell-Out operation so that these features are valued appropriately at the PF-interface. It therefore

¹⁵PF = phonological form; LF = logical form.

follows that this pattern would hold for the subsequent acquisition of languages, except that these features would not have to be acquired as new, but rather their L1 mapping would be reconfigured to that of the new L2 grammar, such that the same syntactic features would Spell-Out onto their new appropriate morphological forms (Putnam et al., 2019).

As regards language attrition, under this framework attrition is understood to be a process characterised by the gradual loss of structural mappings in the L1 due to their relatively low activation under reduced L1 grammar use once the L2 becomes the dominant language. But because the FRH model correlates well with both the Competition Model and the ATH in terms of multiple language (sub)systems competing with one another, it leads us to the conclusion that what the FRH is trying to capture is the competition not between two different grammatical representations *per se*, where one is preferentially activated while the other is inhibited, but rather these two representations together having to compete with the cognitive functions of inhibition and execution. Under this interpretation, language attrition is more akin to the experience of L2/Ln strengthening, rather than L1 degradation (Putnam et al., 2019).

The Interface Hypothesis

The Interface Hypothesis (Sorace and Filiaci, 2006) originally proposed that certain language structures that involve the interface of syntax and other cognitive domains are harder to acquire than those not involving this interface. While initially formulated to explain L2 acquisition patterns, the IH has been extended to account for L1 attrition outcomes by affecting the speaker's ability to process structures at the interface level, without actual loss of the knowledge representation itself (Sorace, 2011, 2016). Notably, this assumption applies to adult L1 attriters, that is to say those speakers with fully acquired L1 systems before the onset of attrition effects, and not to the language experiences of HL speakers (Chamorro and Sorace, 2019).

A study by Chamorro et al. (2016) conducted within the IH framework investigated high proficiency L2 English speakers' selectivity to differential object-marking in their native L1 Spanish. This is the same selectivity reported in L2 acquisition studies (Belletti et al., 2007; Sorace and Filiaci, 2006), also in language pairs where the L2 was English, which led some to conclude that it was the absence of these structures at the interface of syntax and pragmatics that was interfering with felicitous L1 resolution in real-time tasks (Chamorro and Sorace, 2019); however, research into L1 attrition found optionality effects in anaphoric forms also in language pairs that are more typologically similar (de Prada Pérez, 2015; Lozano, 2006; Sorace et al., 2009). These outcomes highlight that the optionality in interface structures could not solely be attributed to English, or to changes at the representational level, but rather to the cognitive strain involved in managing any two language systems in real time (Sorace, 2011, 2016).

The Bottleneck Hypothesis

The Bottleneck Hypothesis (BH; Slabakova, 2008, 2013, 2016) was originally introduced in second language acquisition research as a means of identifying features and constructions which pose greater difficulty for L2 learners to acquire. Its basis is in the generative grammar paradigm, and identifies functional morphology as especially relevant to acquisition, based on the salience of functional morphemes in ascribing particular meaning to a sentence. This is to say that, for instance, the inflection on verbs, the tense, the subject-verb agreement in such features as are relevant to the language being learned, and the way these properties are manifested at an external interface through the presence of functional morphemes, is what ultimately gives a complete meaning to any utterance, absent from its constituent parts in isolation.

In conjunction with the assumptions on language derived from the Minimalist Program, the BH finds that the locus of linguistic variation is in functional morphemes (Slabakova, 2019). This is because the syntactic operations that are at the core of the minimalist view of language (Agree, Merge, Move) are seen as universal, which by necessity means that the variation we have between languages can only be encoded in the functional lexicon (where functional morphology also resides), and at the interface with form and expression.

If the BH can inform assumptions about how languages are acquired by identifying those structures that are problematic for L2 learners to acquire, it therefore follows that the BH can also propose that certain structures are less likely to undergo attrition, in virtue of their perceived resiliency. An interesting study that investigated attrition in functional morphology was conducted by Montrul et al. (2015). They investigated differential object-marking (DOM) both in populations of early attriters (specifically, heritage speakers) and late attriters (adult L1 attriters) of Hindi/Urdu, Mexican Spanish, and Romanian speakers living in the United States. DOM refers to the property in some languages of the object being explicitly marked through morphology to distinguish it from the subject (Aissen, 2003). DOM is modulated by the properties of the subject, animacy and specificity, and semantic properties of the verb such as aspect and agentivity. The three languages largely patterned the same for DOM's semantic restrictions, with the distinction that in Mexican Spanish the marker is less audible than in Hindi/Urdu and Romanian (the vowel *a* compared to the syllabic *ko* and *pe*, respectively). They found that while 62% of the Spanish speakers had attrited in this feature, accepting ungrammatical DOM omission, this property had undergone no attrition in the Hindi/Urdu and Romanian speakers.

The authors explained these results based on the fact that ultimately the markers involved in the functional morphology of the DOM serve other purposes in these languages that are not the same across all three. Similarly, to take the case of Romanian, clitic doubling may have also contributed to the difference in attrition outcome to the Mexican Spanish speakers, in that

accusative clitic doubling is preferred in Romanian but ungrammatical in Mexican Spanish. Because clitic doubling requires the DOM marker to be present in the object noun phrase, it may act as a protective factor against DOM erosion for these speakers (Montrul et al., 2015).

Ultimately, while the BH may be able to propose why certain features are more or less likely to undergo attrition, the question still remains how this is actually manifested in individuals with different linguistic experiences (Slabakova, 2019). Because the multilingual experience presupposes the presence of several sub-grammars operating in tandem, the price of recalling an L1 rule may be costlier than the more frequently accessed L2 one, from a purely processing cost perspective (Sharwood Smith, 2019; Sharwood Smith and Truscott, 2014).

The Complex Dynamic Systems Perspective

The Complex Dynamic Systems Theory (CDST) emerged from the Chaos/Complexity Theory (Cameron and Larsen-Freeman, 2007; Larsen-Freeman, 1997) and the Dynamic Systems Theory (De Bot, 2007; De Bot et al., 2007a, 2007b; Van Geert, 1991, 2009), which were proposed for the study of L2 language acquisition. These two theories are sufficiently compatible for the purposes of investigating language development to be referred to jointly as CDST (Opitz, 2019). The focus of this framework is to embrace the inherent complexity involved in the language experience across the lifespan, in opposition to the desire, otherwise noticeable in certain language research, to abstract away from this complexity. Complex dynamic systems are therefore considered generally stable, yet nevertheless constantly in flux, adapting and changing to accommodate new experiences and learning opportunities (Cameron and Larsen-Freeman, 2007).

Under this paradigm, language attrition is as natural a development as language acquisition, in the sense that because multiple languages are embedded subsystems of a larger language mode, they are all (irrespective of whether they are the L1, L2, or Ln) subject to the same constraints over the lifespan. If the second (or subsequent) language of a speaker can change and vary throughout their life, it stands to reason that those same processes can affect the first language as well, of which attrition is just the most pronounced effect, essentially "negative" language growth (Jessner, 2003, p. 240). In other words, given the nature of the whole system, under conditions that negatively impact the maintenance of a language, such as reduced input and use, adaptations to the subsystem governing a second language can potentially have consequences both on the first language and the overarching language system as a whole.

Because the subsystems as proposed by the CDST are in a constant state of change and adaptability, the developmental processes that underpin them are by definition non-linear and non-predictable, and therefore difficult to capture through a traditional statistical approach, which favours large groups of participants for which observations can be averaged over. This ultimately serves to diminish the inter-individual differences between members of the same

speaker populations, which in turn hinders actual insight into language development *in situ*, i.e., in the actual individuals it happens in (Lowie and Verspoor, 2015; Verspoor and Van Dijk, 2012).

While there will still be questions for which statistical approaches may remain the favourable means by which to answer them, largely different types of research design and data gathering must also be adopted—ones centred on the individual experience and small-scale cases in which factors such as variability and change are prioritised over the course of a longer period of time (so longitudinal language development studies). Because of its inherent breadth and complexity, the dynamic systems perspective does not provide researchers with assumptions that are easily translatable into empirical questions, with relatively few studies in the field of language attrition adopting this dynamic perspective¹⁶.

As a model, CDST favours a constructivist approach to language development research, predicated on the inherent critique of more deterministic methodologies, reliant as they sometimes are on establishing linear causal relationships in an otherwise preponderantly complex system. This is indeed a necessary counterpoint to balance the (very human) tendency to oversimplify that underlines the current prevalent methodologies (Opitz, 2019).

2.2.2 Psycho-/Neurolinguistic Approaches

The following section will explore certain psycho- and neurolinguistic methods that can be applied to further our current understanding of the mechanism(s) underpinning language attrition. Fundamentally of interest from a psycholinguistic standpoint is the degree to which language attrition is the actual experience of loss of knowledge of the underlying linguistic representation, or rather the experience of a loss of performance related to accessing and retrieving existing knowledge in that language, which may indicate changes in brain mechanism over changes in the language (sub)systems themselves.

The main mechanisms that will be discussed in this section concern processing and memory. From a processing perspective, bi(multi)lingual language use is fundamentally characterised by the parallel processing of two (or more) languages, which gives way for the two languages to interact with one another in various (often difficult to predict) ways. Attrition, in this case, is the result of this continued interaction between the languages (Sharwood Smith, 2007). Memory, on the other hand, brings frameworks present in research on knowledge and memory retrieval more broadly in the brain to bear on language processes in particular. Most notably Ecker (2004) used psychological theories of memory and forgetting to explain attrition phenomena. Within this context, the declarative/procedural model of memory (D/P) has often been cited to explain language attrition outcomes (Paradis, 1994; Ullman, 2001).

¹⁶Most notable among studies that do engage a dynamic systems perspective in their analysis of results are Cherciov (2013), Ecker and Hall (2013) and Opitz et al. (2013).

According to Ullman (2001), declarative memory deals with factual knowledge, that is to say explicit knowledge, whereas procedural knowledge acts largely as storage for a set of rules by which to process information, and is therefore largely implicit. The D/P model is a larger memory model that applies to more than language, but for the purposes of its applicability to linguistic research, the typical assumptions are that declarative knowledge deals with the lexicon of a language, while the grammar of that language is procedural knowledge (Köpke and Keijzer, 2019). However, in the context of bilinguals, this distinction does not hold for both languages, with claims that while both L1 and L2 lexical knowledge is declarative, only the L1 grammar system is procedural, with the L2 system largely remaining declarative (Clahsen and Felser, 2006; Köpke, 2007), even in advanced L2 speakers (Paradis, 1994).

While earlier work on memory viewed the brain as analogous to computers, with storage bins in which knowledge was kept (or lost) and from which it could be retrieved, and although this is also a view that underlines the D/P model, it is not something that has conclusively been empirically demonstrated to be the case. Instead, more recently that view has been rejected in favour of the Radical Embodied Cognition theory (Chemero, 2013), which re-frames language skill variation as the outcome of the interaction between the speakers and their surroundings. Under these circumstances, it is the environment the speaker is in that ultimately affects their capacity for language learning, unlearning, or relearning (Keijzer and de Bot, 2019). From a Radical Embodied Cognition perspective, while external factors are not inherently able to determine attrition outcomes, the plasticity of the systems governing language (both in terms of lexicon and grammar) ensures that knowledge is never lost in the true sense of that word, but rather associated with particular contexts that act as triggers for their retrieval (Köpke and Keijzer, 2019).

The following subsections will take a closer look at the processing and memory mechanisms as they relate to language use and language attrition.

Processing Change

Discussions that attempt to include language attrition into a wider cognitive framework by necessity touch upon linguistic representation and language system(s) on the whole, where attrition is treated as a developmental stage along that scale, in the same way acquisition is (though of course with different outcomes). This is due to the fact that the way in which multiple language systems are represented in the mind, and by extension the changes those systems undergo across the speaker's lifespan, are considered to be driven by processing mechanisms (Sharwood Smith, 2007, 2019).

Although some studies have tried to address the issues caused by real-time processing delays when interpreting data on attrition¹⁷, for understandable reasons the focus has so far mainly

¹⁷For instance, Chamorro et al. (2016) and Tsimpli (2007).

been on interpreting potential changes based on very narrow hypotheses within a very specific temporal domain. However convincing the findings and subsequent analysis, and no matter how sound the methodology, ultimately any observations pertaining to language changes that would tend towards evidence of attrition effects can only describe a discrete moment in time, and not the reality of language accessibility overall. This is where a wider framework that encompasses the whole mind fits into the future of language attrition research.

Such a framework that aims to integrate research on linguistic properties with psycholinguistics insights related to performance, i.e., processing in real-time, is the Modular Online Growth and Use of Language (MOGUL) framework. MOGUL aims to bring together various insights, not just from theoretical linguistics, but other areas of cognitive sciences, and shape those approaches into a model of how the brain works with respect to language (Sharwood Smith and Truscott, 2014). Although its architecture owes much to insights across a broad spectrum of cognitive science research, MOGUL was shaped in large part by the research and development carried out by Ray Jackendoff, with certain crucial differences (Jackendoff, 1987, 1997, 2002; Sharwood Smith and Truscott, 2014). At its core this framework interprets the mind as modular, that is to say composed of various expert systems (such as the auditory system, the visual one, etc.) uniquely capable of carrying out their specific tasks, but crucially interconnected within a complex network so as to facilitate collaboration in many different ways (Sharwood Smith, 2019). This in turn enables the system to remain dynamic, i.e., capable of change— both the kind required to establish new networks, as well as the kind required to alter existing networks based on new information.

Underlying the processing mechanisms at play across this cognitive framework are the concepts of working memory and long-term memory. Under the MOGUL framework, each expert system has its own memory module, capable only of storing information relevant to that system (a syntactic memory store, an auditory memory store, and so forth); while the network connecting various modules is itself able to handle the different types of information stored by each module, the systems themselves are unable to read memory stores from one another (in the same way a video file and a music one require different software on your computer to be read, but the computer itself is able to handle and store both types of file). These individualised memory stores collectively hold the information deemed to be part of long-term memory. Working memory, on the other hand, is a temporary storage module active during online processing, but whether it is a shared facility across all systems, or whether each expert system would have its own temporary working memory (as the MOGUL framework stipulates, since at its core it treats all systems as discrete units) is still contested (Sharwood Smith, 2019). Activation within this working memory storage parallels the ATH with its activation threshold, here represented by resting level, with a high resting level signifying an item that is easily retrievable by working memory from long-term memory.

The resting level of activation is akin to the resting potential of quiescent neurons (Daignan-

Fornier and Sagot, 2011)– quiescence is the opposite state to proliferation present in cells, a necessary state to be able to switch in and out of in order for cell proliferation to remain in check. Similarly then, resting level describes the activation state over time, with structures which are frequently activated high on this scale, and structures infrequently activated resting at low levels of activation (Sharwood Smith, 2019); in practice this means that retrieval of that item/structure from long-term memory into working memory, therefore enabling it to participate in real-time processing, is harder- akin to trying to retrieve something from the back of a drawer where it has been pushed by items you use more frequently. In attrition, the gradual decline in resting levels for structures in one language is compounded by the rise in resting levels of structures in another language, so that there is competition for successful retrieval in the working memory.

Memory Retrieval

Corollary to memory retrieval as outlined by the MOGUL framework is the phenomenon described by retrieval induced forgetting (RIF; Anderson et al., 1994); namely, retrieval of a particular item of information stored in long-term memory inhibits accessibility to related but non-retrieved knowledge. Recall the view of multiple languages as subsystems of a larger, overarching language system L. The multilingual mind stores, for instance, the different lexical items (e.g., *cat* in English and *pisică* in Romanian) for the same concept (a small domestic animal sometimes kept as pet); during the processing of a sentence such as *I have a cat*, retrieval of *cat* requires the inhibition of its counterpart *pisică*, which is related (in virtue of expressing the same concept, albeit in a different language) but by necessity remains non-retrieved for the successful processing of that sentence in English.

This mechanism is at play more broadly in language, even in monolinguals, in virtue of items being linked in relation to one another. In experiments with a popular paradigm, participants are provided with a general category- for instance, animals, then primed to think of specific members of this category through prompts such as 'animals starting with a specific letter' (e.g., 'ANIMAL-P____' might induce the retrieval of *parrot*). Participants are cued to retrieve these items from the broader animal category, over competitors that do not fit the description (e.g., *leopard*– still an animal, but does not fit the prompt). Later on, they are tasked with retrieval of both, by introducing a novel cue (e.g., exotic animal, rhymes with...). The main finding is that retrieval of the first item during the initial task causes slower successful retrieval, or hampers retrieval altogether of the second item during the second recall task (examples derived from Linck and Kroll, 2019).

RIF therefore implies that the emergence of language attrition effects may be due to the underlying dynamics inherent to the memory system. In the context of bi(multi)linguals, this means that repeated retrieval of an item in one language reduces accessibility to the item in the other language. Looking at it more broadly, though, because which item is more activated is also heavily influenced by the environment (which language is relevant to the speaker in a given

situation), as well as the larger setting (which language is dominant around the speaker), it is possible to reverse these memory retrieval and processing delays- as has been observed for L1 attriters through re-immersion in the L1 environment, for example in Chamorro et al. (2016) and Park (2015).

Having established the various theoretical frameworks through which language attrition has been studied, as well as those involved in its future study, this chapter will now consider the different types of language attrition. Attrition is commonly divided into lexical attrition and grammatical, or structural, attrition (Schmid, 2011b).

2.2.3 Lexical Attrition

Lexical attrition is largely the process by which a person experiences issues with retrieval of a word from memory (Isurin, 2012; Stolberg and Münch, 2010); although this issue can ultimately manifest as a total loss of a lexical item from memory (Pallier et al., 2003), lexical attrition nevertheless covers the spectrum of that experience, in which complete erasure is the extreme outcome.

For many speakers, lexical retrieval issues will be their first indication that the L1 is undergoing attrition (Schmid, 2013); however, most studies investigating this have failed to consistently find evidence for real lexical loss (Schmid and Jarvis, 2014), nor of substantially impaired lexical retrieval speed (Yilmaz and Schmid, 2012). Most CLI can explain what is superficially experienced by the speaker when they, for instance, use a lexical item from their L2 in an L1 collocation. This does not by extension mean that the original is lost; rather, it simply means that on that particular occasion, the L2 resources were more readily available to underpin the speaker's choice of lexical item (Schmid, 2013).

Beyond these issues affecting lexical fluency – as L1 lexical retrieval issues are categorised, seeing as they predominantly affect the speaker's capacity to retrieve the correct lexical item in real-time – lexical attrition also affects lexical accuracy and complexity. The former relates to the speaker's ability to accurately produce or comprehend the forms of words, and use them in a manner that illustrates the speaker derives the correct meaning from them ('meaning' here also covers the word's potential multiple connotations, as well as its usage in expressions/collocations). Research investigating lexical accuracy found evidence of L2 words entering the speaker's vocabulary as an accepted L1 form (Schmid, 2011b), as well as loan translations, literal translations of idioms, collocations or compounds from the L2 to the L1 (Jarvis, 2003). Investigating the potential attrition of these multi-word units and expressions is particularly interesting not only because there is evidence that they are stored in the mental lexicon, same as individual lexical items, but because they can also contribute to further insights into the networks involved in linking lexical items and memory (Bardovi—Harlig and Stringer, 2013, as highlighted by Jarvis, 2019).

Lexical complexity, on the other hand, refers to the speaker's access to a rich mental lexicon, as evidenced by the variety of words and expressions the speaker is able to produce in speech or writing (Jarvis, 2019). This can further be investigated by understanding lexical complexity to cover diversity (the variety of words in a speech sample or text), density (the proportion of content words), and sophistication (proportion of less frequent/rarer words), as categorised by Bulté and Housen (2012). Of these, lexical diversity has been the most investigated, with findings concluding that L1 attriters do experience a decrease in the levels of diversity for lexical items produced in speech or writing (summarised in Schmid and Jarvis, 2014).

In view of the fact that attrition effects require a prolonged period of time spent in a new, dominant language environment, studies investigating potential effects choose populations that have spent a decade or longer in the non-native language environment (de Bot and Clyne, 1994; Schmid, 2002). This does, however, mean that the issue of lexical retrieval can be compounded by natural ageing effects; the subsection below briefly outlines this possibility.

Ageing effects

How lexical attrition might manifest itself cognitively has been relatively under-investigated, especially through a neurophysiological lens. Two studies seeking to address this absence utilised event-related potentials (ERPs), a measure of the small voltages which occur in neural networks in direct response to a stimuli (Blackwood and Muir, 1990). In the first of these studies, conducted by Datta (2010), ERP responses to English and Bengali words were contrasted, in cases with high and low familiarity; high-familiarity responses typically elicit a lower N400 component than low-familiarity items. The N400 component is an ERP involved in measuring normal brain responses to meaningful stimuli in language processing¹⁸– so not limited to words, but also including sign languages signs (Kutas and Federmeier, 2011). The study showed that Bengali speakers now living in the United States and therefore English-dominant were more responsive to very familiar English words than to high-familiarity Bengali ones.

In the second study, Kasparian and Steinhauer (2016) used highly similar word pairs in Italian to probe lexical processing in potential L1 attriters when a violation had occurred (for instance, swapping the word *cappello-hat* for its confound, *cappella-chapel* in a sentence where the latter constitutes a semantic violation). This is because highly similar phonological/orthographic pairs are more difficult to successfully differentiate in L2 learners (Carreiras et al., 1997; Rüschemeyer, 2005; Rüschemeyer et al., 2008), owing to their reduced inhibition of competing activation from intra-lingual competitors (Elston-Güttler and Friederici, 2007; FitzPatrick and Indefrey, 2010; Weber and Cutler, 2004)– something that has been proven to be affected by language proficiency and exposure (Dijkstra and Van Heuven, 2002; Gollan et al., 2008), factors

¹⁸Though not limited to, as it also plays a role in identifying faces, picture symbols, smells, and other environmental sounds not related to language exclusively.

which also heavily modulate attrition outcomes. Speakers who had resided in Canada, in this case, but retained high proficiency of their native Italian showed the same pattern of N400 effect as the native speakers when the word was swapped with its pair- however the N400 effect was more pronounced with low-proficiency attriters, suggesting that language use and proficiency decline weakens sensitivity to lexical familiarity and the relationship between words and meaning.

These observed neurological effects in potential attriters are also found in ageing monolinguals, who may find themselves making the same substitutions with semantically-related words, or avoiding the use of a term that eludes them in natural speech production as attriters do (Oblor et al., 1985)– an effect that increases with age (Schmitter-Edgecombe et al., 2000). Crucially, however, this decline is not affected by the frequency of words in ageing populations, unlike in attrited ones (Newman and German, 2005). Similar types of word retrieval issues can be seen in both attrited and ageing speakers, though the underlying mechanisms appear to be different (Higby et al., 2019); however, because the timeline for attrition is so long and can overlap with natural ageing, more studies which consider this overlap when investigating neurological processes are necessary. Older adults, apart from being more at risk of ageing effects obfuscating purely attrition ones, are also more likely to have a substantially different language use reality compared to younger potential attriters (retirement, for instance, may severely impair their access to a diversity of people to converse with or situations and environments in which to use their L1).

As this project is not interested in lexical attrition, no more space will be dedicated to it here save to say that issues in retrieving lexical items that might hinder the participants' ability to react to gender inference from the cues in the experiment have been addressed, by presenting participants with the experimental items in a lexical task (more details on this in chapter 4).

2.2.4 Structural Attrition

With respect to grammatical structures undergoing attrition, a large body of research has been carried out, operating under the Chomskyan framework of principles and parameters (see Gürel, 2007; Gürel and Yilmaz, 2011), or the Minimalist Program (for instance, Tsimpli, 2007; Tsimpli et al., 2004)- all interested in the conditions underpinning potential L1 restructuring.

