The effects of discourse topic on global and local markers in Croatian ditransitives

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Abstract

This study investigates the impact that discourse topic (DT) has on (i) word order (global marking) and (ii) referring expression (local marking) in ditransitive structures in Croatian preschoolers and adult controls.

According to general pragmatic principles, the DT argument is expected to be placed before the rest of the sentence, thus complying with the (discourse)topic-comment order (Gundel 1988). It is also expected to be more likely to be expressed with a clitic or omitted altogether (Gundel, Hedberg, and Zacharski 1993).

We tested 58 monolingual Croatian children (mean age= 4;4) and 36 adult controls (mean age=21) in three conditions with different DTs (subject, direct object and indirect object) by using storybooks to elicit ditransitive structures, either the direct object-indirect object (DO-IO) or the indirect object-direct object order (IO-DO).

The results reveal that DT has an impact both on adult word order (DT-comment order) and referring expressions choice, while it has an effect only on children's referring expressions, as the children use IO-DO 75% of the time regardless of DT condition. This is in line with previous studies that find that children mark givenness/newness first on local and then on global markings (Hickmann et al. 1996, Anderssen et al. 2014, Mykhaylyk, Rodina, and Anderssen 2013). We also find that children are over-specific as their use of NPs is higher than the adults' use throughout the task (p.value=0.0006347).

Keywords: discourse topic, givenness, ditransitives, word order, referring expressions

1. Introduction

This study examines how Croatian monolingual children and adults use global markings (object order) and local markings (different referring expressions) to signal the discourse-pragmatic notion of discourse topic in ditransitive structures.

The global marking under investigation here is the relative ordering of the two objects in a ditransitive sentence, indirect-direct (IO-DO) vs. direct-indirect (DO-IO), in relation to the topic-comment structure, more specifically, when one object is the discourse topic, and the other one is not.

According to linguistic theory, the topic precedes the rest of the sentence, which is referred to as comment (Gundel 1988). The use of Referring Expressions (RE) is guided by a Givenness Hierarchy proposed by Gundel, Hedberg, and Zacharski (1993), according to which the more accessible argument is more likely to be expressed with a shorter form (such as a pronoun) or be omitted altogether. Additionally, the type of RE influences the order of the arguments: pronouns tend to precede NPs due to a general tendency for pronouns to precede NPs (Gundel, Hedberg, and Zacharski 1993, Bresnan et al. 2005), and they are also usually less heavy than NPs, and thus placed before them (Arnold et al. 2000).

It has been claimed that children signal givenness/newness through local markers first, and only later through global markers (Hickmann et al. 1996). On the one hand, the studies conducted explicitly on the acquisition of the topic-comment order (Hornby 1971, Dimroth and Narasimhan 2012) revealed that children do not necessarily place the topic before the comment. On the other hand, it has been shown that discourse cues are reflected in children's REs from early on (Tedeschi 2008, Matthews et al. 2006, Gundel and Johnson 2013).

In order to investigate the matter, we have tested Croatian preschool children (n=58, mean age=4;4) and adult controls (n=36, mean age=21), in three conditions with different arguments as the DT (subject=baseline, DO, and IO). The task made use of storybooks in which one of the arguments was the DT, while all the other arguments were considered accessible, because they were visually available to the participant and experimenter. The DT was

expected to precede the other arguments, and to be expressed with a pronoun, a clitic, or a null form. Thus, in the storybook about a cat whose friends give her presents to cheer her up (IO=DT), we expect productions like "The mouse is throwing *her* a candy". However, in the story about a bell that is passed from one character to another (DO=DT), we expect structures such as the following: "The frog is giving *it* to the hedgehog." However, due to the findings of previous studies, we expected the children to be more consistent with their REs than with word order.

The results revealed that the DT has an effect on word order in adults, but not in children, as the children mostly produced IO-DO constructions in the task. With regard to referring expression, the DT was expressed with a lighter form more often than the other arguments, in both children and adults; the preferred expression was dependent on the grammatical function of the argument: when they constituted the DT, subjects were omitted, IOs were expressed with a clitic, while DOs were still mostly expressed by NPs, but significantly less when it was the DT. Children used more NPs expressions than adults.

The paper is structured as follows: Section 2 is dedicated to the background, specifically to defining the DT and referring expressions, followed by summaries of the research conducted on the acquisition of the topic-comment structure, and the use of REs in children. Section 3 discusses the methodology used in the task, while Section 4 defines our research questions and predictions. After that, the results are presented in Section 5 and discussed in Section 6. The last section (Section 7) is reserved for the conclusions.

2. Background

In this section, we explain the topic-comment structure and the choice of referring expressions in terms of global and local markers. These terms were taken from Hickmann et al. (1996), who tested how the two types of markers (global=utterance structure, and local=nominal determiners) signify newness in speakers of English, French, German, and Chinese (both adults and various age groups of children).

In this study, we adopt somewhat different markers: for global markers, we focus only on the object order with regard to the topic-comment structure (Section 1.1), while for local markers, we extend the list of referring expressions to NPs, pronouns, clitics, and omissions (Section 1.2). We will refer to the NPs as 'full' expressions and to the remaining expressions as 'reduced'.

Hickmann et al. (1996) found that local markings emerge first, due to the greater functional complexity of global markers (p.592). The obligatory markers differed among the languages investigated in Hickmann et al. (1996); Chinese was the only language which had obligatory global markers but optional local markers. The study revealed that, even in Chinese, local newness markings were used earlier than global ones (Hickmann et al. 1996)p.615.

A similar result was obtained by two studies conducted on ditransitives, on Russian and Ukrainian, and Norwegian, respectively by Mykhaylyk, Rodina, and Anderssen (2013) and Anderssen et al. (2014). These studies each found one object order that children overuse: IO-DO in Russian and Ukrainian, and the prepositional dative (DO-IO) in Norwegian[1]. Despite this overuse, when omissions happened, they reflected givenness, as the omitted object was usually given. The results suggest that, while preschoolers do not yet implement the givenness value in their full utterances (by using the given before new order), they are nevertheless aware of what is given (and therefore licensed for omission) in the discourse. Additionally, Sauermann (2016) found in a corpus study of German child language, that children are more attentive to their REs than to the object order.

With regard to Croatian, the recipient (IO) is marked with the dative case and the theme (DO) with the accusative, and both IO-DO and DO-IO are grammatical structures (example 1). The REs that will be taken into consideration are NPs (Croatian does not have articles so we will not be dividing them in definite/indefinite NPs), Pronouns, Clitics (which are fixed in second position), and omissions. The last three are considered reduced with respect to the NP.