Investigations into potential language changes (in terms of grammatical structure) that could be attributed to attrition have therefore involved various previously introduced frameworks, such as the IH (Tsimpli et al., 2004, in studies involving the use of null versus overt subjects in Greek and Italian speakers; also Montrul, 2005, investigating unaccusativity in Spanish L2 acquisition), the ATH (Gürel, 2004, in work on Turkish-English speakers contrasting Turkish pronouns with and without an English correspondent for L2 influence or attrition effects; see also Gürel, 2007; Schmitt, 2010), the FRH (notably in work done on HS, see Putnam and

Sánchez, 2013 for a discussion about modelling heritage grammars; also Cuza and Pérez-Tattam, 2016 for work on child heritage Spanish speakers' grammatical gender selection), but also include broader analysis of results more interested in engaging with the CDST framework (Opitz, 2011, 2017) or taking neurolinguistic approaches (such as Kasparian et al., 2017; Keijzer, 2014; Köpke, 2004, to name a very few).

Considering the works mentioned in the previous paragraph in more depth, the Greek and Italian participants in the study conducted by Tsimpli et al. (2004) retained high use of their L1. The participants were tested on production and interpretation of Greek and Italian grammatical subjects, under the assumption that L1 syntax changes would happen at the interface with conceptual cognitive systems. The results from their study supported this idea, with semantic features found to be more vulnerable than syntactic ones. Meanwhile, Gürel (2004) reported some loss of native grammar in Turkish-English speakers, observed as optionality of certain L1 Turkish properties according to their correspondent in the English, in cases of overt and null pronouns. This loss was somewhat predictable, with L1 properties in competition with L2 ones more susceptible to restructuring than ones where this competition was irrelevant.

Opitz (2017) considered findings from four different studies conducted on multilingual L2 learners in Ireland, designed to address several timescales ranging from weeks to years. The findings from this cross-analysis indicated that adults' language systems could not be said to be entirely stable, though certain factors such as use and context could be favourable to those languages attaining some overall stability akin to stasis. These changes could be observed for all languages, irrespective of whether it was the L1/L2/Ln, and held for all timescales, a fact that further compounds attrition as a factor in language acquisition and maintenance, rather than an ultimate state.

With respect to research employing neurolinguistic approaches, Keijzer (2014) considered the unanswered questions in research on L1 attrition that could be addressed with neuroimaging techniques. These questions relate to the degree with which L1 attrition can be attributed to disuse of the L1 over the introduction and subsequent mastery of an L2, and secondly whether attrition is a permanent state, or rather a reflection of temporary inaccessibility of the L1 system. The premise here is that the phenomenon of L1 attrition entails a change in functional brain activation patterns over a restructuring of underlying systems, which are in themselves highly individualised. These individual differences, in turn, are subject to the interaction between neural restructuring and external changes driven by experience.

Unlike lexical attrition, effects of structural attrition are harder to isolate in studies, as grammatical structures straddle various aspects of how languages operate at a cognitive level, all while inhibiting L2 competition of an equivalent construction, if present. What the studies focusing on grammatical restructuring do serve to illustrate is that various aspects of morphosyntax are more or less vulnerable to change and/or decline than others (Schmid

and Köpke, 2017). In fact, as electroencephalography (EEG) studies illustrate¹⁹, though responses to violations on ERP markers such as N400 are not markedly different in attriters versus monolinguals, the former do display additional responses absent in the latter on other markers, such as the P600²⁰ (see Kasparian and Steinhauer, 2016, for sensitivity to violations in constructions with confound item pairs; also Bergmann et al., 2015, investigating violations related to verb finiteness)– which evidence different processing strategies overall, with the potential for concluding these strategies to be more cognitively costly to the attriters (Schmid and de Leeuw, 2019).

In this sense, isolating whether observed changes are evidence of 'superficial' or 'structural' change has underpinned much of the early research into structural attrition, based on a view of attrition as an 'end'-state for a relatively restricted subset of bi(multi)linguals experiencing a radical lack of exposure to and engagement with their L1. This perspective has shifted since the turn of the millennium, with attrition effects understood to be any instances of L2 to L1 transfer across the speaker's lifespan (Schmid and de Leeuw, 2019).

As we have seen in the previous section on gender acquisition, grammatical gender is a feature acquired early in Romance languages. Additionally, there is no equivalent feature present in English, which may act as a protective factor, as there is no direct competition when resolving gender agreement during processing. However, proficiency, as well as recency and frequency of use of the L1 will also impact any potential changes in this feature; language use as it is therefore influenced by these circumstances outside the speaker's internal grammar are addressed in the following subsection.

2.2.5 External Factors

One of perhaps the most relevant aspects to consider with respect to research on language attrition is that the degree to which a speaker can be said to have attrited varies greatly- not unlike the varying degrees to which L2-speakers attain proficiency. As with bi(multi)lingualism, attrition is highly dependant on external factors that have been shown to significantly predict the degree of language loss, such as the amount and frequency of a speaker's use of the attriting language (Cook, 2003; Paradis, 2007). This again ties in with the various frameworks considered earlier, in that with respect to knowledge accessibility and retrieval, recency and frequency are outstanding factors in the successful retention and use of features.

However, it is important to note that considering the frequency of use is not the simple dichotomy of "low" versus "high" frequency that it may initially appear; such a narrow view would be doing a grave injustice to the complex interplay of factors mitigating which of the languages the speaker chooses to use, how often, to what purpose, and not least their attitude

¹⁹See Steinhauer and Kasparian (2019) for review.

²⁰Another language-relevant ERP component involved in handling grammatical incongruities (Gouvea et al., 2010; Hagoort et al., 1999).

towards the chosen language (Schmid, 2013). It is precisely the interplay of these factors that calls into question the degree of certainty with which frequency alone can predict attrition outcomes; indeed, numerous studies have failed to find this link (Keijzer, 2007; Opitz, 2011). Helpful in considering what factors influence these outcomes is defining what the reality of bi(multi)lingualism entails.

As posited by Grosjean (2001), bilingual language occurs in one of three modes: monolingual, intermediate, or bilingual. These modes are not indicative of an end-state; instead, they describe the fluctuation in use and activation that changes naturally as the speaker comes to use their language(s), depending on context. So for instance, the monolingual mode supposes that all other languages are deactivated to the extent that crosslinguistic influence is unlikely (though of course not completely deactivated); this could look like the case when a potential attriter visits their home country, where input and external stimuli for the L2 are absent or severely reduced. At the other end is the bilingual mode, where two or more languages are active concurrently, making frequent code-switching and mixing possible; a speaker may use this setting in casual conversation with their family, for instance, provided they are also bilingual.

While the monolingual mode would necessitate little to no amount of effort in terms of L2 inhibition (due to it being largely deactivated), the bilingual mode would suppose no inhibition at all, as communication is facilitated by the access to both languages at no detriment to the interlocutor. The most onerous mode for the bi(multi)lingual would therefore be the intermediate one: situations prompting activation of the language(s) not in use, but which are unsuitable to code-switching; these situations might arise if the speaker was undertaking interpretation or translation work, or were a language teacher.

Given that situations such as the ones described above are a natural reality of bi(multi)lingual lives, it is clear that simply attributing language change to any one single cause is insufficient in resolving the complex dynamic of multiple language interaction. Therefore, Schmid (2007) suggested that something akin to a saturation effect can obtain with languages also, whereby if a feature has been activated for long enough during acquisition, it no longer necessitates the same frequency of access in order to maintain it– in effect, rendering attrition effects as L2 inhibition failure, rather than a loss of or retrieval issue in the L1. All this to say that, because using the language in familial settings places fewer constraints on code-switching, it is less conducive to successful L1 maintenance than an environment where that mixing is inappropriate– such as a formal (i.e., professional) environment.

As has been covered in the section on gender acquisition, this is a grammatical feature which is acquired early and in a relatively error-free manner. In keeping with the saturation effect described by Schmid (2007), we could therefore expect this feature not to necessitate the same level of constant activation as another, less robust one. However, depending on the individual variation in how the speakers use their L1, we might still be able to observe potential signs of

attrition- for instance, in individuals using their L1 in familial settings only, compared to those who require it in formal settings.

A final point about a speaker's attitude towards their native language also warrants discussion. Trying to establish a clear link between a potential L1 attriter's attitude to their L1 and their attrition outcomes has proven difficult, with different studies producing conflicting conclusions (Cherciov, 2013). This is in part because arriving at a universal methodological approach to quantifying attrition as a variable has been difficult, with some studies using questionnaires to assess participant's attitude to their L1 (Hulsen, 2000; Yağmur, 1997), while others employed interviews (Ben-Rafael and Schmid, 2007; Schmid, 2002).

The situation is complicated further by the fact that the concept of *attitude* can also be difficult to define- not as the behaviour itself, but as "a preparation for behaviour" (Oskamp, 1977, p. 8). The two methodologies mentioned above pattern onto two distinct theoretical viewpoints with regards to attitude. On the one hand, the mentalist perspective considers attitudes to be the result of neutral mental states of disposition (Allport, 1967) which can be inferred from the right stimuli, but not observed; this corresponds to answers elicited via the right kind of questions on a questionnaire. Conversely, the behaviourist perspective interprets attitude as the reaction to a certain situation (Agheysi and Fishman, 1970), so a variable than can be determined through observation of a subject in a certain context; such observation would therefore be possible in interview settings.

Given the logistics of this study being carried out online, a questionnaire was deemed the most suitable tool in collecting individual language background data from the participants. This is not to suggest that there are not indeed merits to interviews, and in fact this author recognises the unreliability of questionnaires, as discussed in chapter 6, in the subsection about this study's limitations. While a speaker's attitude towards their L1 is crucial in maintaining proficiency, that is not a condition that is immediately evident or easy to map out across bi(multi)linguals, with attitudes likely to change over the course of a participant's life²¹.

Going back to the suitability of methodological approaches as investigated by Cherciov (2013), the conclusions revealed there suggest that greater nuances about a speaker's attitude to their L1 can be extracted through interviews than through questionnaires- with the recommendation that questionnaires be supplemented by interview data wherever possible.

Having established the foundation on which the analysis to be undertaken in chapter 6 rests, I would next like to discuss the details of the present investigation into potential attrition in L1 Romanian speakers.

²¹As reported by De Bot et al. (2007a), Herdina and Jessner (2002) and Jessner (2003).

Chapter 3

The Present Study

3.1 Scope of the present study

The experiment as undertaken by this project aims to investigate potential morphosyntactic restructuring in Romanian L1 grammatical gender processing under the competing pressures of a constantly activated, dominant English L2 with no such feature. As such, certain constructions that facilitate gender agreement differently have been chosen for the design of the current research.

Two main conditions form the basis of the experimental design: the first condition is a possessive construction, requiring the presence of the possessive article (*al/a/ai/ale*¹) and a possessor, while the second condition will revolve around superlative adjective constructions. The possessive article condition was chosen as a result of the possessive article's uniqueness to Romanian (Van Peteghem, 2012). Crucially, however, possessive constructions are also the few remaining cases where English expresses gender agreement on pronouns; therefore, this scenario was considered the closest possible in terms of investigating potential transfer/pressure from the now-dominant L2 English on the L1 Romanian of speakers, in terms of there being a recognisable grammatical gender feature in both languages. The superlative adjective condition, meanwhile, patterns in the same way as English in terms of its general construction (*the most [adjective]–cel/cea/cei/cele*² *mai [adjective]*), but contains two gender-agreeing components, the demonstrative and the adjective itself. This construction would thus be a more direct equivalent one to English³, but which necessitates gender agreement on parts of speech that English no longer recognises this feature for.

These two separate conditions will aim to facilitate the choice between two images of nouns as

¹From now on, the singular masculine form *al* will be used when referring to this condition, however all the agreeing possessive article forms are implied.

²From now on, *cel*, see previous footnote.

³That would be the case in simple noun-adjective pairs, where apart from gender missing in English, the order of the words would also be different (Romanian prefers noun-adjective over English's adjective-noun).

inferred through gender agreement, during the eye-tracking experiment. The agreement patterns for these two conditions are illustrated in Table 3.1 below.

Gender	Noun	Gloss	Noun + Adjective		Possessive article	
			<i>Singular</i>	<i>Plural</i>	<i>Singular</i>	<i>Plural</i>
Masculine	Câine	Dog	Câine frumos	Câini frumoși	Al câinelui	Ai câinilor
			Beautiful dog	Beautiful dogs	Of the dog	Of the dogs
Feminine	Carte	Book	Carte frumoasă	Cărți frumoase	A cărții	Ale cărților
			Beautiful book	Beautiful books	Of the book	Of the books
Neuter	Vapor	Ship	Vapor frumos	Vapoare frumoase	Al vaporului	Ale vapoarelor
			Beautiful ship	Beautiful ships	Of the ship	Of the ships

Table 3.1: Agreement patterns for nouns + adjectives/possessive articles

While the agreement between nouns and adjectives is universal in all languages with grammatical gender, the Romanian possessive article has no counterpart in other Romance languages (Van Peteghem, 2012). However, its inflection closely resembles the morphology of the definite article (D’Hulst et al., 2000; see Table 3.2 below), meaning that we should observe the same sensitivity to gender agreement as we would in the case of adjectives.

	Masculine		Feminine	
	<i>Singular</i>	<i>Plural</i>	<i>Singular</i>	<i>Plural</i>
Definite article	-l	-i	-a	-le
Possessive article	al	ai	a	ale

Table 3.2: Definite article and possessive article morphology

With regards to the gender agreement between noun and adjective, in Romanian adjectives naturally have a preference for occurring after the noun, unless a particular stylistic effect is desired. Due to the conceptual requirements of experiments set in the Visual World Paradigm, constructions where the adjective would naturally precede the noun were necessary (as it is the agreement on these adjective cues that should prompt eye movement to the corresponding noun picture). In Romanian, the superlative form of adjectives can only occur before the noun (see Table 3.3); thus, this experiment makes exclusive use of the superlative form of adjectives within that condition.

Gender	Noun	Gloss	Noun + Adjective		Superlative Adjective + Noun	
			<i>Singular</i>	<i>Plural</i>	<i>Singular</i>	<i>Plural</i>
Masculine	Câine	Dog	Câine frumos	Câini frumoși	Cel mai frumos câine	Cei mai frumoși câini
			Beautiful dog	Beautiful dogs	The most beautiful dog	The most beautiful dogs
Feminine	Carte	Book	Carte frumoasă	Cărți frumoase	Cea mai frumoasă carte	Cele mai frumoase cărți
			Beautiful book	Beautiful books	The most beautiful book	The most beautiful books
Neuter	Vapor	Ship	Vapor frumos	Vapoare frumoase	Cel mai frumos vapor	Cele mai frumoase vapoare
			Beautiful ship	Beautiful ships	The most beautiful ship	The most beautiful ships

Table 3.3: Noun + adjective and superlative adjective + noun constructions in Romanian

What is relevant to note in the superlative form is the demonstrative (*cel/cea/cei/cele*), which of

course also must agree in gender and number; the demonstrative morphology also follows that of the definite article exemplified in Table 3.2. In effect, the demonstrative agreement offers the participants an additional salient clue as to the target gender when faced with a choice between two competing nouns. In addition, in order to enforce both the demonstrative and the adjective itself as gendered cues, adjectives derived from the Latin third declension were omitted, as they only inflect for number and not for gender⁴ (Alkire and Rosen, 2010, p. 283).

Returning to the first condition, namely constructions containing the possessive article, it is worth noting that these structures follow particular rules as governed by the genitive determiner phrase (DP) in Romanian. This is to say that structures containing the possessive article are sensitive to adjacency rules, as exemplified in (1).

- (1) a. pisica stăpânilor
 cat-the.DEF.FSG owners-the.DEF.MPL.GEN/DAT
 the owners' cats
- b. pisica deșteaptă a
 cat-the.DEF.FSG smart.ADJ.FSG of.POSS.FSG
 stăpânilor
 owners-the.DEF.MPL.GEN/DAT
 the owners' smart cat

Genitive DPs in Romanian are adjacent to the definite article; if this adjacency is disrupted (by the presence of an adjective, for example), the structure is ungrammatical without the possessive article insertion. The possessive article is similarly barred when the adjacency requirement is respected. These strict requirements motivate the argument that “structures containing *al* are more costly than those without” (D’Hulst et al., 2000, p. 136), which could add an additional layer to the processing required from the language user, and could potentially be observed in reaction times as signalled by eye movement onset during the experiment.

However, Dobrovie-Sorin et al. (2013) contend that perhaps structures of this type are actually all *al*-genitive, but that *al* is deleted in cases of adjacency for morpho-phonological rules similar to haplology; in this case, it could be argued that the constructions investigated here are no more costly than those without overt *al*, since at an underlying level all genitive DPs of this type are represented as *al*-genitive in the mental grammar.

Similarly noteworthy is the fact that the possessive article makes its agreement with the entity which is being possessed, and not with the entity fulfilling the role of possessor, as illustrated in 2a, where the agreement is between the possessée *oile* (*sheep*.FPL.NOM/ACC) and the possessive article so that the corresponding (feminine, plural) *ale* is realised⁵, and not between the possessor *păstorului* (*the shepherd*.MSG.GEN/DAT) and the article, which would result

⁴As is the case in Italian, Spanish, and Portuguese as well.

⁵See Table 3.2 earlier for the different forms of the possessive article.

in the ungrammatical example in 2b. This applies with regards to both gender and number agreement.

- (2) a. Oile negre ale păstorului
 sheep-the.DEF.FPL black.FPL ale.FPL shepherd.DEF.MSG.GEN/DAT
 The shepherd's black sheep.
- b. *Oile negre a păstorului
 sheep-the.DEF.FPL black.FPL a.MSG shepherdDEF.MSG.GEN/DAT

With regards to the possessive article condition, participants will listen to sentences where the possessée in an utterance is missing, but can be inferred from the possessive article; additionally, the gender of the possessor will match that of the possessée in only half of the item pairs in this condition. As illustrated above in (2), the agreement always happens between the possessive article and the possessée, and not the possessor; however, it will be interesting to note if the gender mismatch between possessor and possessée affects reaction times in any way in the data (by introducing a processing delay, for example).

3.2 Research Questions

Calling back to the introduction, this project aimed to investigate the following research questions:

1. *Does English as an L2 affect L1 Romanian attriters' sensitivity to grammatical gender agreement cues in online processing? If so, how?*
2. *Is there a significant difference between the possessive article condition and the superlative adjective one with respect to eye movement onset?*
3. *What factors modulate the similarities/differences observed at an individual level, both from a linguistic internal, as well as linguistic external perspective?*

With regards to the first research question, we were interested in potential CLI effects with respect to the L1 attrition process; CLI is well-documented in the course of L2/Ln acquisition⁶, which makes it reasonable to assume it might exert some effect on the L1 attrition process with enough exposure to the L2 language, as would be implied by a high-use environment; indeed, a great number of attrition studies discussed in chapter 2 make a point of stressing that the transfer is constant between the 2 (or more) languages, with bi-directional effects so that the L2 also exerts pressure on the L1.

⁶See Alonso Alonso (2016), Blom et al. (2017) and Odlin (2012) for an overview.

Given the nature of gender acquisition in L1 as discussed in chapter 2, this author expects no significant negative effect of the English L2 on the Romanian L1 with respect to affinity to gender cues in online processing, such that the gender feature should prove robust enough in this context. It is possible for lexical retrieval issues of the pictured items to interfere with this expectation, however the purpose of the lexical task is to remove those items from each participant's data during processing (more on this in chapter 4).

The second research question undertaken by this study is to compare the two conditions (the possessive article and the superlative adjective) with respect to eye movement onset. This is because any quantifiable difference between the reaction times in these two conditions could evidence processing differences- something to support the idea that certain grammatical structures are more "costly" than others, and therefore could be more (or less) susceptible to potential L1 attrition effects, as well as cross-linguistic influence. Any such observed effects in this data would therefore lend themselves to further study.

The third and final research question wants to address the qualitative aspect of the results gathered by this study. It aims to integrate the results of the language history and background questionnaire to create a more holistic portrait of the participants' language use reality and their engagement with both their native Romanian under reduced circumstances, as well as their now-dominant L2 English.

The existing literature on communities of migrants in L1 attrition contexts (Bot and Clyne, 1994; Cherciov, 2013; Hulsen, 2000; Schmid, 2002, to name a few) underlines the importance of the speakers' attitudes to both their native language, as well as the now-dominant language in what their potential L1 attrition outcome will be. Speakers who remain more engaged with their L1, practice it outside familiar contexts, and generally view their L1 and country of origin positively can expect to retain high-levels in their L1 even in a predominantly high L2-use environment. Conversely, those speakers who report little to no engagement with their L1 and mostly negative views of their country of origin can expect to see a decline in their L1, initially overwhelmingly experienced through lexical loss. Such a potential loss might be revealed to us through the lexical task, which also contributes to our validation of the relevant tokens to be kept in the analysis for each participant, as described in the next chapter.

Chapter 4

Methodology

This section elaborates on the methods used in the design and implementation of the experiment. First, an overview of the methodological approach with respect to the eye-tracking experiment task itself is given, followed by a rundown of the additional tasks undertaken by the participants, such as the language background and history questionnaire, the lexical task, and the English gender-based task. Section 4.2 justifies the criteria used for the participants themselves and their suitability to the study, while section 4.3 discusses the pilot version of the experiment.

4.1 Methodological Approach

Considering the research questions the study set out to investigate, a mixed-method approach with regards to the experimental design was deemed suitable. This would involve two stages to the experiment: firstly, the online eye-tracking task itself, and secondly, a more in-depth look at each individual participant through the collection of language use data (via a questionnaire), as well as specific lexical tasks and gender-based tasks; what follows is a justification of the necessity of these methods.

4.1.1 Online eye-tracking task

With regards to the initial experimental stage, the participants were asked to undertake an online eye-tracking task as facilitated by Webgazer.js (Papoutsaki et al., 2016), an open-source browser tool developed within the jsPsych framework (De Leeuw, 2015). This task was set up using the Visual World Paradigm, a very productive online language processing experimental method, which utilises the fact that human visual attention and linguistic processing are interconnected (Cooper, 1974). Provided with a display of objects or depictions of actions (i.e., a visual world), coupled with an auditory linguistic stimulus, participants' eye movements are predicted to gravitate towards those items in the display that have some association to what they hear

(Alloppenna et al., 1998; Tanenhaus et al., 1995)¹. These fixations have been found to reflect predictive processing, in cases where the auditory cue restricts the correct possible target in the display (Altmann and Kamide, 1999). Given listeners' sensitivity to any potentially useful cue in linguistic processing (Magnuson, 2019), the constraint investigated by the current study is grammatical gender, as motivated by two conditions: agreement between a noun and an adjective, and between the possessive article and the possessée, as explained in chapter 3.

The experiment design tracks the participants' eye movements through their own webcams as they are asked to complete a task. This task involves listening to an audio recording of a native speaker, which contains two cues; either/both of these should dynamically prompt eye movement to the correct corresponding token, as inferred from the grammatical gender information contained by the cues. This relies on sufficient sensitivity in processing of the encoded gender markers, so as to facilitate early fixation on the correct object out of the two possible choices on the screen, which are by design a mismatch in terms of gender.

The design requires the participants to listen to the audio recording in full before moving on to the next item, which is achieved by clicking on the image they believe to be correct; this reinforcement makes use of the fact that when navigating web browsers, users will fixate on the location they intend to click on (Chen et al., 2001; Huang et al., 2012). The experiment in total took an average of 12 minutes, and participants were instructed that they may take a break between items, with the provision that a system recalibration would be necessary before they could resume. A system recalibration also took place prior to the beginning of the experiment, and at the halfway mark, to ensure the validity of the data collected, and account for the participants' movements, which are not as easily controlled as in lab-based settings.

The images used in this experiment are from a repository by Stone et al. (2021), and they were chosen because they depict common items, which was hoped would avoid any lexical retrieval issues. To confirm this, the participants undertook a lexical task, which involved naming each picture item. When pairing the images that would be shown side-by-side on the screen, consideration was given to the items being related semantically, particularly in relation to the audio the participants would be hearing. That is to say, if the verb present in the audio was the verb *to wear*, for instance, then both images in the pair would be items that could be worn. The same consideration was given to choosing adjectives that could equally describe both items in a pair in the superlative adjective condition.

Furthermore, in the context of the sentences and stimuli presented, special attention was paid to the fact that predictions are not solely restricted to targets that satisfy agreement. Agreement relationships are more fallible and subject to locally coherent competitors to sentence-level ones (Stone et al., 2021). As such, consideration was given to avoiding colour adjectives and trying to maintain the same colour between the two images shown in a trial, based on Kukona et al.

¹See Huettig and Altmann (2011) for review.

(2014), who found that locally coherent competitors in a sentence such as "The boy eats the white..." were fixated on as well (so not just the edible item, in this case a white cake, but also the competitor consistent with the adjective white, the white car), as explained in Kukona et al. (2014, p. 340).

An example of the experiment trial can be seen in Figure 4.1 below. The leftmost panel depicts a screenshot of what the participants would have seen during a trial, with the two competitor images displayed while the corresponding audio recording for that trial would be playing. In the centre panel is an example of the screen which appeared between each trial, namely a yellow dot in an otherwise blank page. The participants were instructed to click the dot in order to progress to the next trial (which, as discussed above, is a behaviour which reinforces their fixation on that spot). This also ensured that participants' gazes returned to a neutral point between each trial, to minimise any bias in the eye-tracking data towards one picture over another simply from participants' looks from a previous trial. The last panel in Figure 4.1 depicts another trial, with one of the pictures outlined. The participants were instructed that they could only select an image once the audio had finished playing. When that happened, hovering over either image outlined it, to reinforce that the audio was finished and the image was able to be clicked. Hovering with the cursor over either image prior to the end of the audio recording did not elicit this behaviour, and similarly clicking on the image at that point would have no effect.

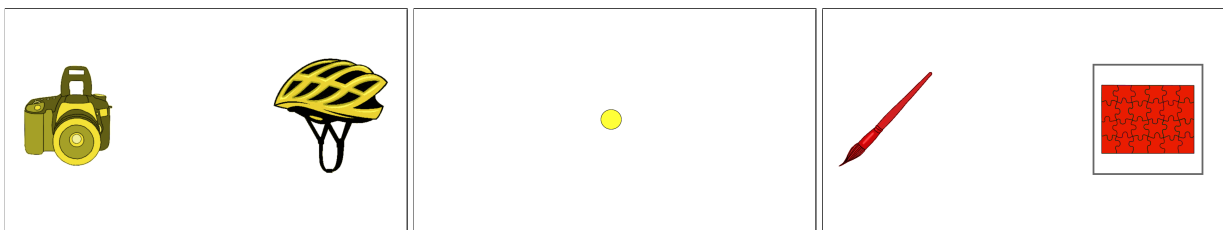


Figure 4.1: Example screenshots of the eye-tracking experiment trials

The sentences the participants would hear were recorded by a native Romanian speaker, in as clear and neutral a tone as possible. The structure of the sentences fell into two distinct categories within each condition. In Romanian, you can manipulate the object of a sentence into occurring before the verb (fronting), by introducing the preposition *pe*. So, within each condition (excepting the fillers) we had half the sentences with *pe*-fronting, and half without. This was especially relevant to the possessive article condition, so that the target cue possessive article itself could be guaranteed to appear first in half of the sentences, as illustrated in (3)–gender agreeing elements highlighted in bold.

- (3) a. **O** vreau **pe a** lui.
 it.FSG want **pe a.FSG** lui
 I want his.

- b. Pe a lui o vreau.
pe a.FSG lui o.FSG vreau
I want his.

All sentences used in this experiment are included in Appendix A, alongside the corresponding picture items for each trial; each condition consisted of 18 sentences, 9 of which were *pe-*fronted, and 9 of which were not. Additionally, there were 17 fillers and 6 practice items, to familiarise users with the experiment prior to its start. Trial order was randomised for each run.

4.1.2 Questionnaire

Additional individual data was collected from each participant, so as to inform the qualitative analysis of the responses from the experiment, as well as providing factors that could act as confounding elements in establishing any correlations between the participants' self-reported language use, and the data collected during the experiment. The answers to the questionnaire could also be used for compiling more in-depth statistical analyses such as regression and mixed effects modelling.

The data consisted of responses to a language history and background questionnaire (Appendix B), which would provide both demographic information about the participants, as well as inform the analysis and discussion of the eye-tracking data through further relevant information, such as the frequency of their native language use, and more generally their engagement with their native L1². This could allow for the establishment of potential compounding factors in the analysis of the participants' sensitivity to gender as tested by the eye-tracking task.

The questionnaire was distributed subsequent to the completion of the eye-tracking task, and in conjunction with both the lexical and the English gender tasks (described below).

4.1.3 Lexical Task

As part of the subsequent stage to the eye-tracking task, participants were also asked to undertake a lexical task; this involved simply naming the pictures they had been shown during the eye-tracking experiment. This task was modelled after a study by Fuchs (2021); given the two populations the study is interested in, retrieval issues regarding lexicon can be expected, and this task was designed to address that possibility by assessing whether the participants were familiar with all the items they had been presented with, thus removing the possibility that a lexical retrieval issue had interfered with their ability to pick up on the audio cue inferring gender.

The lexical task consisted of each picture item from the eye-tracking task being displayed

²Which, as discussed in chapter 2, whether assessed through questionnaires or interviews (or a combination of both), is relevant to the speaker's potential for attrition (Cherciov, 2013).

on the screen, one at a time, with the prompt for the user to name it. Five seconds were allowed per item, with the screen then automatically moving onto the next item. A timed audio identification of the items was preferred over writing-based responses to best attempt to simulate the conditions under which they would have processed the items during the eye-tracking task, which averaged at around 12 minutes per participant (and where each participant progressed at their own pace); the timed lexical task averaged at around 10 minutes per participant, which seemed sufficient given that the eye-tracking task required a more complex cognitive load, yet did not take much longer on average.

Testing the participants in this way would allow for any trial where the respondent could not provide the correct label for the lexical item to be discarded. As motivated by Fuchs, “if a participant does not know one or both of the lexical items in a visual stimulus or their corresponding genders, it cannot be determined whether they were able to use gender in that trial” (Fuchs, 2021, p.13). As a personalised addition to this study’s use of Fuchs (2021)’s task, the task was manipulated so as to make use of the fact that Romanian numerals "one" and "two" are gendered³; the participants were therefore prompted to respond to the image on screen with either "one [named item]" or "two [named item]" (as in Figure 4.2, below). This turned out to be a clever inclusion, as it was the case that in many instances where the participant could not remember the word, this gendered numeral was still produced, making it possible for those trials to be included (as the fact of their lexical loss was not relevant *per se* to this experiment, and the gender on the numeral facilitated the conclusion that the participants were still using gender in that trial). Thus, only instances in which both the numeral and the word were missing, or a word of a different gender altogether was produced, were in fact discarded.

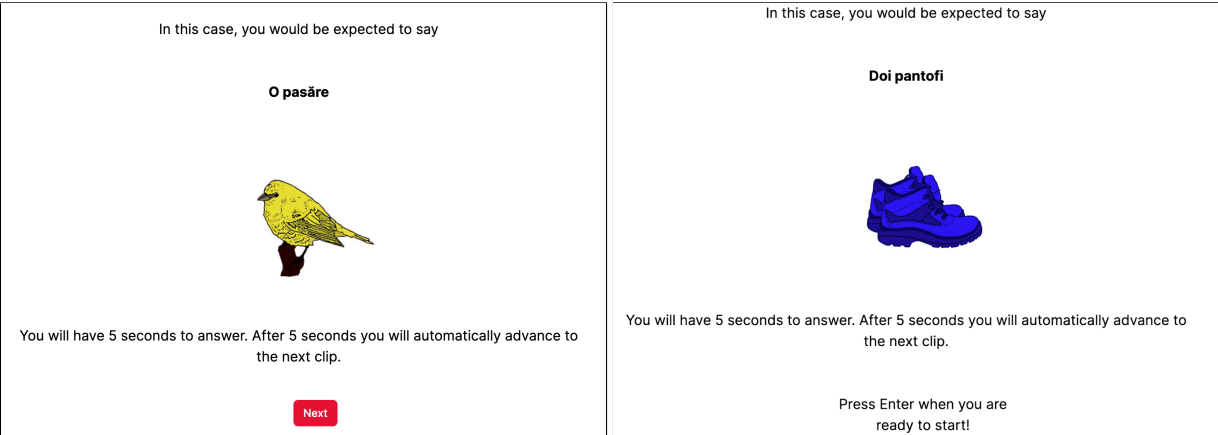


Figure 4.2: The "one [named item]" and "two [named item]" as explained in the lexical task

³As are any subsequent numerals that include "one" or "two", such as "eleven", "twelve", "twenty-one", "twenty-two", and so forth.

4.1.4 English Gender Task

This task was modelled after a study conducted by Antón-Méndez (2010) investigating gender errors of Spanish and Italian native speakers in production of possessive pronouns in their L2 English. These gender errors have been found to occur even in more proficient L2 English speakers (Collins et al., 2009; White et al., 2007).

This project wanted to test the participants' sensitivity to potential gender violations in English; given the limited distribution of gender agreement in this language, possessive article constructions were used. In English, the gender agreement in these cases is between the possessor and the possessive pronoun in 3rd person singular, as no other nouns encode for gender in this language. In the case of Romanian, recall the possessive article example in chapter 3 (repeated below for convenience); here the possessive article (in this case *a*) always agrees in gender and number with the possessée, not the possessor.

- (4) a. Oile negre ale păstorului
sheep-the.DEF.FPL black.FPL ale.FPL shepherd.DEF.MSG.GEN/DAT
The shepherd's black sheep.
- b. *Oile negre a păstorului
sheep-the.DEF.FPL black.FPL a.MSG shepherdDEF.MSG.GEN/DAT

However, of interest now is the possessive pronoun, and how agreement is made there. Take for instance a slightly altered example of the above, with the singular *oaie-the sheep* (as third person plural pronouns do not have gender markers):

- (5) a. Oaia neagră e a păstorului.
sheep-the.DEF.FSG black.FSG is.V a.FSG shepherd.DEF.MSG.GEN/DAT
The black sheep is the shepherd's.
- b. Oaia neagră e a lui.
sheep-the.DEF.FSG black.FSG is.V a.FSG lui.MSG.GEN/DAT
The black sheep is his.
- c. Oaia neagră e a sa.
sheep-the.DEF.FSG black.FSG is.V a.FSG sa.FSG.GEN/DAT
The black sheep is his.

Here again the agreement pattern is as exemplified up until now, with the possessive article *a* agreeing in gender and number with the possessée *oaia-the sheep*, but not with the possessor *păstorul-the shepherd* (5a). However, in 5b the construction changes to that with a possessive pronoun, which now agrees in gender and number with the possessor, as would be the case in English; it is only in the reflexive pronoun example in 5c that the agreement pattern is the same as that of the possessive article, and therefore the same as the possessée (thus patterning more broadly with agreement in other Romance languages).

During the gender task participants were introduced to two characters, John and Anna, as well as their respective siblings (Figure 4.3 below).

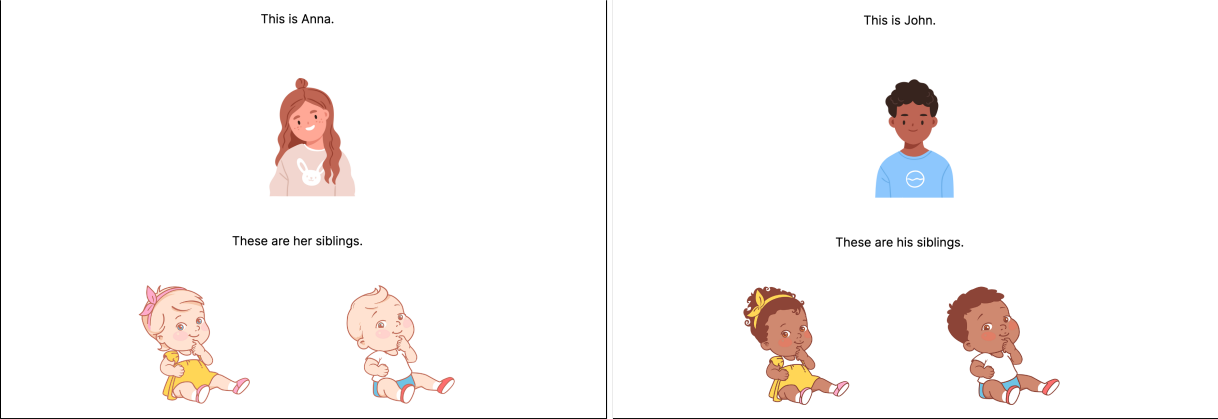


Figure 4.3: The characters in the English gender task which would correspond to the his/her possessive pronouns

These characters would be involved in different scenarios with each other and various objects in their surroundings. The participants were tasked with choosing via their keyboard which of two sentences they believed to be correct; these sentences were describing the scenario that was displayed through pictures on their screen (Figure 4.4).

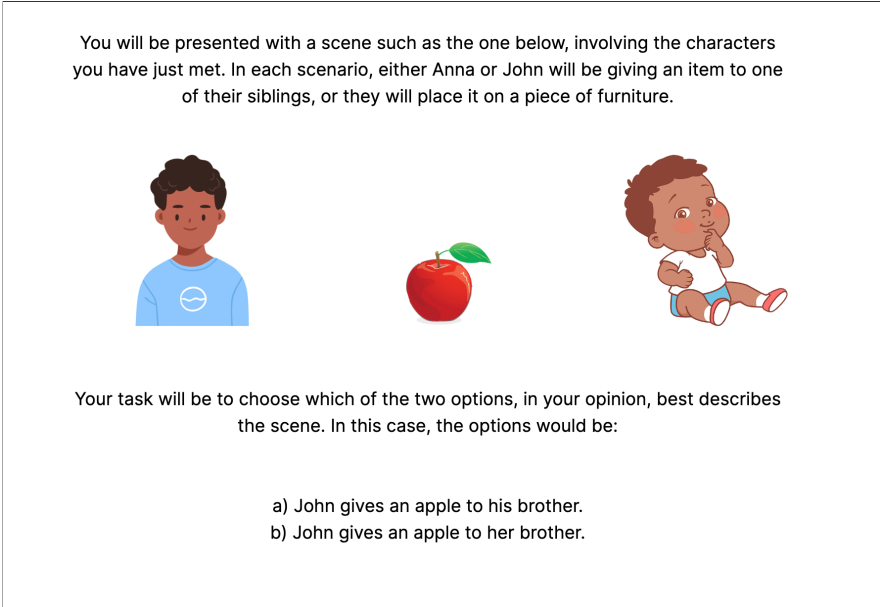


Figure 4.4: An example of a scenario involving the characters and possessive pronoun constructions from the English gender task

The conditions throughout the task consisted of various gender combinations for the possessor (John/Anna), the noun in the possessive noun phrase (either *brother/sister* or an inanimate location *table/chair*), and the object in the sentence (either a fruit or a vegetable; examples

in Figure 4.5 below). Although the gender for the nouns in the possessive noun phrase was relevant only to Romanian, and the task was in English, languages in bilingual minds are always activated and in competition⁴; this task wanted to exploit that fact in establishing how gender was processed in these English constructions, given the susceptibility to L1 transfer of even highly proficient L2 speakers, as reported by Antón-Méndez (2010).

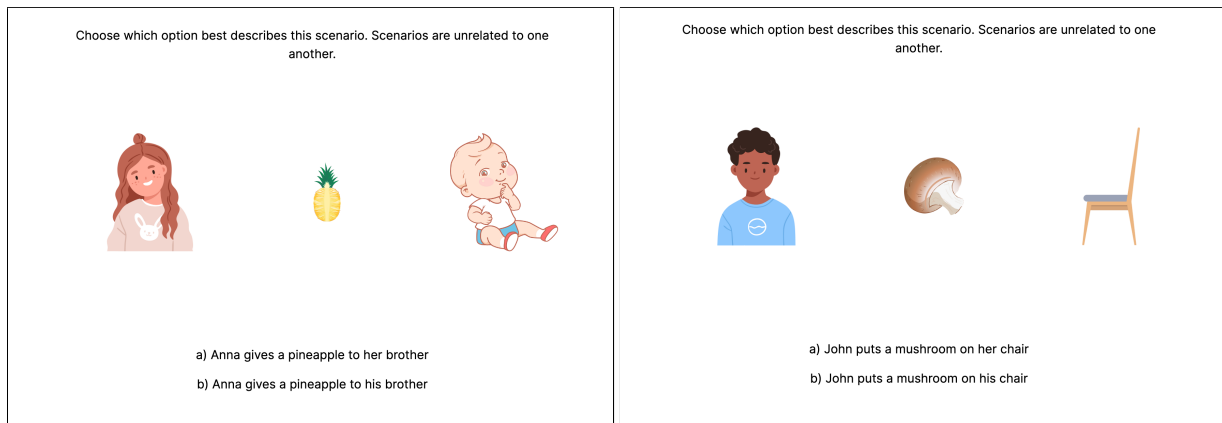


Figure 4.5: Examples of conditions in the gender task involving either a sibling or a location as the noun in the possessive noun phrase

4.2 Participants

The participants required for this project consisted of native speakers of Romanian who have lived and studied/worked in Romania at least until adulthood (18yrs old), but have since moved and reside in a predominantly English-speaking country⁵. As part of the design of the study, some native Romanian speakers who continually resided in Romania were involved in the pilot study (see subsection 4.3).

Participants in the study were required to have lived predominantly abroad, in an English-speaking country, for a period of at least 10 years. This classification was undertaken based on the fact that potential attrition effects are more pronounced in the first decade after immigration, compared to later periods (Schmid, 2011a).

Recruitment of the participants took place online. Initially, a poster (Appendix C) outlining the main requirements necessary to take part in the study was disseminated, whereby potential participants could register their e-mail address as a show of interest, and in order to be contacted further. Once enrolment through the poster was successful, respondents were e-mailed a consent form (Appendix D), in accordance with data protection regulation in Norway, overseen by the Norsk Senter for forskningsData (NSD). This included more details about the experiment, and information about how their data would be handled during, as well as after the study had

⁴For recent reviews see Kroll et al. (2015) and Schmid and Köpke (2017)

⁵Namely the United Kingdom, Ireland, the United States of America, Canada, Australia, New Zealand, or South Africa.

concluded. Once the consent forms were processed, a link to the eye-tracking task was sent out, facilitated by the Gorilla platform; this is the eye-tracking task outlined earlier in this chapter. This constituted the first phase of the experiment.

Subsequent to the successful completion of the eye-tracking task, a second link containing the language history and background questionnaire, followed by the lexical task and finally the English gender task⁶ (all outlined above) was sent out to the participants. This constituted the second and final phase of the experiment. Once this part had also been completed, a final e-mail containing a link to their gift card concluded their participation in the study.

The materials available in the run-up to the experiment (recruitment poster, consent form), as well as the instructions throughout the experiment, were available both in English and Romanian; as part of the design of the study, we requested participants to choose which language they would prefer to continue in, and recorded their responses. This choice could be used to inform any discussion of individual language use.

Despite the fact that the experiment was circulated widely online in communities of potential participants across all the countries considered to fit the criteria of predominantly English-speaking, all but two respondents were residing in the United Kingdom (Figure 4.6). The other two participants turned out to actually have been residents of Denmark and Sweden, respectively, a fact that did not transpire until their responses to the language history and background questionnaire were collected- these participants were therefore discarded from the eye-tracking data. Despite the Nordic countries exhibiting an increased level of English-use, and the two participants in question reporting a higher level of English use than of their respective Scandinavian language, it was deemed that the linguistic environment more generally would still be too different to form a suitable comparison to those participants solely surrounded by English.

⁶Materials related to the gender task can be found in Appendix E.

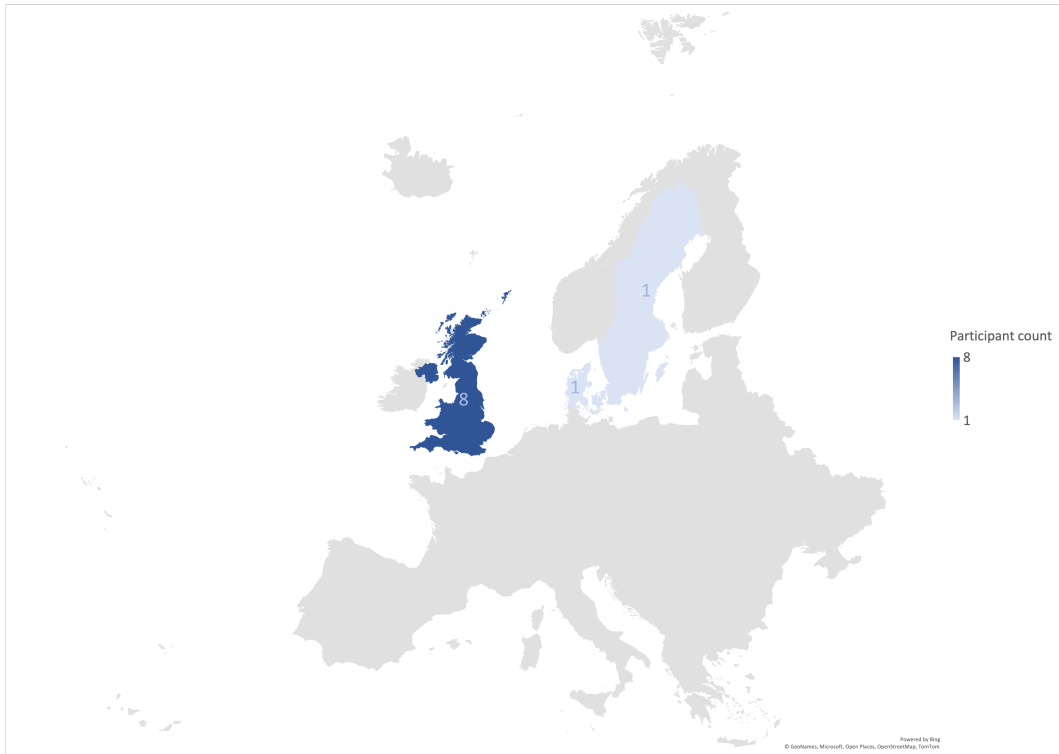


Figure 4.6: Participant Geographical Distribution

Participants were predominantly female (80%, see Figure 4.7), with one male and one non-binary respondent. This is characteristic of social science studies, which routinely engage predominantly women respondents (Porter and Whitcomb, 2005; Underwood et al., 2000).