[1] The Anderssen et al. (2014) study also found an effect of givenness, while Mykhaylyk, Rodina, and Anderssen (2013) did not.

(1) a. Marlon je dao Stigu igračku.
Marlon.NOM is.AUX give Stig.DAT toy.ACC
"Marlon gave Stig a toy."
b. Marlon je dao igračku Stigu.
Marlon.NOM is.AUX gave toy.ACC Stig. DAT
"Marlon gave a toy to Stig."

2.1 (Discourse) topic-comment structure and its acquisition

Reinhart (1981) introduced the term *pragmatic aboutness* to address what the topic of a sentence is. According to Pereltsvaig (2004) topic is defined as the part of the clause that denotes discourse-accessible information that is matter of common concern for the speaker and the addressee. This entails that topics of new sentences have to be referentially linked to expressions in previous sentences. The current study focuses on the continuity of a referent as the DT, i.e., what Frascarelli and Hinterhölzl (2007) defines as *familiar topics*. We refer to it as discourse topic (DT), since it bridges over a number of sentences in the same discourse. In his work on topic continuity, Givón (1983) claims that topics are more easily available when persistent, which relates to the concept of DT that we are exploring in the current study.

No differences in the positioning of topics and DTs have been observed, so we will report both on studies regarding the topic>comment and the DT>comment order. The topic-comment structure is related to the given-new and background-focus orders (Gundel 1988, Siewierska 1988), even though the concepts do not fully overlap. According to Gundel (1988), it is generally accepted that topics precede comments.

The immediate goal of the current study is to discover whether Croatian children place the DT object before the non-DT object in their productions; more broadly, we also aim to shed light on how the DT is expressed in Croatian in general. This latter goal will be accomplished based on the data from the adult controls (see Methodology).

Discourse Topics have not been extensively studied in child language, and there are very few studies conducted explicitly on them (Hornby 1971, Dimroth

and Narasimhan 2012). For this reason, we also include studies on the acquisition of topics, such as Chien and Lust (1985) and De Cat (2009).

Hornby (1971) tested both comprehension of topic and production of topics in English-speaking children (ages 6, 8, and 10). The author found that even the youngest children in the study comprehend the topic of a variety of syntactic structures, and that, by the age of 8, there is a clear distinction of topic and comment in all the tested sentence types (p.1981). The production part of the study revealed that, regardless of age, the children were able to produce a topic-comment relation over 90% of the time, but they employed mostly stress to signal topichood. Stress remained the most frequently used strategy to signal topic across all age groups, but a decline can be noticed in favor of cleft, pseudo-cleft, and passive sentences.

Dimroth and Narasimhan (2012) investigates the effect of DT on the ordering of NP-NP pairs. They presented the objects one after the other to German 4- and 5-year-olds, with one of the objects also being talked about throughout the discourse (which makes it the DT). This data is compared to their previous study (Narasimhan and Dimroth 2008), in which DT was not a variable. The results do not differ, as the children prefer the new>given order regardless of topicality, and do not place the DT first.

Chien and Lust (1985) conducted an experiment on Chinese, a topic-prominent language. The aim of the task was to investigate if children can access the concepts of grammatical subject and pragmatic topic (p.1392) In Chinese, the subject and the topic are marked differently in certain constructions, even if they can be co-referential. The task consisted in an elicited imitation task of 'equi' sentences which provide a context for the subject and topic to be distinguished (such as "The puppy, its eyes like to move around.")[2], and in coordinate sentences used as controls which do not require reference to the subject. The results revealed that the children (age range=2;6-5;0) did not omit the topic where it was not grammatical, but omitted it as much

[2] Example taken from Chien (1985); Chinese is a topic-prominent language but these sentences require reference to the subject thus topic and subject are distinguished in this structure.

as the subject where it was possible, suggesting that they already sensitive to the distinction between subject and topic.

De Cat (2009) investigated how preschool children at different ages mastered the use of topic in French. Topics in French are expressed as dislocated phrases, and are referred back to with a pronominal element inside the clause, which is different from how a non-topicalised subject is expressed (i.e., without dislocation). The author found that children progressively reduced the use of subject clitics as they employed more dislocated NPs for the topics. Even the youngest children used dislocated NPs to encode the topic, and never used indefinites in this position, which entails that they are aware of the topic status of dislocated NPs (p.233). Thus, French children use word order to signal (sentence) topic.

To summarize, previous studies found different effects of (discourse) topic: from no effect (Dimroth and Narasimhan 2012), to the use of prosody (Hornby 1971), omission (Chien and Lust 1985) or dislocation (De Cat 2009) to signal topichood. However, these mechanisms might be specific to the languages of each experiment. Croatian does not provide the speaker with specific mechanisms for signaling topic, but it has been claimed by Browne (1993) that the constituent order is determined largely by the topic-comment structure. We thus expect that children will have to rely on word order, which is also used for signaling other domains of information structure.

2.2. Referring expressions and their acquisition

In this study, the choice of referring expressions (RE) is used to test for local markers of discourse topics (Section 1). A RE is the way a speaker chooses to express a referent in a certain context, either with an NP, pronoun, or no expression at all (omissions). Speakers use pronouns for already evoked referents; conversely, new referents are introduced with more descriptive forms (Arnold 2010). REs also influence word order, as pronouns typically precede fuller expressions. This influence is related to factors such as givenness and weigh, since referents expressed with pronouns are usually given, and pronouns are usually shorter than full NPs. These factors all contribute to *quantitative*

harmonic alignment (de Marneffe 2012): given>new (Clark and Haviland 1977, Kathryn Bock and Irwin 1980, Bresnan et al. 2005, Kučerová 2007), short before long (Arnold et al. 2000, Bresnan et al. 2005), and pronoun before non-pronoun (Gundel, Hedberg, and Zacharski 1993, Collins 1995, Bresnan 2005). The null expression/omission is a special kind of RE, because it excludes an argument from the linearization, and thus, we cannot observe the relative object order if an object is omitted. We thus consider it an intersection of global and local markers.

Referents that are highly prominent in the linguistic discourse — such as the ones denoting the topic — can be referred to by short forms, like unstressed pronouns or clitics- Less prominent referents, however, require more explicit forms, like definite or indefinite descriptions (Hendriks, Koster, and Hoeks 2014).