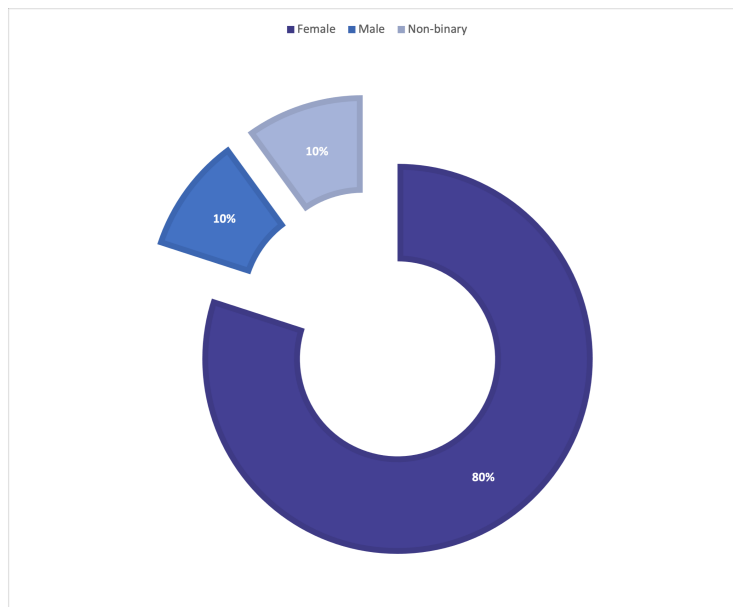


Figure 4.7: Participant Gender Distribution

With respect to age distribution, the categories were 28-38, 39-48, 49-58, and 58+ years old; 28 years old was selected as the starting point given that we needed the participants to have spent

a minimum of 10 years in an English-speaking country, with 18 being the youngest they could have emigrated as adults. The majority of the participants fell into the youngest age bracket (28-38 years old, as illustrated in Figure 4.8).

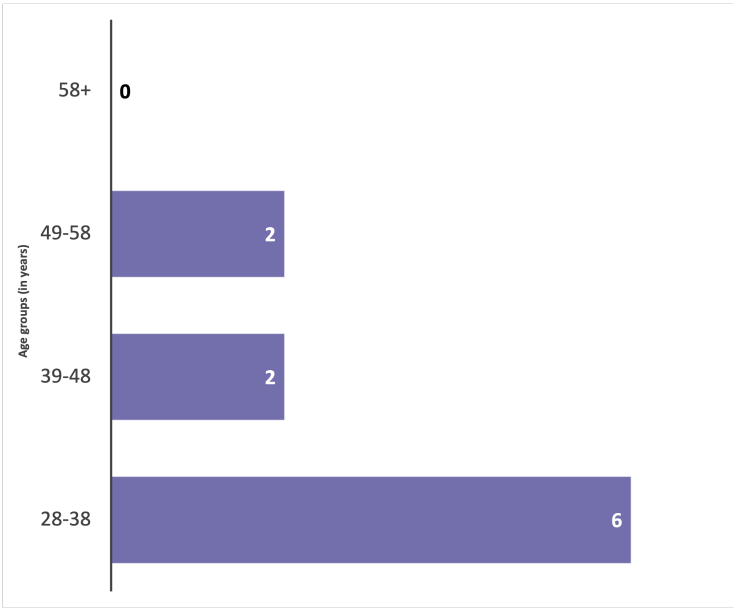


Figure 4.8: Participant Age Distribution

The respondents tended to be highly educated, with a minimum of high school education (see Figure 4.9). The single participant who responded "high school" as their highest form of education was also an older female; this is relevant in the context of growing up under Communist rule in Romania, where access to higher education, especially for women, was less prevalent.

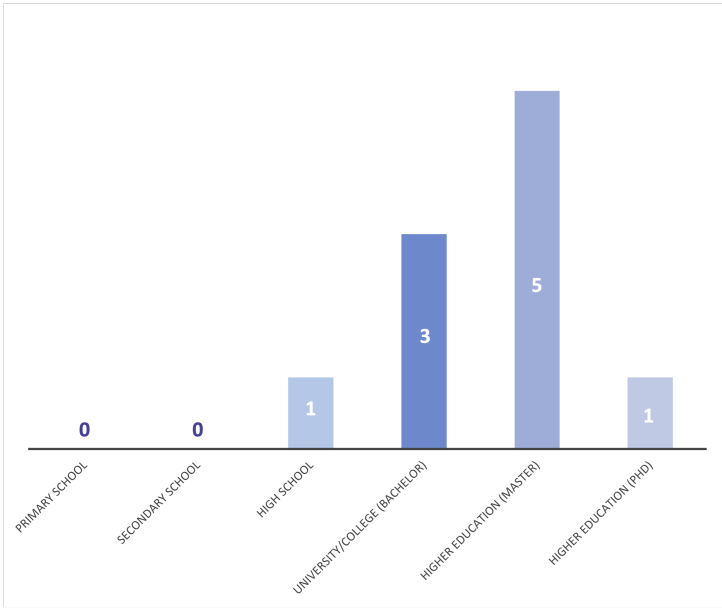


Figure 4.9: Participant Education Level

Nevertheless, the predominance of university-level completed education confirms the earlier statistics from the European Commission, that is to say that highly skilled individuals migrate in larger numbers and for extended periods of time (European Commission and Directorate-General for Employment, Social Affairs and Inclusion, 2018). However, this author would like to stress that it is also true that social science studies in general can be guilty of a bias in this respect, in so far as their distribution does not always go out of its way to seek lower-skilled/educated participants. As regards this study, every effort was made to distribute the study across online forums and channels where people of all skills would have access to them; it remains the case, however, that participation in studies such as this still requires a certain degree of commitment of one's personal time— a resource lower-skilled individuals who face precarious work conditions or simply longer working days may not have the luxury of affording.

4.3 Pilot study

In order to test the concept of the eye-tracking task and ensure that the gender cues were salient enough to prompt eye movement to the corresponding picture item, a pilot run of the experiment was undertaken with native Romanian speakers who have remained permanent residents in Romania. Their responses were requested as proof of concept for the design of the eye-tracking experiment i.e., ensuring that the gender audio cues were sufficient in inferring which picture item was being referred to in each of the item pairs.

The aim of this small pilot sample was to test the proof of concept behind the experimental design, and ascertain the validity of the gender audio cues, in terms of meeting the requirement for the completion of the experiment by facilitating the inference of the corresponding picture item. What this study wanted to avoid was any type of comparison between the potential attriters and this other, monolingual group, acting as some kind of benchmark “control”.⁷ Given that the language use and histories of bi(multi)linguals who no longer predominantly use their L1 is vastly different to that of monolingual speakers, or indeed native speakers still immersed in their L1 environment, this pilot group setting any kind of threshold was deemed problematic and not conducive to an equitable exploration of language change and outcomes in multilingual minds.

The participants in the pilot study were presented with the same online eye-tracking experiment as the target participants, and instructed to complete the experiment in the same way. As they acted as a proof-of-concept for the design of the eye-tracking experiment, they were not requested to complete the subsequent tasks (language history questionnaire, lexical task, English gender task). Their performance in the eye-tracking task is discussed in more detail in chapter 5.

⁷For a more in-depth discussion on the validity (or not) of control groups in language studies, see Rothman et al. (2023).

Chapter 5

Results

The results of this study were processed through spreadsheets fed into RStudio (RStudio Team, 2020); these spreadsheets consisted of the eye-tracking coordinates for each of the trials encountered by each participant, which would allow for the interpretation of where exactly on the screen the participants were looking, and whether this corresponded to the correct image (in addition to the competitor image, the participants may also have been looking off-target, i.e., at neither image). In addition, information about how the participants' gazes shifted during the playback of the audio was also extracted; this would in turn determine if the cues as to which image was correct had the desired effect on the participants. Tracking the participants' gazes was established by working out when the cues occurred in the audio, and calculating the proportion of looks over the duration of the audio playback, with the cues highlighted along this timeline. A higher proportion of fixation on the correct image once one (or both) cues were heard would be expected.

This section will also report the summary of findings related to the other tasks the participants had to undertake (the language history and background questionnaire, the lexical task, and the English gender task). These results will be used to inform the discussion carried out in chapter 6.

Unfortunately, given the modest total number of participants that completed the experiment, not all the statistical analysis intended to be carried out was possible. This fact informs some of the discussion in chapter 6. However, the remainder of this chapter will instead focus on presenting the results and the processing that was possible to be carried out, with a view of contextualising the participants' performance on the eye-tracking task more descriptively (by incorporating information from the language background and history questionnaire, as well as the lexical task). This qualitative, individualised approach is something not always possible to focus on in large datasets.

5.1 Pilot Eye-tracking Experiment Results

As discussed in chapter 4, the pilot experiment was run as proof of concept of the experiment and the salience of the items in carrying out the task as expected. Therefore, no comparison between the results from the potential attriters and the ones extracted from the native L1 speakers still residing in Romania was undertaken as part of the analysis in the next chapter. Indeed, it is the view of this author that "true" monolingual comparison groups are in fact increasingly harder to gather¹, at least outside of research into isolated or indigenous languages, or dialects spoken by relatively small populations– in separate conversations with the pilot participants following their completion of the task, they all confirmed often using English words or expressions naturally in conversations, despite never re-locating abroad; this held true even for the older pilot participants (55+ years old). If these speakers' knowledge of English is sufficient to facilitate regular code-switching and 'mixing', their language use may not be too dissimilar to that of an early L2 learner, at the very least, making constant referral to them as 'monolinguals' slightly misleading.

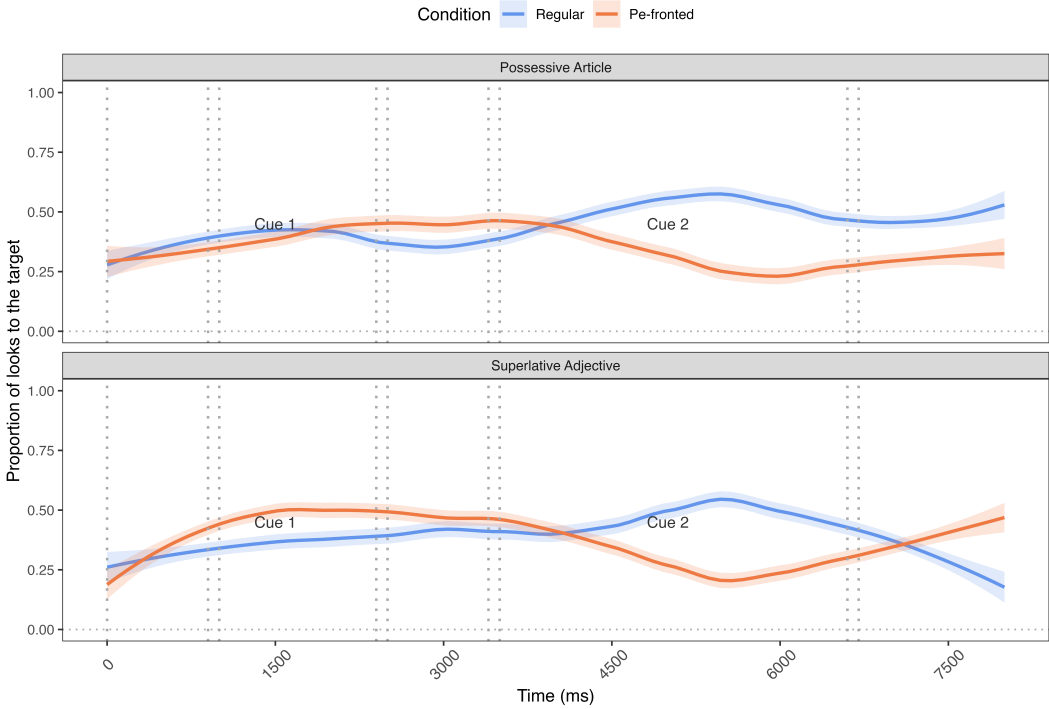


Figure 5.1: Pilot group proportion of looks to the target

Similarly to how the participants' data in the experiment was handled, the pilot eye-tracking data was plotted against the average length of time spent on each item pair screen, during which time the audio was heard and the two competing images were displayed; this was shorter for the pilot group than for the participants. Figure 5.1 above shows the proportion of looks to the target in each of the main conditions. As can be seen, in the possessive article condition at the

¹As discussed by Rothman et al. (2023), also mentioned in chapter 4.

top, the regular Subject-Verb-Object (SVO) word-order constructions (in blue) saw a significant rise in proportion of looks to the target once the possessive article *al* was heard (cue 2), whereas in the same condition, the *pe*-fronted constructions (in orange), where the *al* article occurs first, exhibits the opposite trend (cue 1 and immediately after elicits a higher proportion of looks to the target). In the second condition, namely that of the superlative adjective, the same general effect holds: in the regular (blue) cases, the second cue is strongest, and this is also the cue containing the superlative adjective construction itself, while in the *pe*-fronted (orange) cases, the cue order is reversed so that the superlative adjective constructions occurs first, and this is tracked again through the high proportion of looks to the target then.

5.2 Eye-tracking Experiment Results

The results of the eye-tracking task were plotted on a timeline of the trial duration, during which time the participants would hear the audio recording and select one of the two images displayed on their screen. The x-axis marks the duration of the trials, with the time at which the audio cues occurred highlighted along this timeline, while the y-axis plots the proportion of looks throughout the trial (on a scale from 0 to 1).

Figure 5.2 below represents the fluctuation in the proportion of looks only to the target item in both the trials containing possessive article agreement, as well as those with superlative adjective agreement. The blue line corresponds to the regular SVO structures in each of these conditions, while the orange line indicates those trials in which the object was manipulated into occurring before the verb through *pe*-fronting, as discussed in chapter 4.

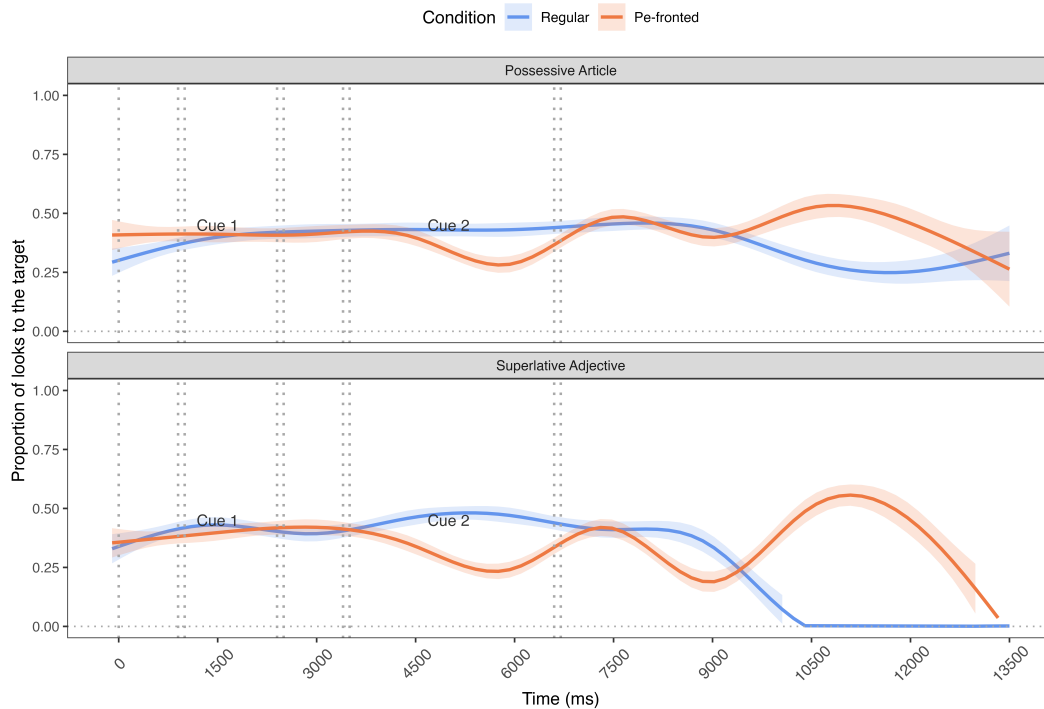


Figure 5.2: Participant group proportion of looks to the target

In the possessive article condition, the cues in the regular word order sentences appear not to facilitate agreement significantly, as the proportion of looks to the target remains at a steady slope; however, in the *pe*-fronted trials, there is a noticeable increase in the proportion of looks to the target once the second cue has also been heard.

With respect to the superlative adjective condition, here there is a modest uptick in the proportion of looks to the target in the SVO trials upon hearing the first cue, with a slightly higher slope confirming the fixations on the target choice once the second cue has reinforced it. In the *pe*-fronted trials, there is a similar uptick in proportion of gazes to the target during the first cue, but the subsequent peaks and troughs highlight a difficulty in processing the correct choice after the second cue, before eventually looks fixate on the target before the end of the trial. This could be due to the fact that, while grammatically correct, *pe*-fronted structures have a stylistic effect, which may make it more difficult for participants to focus on the gender marked cues, especially as the more salient one (the superlative adjective construction itself) would occur first in this scenario, therefore requiring higher recall from the participants in resolving the competition.

Figure 5.3 below, on the other hand, plots the overall proportion of looks during the experiment in each condition, across both SVO word order and *pe*-fronted structures; that is to say, whether participants were looking at the target (marked in green), the competitor (marked in red), or elsewhere on the screen outside of these areas of interest (marked in dark blue). This is so as to better visualise the path of their gazes throughout the trials.

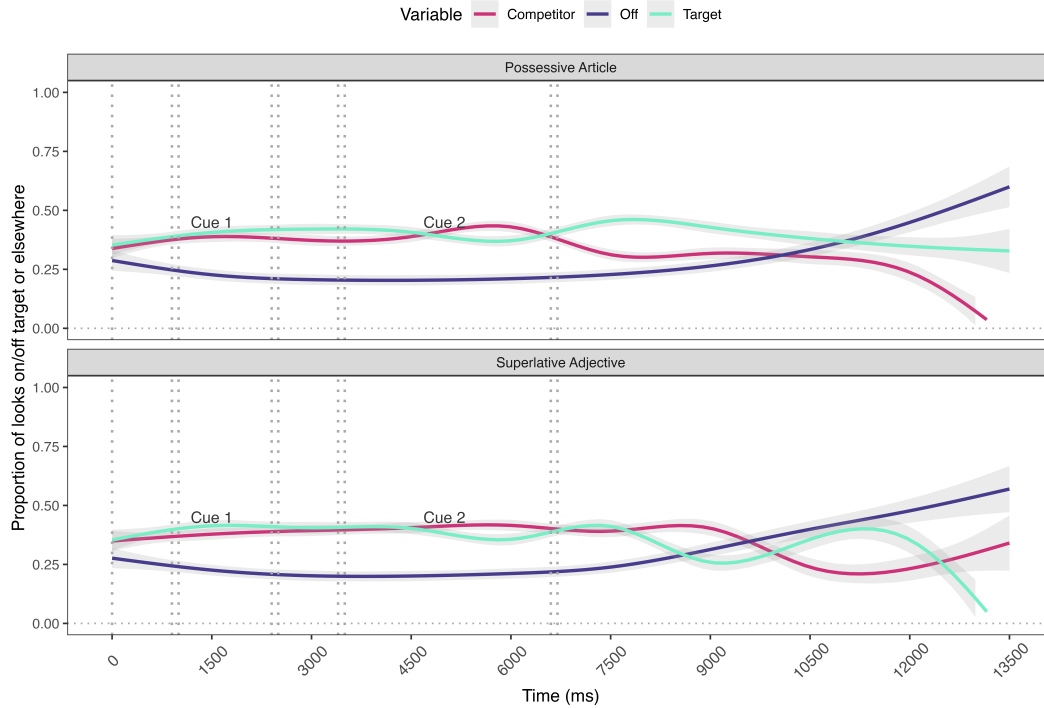


Figure 5.3: Participant group proportion of looks to either the target, the competitor, or elsewhere

Focusing on the possessive article condition, it is now noticeable that after hearing the first cue, there is a higher proportion of looks to the target than to the competitor; while the second cue is being heard, both the target and the competitor are being considered, but once the second cue has been processed, a clear preference emerges for the target over the competitor.

In the superlative adjective condition, the competition between the two items is harder to resolve, with the proportion of looks alternating between the target and the competitor even after the second cue occurs. The target image is only marginally more fixated on until pretty much the end of the trial.

In both conditions, the off-target line behaves as expected; between each trial, a focus point appeared on the middle of the screen to return the participants' gazes to a neutral place before the next pair of items was shown, so as to avoid a bias in the data simply from the participants' looks remaining on one or the other item from before. This is borne out by the graph in that the gazes start off from a fixed point, with the off-target line remaining low while the competition between the two images is resolved, and increasing towards the end of the trial as the participants make their choice and have to return their gazes to a neutral place (marked as 'off' during data processing).

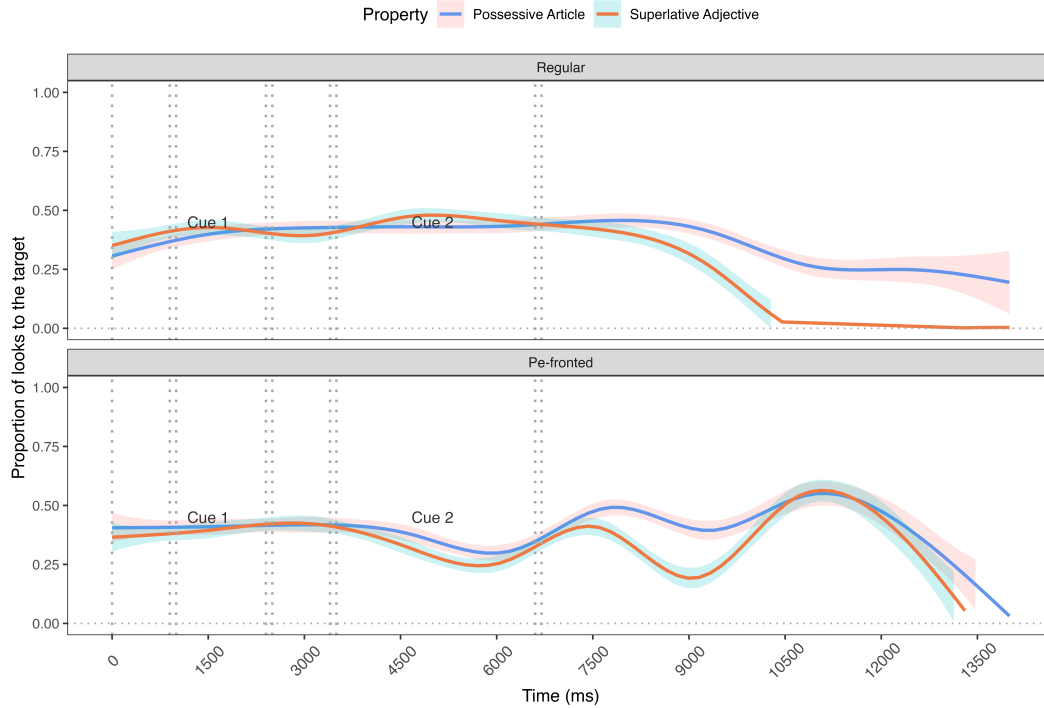


Figure 5.4: Participant Group Proportion of looks to the target, by condition

Figure 5.4 above groups the proportion of looks to the target by the condition this time, first looking at both the possessive article condition (marked in blue) and the superlative adjective constructions (marked in orange) in the regular SVO word order, and then in the *pe*-fronted one.

This allows for noticing the same modest increase relative to the cues being heard in the possessive article trials, with a slight increase in fixations to the target only after the second cue. Similarly to Figure 5.2, the same trend can be observed as before for the superlative adjective condition in these SVO structures, where during the second cue there is a higher proportion of looks to the target.

In both conditions, however, the *pe*-fronted structures elicit a higher proportion of gazes to the target after the second cue— these are clearly the structures where the participants show a greater sensitivity to the cues, particularly the second one (though it is worth noting that these are the structures with the significant overlap in cues, such that the second cue immediately follows the first cue, making their strengths harder to gauge independently of one another).

Similarly to Figure 5.3, the graph in Figure 5.5 below plots the overall proportion of looks to either the target, the competitor, or elsewhere (as before, marked in green, red, and dark blue, respectively), this time grouped by condition.

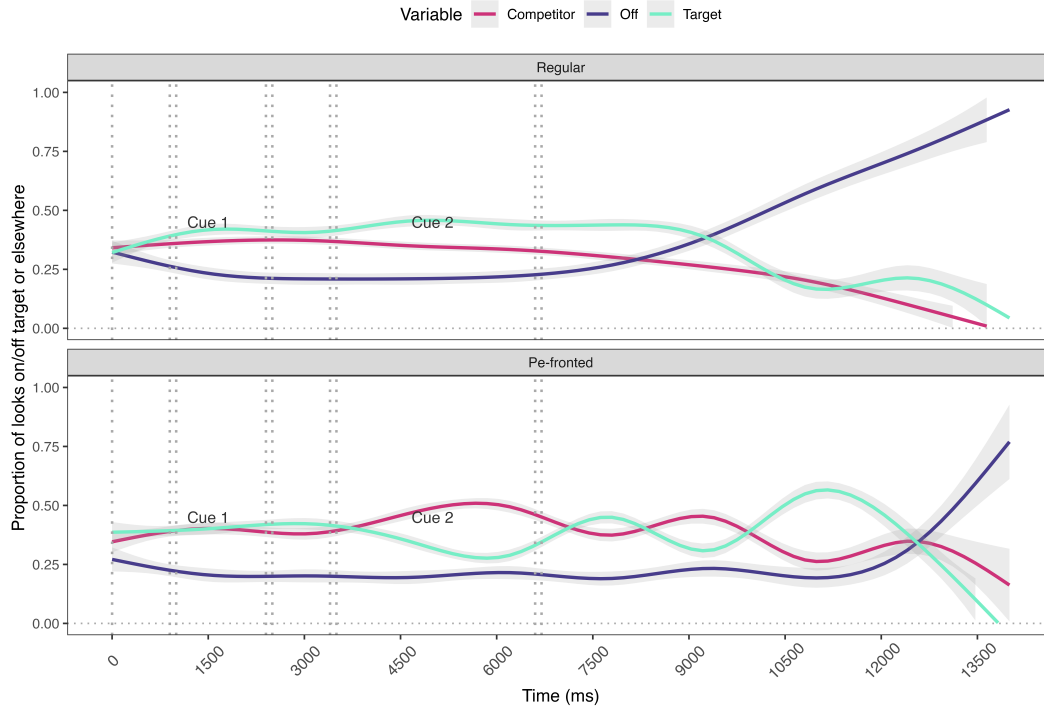


Figure 5.5: Participant group proportion of looks to either the target, the competitor, or elsewhere, by condition

In the regular SVO word order trials, the target is being reinforced by the second cue both in the possessive article, as well as the superlative adjective condition, though there is a modest increase in proportion of looks to the target versus the competitor during the second cue—most likely an effect of the stronger preference from the superlative adjective constructions.

Meanwhile, the *pe*-fronted trials exhibit the same trend noted earlier, towards a higher competition between the two items in each trial, with the conflict being resolved in favour of the target image a while after the occurrence of the second cue. More consideration to this apparent processing delay, and its potential explanation, is given in chapter 6.

5.3 Language History and Background Questionnaire Results

This section will highlight the information gathered through the language history and background questionnaires the participants were requested to fill out, subsequent to the completion of the eye-tracking task. Not all of the participants who completed the eye-tracking task went on to complete the second stage of the experiment, including the questionnaire, lexical task, and English gender task, or in some cases did not feel they could adequately answer some of the questions; this is why the number of responses in the following graphs will not always contain the total number of participants. For each of the graphs, all available data from the

participants who did complete those sections of the questionnaire were included.

Some of the information gathered in the questionnaires has informed the participant profiles presented in that subsection of chapter 4. In addition to the demographic information, participants were also requested to answer a series of questions related to their language attitude and use, both with respect to their native Romanian, and their dominant L2 English.

5.3.1 Language Use and Attitude

As discussed in chapter 2, speaker attitude to their L1 has an impact on their potential attrition outcomes, the same way that a learner’s attitude to the L2/Ln they are learning can affect their ultimate attainment of that language. In order to assess the participants’ engagement with, and general attitude towards, their native Romanian, they were asked to assess which culture and/or language they identified with more in a series of categories, from a scale ranging from 1 (no association) through to 7 (extremely strong identification). The responses are presented in Figure 5.6 below.

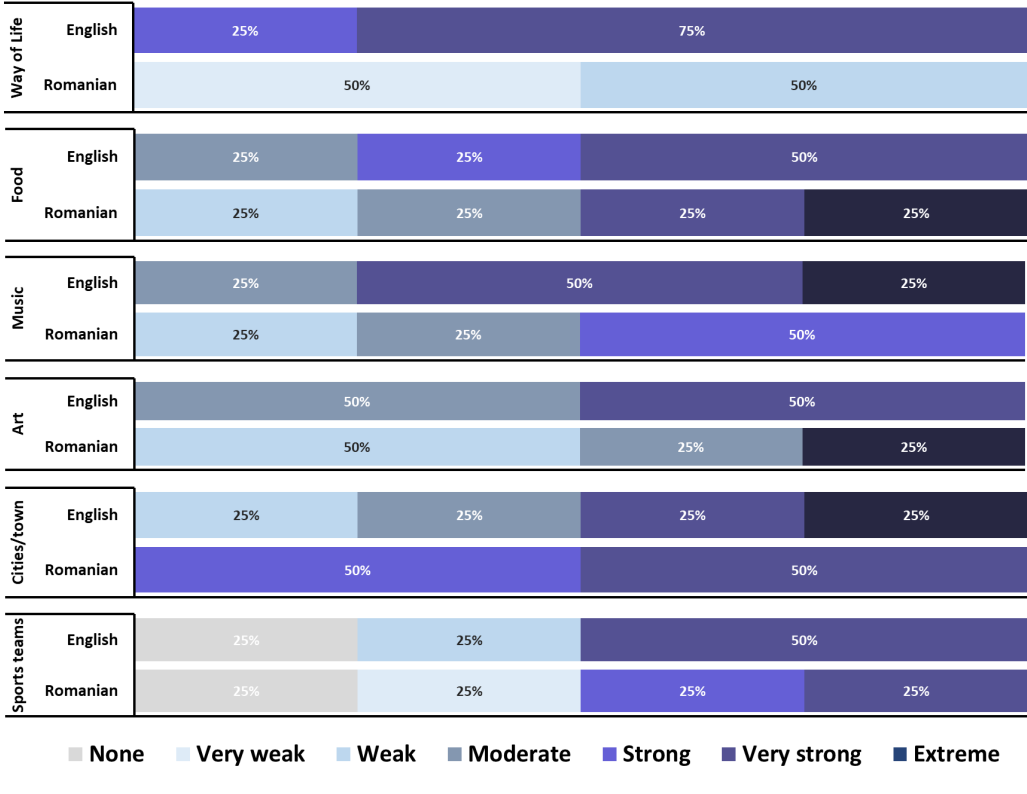


Figure 5.6: Participant Sociolinguistic Associations

The categories towards which the participants were asked to gauge their attitude are represented on the left-hand side of the graph, along the Y-axis; each category is split into Romanian and English (participants scored their attitude in each category for each language they spoke; although all participants spoke more than 2 languages, Romanian and English were highest

for all, in the sense of frequency of use²). These scores were translated into percentages for readability.

Starting from the top of Figure 5.6 and working down, way of life scored higher for English (a 25/75 split between strong and very strong association) than for Romanian (50/50 split between very weak and weak). This can be expected from long-term immigrants, who have relocated a decade or longer ago, and who need to adjust to their new residence and engage with their new lives there fully in order to integrate successfully. Often there can be multiple factors at play that influence a person's decision to relocate, outside of the purely economical ones, which then allow them to feel a closer affinity to their chosen home over their native one.

Food, music, and art, on the other hand, are much more emotive categories, in the sense that affinity towards the L1 culture in these cases will not preclude the speaker from successful integration into their new culture and environment. Some respondents still retained very strong, even extreme associations with Romanian food and art, in particular; in general these are also categories that are easy to integrate into a new life, as sharing new food or discussing art that is not so well-known to one interlocutor can lead to instances of bonding and relationship-building for a recent (or even established) immigrant. These are also fundamentally things that can be held onto without impacting on the immigrant's ability to assimilate into their new environment.

Sports teams as well act as a very emotional attachment that can be held onto (provided the person is interested in sport to begin with), while also allowing an easy way into a new community of supporters once the person is living in a different country. Indeed, as can be seen in the graph, for those respondents who had strong and very strong associations with sports teams in Romania, they could also form similarly strong associations with new sports teams in the UK.

On average, the participants had been living for 18 years and 3 months in an English-speaking country, which places them well past the 10 year mark identified in attrition studies as sufficient for potential L1 attrition effects to become noticeable to the speaker. Length of stay was considered as a potential counterpart to performance in the eye-tracking task in the subsection on correlation (this chapter).

On average the participants showed a clear preference for using English throughout (making the choice to have additional materials such as the consent form and questionnaire in English, as well as the instructions during the eye-tracking experiment itself), with all but 3 participants opting for English over Romanian. These participants fell in the youngest age bracket, but were also ones to report a higher number of friends with whom they maintain the use of Romanian. Again, diversity of use of the L1 promotes engagement with it even once the L2 becomes dominant, whereas reduced L1 use even in informal contexts makes it then more difficult to opt

²With the exception of 1 respondent who also scored Serbian highly in some categories, as a result of being married to a Serbian-speaker and using Romanian/English/Serbian interchangeably at home with their children.

for its use in other, less familiar contexts.

5.4 Lexical Task Results

In order to generate the scores for the lexical task, each participants' audio recording was manually transcribed. Recall from chapter 4 that the participants were shown each item that had been used in the eye-tracking task, and were instructed to name the item (in Romanian), preceded either by the cardinal "one" or "two", which have gendered markings on them. In this way, it could be established if participants were still using gender in those trials involving those items they could not retrieve the lexical item for, but for which they still provided a gendered cardinal. The transcribed data was annotated accordingly, where a correct answer was either,

- the participant providing the correct gendered cardinal + the lexical item, as expected
- the participant providing the correct gendered cardinal + a synonym for the item of a matching gender
- the participant providing the correct gendered cardinal, but no lexical item

and an incorrect answer was either,

- the participant providing the incorrect gendered cardinal + a synonym for the item of matching gender to the cardinal, but not to the target item
- the participant providing the incorrect gendered cardinal, but no lexical item
- the participant providing neither a gendered cardinal, nor a lexical item
- the participant interpreting the item unexpectedly

With respect to this last possibility listed above, an item was deemed to have been interpreted unexpectedly by the participant if they provided unforeseen detail when naming the item. For example, several of the fruit and vegetable tokens were images depicting a cross-section of that fruit, for easy identification. However, in some cases, participants would produce "o jumătate de [item]/a half [item]", which in Romanian necessitates the cardinal to agree in gender with the quantity (so in this case, *jumătate*– *half*), and not with the lexical item we were interested in. As such, it was deemed that in trials involving these items, it was difficult to ascertain if gender was being used correctly.

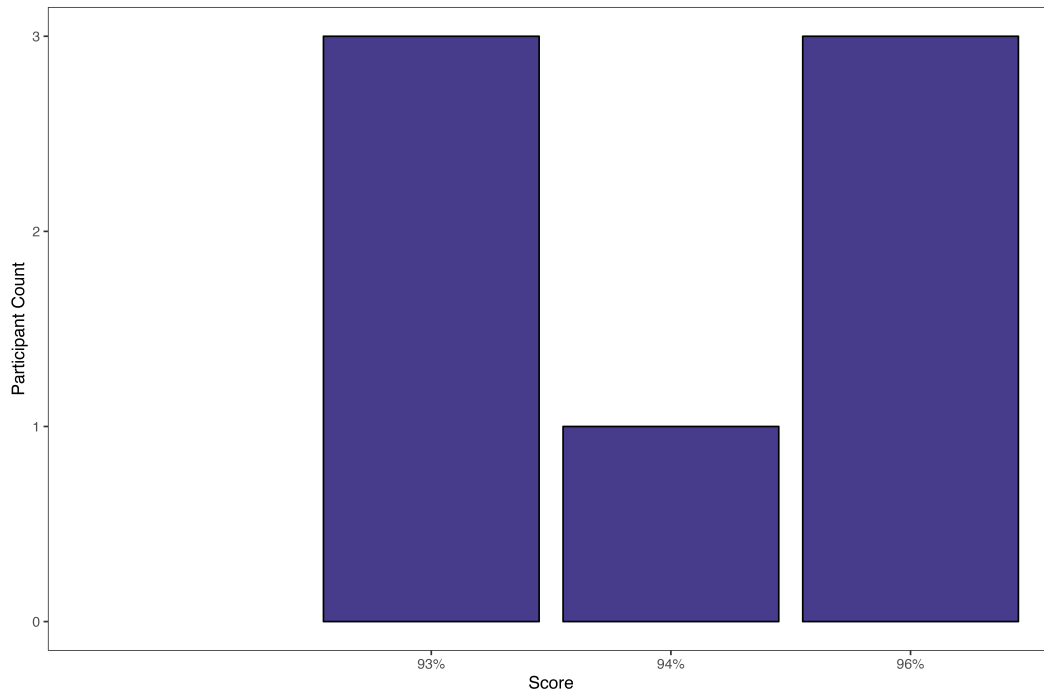


Figure 5.7: Participant Lexical Task Score Distribution

As illustrated in Figure 5.7, the participants scored highly. This is due partly to the nature of the items themselves (this study favoured the use of common items that were considered to be less likely to have undergone lexical attrition), and partly due to the fact that as long as a correct gendered cardinal was provided, for the purposes of what this experiment wanted to test, those cases were treated as correct answers.

An interesting fact to emerge from this elicitation of the lexical item accompanied by its corresponding gendered cardinal was that no instances were recorded of participants producing an incorrect gender marked cardinal (save for the cases where it was paired with a matching synonym noun to that was not the target gender)³. However, the fact that even when a lexical item could not be retrieved, the correct gendered cardinal was provided, offers valuable insight into the storage and accessing of information related to a lexical item, even when retrieval of that lexical item is impaired—namely that even in the absence of the lexical item itself, it would appear that information about its grammatical properties is retained and more readily available.

For each participant, all trials involving items that were labelled as incorrect were individually removed from that participant’s eye-tracking data.

³For instance, the token depicting a camera for photography was labelled as masculine in the data (*un aparat foto*) but could also be identified by its feminine synonym (*o cameră foto*). While it was the case that some participants produced the feminine form, therefore leading to those trials being excluded, there were no instances of a mismatch between the gendered cardinal and the noun ultimately retrieved (such that would result in **un cameră foto*/**o aparat foto*, both ungrammatical constructions).

5.5 English Gender Task Results

The participants' performance in the English gender task suggests that they did not have any issues in resolving gender in English constructions utilising the possessive pronouns; in fact, as can be seen in Figure 5.8 below, all bar one of the participants who completed this task scored the maximum possible, while the other participant made one mistake, which in and of itself is not a strong indication that they were unable to resolve gender agreement in this task.

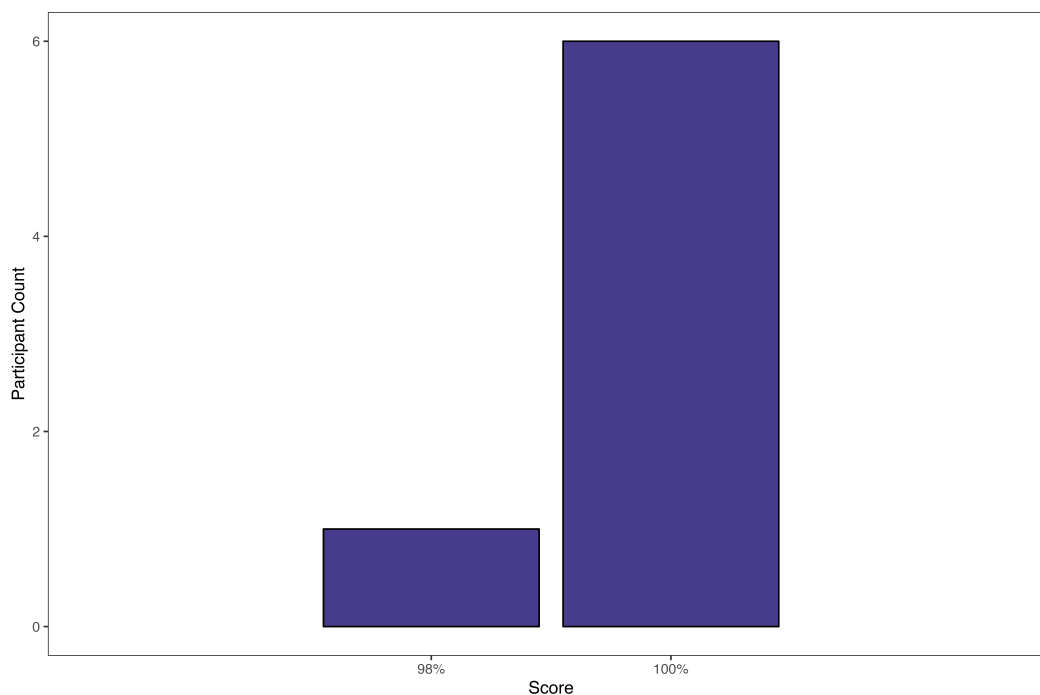


Figure 5.8: Participant English Gender Task Score Distribution

This contradicts the findings from Antón-Méndez (2010)'s study that this task was based on, namely that even highly proficient Italian and Spanish speakers struggled with correct gender agreement in English. This is not an entirely unexpected finding for Romanian-English speakers, however, given that Romanian allows for grammatically correct possessive pronoun agreement with the possessor, as in English, and only patterns more broadly with other Romance languages in the case of sentences utilising the reflexive pronoun (as previously explained in chapter 4).

For the purposes of the discussion undertaken in chapter 6, these results serve to demonstrate that English gender agreement does not pose difficulties to Romanian speakers.

5.5.1 Correlation

In order to investigate if any of the sociolinguistic parameters had an effect on the results, a correlation analysis was undertaken. First, the participants were scored on their performance

in the task, i.e., in how many of the trials they had picked the target picture. This was worked out of a possible individual total, because some trials for some participants were discarded if it could not be established that they were using gender in the trial, as discussed above; it was essential that the percentage of right/wrong answers be comparable between participants, so as to avoid a situation whereby some would be penalised in their ranking due to their missing trials.

Given the insufficient overall number of participants, it is important to note that little can really be gleaned from this correlation modelling, as the sample size is simply too small to generate meaningful statistical results, as might be evidenced through more complex predictive models such as regressions. Furthermore, as the old adage goes, "correlation is not causation", so quite apart from there being scant data, this author also understands any tangible relationship is impossible to establish on the basis of these correlation coefficients alone. Carrying out more complex analyses remains therefore something for future work, and which this author would like to attempt with a more complete data set. However, it is worth recalling some of the points raised in chapter 2, discussing the validity of statistical methods, and how they may not always be the best measure for effects that are highly individualised and involve teasing apart complex relationships between multiple variables that do not necessarily affect each speaker to the same degree.

On the whole the participants scored very highly in their correct grammatical gender selection, which independently already makes the correlation analysis rather moot, simply because there is not sufficient difference in their performance to probe the cause for with other variables. Nevertheless, a Spearman coefficient was computed against their scores for variables commonly associated with possible attrition effects, such as age, length of residence in the dominant L2 country, and their proficiency in English. The score for this coefficient on age over performance in the task was 0.01334401, which indicates low/no relationship between the two variables tested⁴. In the case of length of stay, the value was -0.100313, which indicates the same low/no relationship; however the trend observed in other attrition studies is borne out by the fact that the value is negative, which indicates that the longer the participants spend in the dominant L2 environment (the length of stay value increases), the more their performance on L1 tasks can be affected (so their scores on the task decrease).

⁴The Spearman coefficient can range from -1 to 1, with positive values indicating that the values for X and Y increase/decrease together, and negative values indicating an inverse relationship such that the values for X and Y change in opposite directions (Levshina, 2015).

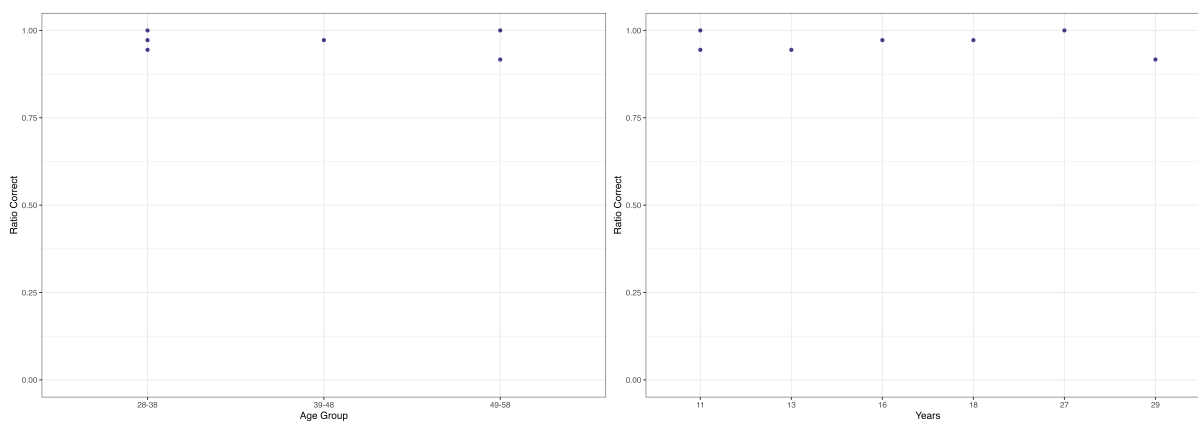


Figure 5.9: Scatter plots for participant scores against their age (left) and their length of stay in their L2 country (right), in years

Figure 5.9 above plots the distribution of participants based on their scores (ranging from 0 to 1, with 1 being the highest possible score) against their current age and also against the length of their stay in the dominant L2-speaking country. As can be seen in general the scores are very high (lowest score of 0.91, or 91% correct), which in and of itself suggests that processing gender correctly during those trials where gender was present for the participants did not pose significant difficulty. As can be seen from the two graphs, the age does not impact performance, as indicated by the Spearman coefficient value, while the length of stay similarly did not impact performance significantly (the lowest value is for the person with the lengthiest stay, which bears out the negative value of the Spearman coefficient computed in this case, however it is not a strong relationship, as the second lengthiest stay scores the highest possible on the task).

The Spearman coefficient was also computed against English proficiency and their performance in the task, and the value returned was 0.3313667. This generally indicates a moderate positive monotonic relationship⁵, which at first may be surprising; however, if we consider that English does not have an equivalent for grammatical gender in the same way that Romanian does, this stronger, positive relationship between the two (the more proficient a speaker is in English, the better they also perform on the gender eye-tracking task in Romanian) can be viewed as potential evidence of the protective factor of a dominant L2 on a less-used L1 when there is no competing structure, enforcing attrition research findings that stress frequency of use *and* competition together as more likely to influence attrition outcomes than frequency of use alone (recall findings from Gürel, 2004).

⁵And indeed this author wishes to stress that none of these statistical findings actually argue for any conclusion with any amount of certainty.