According to (Gundel, Hedberg, and Zacharski 1993), the *givenness hierarchy* (GH) accounts for the restrictions of the distribution of forms for a particular reference. The proposed idea is that the stages of the GH are cognitive statuses, and not linguistic forms; the latter encode the former and provide information on how to access the referent (Gundel and Johnson 2013). The representation of how REs relate to the givenness hierarchy from Gundel, Hedberg, and Zacharski (1993) is presented in Table 1 for English and Russian. We will assume that the scale for using REs in Croatian will resemble Russian, since both languages are Slavic, do not have articles, and are subject-drop languages.

	High end					Low end
Cognitive status	In focus	Activated	Familiar	Uniquely identifiable	Referential	Type identifiable
RE English	*it*	*that*, *this*, *this* N	*that* N	*the* N	indefinite *this* N	*a* N
RE Russian	Ø *on* 'he'	*on*, *eto* 'this', *to* 'that'	*Eto* N, *to* N	Ø N		

Table 1: Referring expression in relation to the givenness hierarchy.

A key aspect of the GH is that each cognitive status can be expressed with an RE designated to any lower status, and still lead to a successful communication, but using an expression for a mental status higher up in the scale leads to unsuccessful communication (Gundel, Hedberg, and Zacharski 1993, 276). This means that speakers could, in principle, always use full expressions—in which case the listener's perspective would not be necessary to account for, because the referent would always be explicit. Speakers, however, tend not to be over-informative. According to Grice's Maxim of Quantity, speakers make their contribution as informative as required, but not more informative than required (Grice, Cole, and Morgan 1975). The hierarchy in Table 1 does not specify the appropriate RE for topics, but the definition of *in focus* states that the referent is not only in short term memory, but also at the current center of attention, and also that these entities generally include at least the topic of the preceding utterance and higher-order topics (such as DT) (Gundel, Hedberg, and Zacharski 1993, 276). Therefore, we can safely assume that DT is placed on the highest point of the givenness hierarchy.

The GH does not provide the relative hierarchical order of pronouns and clitics either. However, we will assume that they are at the same level: Ø > Clitic/ Pronoun > Demonstrative > Noun. In Croatian, the clitic is obligatorily placed in second position (Schütze 1994), while the pronoun is freely ordered; moreover, the IO is very frequently realized by a clitic: in the Croatian Double

Object Database[3] (Velnić 2014), out of 559 occurrences of child and child-directed speech with no omissions, in 430 with IO is expressed as a clitic. However, the referent of the IO was one of the interlocutors (1^{st}SG, 2^{nd}SG, 1^{st}PL, 2^{nd}PL, or reflexive) most of the time (396/430).

Additionally, as some studies show, the use of pronouns can be related to grammatical functions. For example, investigating the use of pronouns in subjects and IOs, Arnold (2001) found that pronouns are used more often with IOs. Unfortunately, Arnold (2001) does not discuss the possibly different accessibility of the theme (DO) and the goal (IO), and the present study focuses also on the different REs used for the two objects. For Croatian, based on the data in the Double Object Database (Velnić 2014), it is possible that the preference for a specific RE is related to grammatical function, so that the IO is preferably expressed as a clitic.

There are two possible ways in which children can wrongly apply the GH: either by being under-informative, and thus using pronominal forms when an NP is required, or by being over-informative, and using NPs when the use of pronouns is expected. The former is a much stronger violation of the GH, since the hierarchy allows a higher cognitive status to be expressed with a RE designated for a lower cognitive status, but not vice versa. Being under-informative can thus leads to unsuccessful communication. Over-informativeness, on the other hand, can make the listener believe that the attention has shifted to a new referent (Arnold and Lao 2008). We will first outline the studies which found that children are under-informative.

Campbell, Brooks, and Tomasello (2000) investigated how contexts of general ("What happened?") and specific ("What did you do with the ball?") questions influences the production of REs in English-speaking children (mean ages: 2;6 and 3;6). The results indicate that children are sensitive to the context, as they produced an NP or a pronoun with general questions, and a null referent to respond to the specific questions. However, the results also point towards an overuse of pronouns, because the responses to the general questions

[3] The data sorted in the Double Object Database is taken from the Kovačević (2004) corpus present in the CHILDES database (MacWhinney 2000)

were more frequently pronouns than NPs in both age groups. Tedeschi (2008) also applied the methodology of general and specific questions on Italian children aged 2;6-6;5. Her results show a progression from under-informativeness to an almost adult-like use of REs: the youngest children exhibit the same amount of omissions in both question types (overuse of omissions in a general setting); the three-year-olds used clitics and omissions predominantly for the specific questions and used more NPs with general questions, but their use of clitics in the general questions was higher than that of the adults controls; the five-year-olds used only NPs in the general question and few NPs in the specific question, thus being over-informative, but almost adult-like.

The studies that found the tendency of over-informativeness are much more numerous. Continuing with the methodology of general vs. specific questions, Wittek and Tomasello (2005), tested German speakers aged 2;6 and 3;6 and found that they overuse NPs in the specific condition. Thus, unlike the results obtained by Tedeschi (2008), young German children were over-informative.

Matthews et al. (2006) expanded the methodology and added the conditions of *perceptual availability* and *prior mention*. English-speaking children aged 2, 3, and 4 were tested. Perceptual availability did not have an effect on the youngest group, as they used mostly NPs, regardless of whether the interlocutor could see the visual input or not. The other age groups used more NPs in the condition where the referent was not perceptually available to the interlocutor, and used less NPs in the condition where it was available — however, with a tendency to be more specific than necessary. In the tasks with prior mention, an effect was observed also for 2-year-olds as they used more nouns when the referent had not been previously mentioned. Thus, linguistic givenness had more effect on the RE choice than visual accessibility. The reason for this might be that two-year-olds are not good at assessing the listener's cognitive perception, but are nevertheless attentive to linguistic context.

Among the studies conducted on corpora, we will refer to Gundel and Johnson (2013) and Sauermann (2016). Gundel and Johnson (2013) applied the GH framework to child corpora of English-speaking children, and found that

children begin using REs appropriately by age 3. However, the corpus contained instances of indefinite and definite NPs in the higher GH statuses such as *In focus*, *Activated*, and *Familiar*, in which more reduced forms would have sufficed (check Table 1). Thus, children younger than four years were more specific than needed. However, the authors also point to the limits of corpus data, since it provides little opportunity for errors, as most of the referents are at least 'activated'.