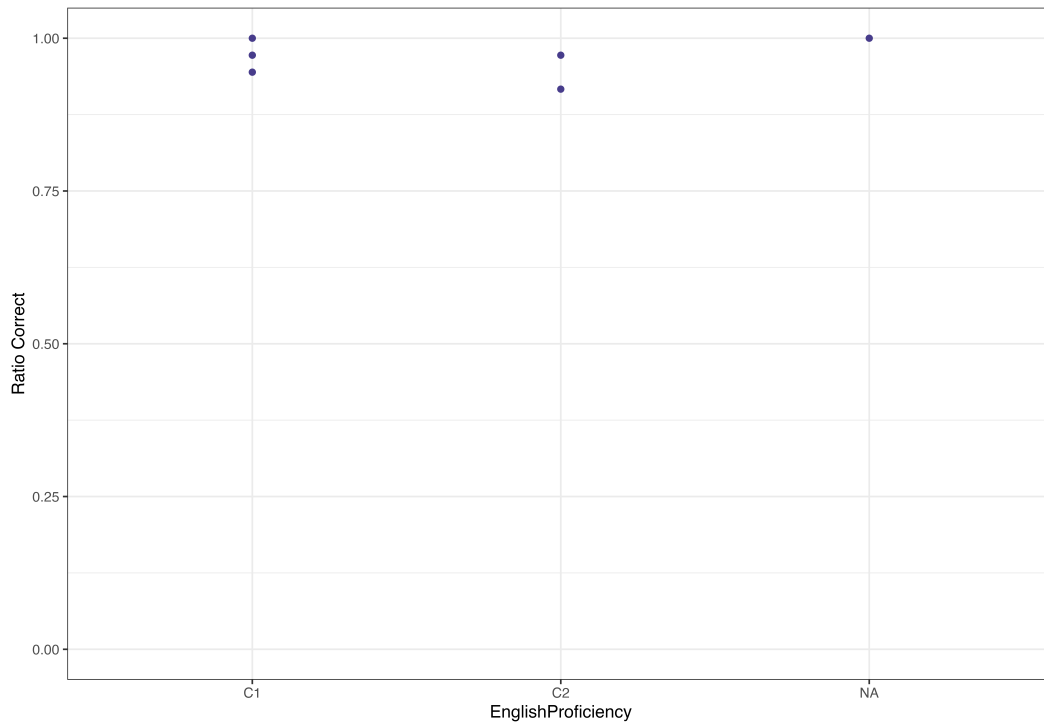


Figure 5.10: Participant Distribution of eye-tracking task scores against their self-reported English proficiency

Figure 5.10 above similarly plots the performance scores of the participants against their self-reported English proficiency. The English proficiency scores of the participants were collected during the language history and background questionnaire- all but one of the participants (labelled NA in the graph) provided their scores to standardised tests that they had taken, which were either the Cambridge Advanced (CAE)/Cambridge Proficiency Exams (CPE), TOEFL⁶, or IELTS⁷; these scores were then standardised against the Common European Framework of Reference for Languages (CEFR), so as to be comparable. The participants' proficiency in English was very high (C1 and above level indicates proficient use, with C2 the maximum possible to achieve); this is particularly meaningful as these tests were taken by all participants just prior to relocating to the United Kingdom, meaning they were already highly proficient speakers even before that competence was likely to increase through immersion.

Finally, during the questionnaire the participants were asked to estimate the number of hours a day they spent using the languages they spoke, and the contexts in which they used them, as well as self-report internal use of their languages, in contexts such as speaking to yourself, dreaming, thinking, arithmetic, recalling numbers, expressing emotion, and praying. The participants were asked to gauge these internal metrics on a scale from 1 to 7, 1 being never doing these activities in their native language, and 7 being always doing those activities in their L1. In processing these results for the correlation analysis, their self-reported scores were represented as values

⁶Test of English as a Foreign Language.

⁷International English Language Testing System.

out of a total possible 49 points (if they had scored each of the 7 categories a maximum of 7 on the scale).

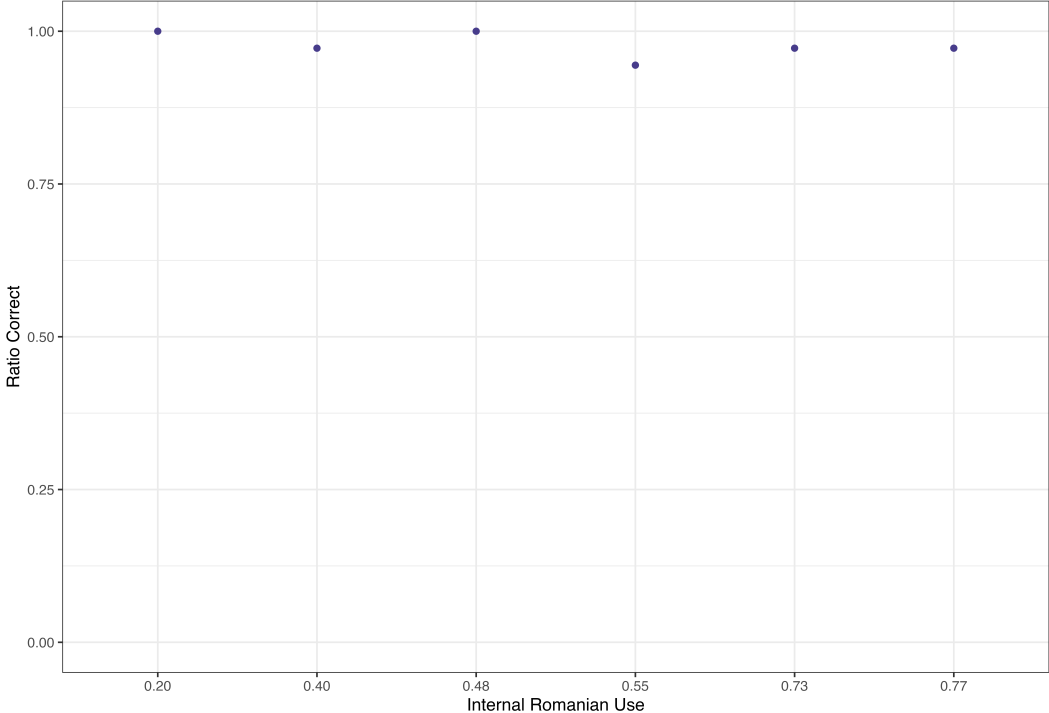


Figure 5.11: Participant Distribution of eye-tracking task scores against their self-reported use of Romanian in internal/self-directed contexts

In Figure 5.11, the results of this correlation are plotted; the Spearman coefficient for this correlation is -0.4767313 , which indicates a more moderate negative relationship between the two variables. This is again somewhat unexpected, as reporting a high use of the L1, even in internal monologues or subconscious activities such as dreaming, would be expected to have some sort of benefit for language maintenance, but this would appear not to be the case as indicated by this very limited dataset. This small sample would hint at evidence that communication as it is understood to take place between one or more people, in a variety of contexts, would provide a bigger benefit to improved language maintenance outcomes. This is of course an observation that would benefit from further study on a larger, more significant sample size.

Chapter 6

Discussion

This section will consider the results presented in the previous chapter, particularly in relation to the research questions posed at the start of the study (repeated below for convenience). In the second part of the chapter, the limitations of this study will also be reviewed, as well as potential solutions to those issues.

The study undertaken here sought to answer 3 questions:

1. *Does English as an L2 affect L1 Romanian attriters' sensitivity to grammatical gender agreement cues in online processing? If so, how?*
2. *Is there a significant difference between the possessive article condition and the superlative adjective one with respect to eye movement onset?*
3. *What factors modulate the similarities/differences observed at an individual level, both from a linguistic internal, as well as linguistic external perspective?*

With respect to the first research question, it does not appear that English affected the L1 Romanian gender agreement processing in the two conditions tested. This is supported by the structural attrition research undertaken in the field and presented in chapter 2, in that certain grammatical structures are more robust to attrition effects than, for instance, the lexicon is, but also more resilient than other grammatical structures. Additionally, while competition is present in all bilinguals through constant activation of two languages¹, and while the realities of the bi(multi)lingual living abroad are those of reduced L1 input, for the L1 to be most vulnerable to interference from the L2, there must be an equivalent competing structure in both languages,

¹For recent reviews, see Kroll et al. (2015) and Schmid and Köpke (2017).

such that reduced frequency of use of the L1, together with direct competition of a similar structure in the L2 is ultimately responsible for difficulties in processing of the L1 structure².

This frequency of activation + L2/Ln competitor can also explain why the lexicon is much more vulnerable to attrition; as long as the speaker knows the word in both/all languages they speak, constantly using the one form over the other as dictated by their preferential exposure and use of their L2 English, in this case, necessitates the suppression of its L1 Romanian competitor at all times. Although the bi(multi)lingual speaker may have different representations of their lexicon, the lemmas themselves still map on to the same concepts, such that retrieval of, for instance, *dog* will also activate *câine*; as the former is routinely used over the latter, *câine* becomes gradually harder to recall.

Furthermore, this study was able to reveal³ that the gender marking associated with a word is more robust than the surface form of the word itself, especially when there are delays in retrieving the lexical item. By designing the lexical task such that a gendered numeral was solicited prior to the lexical item itself, it was possible to establish with a greater degree of certainty whether the expected delay that can affect potential attriters in word-retrieval tasks (the lexicon being more vulnerable than the grammar domain) was due to their (potentially temporary) loss of the ability to successfully recall the word, rather than a loss of the morphosyntactical features associated with that word. This distinction is crucial in allowing greater insights into both the mental representation of languages, as well as how the different components of grammar and vocabulary interact, and by extension, which linguistic features are more protected than others.

Grammatical gender as a feature is also additionally protected in this case not just by its absence from the L2 English, but also because it is a grammatical structure acquired early by the native speakers. As the population this study was interested in consisted of adult migrants who had fully acquired the L1 under normal circumstances prior to their relocation, grammatical gender was already a much more "stable" feature, benefitting from entrenchment. The participants also reported a high proficiency level in their L2 English prior to moving to a predominantly English-speaking country. High proficiency in English even before their relocation also makes it likely that transfer effects between the L1 to the L2 had been successfully resolved; the increased exposure to English to the detriment of Romanian that would now precipitate L2 transfer to the L1 would not be expected to affect Romanian grammatical gender, as no such equivalent feature remains in English.

With respect to the second research question posed at the start of this study, the eye-tracking could not provide exact enough measurements in terms of a direct comparison of eye-movement onset times; however, there is clearly a difference in the two conditions (and their SVO/pe-

²As investigated by Gürel (2004).

³At least at the level of this very small sample.

fronted subconditions) in terms of the trajectory of looks to the target during online processing. Recall Figure 5.2; in the regular SVO word order, the increase in the proportion of looks to the target picture is gradual over the course of hearing the two cues in the possessive article condition, but sharper during the second cue in the superlative adjective condition. In the *pe*-fronted cases, although there is some conflict to resolve after the second cue in both conditions, in the possessive article one the increase is sharper immediately after the second cue, whereas in the superlative adjective one there is a very slight uptick in looks to the target after the first cue, followed by peaks and valleys as the sentence is being processed. This is similar to the curve trajectory in the *pe*-fronted possessive article condition subsequent to hearing the second cue, however the peaks and valleys in this case are less pronounced.

The pattern of the proportion of looks across the trials overall, i.e., to either the target, the competitor, or elsewhere from Figure 5.3, illustrates the dynamic between the target and the competitor throughout the processing of the audio input in the two conditions. Again, it is the superlative adjective condition that seems to be eliciting more processing demands (as evidenced by the fluctuating fixation patterns on either the target or the competitor), particularly after the second cue. In the possessive article condition, both images are considered during the second cue, however the preference is strongly in favour of the target once the second cue has been heard, and remains so for the remainder of the trial.

Taking a closer look at the patterns of the proportion of looks captured by Figure 5.5, where focus is on the subconditions within each condition, it is actually the *pe*-fronted subcondition that is highest in terms of processing demand. This is not altogether unexpected, as *pe*-fronting, while completely grammatical, does carry a certain stylistic effect at a pragmatic level; it is also the sentence structure in which the most salient clues (the ones where the possessive article/the superlative construction itself occurs) are heard first (Cue 1 in the graphs), therefore demanding a higher recall by the end of the audio in order to determine which of the images is correct based on grammatical gender agreement.

To answer the second research question, then, it can be said from this very modest dataset that there seems to be a difference between the two conditions, overall driven largely by the trials with *pe*-fronting. However, despite the apparent additional processing cost extracted in the superlative adjective condition, prompted largely by the *pe*-fronted subcondition, overall the participants performed well in the eye-tracking task, with high scores⁴ for correctly completing the task (through their ultimate correct choice of target image over competitor).

Chapter 3 undertook a brief discussion of strict grammatical requirements for the possessive article within the DP in Romanian, namely that genitive DPs are required to be adjacent to the definite article, and that disrupting this adjacency necessitates the insertion of the possessive article to remain grammatical (page 32, this document). This fact prompted differing views

⁴Lowest score of 0.91, or 91% correct, as discussed in chapter 5.

in the literature, with D'Hulst et al. (2000) proposing that this made structures where the possessive article *al* was present "costlier" than those without, while Dobrovie-Sorin et al. (2013) held that all genitive structures of this type are represented as containing the possessive article *al* in the speaker's mental grammar, with rules that stipulate its deletion in cases of adjacency (something that would be handled by an operation such as Spell-Out at the pragmatic interface). From the pattern of looks observed in this study, it would appear that the possessive article did not cause any significant processing delays, certainly not compared to a "straightforward" structure⁵ such as the superlative adjective, suggesting perhaps the latter viewpoint as argued by Dobrovie-Sorin et al. (2013) to be more accurate as to how these structures are represented in the mental grammar of speakers.

Finally, the third research question posed by this study related to the degree to which the speakers themselves, and their linguistic outcomes as tested by this experiment, varied. In order to investigate this, findings from the language history and background questionnaire were brought to bear on the performance of the participants, to see whether there could be any correlations between their experiences and their retention of grammatical gender agreement in their L1 Romanian, given the pressure exerted by their now-dominant L2 English.

As previously mentioned, all participants performed the eye-tracking task with minimal error, a fact which strongly suggests that their retention of the grammatical gender feature for Romanian remains high, despite the prolonged period of time they spent in the UK (on average participants had been living for over 18 years in a predominantly English-speaking country). Furthermore, this feature did not interfere with their performance in the complimentary English gender task, where again the lowest score was 98% (equivalent to one mistake, only one participant), while the rest all scored the highest possible, i.e., made no mistakes in selecting the correct gendered possessive pronoun in English in each scenario of the task. As their performance in the Romanian possessive article condition during the eye-tracking task seemed to incur less processing cost than the superlative adjective one, it is also likely the case that English gender in those limited possessive constructions did not negatively impact their handling of Romanian gender agreement.

It is worth noting that the participants all reported very high English proficiency scores prior to their relocation as adults, a fact that serves to underscore that any potential for transfer of this feature in either direction (L1 to L2 or vice versa) would already have been minimal. Furthermore, the fact that grammatical gender is a feature acquired early by speakers, coupled with the fact that its occurrence in English is so limited, seem to serve somewhat as protective factors against attrition effects.

Lastly, participants' responses to the language background and history questionnaire reported their way of life highly correlated to their country of residence, with a 50/50 split between

⁵i.e., with no additional rules regarding its occurrence in a sentence.

Strong and Very Strong identification. This is not unusual in communities of migrants that are well established in their new country of residence, more so when their relocation to those countries was voluntary. While this result would be interesting from the perspective of additional pressure of the now dominant L2 on the L1, given the fact that attitude can change language use and maintenance outcomes, in this dataset it does not seem to have had much of an effect on the retention of the feature of grammatical gender in Romanian. As discussed above, given the absence of this feature in English, this is not an unexpected finding; it is, however, one that raises interesting questions for whether such a strong correlation between way of life and the country of residence would have a detrimental impact on the L1 in language pairs with competing features, further compounded by those cases where a stronger identification with the new country of residence came at the cost of reduced affinity towards the origin one.

6.1 Limitations

As is the case with all research, and viewed with the benefit of hindsight, there are certain shortcomings to the work undertaken by this project. This section will highlight them, along with suggestions as to what might have been done differently, with a view to how the work could be approached in future, which will also be discussed in more depth in chapter 7.

The most immediately obvious drawback of the work presented herein is the very small total number of participants that completed the experiment. Despite a lengthy recruitment phase, where the sign-up for participants was circulated widely in online spaces relevant to the population of interest⁶, the ultimate number of successful completions of the experiment (and its complementary tasks) remained low. Initially, recruitment was sought through a form to register interest in taking part in the research by consenting to be contacted with a link to the experiment via email; this was partly so that the process of managing the participants and their data could be better controlled, and partly due to constraints with the Gorilla server hosting the experiment. Participation in experiments expends tokens, more of which must be purchased if they are all consumed. Participants would expend their token even if they had attempted the experiment and, for instance, failed the calibration (meaning they had not actually completed the experiment). A lot of the time this was due to them not following the instructions which had been presented to them prior to the start of the experiment (in the form of an instructional 2-minute video)⁷. As a means of avoiding loss of participants due to this, it was simply better to be able to have a record of communication and a means to contact them in order for them to retry the experiment, or in general to be in touch should they have questions regarding the

⁶Facebook groups for Romanian diaspora in English-speaking countries, word-of-mouth through people who already signed-up, online platforms for participant research recruitment such as SurveyCircle, targeted emails to other Romanian researchers abroad with access to/interest in Romanian immigrant populations, alumni groups at universities in the UK.

⁷And something that is more easy to intervene in and correct during lab-based testing, but for which there are fewer safeguards remotely.

instructions.

This recruitment stage of the exercise garnered strong interest, with very promising sign-up numbers. However, following contact with these potential participants and the forwarding of information about the experiment, as well as detailed consent forms for handling their data according to Norwegian General Data Protection Rights (GDPR) laws, their response rate declined sharply. Most simply never replied to the e-mail or followed the link included to the experiment, or any follow-up reminders. Of the ones who did eventually complete the eye-tracking task successfully, 3 did not go on to complete the second part of the experiment, involving the additional language tasks and the language history questionnaire, thus reducing the available data further for that part of the analysis of particular relevance to the third research question.

This outcome is naturally disappointing, and probably the greatest disadvantage of online-only methods over a physical, on-location approach. There is no question that the population of interest to this study is out there, as evidenced by the statistics gathered by the European Commission and presented in chapter 1, however, none of the methods to increase participation that were attempted during the course of the project were ultimately fruitful; in hindsight, trying to reach out to international schools (for access to parents of immigrant children) and adult learning centres in English-speaking countries, as well as consulates and embassies should also have been considered. Ultimately, perhaps even a short visit to some of the countries to attend social events for migrants and recruit there could have proven beneficial, and so these are the first steps to consider should work on this project be carried on.

The very modest final number of participants ultimately proved very limiting with regards to how much statistical analysis could be done, and to the project's ability to answer with any degree of certainty the research questions it proposed. This is not, however, to suggest that only statistical results offer answers to (psycho)linguistic questions; indeed, as evidenced by the not inextensive research on the subject of speaker language maintenance, the variation within speakers is such that statistical approaches are not necessarily the most likely to tease apart the nuanced complexity often involved in processing language. Nevertheless, such a small sample cannot really speak more broadly to the scope of language attrition studies, and as such cannot adequately contribute any real insights into the matters under investigation; it remains, therefore, something to be explored in future work with a larger sample size (and potentially other interesting factors to consider, as explored in chapter 7).

With respect to the design of the experiment itself, choosing only constructions with no direct equivalent in the speakers' L2 English narrowed the scope of what potential signs of L1 Romanian attrition might be observed. Contrasting conditions reliant on a feature only present in the L1 (such as grammatical gender in this language pair), with another that has an L2 equivalent, even if its realisation might be different at the syntax-pragmatic interface (such

as tense or aspect, for instance), might have been able to reinforce (or dispute) the notion that reduced frequency of use and L2 competition are together a greater force for L1 attrition than reduced frequency of use alone. This is certainly something that could be added as a second stage to the experiment, more so because features such as tense and aspect similarly lend themselves to eye-tracking experiments set in the Visual World Paradigm⁸.

With regards to the language and history questionnaire data, there is cause to consider how this was implemented as a limiting factor in this project as well. Questionnaires were preferred at the onset due to the online-only nature of the experiment; supplementing these with interviews was also considered, partly given the inherent bias in self-reported answers that is impossible to completely rule out in questionnaires, and partly in line with Cherciov (2013) and her recommendation that interviews supplement the information collected through questionnaires whenever possible. However, given the general unavailability of participants and the necessity of prioritising their completion of the eye-tracking task primarily, this idea quickly proved impossible to implement. Again, should the recruitment process have involved an in-person component, interviews might also have been possible to be carried out at that time, and it is certainly a strategy worth considering in future.

⁸It is worth noting though, that the addition of a second stage would need to be implemented with due consideration for the time commitment necessary from each participant, as significantly lengthening the duration of the experiment would likely lead to fewer participants completing it, therefore compounding a pre-existing problem.

Chapter 7

Further Work

Having analysed the data collected during the course of this project, as well as discussed the limitations of the work presented herein, this chapter would like to turn to the future directions this incipient research could take. These ideas will start with some additional potential areas of interest within the L1 Romanian-L2 English language pair, before moving on to broader suggestions of interest to the study of language attrition, as well as bi(multi)lingualism overall.

The immediate next step in carrying forward with this research would of course entail the successful recruitment of additional participants, ideally in English-speaking countries other than the UK for a more universal perspective. This could hopefully be achieved through some of the means mentioned in the section on this study's limitations (see previous chapter). Provided a significant uptake in participant numbers, the addition of a component investigating structures with equivalents in English would be the first relevant addition to supplement this study.

Moreover, manipulating the sentences and tokens presented during the experiment to account for agreement patterns in Romanian complex subject noun phrases could also prove to be an interesting addition to the study with respect to changes in gender agreement processing for potential L1 attriters. This is because in Romanian, agreement patterns are more complex than, for instance, in French, where in the case of complex subject noun phrases, the masculine overrides the feminine without exception (Maurice, 2001); take, for instance, the example in (6):

- (6) Un educator și o învățătoare mult *tracasați*.
a teacher.INDEF.MSG and a teacher.INDEF.FSG very harried.MASC.PL
A very harried (male) teacher and a very harried (female) teacher.

In this example, the qualifier *tracasați*–*harried* takes the masculine form over the feminine (*tracasate*) when agreeing with a complex subject noun phrase containing both a masculine and

a feminine noun. However, in the case of (7)¹ below, both nouns are feminine², but the second is the feminine epicene *persoană*–*person*. In this example, it is further qualified by the descriptor *cu barbă*–*with a beard/bearded*, which implies a male referent³, again prompting masculine agreement.

- (7) Maria și persoana cu barbă au fost
 Maria.FEM and person-the.DEF.FSG with beard.INDEF.FSG have been
 văzuți.
 spotted.MASC.PL
 Maria and the person with a beard have been seen.

This is not the case in the very similar example in (8), again assuming a stereotypical view of a female being more likely to wear a skirt:

- (8) Maria și persoana cu fustă au fost
 Maria.FEM and person-the.DEF.FSG with skirt.INDEF.FSG have been
 văzute.
 spotted.FEM.PL
 Maria and the person with a skirt have been seen.

Therefore, it can be observed from these examples that referential gender can override grammatical gender when it comes to agreement in Romanian, at least in complex subject noun phrases. In the cases with a simple subject noun phrase, grammatical gender agreement is preserved, as illustrated in (9):

- (9) Persoana cu barbă a fost văzută.
 person-the.DEF.FSG with beard.INDEF.FSG has been spotted.FEM.SG
 The person with a beard has been seen.

So far these examples have all referred to animate subjects, whether in simple or complex noun phrases. The agreement pattern is different, however, in cases with inanimate subjects; namely, if the complex subject contains a noun in singular and another in plural, the noun in plural mandates the agreement pattern (Maurice, 2001), as seen in (10):

- (10) a. Stejarul și lalelele au fost tăiate.
 oak-the.DEF.MSG and tulip-the.DEF.FPL have been cut.FEM.PL
 The oak tree and the tulips have been cut.
 b. Stejarii și lăleaua au fost tăiați.
 oaks-the.DEF.MPL and tulip-the.DEF.FSG have been cut.MASC.PL
 The oak trees and the tulip have been cut.