Sauermann (2016) used corpora of German 2- to 4-year-olds to investigate how animacy, givenness, definiteness, and REs influence word order in double object structures. The corpus analysis showed that, within the IO-DO order, 60% of occurrences were pronoun>NP in both children and their mothers. Within the DO-IO structures, pronoun>NP occurred in the child-directed speech (39%), but rarely in the child language (9%), since they expressed most of the DO-IO utterances with two pronouns. Although the DO was expressed more often as an NP both by the children and the adults, when the DO was expressed as a pronoun, the probability of DO-IO increased; hence, RE can be considered a significant predictor of word order. Sauermann (2016) concludes that, for German-speaking children, the relative order of the two objects can be largely predicted by the type of RE that expresses the DO.

From these studies, we can conclude that children are rather over-specific than under-specific in their use of REs, but nevertheless sensitive to the discourse from very early on. Two-year-olds might have some difficulty in assessing the speakers' knowledge, but linguistic cues such as prior mention are strong enough to impact their RE choice.

3. Research Questions and Predictions

The current study aims to discover how being a DT affects the placement of the given argument (global markings) and which form it takes (local markings). Our task was guided by the following research questions:

1. How does DT influence object order? Do speakers use the DT>comment order to express the topic?

2. How does DT influence RE? Is an argument more likely to be expressed with a reduced expression (pronoun or null) when it is the DT?
3. Are children over- or under-informative?
4. Is there a preference for certain arguments (S, IO, DO) to be expressed with a specific RE?
5. Do speakers use global markers (object order) or local markers (choice or RE) more, to signal the DT?
6. Are there any differences between children and adults?

With regard to the first question, we expect to find an overall preference for the DT-comment order. However, we expect the DT to influence the object order of adults more than that of children, as previous research has shown that children might struggle with the correct topic placement (Hornby 1971, Dimroth and Narasimhan 2010).

For our second research question, in light of previous findings on children's use of REs, we predict that the DT object will be expressed with a pronominal (pronoun or clitic) in both types of speakers. The DT is also more likely to be omitted, based on the given object omission results obtained by Mykhaylyk, Rodina, and Anderssen (2013) and Anderssen et al. (2014).

If the children do not use REs in an adult-like manner, there are two possibilities: the full forms are either overused or underused. In light of what has been seen from previous research (Section 2.2), it is more likely that Croatian children will over-use NPs. This situation does not violate the Givenness Hierarchy proposed by Gundel, Hedberg, and Zacharski (1993), and still leads to a successful communication, but it signals that children have not yet acquired the in which contexts a pronominal form is preferred.

We expect to find a relation between RE and grammatical function: Croatian is a subject-drop language, and thus we expect to see many examples of subject drop when the subject is the DT; we also expect the IO to be expressed as a clitic quite frequently, as this is how these elements are frequently expressed in naturalistic data (Velnić accepted). The DOs are expressed either as NPs or pronouns in naturalistic data (Velnić 2014) — which

was also found by Sauermann (2016) for German — so we expect the DOs to be less prone to be expressed with a pronominal form than the IOs.

Concerning the fifth research question, according to the literature, children have less difficulty with expressing local markers of givenness (REs) than global markers (object order) (Hickmann et al. 1996). Furthermore, studies conducted on topic-comment order (section 2.1) or the on use of REs (section 2.2) suggest that children struggle with the former than the latter. Thus, we expect the children to be more target-like with their use of REs, than with ordering the objects based on which one is the DT. At the same time, we expect the adult controls to conform to both types of marking for the DT.

Table 2 summarizes the eight possible outcomes of RE and object order combinations. Recall that we consider all occurrences that include an NP as 'full forms', while the rest of the referring expressions are referred to as 'reduced'. Omissions are not taken into consideration in Table 2, because, when one object is omitted, there is no object order to be reported.

DT-comment	Comment-DT
Reduced-reduced	Reduced-reduced
Reduced-full	Reduced-full
Full-full	Full-full
Full-reduced	Full-reduced

Table 2: Possible combinations of object order and REs

The majority of occurrences are expected to fall within the DT-comment order; we also expect the DT to be expressed as a pronoun or clitic, because it is introduced in the context before the target utterance; consequently, we expect that the majority of occurrences should be reduced-full and reduced-reduced combinations. We do not expect to find full-reduced combinations in the DT-comment order, as this would violate the Pronominality Principle of the Quantitative Harmonic Alignment (de Marneffe 2012). We expect to find some occurrences of comment-DT order, especially in children, in case they are not yet using word order to signal Information Structure. However, whether the

participants produce more reduced-full or full-reduced combinations within the comment-DT order depends on what the speakers pay more attention to: the DT (givenness) or pronominality order. If the speakers pay attention to the former, we expect them to produce full-reduced combinations to signal the given status of the DT. If the speakers pay more attention to the latter, however, the pronoun will precede the full expression due to harmonic alignment (Gundel, Hedberg, and Zacharski 1993, Collins 1995, Bresnan et al. 2005), producing a DT that follows the comment and is expressed with an NP. Overall, we do not expect many of these combinations to occur, because the full-reduced (comment-DT) order violates pronominality order, while the reduced-full (comment-DT) order completely fails to signal the DT.

We have already outlined our prediction for the last research question: if the children prove not to be adult-like, they will most likely not mark the DT with object order, but they will use more reduced expressions for the DT.

An additional factor most likely affecting productions is animacy. The task in this study did not balance animacy, and we always use the prototypical animacy condition (IO-animate, DO-inanimate). A recent study by (Velnić Submitted) found a strong influence of animacy on object order in ditransitives in Croatian, more so in children than in adults, causing the IO to be placed first irrespective of whether it was given or not. Thus, keeping in mind the prototypical conformation of animacy in our task, we may expect to find the children to prefer the IO-DO order in the current task. This also means that there might be less deviation from the expected object order when the IO is the DT, than when the DO is the DT, because in the former animacy and DT are not in opposition. Moreover, Fukumura and van Gompel (2011) found that animacy also affects referring expression choice as animate entities were more likely to be expressed as pronouns in an elicitation task conducted on the adult population. Again, our task was not set up to investigate this, but depending on the results, we might come back to this in the discussion.

4. Methodology

The experiment was a semi-controlled elicitation task, using three storybooks, each one with a different grammatical function as the DT: the subject (S), the IO, and the DO. Since we are interested in how DTs influence the ordering of the objects in ditransitive structures, the S-DT condition is used to establish a baseline order of IO and DO, when neither object is the DT and both of them are new in every target image. Because the storybooks are visually available to both interlocutors, all the referents can be considered at least conceptually available with regard to the Givenness Hierarchy seen is section 2.2, but with different salience, following Arnold (1999). Arnold (1999) found that topic and focus are more salient than referents that are not the topic or in focus. Salience is defined as a competitive property, entailing that the RE with which an argument is expressed depends, among other factors, on contextual saliency. Thus, the DT should be the most salient argument, as this is what the discourse is about.