¹Example from Farkas and Zec, 1995.

²*Maria* is the equivalent Romanian version of *Mary*, a female name.

³Provided the stereotypical assumption of a person with a beard referring to a male.

Furthermore, in cases where the inanimate subjects are both plural, the closest to the predicate dictates agreement, as in (11):

- (11) a. Stejarii și lalelele au fost tăiate.
 oaks-the.DEF.MPL and tulip-the.DEF.FPL have been cut.FEM.PL
 The oak trees and the tulips have been cut.
- b. Lalelele și stejarii au fost tăiați.
 tulips-the.DEF.FPL and oaks-the.DEF.MPL have been cut.MASC.PL
 The tulips and the oak trees have been cut.

Given these more complex cases with respect to gender agreement, it would be interesting to see if any changes in acceptability of grammatically correct structures involving these scenarios would manifest in potential L1 attriters. This is compounded by the fact that these complex constructions are reported to be avoided in everyday speech (Avram, 1997, from Maurice, 2001). Even if acceptability of ungrammatical constructions remained low among attriters, designing an experiment such that monitoring the participants' neurological responses as they processed these sentences (similar to the study on Italian cognates carried out by Kasparian and Steinhauer, 2016, described in chapter 2) might offer further insight into the processing load involved in parsing these constructions for this population. If the intricacy of how languages change and adapt is to be teased out in attrition studies, it is this author's belief that valuable insights can be found at these very interstices between rules and complex exceptions in a given grammatical feature.

Another interesting add on to the experiment in conditions where evidence of attrition was uncovered would involve comparing the results from that eye-tracking task with their performance in the same task, but after listening to a short text in Romanian. This is due to the fact that even brief immersion in their L1 linguistic environment could boost performance on the task.

In the course of recruiting participants for this study, some respondents had to be discarded because they did not fulfil the residency requirement of having lived in a predominantly English-speaking country for 10 years or more. However, they did live in countries where the predominant language recognised grammatical gender as a feature, which would therefore allow for the situation where the reduced frequency of use of the L1 is compounded by the competition of a separate gender system from the L2. Furthermore, to take the example of potential Romanian attriters living in Norway (some of which I became acquainted with during the course of this project), how this competition is resolved would be interesting to test in conditions using tokens where the gender does not map one-to-one between the two languages. Additionally, because Norwegian recognises a true three-gender distinction⁴ (i.e., the neuter

⁴Though some dialects are losing the feminine gender, see Busterud et al. (2019), Lohndal and Westergaard (2021) and Lundquist et al. (2016).

has its own agreement as evidenced by distinct morphological inflection on determiners and adjectives, for instance), including these examples would add another potential crosslinguistic factor to the analysis.

Finally, in a longer-term view of the directions this type of work could take, it would be interesting to consider the neurolinguistic impact of bi(multi)lingualism. We know that bi(multi)lingual minds are showing better prospects in delaying the onset of dementia (particularly in reference to Alzheimer's Disease: Bialystok et al., 2007; Craik et al., 2010; Zheng et al., 2018). Given this clear incentive to promote bi(multi)lingualism, can it be said that there is any perceived advantage to holding on to your native language at high proficiency compared to say, simply learning a new language later on in life (even at low proficiency)? This is mainly in consideration to the experience of bilingualism, i.e., a different language experience for different speakers across a spectrum of how languages are obtained and, crucially, how they are used. Higby et al. (2019) touches on this when discussing that holding on to the L1 more can provide those cognitive advantages linked to better neural decline outcomes. This is because the constant and successful activation/suppression of multiple language systems is what provides that cognitive advantage, over simply relying on the now dominant one exclusively. Supplementing this activation/suppression through competition from other languages may not have the same effect unless those languages are used to a sufficient degree to maintain the cycle (therefore similarly attriters who do not continue using their L1 might expect reduced benefits from their bilingual experience).

Chapter 8

Conclusion

Throughout this thesis, the feature of grammatical gender as it pertains to Romanian potential attrited speakers of English as a second, now dominant language, and the experience of attrition as an aspect of bi(multi)lingualism, and not an "end-state" as such, were considered. A web-based, eye-tracking task, followed by a language background and history questionnaire and tasks ascertaining the speakers' lexical knowledge of items present in the experiment, as well as of gender in the (isolated) conditions in which it is recognised in English, constituted the methodology employed in gathering the data. Three research questions were proposed: the first and second questions were interested in whether it could be said that the speakers' grammatical gender feature had undergone any change due to their increased exposure to a language without this property, and if either of two tested conditions¹ underwent more (if any) change, while the third research question considered the broader language experience of the participants in interpreting the results.

Unsuccessful as this study was in recruiting a sufficient amount of participants, some tentative trends were observable, conservatively though they must nonetheless be taken. With respect to the first and second research questions, no concrete evidence of attrition effects was noticeable, with participants generally performing very well in the eye-tracking task. While very minor differences in eye-movement patterns occurred between the two conditions tested, as well as there being potential indication of processing delays in the subconditions, a larger sample size of participants would be needed in order to attribute these observations to actual first language attrition effects. Nevertheless, the data that was collected showed a trend that corroborates previous findings from this field, namely that L1 attrition is more likely when the L1 and L2 have competing structures. Since this was not the case for this language pair, it therefore follows that the feature of grammatical gender in Romanian has remained robust.

¹The conditions were either constructions containing the possessive article *al/ai/ale* or superlative adjective constructions of the form *cel/cea/cei/cele mai [adjective]*. Within these conditions, two subconditions were also investigated: regular SVO word-order and sentences where the object was manipulated into occurring before the verb through *pe*-fronting.

Similarly, regarding the third research question, the paucity of data prevented regression and mixed-modelling effects analyses from being carried out. However, it can be said that the participants in this experiment showed a positive relationship with their now dominant L2, something which did not appear to negatively impact their L1 attrition outcomes. While further work would need to be carried out with more participants, this finding also supports the necessity of competing structures in the two language systems, and the general stability of syntax in L1 attrition contexts, even under reduced circumstances.

Despite its limitations, this project has nonetheless undertaken a great deal of work. All materials² used in the recruitment and handling of participants (be it posters, consent forms, instructional videos for running the experiment successfully, graphics for the English gender task, as well as the sentences designed to fit each condition in the experiment, and those used in the gender task) were all created by myself specifically for this study. Additionally, much was learned from designing and implementing an eye-tracking experiment from scratch, as well as processing (in RStudio) and analysing the albeit scant data that was able to be collected. While the number of participants restricted proper statistical analyses, I nevertheless believe the experiment itself has both merit and potential.

Another interesting finding to arise from this study, and one that also warrants further investigation, is that the retrieval of gender was possible even in instances where the lexical item itself could not be accessed as readily. The fact that the correct gendered cardinal was produced by participants even in the absence of the accompanying lemma offers an interesting insight into how grammatical features are stored and accessed versus the lexicon, as well as opening up new avenues to explore in terms of what makes these features more readily available and less susceptible to retrieval issues than the lexical items themselves.

Interest in language attrition research has been growing exponentially, which is increasingly relevant in the globalised world we now live in. There is still a great deal of work to be carried out in understanding how languages interact in the mind, and crucially what maintains a strong first language, something so often taken for granted, across the lifespan, particularly in contexts where there is increased competition from an L2/Ln. These insights are key not only because language is inextricably a part of the fabric of our lives, and enriches our brief time on Earth in innumerable and complex ways, but because maintenance of bi(multi)lingualism also aids us cognitively in old age. Untangling the threads woven by the complex interaction between language use, maintenance, competition, crosslinguistic influence, and attrition is not an easy task— something to hopefully embolden and excite all researchers interested in this field.

²Excepting the experiment tokens themselves, which were from a repository by Stone et al. (2021).

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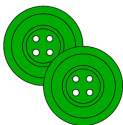

















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Appendices

Appendix A

Condition	pe-fronted	Sentence	Picture1	Gender	Picture2	Gender
PossArt	No	Iarăși le amestecă cu ale secretarelor.		M		F
PossArt	No	Astăzi îl împrumut pe al nepotului.		M		F
PossArt	No	Deja o compară cu a mamei.		F		M
PossArt	No	Acum îi returnez pe ai băieților.		F		M
PossArt	No	Sigur o cumpără pe a studentei.		M		F
PossArt	No	Mereu îl îngrijește pe al prietenului.		F		M
PossArt	No	Probabil o găsec cu a vânzătoarei.		F		M
PossArt	No	Parca îi alegeai pe ai clovnului.		M		F(N)
PossArt	No	Totdeauna o folosim pe a țăranilor.		F		M



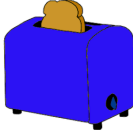







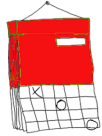


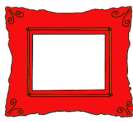









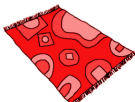






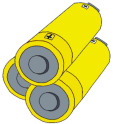





Condition	pe-fronted	Sentence	Picture1	Gender	Picture2	Gender
PossArt	Yes	Sincer, pe a copiilor o va pierde.		M		F
PossArt	Yes	Nu, pe al familiei îl folosesc dimineața.		M(N)		F
PossArt	Yes	Da, pe al vecinului îl prepar la cină.		M		F
PossArt	Yes	Desigur, pe a soțului o schimbăm mâine.		F		M(N)
PossArt	Yes	Bineînțeles, pe a fetei o alege la fel.		M(N)		F
PossArt	Yes	Totodată, pe al soției îl agăț pe perete.		M(N)		F
PossArt	Yes	Poate pe al șefului l-am pus pe birou.		M(N)		F
PossArt	Yes	Vai, pe a băiatului o strică și mai tare!		M(N)		F
PossArt	Yes	Clar pe al colegului îl recomand cu drag.		M(N)		F

Figure A.1: Possessive Article condition (and subconditions)– sentences + experiment tokens

Condition	pe-fronted	Sentence	Picture1	Gender	Picture2	Gender
SupAdj	No	Zău, o poartă pe cea mai jerpelită!		M(N)		F
SupAdj	No	Astăzi îl cumpăr pe cel mai scump.		M(N)		F
SupAdj	No	Sincer, o aleg pe cea mai colorată.		F		M(N)
SupAdj	No	Chiar îl aduci pe cel mai ruginit?		F		M(N)
SupAdj	No	Bineînțeles, o încerc pe cea mai gustoasă!		F		M(N)
SupAdj	No	Crede-mă, îl vând pe cel mai nou.		M(N)		F
SupAdj	No	Aici le găesc pe cele mai ieftine?		F		M
SupAdj	No	Nesurprinzător, îl repar pe cel mai folosit.		F		M
SupAdj	No	Sigur, copilul o mănâncă pe cea mai coaptă.		F		M(N)









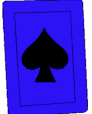

























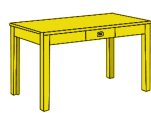

Condition	pe-fronted	Sentence	Picture1	Gender	Picture2	Gender
SupAdj	Yes	Privește, pe cel mai primejdios îl alege!		F		M(N)
SupAdj	Yes	Uite, pe cea mai mică o răstoarnă!		M(N)		F
SupAdj	Yes	Chiar pe cel mai vechi îl preferi?		M(N)		F
SupAdj	Yes	Atunci pe cea mai strălucită o voi admira.		M(N)		F
SupAdj	Yes	Corect, pe cel mai uzat îl arunc la gunoi.		F		M(N)
SupAdj	Yes	Cică pe cel mai cârpit îl coși din nou.		M(N)		F
SupAdj	Yes	Desigur, pe cea mai crudă o refuză.		F		M
SupAdj	Yes	Zău, pe cel mai galben îl îngroapă.		M(N)		F
SupAdj	Yes	Da, pe cea mai rapidă o privesc pe geam.		M(N)		F

Figure A.2: Superlative adjective condition (and subconditions)– sentences + experiment tokens

Condition	Sentence	Picture1	Gender	Picture2	Gender
Filler	Pe care o folosești, nu știi.		F		M(N)
Filler	Și dacă o pierzi, asta e.		M(N)		F
Filler	Pe care îl vrei, nici o problemă.		M(N)		F
Filler	Poți să îi pui aici după ce termini.		F		M
Filler	Nu, nu o lua în vacanță totuși.		M(N)		F
Filler	Ce spui, îl recomanzi așa ruginit?		F		M(N)
Filler	Normal că îl deschid imediat!		M(N)		F
Filler	Fără discuție o știi să fie cam stricată.		F		M(N)
Filler	Zău, nu îl strica din prima!		F		M(N)


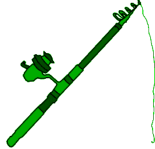


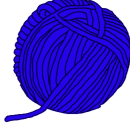



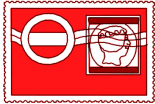


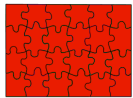



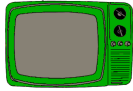
Condition	Sentence	Picture1	Gender	Picture2	Gender
Filler	Dacă vrei, îl pun înapoi în dulap.		M(N)		F
Filler	Cine nu îl mănâncă să fie sănătos.		M		F
Filler	Văd că îl distruge de tot.		M(N)		F
Filler	Bineînțeles că o curăț degeaba.		F		M(N)
Filler	Hai că o scap iar din mâini.		M(N)		F
Filler	Și dacă o vreau să fie de calitate, ce?		F		M(N)
Filler	Cum ziceam, o văd să fie la fel de scumpă.		F		M(N)
Filler	Și când o ascult, mă simt mai bine.		F		M(N)

Figure A.3: Filler sentences + experiment tokens

Appendix B

Language History and Background Questionnaire (English)

This questionnaire mainly involves questions regarding your personal linguistic background, as well as some demographic questions. Please read the questions carefully before answering them.

(1) Participant ID number				(2) Age	
(3) Gender		<input type="checkbox"/> Male	<input type="checkbox"/> Female	<input type="checkbox"/> Non-binary	<input type="checkbox"/> Prefer not to say
(4) Education		<input type="checkbox"/> Graduate school (PhD)	<input type="checkbox"/> Graduate school (Master)	<input type="checkbox"/> College (Bachelor)	
		<input type="checkbox"/> High school	<input type="checkbox"/> Middle school	<input type="checkbox"/> Elementary school	<input type="checkbox"/> Other
(5) Parents' Education n*	Parent 1	<input type="checkbox"/> Graduate school (PhD)	<input type="checkbox"/> Graduate school (Master)	<input type="checkbox"/> College (Bachelor)	
		<input type="checkbox"/> High school	<input type="checkbox"/> Middle school	<input type="checkbox"/> Elementary school	<input type="checkbox"/> Other
	Parent 2	<input type="checkbox"/> Graduate school (PhD)	<input type="checkbox"/> Graduate school (Master)	<input type="checkbox"/> College (Bachelor)	
		<input type="checkbox"/> High school	<input type="checkbox"/> Middle school	<input type="checkbox"/> Elementary school	<input type="checkbox"/> Other
*Leave the second blank if you grew up with only one parent					
(6) Handedness		<input type="checkbox"/> Right-handed	<input type="checkbox"/> Left-handed	<input type="checkbox"/> Ambidextrous	
(7) Eye sight		<input type="checkbox"/> Normal	<input type="checkbox"/> Corrected (through glasses, contact lenses etc)	<input type="checkbox"/> Other (please specify)	

(8) Indicate your native language(s) and any other languages you have studied or learned, the age at which you started using each language in terms of listening, speaking, reading, and writing, and the total number of years you have spent using each language.

*For "Years of use", you may have learned a language, stopped using it, and then started using it again. Please give the total number of years. If there are periods where you stopped using it, or used it irregularly, you may break down the total number of years with a "/". If you would like to give more information about the periods you stopped using a language for, please feel free to do so in the comment box at no. 26.

Language	Listening	Speaking	Reading	Writing	Years of use*

(9) Country of origin	
(10) Country of residence	

(11) If you have lived or traveled in countries other than your country of residence for three months or more, then indicate the name of the country, your length of stay (in Months), the language you predominantly used, and the frequency of your use of the language for each country.

* You may have been to the country on multiple occasions, each for a different length of time (with each visit accounting for a minimum of 3 months). In that case, add all the trips together.

Never Rarely Sometimes Regularly Often Usually Always
 1 2 3 4 5 6 7

Country	Length of stay (in Months)*	Language	Frequency of use
			<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.
			<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.
			<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.
			<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.

(12) Indicate the way you learned or acquired your non-native language(s). Check one or more boxes that apply. * e.g., immigrating to another country where the dominant language is different from your native language so you learn this language through immersion in the language environment.

Non-native Language	Immersion*	Classroom instruction	Self-learning
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(13) Indicate the age at which you started using each of the languages you have studied or learned in the following environments (Including native language).

Language	At home	With friends	At school	At work	Language software	Online games

(14) Indicate the language used by your teachers for instruction at each educational level. If the instructional language switched during any educational level, then also indicate the "Switched to" language. If you had a bilingual education at any educational level, then simply check the box under "Both Languages".

Environment	Language	(Switched to)	Both Language
Elementary school			<input type="checkbox"/>
Middle school			<input type="checkbox"/>
High school			<input type="checkbox"/>
College (Bachelor)			<input type="checkbox"/>
Graduate school (Master)			<input type="checkbox"/>
Graduate school (Doctor)			<input type="checkbox"/>

(15) Rate your language learning skill. In other words, how good do you feel you are at learning new languages, relative to your friends or other people you know?

Very poor Poor Limited Average Good Very good Excellent
 1 2 3 4 5 6 7

(16) Rate your current ability in terms of listening, speaking, reading, and writing in each of the languages you have studied or learned (including the native language).

Very poor Poor Limited Average Good Very good Excellent
1 2 3 4 5 6 7

Language	Listening	Speaking	Reading	Writing

(17) Rate the strength of your foreign accent for each of the languages you have studied or learned.

None Very weak Weak Moderate Strong Very strong Extreme
1 2 3 4 5 6 7

Language	Accent
	<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.
	<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.
	<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.
	<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.

(18) If you have taken any standardized language proficiency tests (e.g., TOEFL, IELTS, TOEIC, etc.), then indicate the name of the test, the language assessed, and the score you received for each. If you do not remember the exact score, then indicate an "Approximate score" instead.

Test	Year taken	Language	Score	Approximate score

(19) Estimate how many hours per day you spend engaged in the following activities in each of the languages you have studied or learned (including the native language).

Language	Watching television	Listening to radio	Reading for fun	Reading for school/work	Using social media and Internet	Writing for school/work

(20) Estimate how many hours per day you spend speaking with the following groups of people in each of the languages you have studied or learned (including the native language).

*Include significant others in this category if you did not include them as family members (e.g., married partners)
 **Include anyone in the work environment in this category (e.g., if you are a teacher, include students as co-workers).

Language	Family members	Friends*	Classmates	Others (co-workers**, roommates, etc.)

(21) If you use mixed language in daily life, please indicate the languages that you mix and estimate the frequency of mixing in normal conversation with the following groups of people.

*Include significant others in this category if you did not include them as family members (e.g., married partners)
 **Include anyone in the work environment in this category (e.g., if you are a teacher, include students as co-workers).

None Very weak Weak Moderate Strong Very strong Extreme
 1 2 3 4 5 6 7

	Language 1	Language 2	Frequency of mixing
Family members			
Friends*			
Classmates			
Others (co-workers**, roommates, etc.)			

(22) In which language do you communicate best or feel most comfortable in terms of listening, speaking, reading, and writing in each of the following environments? You may be selecting the same language for all or some of the fields below.

	Listening	Speaking	Reading	Writing
At Home				
At school				
At work				
With friends				

(23) How often do you use each of the languages you have studied or learned for the following activities? (including the native language)

*This includes shouting, cursing, showing affection, etc.
 **This includes counting, calculating tips, etc.
 ***This includes telephone numbers, ID numbers, etc.

Never Rarely Sometimes Regularly Often Usually Always
 1 2 3 4 5 6 7

Language	Thinking	Talking to yourself	Expressing emotion*	Dreaming	Arithmetic**	Remembering numbers***	Praying

(24) What percentage of your friends speak each of the languages you have studied or learned? (including the native language)

Language	Percentage
	%
	%
	%
	%

(25) Which cultures/languages do you identify with more strongly? Rate the strength of your connection in the following categories for each culture/language.

Very poor Poor Limited Average Good Very good Excellent
 1 2 3 4 5 6 7

Culture/Language	Way of life	Food	Music	Art	Cities/Towns	Sports teams

(26) Use the comment box below to indicate any additional answers to any of the questions above that you feel better describe your language background or usage.

(27) Use the comment box below to provide any other information about your language background or usage you think may be relevant that hasn't been covered above.

Language History and Background Questionnaire (Romanian)

Acest chestionar se referă în principal la istoricul dumneavoastră lingvistic, și totodată va conține și câteva întrebări cu caracter demografic. Vă rugăm să citiți întrebările cu atenție și să completați fiecare răspuns.

(1) Numărul de identificare al participantului				(2) Vârsta			
(3) Gen		<input type="checkbox"/> Masculin	<input type="checkbox"/> Femeie	<input type="checkbox"/> Non-binar	<input type="checkbox"/> Prefer să nu menționez		
(4) Educație		<input type="checkbox"/> Studii postuniversitare (doctorat)		<input type="checkbox"/> Studii postuniversitare (masterat)			
		<input type="checkbox"/> Liceu		<input type="checkbox"/> Gimnaziu			
		<input type="checkbox"/> Școală elementară		<input type="checkbox"/> Alta			
(5) Educația părinților	Primul părinte	<input type="checkbox"/> Studii postuniversitare (doctorat)		<input type="checkbox"/> Studii postuniversitare (masterat)			
		<input type="checkbox"/> Liceu		<input type="checkbox"/> Gimnaziu			
			<input type="checkbox"/> Școală elementară		<input type="checkbox"/> Alta		
	Cel de-al doilea părinte	<input type="checkbox"/> Studii postuniversitare (doctorat)		<input type="checkbox"/> Studii postuniversitare (masterat)		<input type="checkbox"/> Colegiu/ Universitate (licență)	
		<input type="checkbox"/> Liceu		<input type="checkbox"/> Gimnaziu		<input type="checkbox"/> Școală elementară	
			<input type="checkbox"/> Școală elementară		<input type="checkbox"/> Alta		
(6) Dexteritate		<input type="checkbox"/> Dreptaci		<input type="checkbox"/> Stângaci			
		<input type="checkbox"/> Ambidextru					
(7) Văz		<input type="checkbox"/> Normal		<input type="checkbox"/> Corectat (prin ochelari, lentile de contact etc.)			
				<input type="checkbox"/> Alta (vă rugăm să specificați)			

(8) Indicați limba (limbile) maternă(e) și orice alte limbi pe care le-ați studiat sau învățat, vârsta la care ați început să utilizați fiecare limbă în ceea ce privește ascultatul, vorbitul, cititul și scrisul, și numărul total de ani pe care i-ați petrecut folosind fiecare limbă .

*Pentru „Ani de utilizare”, este posibil să fi învățat o limbă, să nu mai o folosiți, și apoi să începeți să o folosiți din nou. Vă rugăm să dați numărul total de ani. Dacă au fost perioade în care nu ați folosit limba, sau ați folosit-o infrecvent, puteți separa anii cu „/”. Dacă doriți să oferiți detalii suplimentare cu privire la perioadele în care nu ați folosit limba, sunteți încurajați să o faceți în căsuța de comentarii la nr. 26.