The animacy values of the arguments are constant in all three DT conditions. The main reason for not balancing animacy in the task is that IO-animate and DO-inanimate is the most naturally occurring situation, which we wanted to maintain throughout the task.

4.1 Materials

The task consisted of three storybooks, each with a different argument as the DT (subject, IO, and DO). Each storybook was made up of 13-15 images, 5 of which were target images and were meant to elicit a ditransitive structure. The pages were printed in an A5 landscape format; they were laminated and held together by a spiral. A detailed overview of the images contained in each book is presented in Tables 3–5, which describe the storybooks where the DT is the Subject, the IO and the DO, respectively. The target images are shaded in grey.

Image type	**Image description**
1. Cover	A happy squirrel in a Santa Claus hat.
2. Introduction	Bob the squirrel really loved making other animals happy, so he gave them presents. (Image of Bob surrounded by thought bubbles of smiley faces)
3. Target	Bob gives a present to a dog.
4. Filler	The dog opens the present and there is a bone inside; the dog is very happy.
5. Target	Bob gives some cheese to a mouse.
6. Filler	The mouse hugs the cheese.
7. Target	Bob gives some milk to a kitten.
8. Filler	The kitten is happy and licks its snout.
9. Filler	Bob goes up a tree to see if some other of his friends need anything that could cheer them up.
10. Target	Bob gives a banana to a monkey.
11. Target	Bob gives some flowers to a female squirrel.
12. Filler	She kisses him on the cheek.
13. Final	Bob goes to sleep with a smile on his face.

Table 3: **Subject** as Discourse Topic (baseline condition): *Bob the generous squirrel.*

Image type	Image description
1. Cover	A cat sleeping on a mat, it has a grumpy face and is surrounded by toys (not the toys that will be used in the booklet).
2. Introduction	The weather is nice, but Mina does not want to play outside. (Image of the cat sitting, sad/grumpy face, while the sun shines through the window)
3. Introduction	The other cats are playing outside and want Mina to join them. (Image of cats playing and a thought bubble with Mina's image. The experimenter says that is why they decide to bring interesting toys to her).
4. Target	Cat 1 brings Mina a mouse.[4]
5. Filler	Mina refuses to play with the mouse.
6. Target	The mouse then throws Mina some candy.
7. Filler	Mina eats the candy and goes back to sleep.
8. Target	Cat 2 brings Mina a ball of yarn.
9. Filler	Mina pushes the ball of yarn away.
10. Target	A puppy brings Mina a stick.
11. Target	Cat 1 brings Mina a ball.
12. Filler	Mina pushes the ball away.
13. Final	Mina's kittens come and she finally plays with them, she is happy.

Table 4: Indirect object as Discourse Topic: *Mina the grumpy cat.*

[4] This is the only instance of an animate DO in the task, but it is nevertheless lower on the animacy scale than the IO because it is perceived as a toy or even food. It did not affect the results as the DO was expressed as an NP by all the children.

Image type	**Image description**
1. Cover	A bell on the cover of the booklet.
2. Introduction	A cat, Bella, is walking in the grass, and she has a bell around her neck.
3. Introduction	The bell slips and falls in the grass; Bella doesn't notice.
4. Introduction	Bella is home and sees she has no bell; she is sad.
5. Filler	A dog finds the lost bell in the grass.
6. Target	The dog gives the bell as a gift to her puppy.
7. Filler	The puppy is playing with the bell, while a crow is watching from a tree.
8. Target	The crow steals the bell from the puppy.
9. Filler	The crow can't fly, because the bell is too heavy
10. Target	The crow throws the bell to the frog.
11. Filler	A hedgehog sees the bell falling.
12. Filler	The hedgehog asks the frog for the bell.
13. Target	The frog gives the bell to the hedgehog.
14. Target	The hedgehog goes to Bella and gives the bell back to Bella.
15. Final	Everybody is happy: Bella has her bell back on, and the two animals dance.

Table 5: **Direct object** as Discourse Topic: *The story of the lost bell*.

Figures 1, 2 and 3 show a target image from each condition.

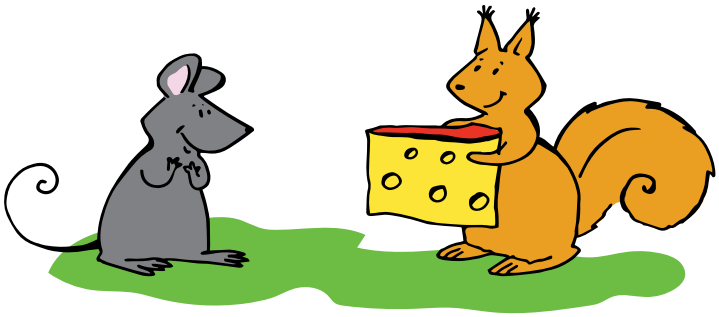

Figure 1: Bob the squirrel gives some cheese to a mouse (DT-S condition)

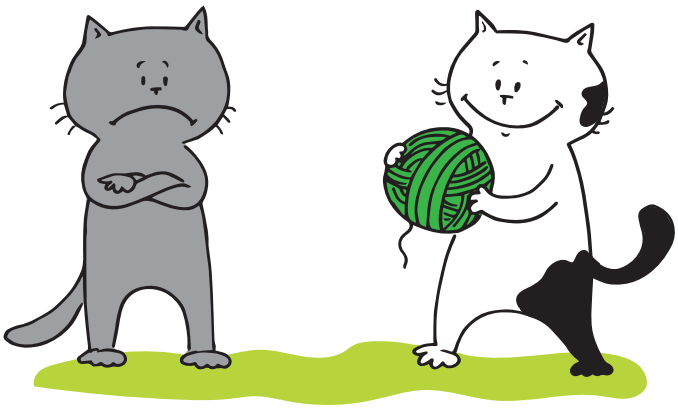

Figure 2: A cat gives Mina a yarn (DT-IO condition)

Figure 3: The frog gives the bell to the hedgehog (DT-DO condition)

4.2 Participants

A total of 58 Croatian monolingual children of ages 3;6–5;1 (mean=4;4) took part in the experiment. The children were recruited from four kindergartens in Rijeka; all were part of a larger kindergarten group. The parents were given an information sheet about the study, and had to sign a consent form in order for the children to participate.

We also tested 36 adult controls, between the ages of 19–28 (mean=21; 8 males). All the participants were born to two Croatian parents and had grown up in Croatia; other languages learned later in life were not controlled for. They each received a 100 Kuna (approximately 13 euros) gift certificate for a local bookstore. The participants were recruited at the Psychology and Law departments of the University of Rijeka.

This study has been approved by the Norwegian Ethics Committee (NSD) under reference number 40063.

4.3 Procedure

The recordings (audio only) were conducted in a room on the kindergarten premises, where the child and the researcher could be undisturbed. For the adult controls, the testing took place either in the psychology lab, or in a classroom at the university. The recorder (Sony ICD-px333) was placed on the table facing the participants. The researcher explained that they would be

reading a story together, and all three storybooks were placed on a table; the participant chose which one to start with, thus randomizing the order in which the storybooks were presented. Once the participant had chosen a story, the experimenter would begin to tell the story, by describing the images up to the first target image (tables 4-6); then the participant had to continue telling the story. After the first story was finished, the participant chose the next story to tell. For the adult controls, this task was integrated with another task, alternating between one storybook and a set from the second task; the children completed the two tasks on different days, and thus read the stories one after the other.

5. Results

In this section, we analyze the data on word order and referring expressions in both child and adult responses and compare the two groups at every level of the analysis. First, however, we will outline how the statistical models were set up as some of these models were used for the initial assessment of the data and are not explicitly discussed in the paper. A full summary of these models and the raw data can be found in the appendix.

5.1 Models

Three models were set up, using the linear mixed effect model from R (Bates et al. 2015): The first model analyzes the total word order distribution, the second one the word order distribution only within NP-NP combinations, and the third one analyzes the distribution of REs with regard to the DT. In each of these models, the participant and image order were set as random effects. The order of the story (1st (DT-S), 2nd (DT-IO), or 3rd (DT-DO)) was not set as a random effect, as it did not influence the results in any way: we compared the models with and without this factor as a random effect, and it was not significant. The DT condition and the group (children vs. adults) were the dependent variables.

From these models, we learned that the DT condition and group had significant effects, and we proceeded to test these more thoroughly. The said models will not be further discussed in this paper, and the full results obtained by these models are located in the Appendix (Tables A1-A3).

We thus proceeded by conducting a pairwise comparison (Lenth 2016) within group for each model described above. The results obtained by the pairwise comparisons will be discussed throughout the current section. We have also conducted ANOVAs between each initial model, with and without group being the dependent variable, in order to establish the difference between adults and children. The differences are summarized at the end of each subsection presenting the results.

5.2 The data

The task was quite engaging, and we obtained a ditransitive structure with most of the target images: a total of 789/870 data points for the children, and 502/540 for the adults. The non-applicable data was due to a failure to produce a ditransitive structure.

A response from the children (not the same child) is given for each condition below.

(2) DT-S condition (Child #36)

I onda je vjeverica dala pasu poklon

And then is.AUX squirrel.NOM gave dog.DAT present.ACC

"And then the squirrel gave a dog a present"

I vjeverica je dala jednom mišu sirić

And squirrel.NOM is.AUX gave one.DAT mouse.DAT cheese.ACC

'And the squirrel gave a mouse some cheese'

I maci je dao[5] mlijeko

And cat.DAT is.AUX gave milk.ACC

'And to the cat he gave some milk'

I majmunu je dala bananu

And moneky.DAT is.AUX gave banana.ACC

'And to the monkey he gave a banana.'

[5] The child here uses the masculine form of the verb and the feminine form in the sentence below, this is most likely due to the incongruence of the name Bob (masculine) and the noun for squirrel (feminine) in Croatian, so in this case Bob the squirrel can have both agreements.

I dala je njezinoj prijateljici cvijet
And gave is.AUX her.DAT friend.DAT flower.ACC
'And to his friend he gave a flower.'

(3) DT-DO condition (Child #16)
Pas je dao zvono drugom psu
Dog.NOM is.AUX gave bell.ACC other.DAT dog.DAT
'The dog gave the bell to another dog.'
Vrana je uzela zvono psu
Crow.NOM is.AUX took bell.ACC dog.DAT
'The crow took the bell from the dog.'
I onda je to dala žabi
And then is.AUX it.ACC gave frog.DAT
'And then she (the crow) gave that to a frog.'
Ona to daje njemu
She.NOM it.ACC gives him.DAT
'She is giving it to him.'
Onda je ježić to dao maci.
Then is.AUX hedgehog.NOM it.ACC gave cat.DAT
'Then the hedgehog gave that to the cat.'

(4) DT-IO condition (Child #4)
Miš joj je dao slatkiše
Mouse.NOM her-CL.DAT is.AUX gave sweets.ACC
'The mouse is giving her sweets.'
Kako je druga mačka je poklonila od uža lopticu
How is.AUX other.NOM cat.NOM is.AUX gifted of rope-GEN ball.ACC (it was a yarn)
'How the other cat is giving her a ball of yarn as a gift.'
I sad joj je pas poklonio stablo
And now her- CL.DAT is-AUX dog.NOM gifted tree ACC (ita was a branch)
'And now a dog is giving her a tree as a gift.'

Poklonila joj je za košarku loptu
Gifted her- CL.DAT is.AUX for basketball ball.ACC
'(It) gave her a basketball as a gift.'

From the sample above, it seems that children are attentive both to global markers (use of DO-IO in the DT-DO, and IO-DO in the DT-IO) and to local markers (the DT is, in most cases, omitted or pronominal). These markers are analysed with more detail in the following sections.

5.3 Word order distribution with regard to DT

Our first step in the analysis of the data is to see how the DT affected word order, without considering RE. Figures 4 (adults) and 5 (children) show the distribution of IO-DO and DO-IO word orders in the three DT conditions. Naturally, structures in which one of the objects has been omitted do not yield object order. Nevertheless, the proportions in the figures were calculated by taking into consideration all responses, including omissions. This provides us with a full overview of the adult and child productions. Omissions are discussed section 5.4. The raw data can be found in the appendix (Tables A4-A5).