Limba	Ascultat	Vorbit	Citit	Scris	Ani de utilizare *

(9) Țara de origine	
(10) Țara de reședință	

(11) Dacă ați locuit sau ați călătorit în alte țări decât țara de reședință timp de trei luni sau mai mult, atunci indicați numele țării, durata șederii (în luni), limba pe care ați folosit-o și frecvența utilizării limbii pentru fiecare țară.

*Este posibil să fi fost într-o țară de mai multe ori, de fiecare dată pentru o perioadă diferită de timp (cu fiecare vizită de cel puțin 3 luni). În acest caz, vă rugăm să adăugați toate călătoriile împreună.

Niciodată Rareori Câteodată În mod regulat Deseori În mod obișnuit Totdeauna
1 2 3 4 5 6 7

Țară:	Durata șederii (în luni) *:	Limba:	Frecvența de utilizare:
			<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.
			<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.
			<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.
			<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.

(12) Indicați modul în care ați învățat sau ați dobândit limba (limbile) dvs. nativă(e). Bifați una sau mai multe căsuțe care se aplică. *de exemplu, imigrarea într-o altă țară în care limba dominantă este diferită de limba maternă, astfel încât învățarea acestei limbi are loc prin expunerea prelungită la noul mediu lingvistic.

Limba non-maternă	Imersiune*	Instrucțiuni în clasă	Învățarea de sine
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(13) Indicați vârsta la care ați început să utilizați fiecare dintre limbile pe care le-ați studiat sau învățat în următoarele medii (inclusiv limba maternă).

Limba	Acasă	Cu prietenii	La școală	La muncă	Software de învățare a limbilor străine	Jocuri online

(14) Indicați limba utilizată de profesorii dvs. pentru instruire la fiecare nivel educațional. Dacă limba de instruire s-a schimbat pe parcursul oricărui nivel educațional, atunci indicați în ce limbă s-a schimbat sub „A trecut la”. Dacă ați avut o educație bilingvă la orice nivel educațional, bifați pur și simplu căsuța de sub „Ambele limbi”.

Mediu înconjurător	Limba	A trecut la	Ambele limbi
Școală elementară			<input type="checkbox"/>
Gimnaziu			<input type="checkbox"/>
Liceu			<input type="checkbox"/>
Colegiu/universitate (licență)			<input type="checkbox"/>
Studii postuniversitare (masterat)			<input type="checkbox"/>
Studii postuniversitare (doctorat)			<input type="checkbox"/>

(15) Evaluați-vă abilitățile de învățare a limbilor străine. Cu alte cuvinte, cât de bine simțiți că învățați limbi noi, față de prietenii dvs., sau de alte persoane pe care le cunoașteți?

Foarte sărac Sărac Limitat În mediu bine Bine Foarte bine Excelent

1 2 3 4 5 6 7

(16) Evaluați-vă abilitatea actuală în ceea ce privește ascultatul, vorbitul, cititul și scrisul în fiecare dintre limbile pe care le-ați studiat sau învățat (inclusiv limba maternă).

Foarte sărac Sărac Limitat În mediu bine Bine Foarte bine Excelent

1 2 3 4 5 6 7

Limba	Ascultat	Vorbit	Citit	Scris

(17) Evaluați puterea accentului dvs. străin pentru fiecare dintre limbile pe care le-ați studiat sau învățat.

Niciunul Foarte slab Slab Moderat Puternic Foarte puternic Extrem

1 2 3 4 5 6 7

Limba	Accent
	<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.
	<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.
	<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.
	<input type="checkbox"/> 1, <input type="checkbox"/> 2, <input type="checkbox"/> 3, <input type="checkbox"/> 4, <input type="checkbox"/> 5, <input type="checkbox"/> 6, <input type="checkbox"/> 7.

(18) Dacă ați susținut teste standardizate de competență lingvistică (de exemplu, TOEFL, IELTS, TOEIC etc.), atunci indicați numele testului, limba evaluată și scorul pe care l-ați primit pentru fiecare. Dacă nu vă amintiți scorul exact, indicați în schimb un „Scor aproximativ”.

Test:	Anul în care l-ați susținut:	Limba:	Scor:	Scor aproximativ:

(19) Estimați câte ore pe zi petreceți în următoarele activități în fiecare dintre limbile pe care le-ați studiat sau învățat (inclusiv limba maternă).

Limba	Uitându-vă la televizor	Ascultând radioul	Citind de plăcere	Citind pentru studiu/servici	Folosind internetul/rețelele sociale	Scrind pentru studiu/servici

(20) Estimați câte ore pe zi petreceți vorbind cu următoarele grupuri de persoane în fiecare dintre limbile pe care le-ați studiat sau le-ați învățat (inclusiv limba maternă).

*Includeți alte persoane semnificative în această categorie dacă nu le-ați inclus ca membri de familie (de exemplu, parteneri căsătoriți)
 **Includeți pe oricine din mediul de lucru în această categorie (de exemplu, dacă sunteți profesor, includeți elevii drept colegi de muncă).

Limba	Membrii de familie	Prieteni*	Colegi de clasă	Alții (colegi de muncă**, colegi de cameră, etc.)

(21) Dacă utilizați limbaj mixt în viața de zi cu zi, vă rugăm să indicați limbile pe care le amestecați și să estimați frecvența amestecului în conversația normală cu următoarele grupuri de oameni.

*Includeți alte persoane semnificative în această categorie dacă nu le-ați inclus ca membri de familie (de exemplu, parteneri căsătoriți)
 **Includeți pe oricine din mediul de lucru în această categorie (de exemplu, dacă sunteți profesor, includeți elevii drept colegi de muncă).

Deloc Foarte rar Rar Moderat Des Foarte des Mereu
 1 2 3 4 5 6 7

	Limba 1	Limba 2	Frecvența cu care le amestecați
Membrii de familie			
Prieteni*			
Colegi de clasă			
Alții (colegi de muncă**, colegi de cameră, etc.)			

(22) În ce limbă comunicați cel mai bine sau vă simțiți cel mai confortabil în ceea ce privește ascultatul, vorbitul, cititul și scrisul în fiecare dintre următoarele medii? Este posibil să selectați aceeași limbă pentru toate sau doar pentru unele dintre câmpurile de mai jos.

	Ascultare	Vorbire	Citare	Sciere
Acasă				
La școală				
La servicii				
Cu prietenii				

(23) Cât de des folosiți fiecare dintre limbile pe care le-ați studiat sau învățat pentru următoarele activități? (inclusiv limba maternă)

*Aceasta include strigătele, înjurăturile, manifestarea afecțiunii etc.
 **Aceasta include număratul, calculul bacșifului etc.
 ***Aceasta include numere de telefon, numere de identificare etc.

Niciodată Rareori Câteodată În mod regulat Deseori În mod obișnuit Mereu
 1 2 3 4 5 6 7

Limba	Gândit	Vorbit cu sine însuși	Exprimat emoții*	Visat	Aritmetică**	Amintit numere***	Rugat

(24) Ce procent din prietenii dvs. vorbesc fiecare dintre limbile pe care le-ați studiat sau le-ați învățat? (inclusiv limba maternă)

Limba	Procentaj
	%
	%
	%
	%

(25) Cu ce culturi/limbi vă identificați mai puternic? Evaluați puterea conexiunii dvs. în următoarele categorii pentru fiecare cultură / limbă.

Foarte slab Slab Limitat Moderat Puternic Foarte puternic Excelent
1 2 3 4 5 6 7

Cultura/Limba	Mod de viață	Gastronomie	Muzică	Artă	Orașe	Echipe sportive

(26) Utilizați căsuța de comentarii de mai jos pentru a indica orice răspunsuri suplimentare la oricare dintre întrebările de mai sus, sau pentru descrieri în amănunt cu privire la limba sau utilizarea limbii dvs.

(27) Utilizați căsuța de comentarii de mai jos pentru a furniza orice alte informații despre limbajul sau utilizarea limbii dvs.

Appendix C



Figure C.1: Recruitment Poster (English)

UiT The Arctic
University of Norway

**Participă la un
STUDIU**

**Da,
TU!**

Vorbitor de limba română?

Esti interesat(ă) în lingvistică și vrei să ne ajuți
prin a lua parte la studiul nostru? Înscrie-te la
link-ul de mai jos!

Pentru mai multe detalii și înscriere
ACCESEAZĂ LINKUL DE MAI JOS
sau
SCANEAZĂ CODUL QR

Întrebări? Trimite un email la: mirela-andreea.piciu@uit.no

Figure C.2: Recruitment Poster (Romanian)

Appendix D

Consent Form (English)

Are you interested in taking part in the research project “Looking sharp: a web-based eye-tracking study of the role of L2 English in L1 Romanian morphosyntactic attrition”?

This is an inquiry about participation in a research project where the main purpose is to investigate the native language of Romanian speakers who have had extensive exposure to English by moving to and living in a predominantly English-speaking country. This investigation will be carried out in the form of an online eye-tracking experiment. In this letter we will give you information about the purpose of the project and what your participation will involve.

Purpose of the project

This project supports the student’s master’s thesis requirement. The purpose of the experiment is to investigate potential restructuring in L1 native Romanian speakers’ grammar under the constant activation of a competing grammatical system from their L2 English, with particular interest in the feature of grammatical gender. Questions relating to the degree of effects of the second language on the first are pertinent to the growing linguistic body of research, particularly with the rise of multilingualism and population migration. Relatively little research has been carried out on Romanian, compared to other Romance languages such as French, Italian, and Spanish; the work undertaken here also aims to address that disparity.

The objectives of the project are to quantify the participants’ sensitivity to audio cues when processing gender agreement during a (web-based) eye-tracking task. These changes will be based on response times and fixations to target regions. Romanian-English is a favourable language pair in that the feature of grammatical gender is present in Romanian, but absent in English, allowing for insights into the degree of potential morphosyntactic restructuring in the former under influence from the latter.

Who is responsible for the research project?

UiT The Arctic University of Norway, based in Tromsø, Norway, is the institution responsible for the project.

Why are you being asked to participate?

You are being asked to participate after registering your interest in taking part in this research and signing up via e-mail for further instructions. The sample population selected for this project consists of native Romanian speakers, either living in Romania or in a predominantly English-speaking country, above the age of 18. For those participants living in Romania, they must have spent no longer than 6 months living abroad. For those participants living abroad, they must have spent at least 10 years living in a predominantly English-speaking country, or routinely relying on English for day-to-day communication.

What does participation involve for you?

Participation involves filling out a questionnaire sent to you by e-mail, which you must fill out electronically and return. The questionnaire should take 15-20 minutes to complete. Your suitability for the experiment will be judged by the answers in your questionnaire. The questions include your age, gender, current country of residence, information about your eyesight, and language background. Should you progress to the online eye-tracking task, you will be required to have access to a laptop/computer with a webcam and steady Internet connection, and be running the latest version of Chrome or Firefox browser. The experiment will run in a browser window and will require approx. 30 minutes to complete. Your answers will be recorded electronically.

Participation is voluntary

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you choose not to participate or later decide to withdraw.

Your personal privacy – how we will store and use your personal data

We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

- Your data will be accessible to the student carrying out the research, as well as to their supervisor, in connection with UiT The Arctic University of Norway, the institution responsible for the project.
- Your name and contact details will be replaced with a personalID code, which will be your sole identifier throughout the experiment. The list of names, contact details etc. and the respective codes assigned to each participant will be stored separately from the rest of the collected data, on an encrypted research server.
- The data collection and eye-tracking task will be done through Gorilla (<https://gorilla.sc/>), a UK cloud-based research platform.

Data presented in publications will not be identifiable to the participants. Anonymous reference to age and country of residence may be made.

What will happen to your personal data at the end of the research project?

The project is scheduled to end 15.05.2024. The data will continue to be stored securely for another five years, in an encrypted format on a secure server or external storage device, and

accessible only to approved academic researchers. At the end of this period, the data will be securely archived.

Your rights

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and
- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

What gives us the right to process your personal data?

We will process your personal data based on your consent.

Based on an agreement with UiT The Arctic University of Norway, Data Protection Services has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have questions about the project, or want to exercise your rights, contact:

- UiT The Arctic University of Norway via Mirela-Andreea Piciu (mirela-andreea.piciu@uit.no). Supervisors: Fatih Bayram PhD (faith.bayram@uit.no) and Anamaria Bentea PhD (anamaria.bentea@uni-konstanz.de)
- Our Data Protection Officer: Joakim Bakkevold (joakim.bakkevold@uit.no)
- Data Protection Services, by email: (personverntjenester@sikt.no) or by telephone: +47 53 21 15 00.

Consent Form (Romanian)

Doriți să participați la studiul intitulat “Looking sharp: a web-based eye tracking study of the role of L2 English in L1 Romanian morphosyntactic attrition”?

Acest document dorește să stabilească condițiile în care veți lua parte la un experiment al cărui scop este de a investiga limba maternă a vorbitorilor de limba română, care au avut un grad ridicat de expunere la o limbă străină (în acest caz, limba engleză), datorită faptului că au emigrat într-o țară predominant vorbitoare de limba engleză. Acest studiu va fi bazat pe un experiment de tip “eye-tracking”, ce va decurge online. În cele ce urmează vă vom furniza cu toate informațiile necesare despre proiect și ce va presupune participarea dumneavoastră. Consimțământul dvs. este necesar la final pentru a lua parte la acest studiu.

Scopul proiectului

Acest proiect face parte din lucrarea de masterat a studentei Mirela-Andreea Piciu. Scopul acestui experiment este de a investiga potențiale restructurări ale sistemului gramatical al limbii materne (în acest caz, limba română) în condiții constante de activare a unui sistem gramatical ce aparține unei limbi străine (în acest caz, limba engleză). În mod deosebit, trăsătura ce ne interesează în acest studiu este aceea a genului gramatical. Modul în care o a doua limbă vorbită are efecte asupra limbii materne constituie un subiect de interes în studiile lingvistice recente, cu atât mai mult cu cât migrarea populațiilor este în creștere la nivel mondial. Relativ puține studii au fost făcute cu accentul pe limba română, comparativ cu cele pentru alte limbi similare precum franceza, italiana sau spaniola. Acest studiu își asumă totodată și responsabilitatea de a adresa această disparitate. Obiectivele acestui studiu sunt acelea de a stabili în ce măsură participării la studiu sunt atenți la semnale audio cu privire la genul gramatical pe parcursul unui experiment de tip „eye-tracking”. Experimentul presupune ascultarea unei fraze în limba română, timp în care pe ecran se vor afișa două poze. Fraza pe care o ascultați va conține un „pont” pentru a vă îndemna să alegeți una dintre cele două imagini. Perechea română-engleză este una propice pentru a investiga oarecare schimbări în procesarea genului gramatical, fiindcă aceasta este o trăsătură prezentă în limba română, dar ce lipsește din limba engleză.

Cine este responsabil pentru acest studiu?

UiT Norges arktiske universitet, universitatea din Tromsø, Norvegia, este instituția responsabilă pentru acest proiect.

De ce sunteți rugat(ă) să participați?

Sunteți rugați să participați deoarece v-ați înregistrat interesul la momentul înscrierii prin adresa de e-mail. Acest proiect este interesat în participanți vorbitori nativi de limba română, atât domiciliați în România, cât și în țări predominant vorbitoare de limba engleză, în vârstă de cel puțin 18 ani. Pentru acei participanți domiciliați în România, este necesar să nu fii locuit în altă țară pentru o perioadă mai îndelungată de 6 luni. Pentru acei participanți domiciliați în străinătate, este necesar să fii trăit pentru o perioadă de cel puțin 10 ani într-o țară predominant vorbitoare de limba engleză, sau o țară în care în mod obișnuit s-au folosit de limba engleză în viața de zi cu zi.

Ce presupune participarea dvs.?

Participarea dvs. presupune în mod preliminar completarea unui chestionar online. Chestionarul va dura aproximativ 15-20 de minute. Scopul chestionarului este de a stabili dacă întruniți condițiile necesare pentru a lua parte la experiment. Întrebările din chestionar vor include date personale precum vârsta, sexul, țara în care sunteți domiciliat(ă), informații cu privire la oarecare probleme de vedere, și un istoric lingvistic. Dacă veți fi selectați pentru a continua cu experimentul, va fi nevoie să aveți acces la un laptop/computer dotat cu webcam și o conexiune bună de internet, și pe care aveți instalată varianta cea mai recentă de browser, fie de Chrome sau Firefox. Experimentul va avea loc într-o fereastră web și va dura aproximativ 30 de minute. Veți putea lua pauze la discreția dvs. Răspunsurile dvs. vor fi înregistrate în mod electronic.

Participarea dvs. este voluntară

Participarea la acest proiect este voluntară. Dacă vă decideți să participați, consimțământul dvs. poate fi retras la orice moment, fără să fiți nevoiți să dați un motiv. Toate datele dvs. vor fi anonimizate. Nu există consecințe dacă vă decideți să nu participați sau dacă ulterior doriți să vă retrageți.

Datele dvs. personale – cum vom reține și procesa datele dvs.

Vom folosi datele dvs. personale numai în scopul explicat în acest formular. Datele dvs. personale vor fi procesate în concordanță cu legile cu privire la protecția datelor personale (GDPR, the General Data Protection Regulation and Personal Data Act).

- Datele dvs. personale vor fi accesibile studentului ce și-a propus să susțină acest proiect ca parte din lucrarea sa de masterat și profesorului supervisor, în conexiune cu UiT Norges arktiske universitet, instituția responsabilă pentru acest proiect.
- Numele și detaliile dvs. personale vor fi înlocuite cu un cod de identificare personal, ce va deveni singurul identificator al dvs. pe durata experimentului. Lista cu numele, detaliile personale etc. și codurile de identificare atribuite fiecărui participant vor fi reținute separat de restul datelor colectate pe durata experimentului, pe un server criptat.
- Procesarea datelor dvs. personale și experimentul de tip „eye-tracking” vor fi facilitate de către Gorilla (<https://gorilla.sc/>), o platformă de cercetare online, bazată în Marea Britanie.

Datele prezentate în publicații nu vor putea fi folosite pentru a identifica participanții personal. Detalii personale ce pot fi discutate, precum vârsta sau țara de domiciliu, vor avea caracter anonim.

Ce se va întâmpla cu datele dvs. personale la sfârșitul proiectului?

Conform programului de masterat, proiectul va fi finalizat pe data de 15.05.2024. Datele colectate pe durata experimentului vor continua să fie păstrate într-un format criptat pentru următorii 5 ani, pentru a putea fi folosite în cadrul altor studii relevante. Aceste date vor fi accesibile doar altor cercetători/academicieni. La sfârșitul acestei perioade, toate datele vor fi arhivate.

Drepturile dvs.

Atâta timp cât puteți fi identificat(ă) în datele colectate, aveți dreptul să:

- accesați datele dvs. personale

- cerți ca datele dvs. personale să fie distruse
- cereți ca orice date personale ale dvs. să fie corectate/rectificate
- primiți o copie a datelor dvs. personale
- trimiteți o plângere către persoana responsabilă de protejarea datelor dvs. personale, sau către autoritatea norvegiană responsabilă de protejarea datelor dvs. personale, cu privire la procesarea datelor dvs.

Ce ne dă nouă dreptul să procesăm datele dvs.?

Vom procesa datele dvs. pe baza consimțământului dvs, ce va fi solicitat în cadrul experimentului, înainte ca acesta să înceapă.































În baza acordului cu UiT Norges arktiske universitet, serviciile norvegiene de protejare a datelor dvs. personale au evaluat că procesarea datelor dvs. în acest proiect întrunește cererile legislației cu privire la protecția datelor personale.

Unde pot afla mai multe detalii?

Dacă aveți nelămuriri cu privire la acest proiect, sau doriți să vă exercitați drepturile, vă rugăm să luați legătura cu:

- UiT Norges arktiske universitet prin Mirela-Andreea Piciu (mirela-andreea.piciu@uit.no). Profesori supervizori: Fatih Bayram PhD (fatih.bayram@uit.no) și Anamaria Bentea (anamaria.bentea@uni-konstanz.de)
- Persoana noastră de legătura în cadrul UiT cu privire la protecția datelor personale: Joakim Bakkevold (joakim.bakkevold@uit.no)
- Serviciile norvegiene de protecție a datelor personale, prin e-mail (personverntjenester@sikt.no) sau la nr. de telefon: +47 53 21 15 00

Appendix E

Subject	Object	Item	Sentences	Gender mismatch
			a) Anna gives an orange to her sister b) Anna gives an orange to his sister	Yes
			a) Anna puts a cherry on his table b) Anna puts a cherry on her table	No
			a) Anna gives an apple to her brother b) Anna gives an apple to his brother	Yes
			a) Anna gives a lemon to his brother b) Anna gives a lemon to her brother	No
			a) Anna gives a watermelon to her sister b) Anna gives a watermelon to his sister	No
			a) Anna gives a mushroom to his brother b) Anna gives a mushroom to her brother	No
			a) Anna puts a carrot on her chair b) Anna puts a carrot on his chair	Yes
			a) Anna puts a mushroom on his table b) Anna puts a mushroom on her table	Yes
			a) Anna puts a cucumber on her table b) Anna puts a cucumber on his table	No
			a) Anna gives a cherry to his sister b) Anna gives a cherry to her sister	Yes





























































Subject	Object	Item	Sentences	Gender mismatch
			a) Anna puts an orange on her table b) Anna puts an orange on his table	Yes
			a) Anna puts a mushroom on his chair b) Anna puts a mushroom on her chair	No
			a) Anna puts a pineapple on her chair b) Anna puts a pineapple on his chair	Yes
			a) Anna gives an apple to his sister b) Anna gives an apple to her sister	No
			a) Anna gives an orange to her brother b) Anna gives an orange to his brother	No
			a) Anna puts a lemon on his chair b) Anna puts a lemon on her chair	No
			a) Anna gives a pineapple to her brother b) Anna gives a pineapple to his brother	Yes
			a) Anna puts a cucumber on his table b) Anna puts a cucumber on her table	No
			a) Anna puts a kiwi on her chair b) Anna puts a kiwi on his chair	Y
			a) Anna gives a lemon to his sister b) Anna gives a lemon to her sister	Y

Figure E.1: Gender task sentences + tokens for scenarios with the character Anna

Subject	Object	Item	Sentences	Gender mismatch
			a) John gives a cherry to his sister b) John gives a cherry to her sister	Yes
			a) John puts a cherry on her table b) John puts a cherry on his table	Yes
			a) John gives a watermelon to his brother b) John gives a watermelon to her brother	Yes
			a) John gives an apple to her brother b) John gives an apple to his brother	Yes
			a) John puts a carrot on his chair b) John puts a carrot on her chair	Yes
			a) John gives a mushroom to her sister b) John gives a mushroom to his sister	Yes
			a) John gives a carrot to his brother b) John gives a carrot to her brother	Yes
			a) John puts an orange on his table b) John puts an orange on her table	Yes
			a) John puts a lemon on his table b) John puts a lemon on her table	Yes
			a) John gives a kiwi to her brother b) John gives a kiwi to his brother	Yes































Subject	Object	Item	Sentences	Gender mismatch
			a) John puts a cherry on his chair b) John puts a cherry on her chair	No
			a) John puts a pineapple on her table b) John puts a pineapple on his table	No
			a) John gives a pineappple to his sister b) John gives a pineapple to her sister	No
			a) John gives a watermelon to her sister b) John gives a watermelon to his sister	No
			a) John gives an orange to his brother b) John gives an orange to her brother	No
			a) John puts an orange on her chair b) John puts an orange on his chair	No
			a) John gives an apple to his sister b) John gives an apple to her sister	No
			a) John gives a cherry to her brother b) John gives a cherry to his brother	No
			a) John puts a mushroom on his table b) John puts a mushroom on her table	No
			a) John puts a mushroom on her chair b) John puts a mushroom on his chair	No

Figure E.2: Gender task sentences + tokens for scenarios with the character John