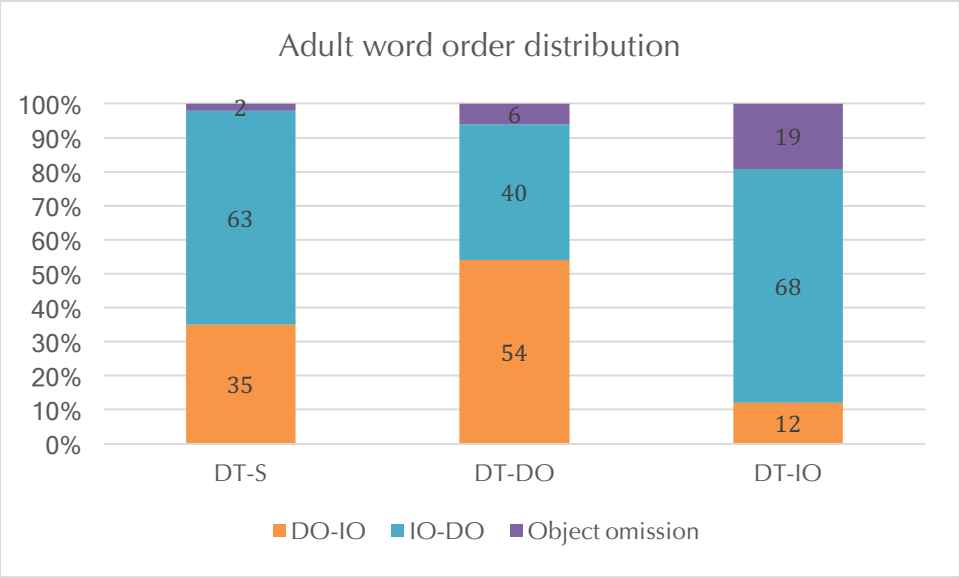

Figure 4: Adult word order distribution (all REs).

The IO-DO is the more attested order overall, but there is nevertheless a considerable decrease of the IO-DO order in the DT-DO condition, and a considerable decrease of the DO-IO order in the DT-IO condition. This entails that the DT influences word order in Croatian ditransitives.

It has already been outlined in the previous section how the statistical analysis has been set up. We thus proceed in explaining the results obtained with the pairwise comparison. The obtained results are shown in Tables 6 (adults) and 7 (children).

	Odds. ratio	Standard error	p.value
DT-S vs. DT-IO	0.188	0.07	<0.0001
DT-S vs. DT-DO	3.684	1.33	0.0009
DT-IO vs. DT-DO	19.594	9.014	<0.0001

Table 6: Summary of the model of pairwise comparison of object order distribution in the adult data.

The data from Table 6 shows that the distribution of word order is significantly different for each condition, entailing DT influences the order in which the adults express the objects in a ditransitive structure. From Figure 4, we can see that this difference is target-like, as the production of DO-IO increases when the DO is the DT, and it decreases when the IO is the DT.

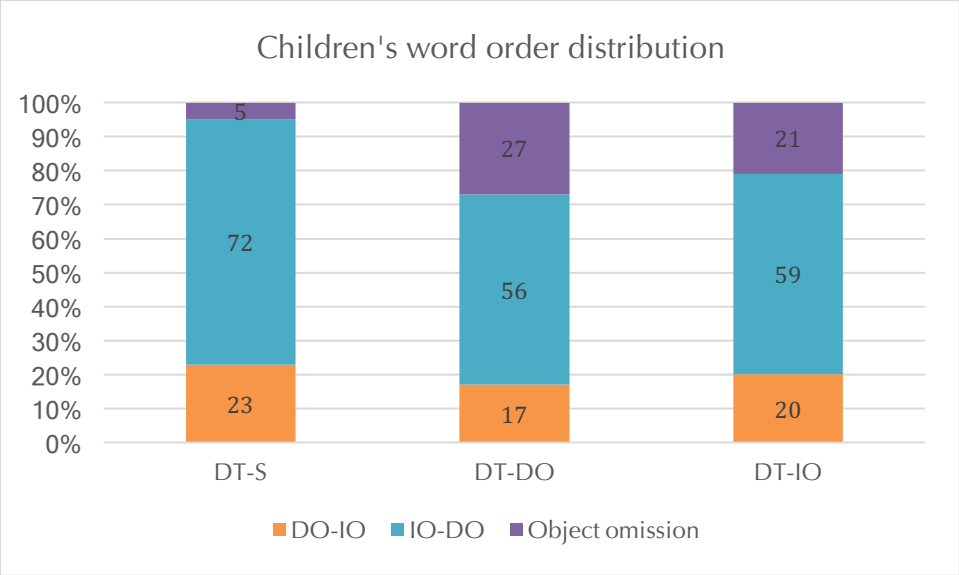

Figure 5: Children's word order distribution (all REs).

It is obvious that children have a strong preference for IO-DO; we can observe this preference in both target conditions (DT-DO and DT-IO). The proportion of IO-DO decreases in the two target conditions with respect to the baseline, but the proportion of DO-IO remains more or less the same. This is due to an increase in object omissions in the target conditions, and Figure 9 will show whether the omissions are linked to the DT. We now move on to observing what the pairwise comparison revealed for the child data.

	Odds. ratio	Standard error	p.value
DT-S vs. DT-IO	1.16	0.351	0.8667
DT-S vs. DT-DO	0.800	0.292	0.8145
DT-IO vs. DT-DO	0.686	0.275	0.6154

Table 7: Summary of the model of pairwise comparison of the conditions in the child data.

The distribution of the word orders is not significantly different in any condition. This suggests that children do not vary the use of their object order, in relation to the different DT. From Figure 5, we can clearly see that the word order that is mostly used is IO-DO. Its proportion is lower in the target conditions with

respect to the baseline; however, there is no increase of DO-IO order, which suggests that there are more omissions in the target conditions.

The ANOVA conducted with/without group as a factor (Table 8) has revealed significant differences in how children and adults use word orders. This is due to the children's overuse of IO-DO. Thus, children use IO-DO significantly more than adults.

	AIC	BIC	p.value
Without Group	1125.2	1165.3	0.02777
With Group	1122.4	1167.5	

Table 8: ANOVA comparison of the distribution of word orders in children and adults (all REs).

Nevertheless, clitics in Croatian are syntactically fixed is second position, and this dictates word order, therefore the effect of the DT on word order will be best observed if we only take NPs into consideration (Figures 6 and 7). Note that, in the following figures, the proportions are calculated based only on NPs; other REs (including omissions), were not taken into consideration.

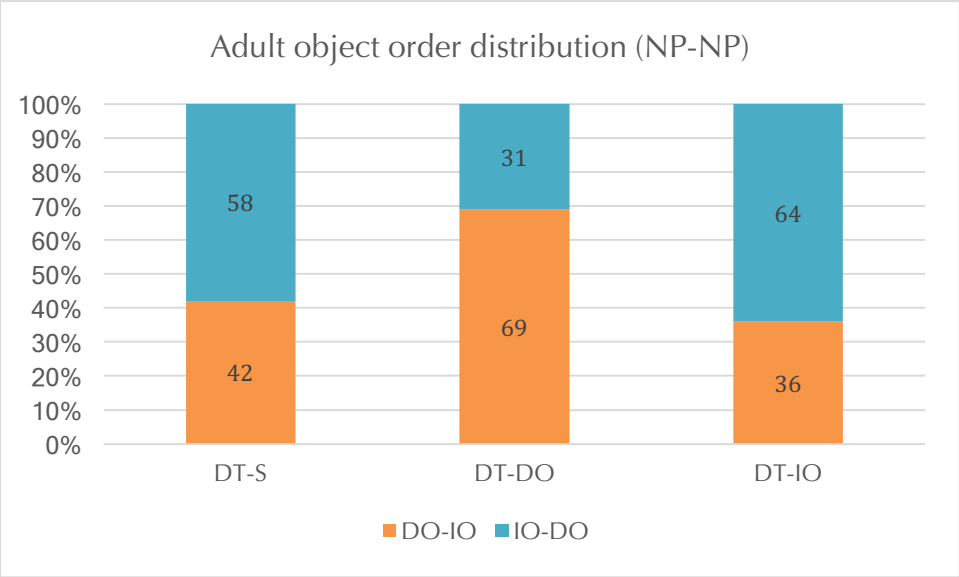

Figure 6: Adult word order distribution (only NPs).

As Figure 6 shows, adults use the two word orders with a similar proportion in the baseline condition. The object order preference is more pronounced in the DT-DO condition, when compared to the data in Figure 4. Furthermore, the target order (DO-IO in DT-DO and IO-DO in DT-IO) is used at similar proportions in the two target conditions. Again, pairwise comparisons were conducted on these data.

	Odds. ratio	Standard error	p.value
DT-S vs. DT-IO	0.288	0.149	0.0428
DT-S vs. DT-DO	7.169	3.26	<0.0001
DT-IO vs. DT-DO	0.04	0.255	<0.0001

Table 9: Pairwise comparison of object order of NP-NP occurrences in the adults.

As Table 9 shows, the difference between DT-S and DT-IO is less pronounced. This is due to the exclusion of the omissions, as the omissions were significantly more numerous in the DT-IO condition than in the baseline. Consequently, the distribution of IO-DO in the IO-DT condition comes out as more similar to the baseline. But now that the omissions are not accounted for, the distribution of the object orders in the DT-S and DT-IO is not different. The DT-DO condition still stands out, as it significantly differs from the other two conditions.

In the child data, the preference for IO-DO remains the same in all conditions (Figure 7). This is confirmed by the pairwise comparison displayed in table 10.

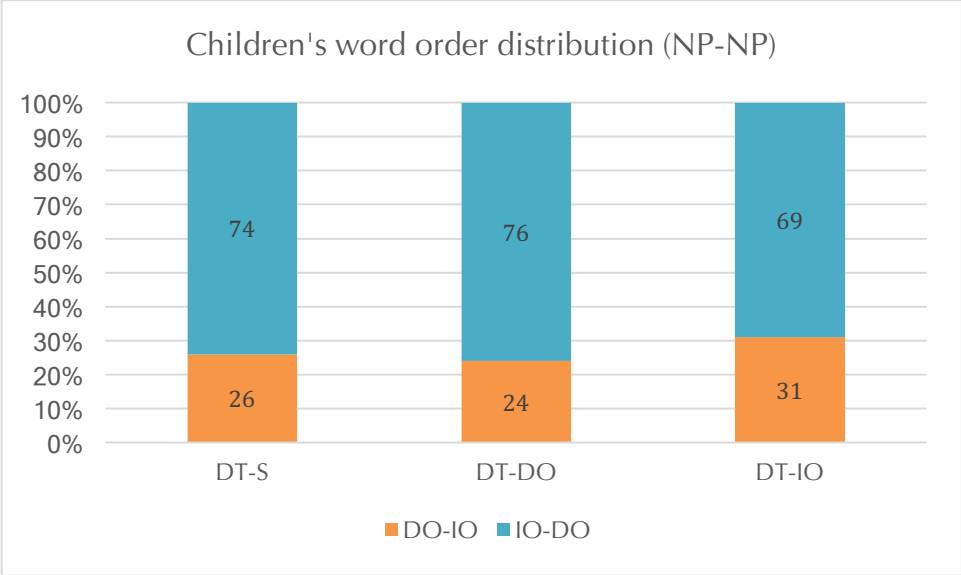

Figure 7: Children's word order distribution (only NPs).

	Odds. ratio	Standard error	p.value
DT-S vs. DT-IO	1.29	0.453	0.73338
DT-S vs. DT-DO	0.888	0.341	0.9492
DT-IO vs. DT-DO	1.461	0.653	0.6729

Table 10: Summary of pairwise comparison of object order in NP-NP occurrences in children.

As the results in Table 10 illustrates, the children do not display any object order difference between the three conditions. This means, as is obvious from Figure 4, that the children's tendency to use IO-DO does not vary depending on which argument is the DT (givenness). Possible reasons for this will be discussed in section 6.

The results in this section have revealed that the DT influences word order in the adults, but not in the children, as their preference for IO-DO remains stable across the tasks. The adults vary their object order according to DT, but the effect is most pronounced in the DT-DO condition, because the adults also have a tendency to overuse IO-DO, and, because of this, the distribution of the object orders in the baseline and in the DT-IO conditions appears more similar.

In order to test the impact of group on the model, we conducted an ANOVA comparing adults and children.

	AIC	BIC	p.value
Without Group	825.18	867.38	0.002609
With Group	818.11	865.01	

Table 11: ANOVA comparison of the distribution of word orders in children and adults (only NPs).

The group effect is more significant when only NP-NP combinations are taken into consideration. The most likely reason for this is that adults use the two object orders more equally in the baseline of the NP-NP combinations, while children continue using IO-DO to the same extent as in the previous test, thus making the difference between the two groups bigger.

We now move on to analyze the omissions that we have briefly commented on in the overviews provided in Figures 4 and 5; subsequently, we will take a closer look at the use of REs.

5.4 Distribution of Omissions with regard to DT

In Figure 5 in the previous section, we saw that there was a decrease of IO-DO productions in the two target conditions of the child data, as compared to the DT-S condition. However, the proportion of DO-IO remained the same as in the DT-S condition. As also illustrated in Figure 5, the discrepancy can be accounted for with reference to object omission in the child data. Figures 8 and 9 display the object omission in each condition, in adults and children respectively. Like for Figures 4 and 5, the whole dataset is taken into consideration for the totals.

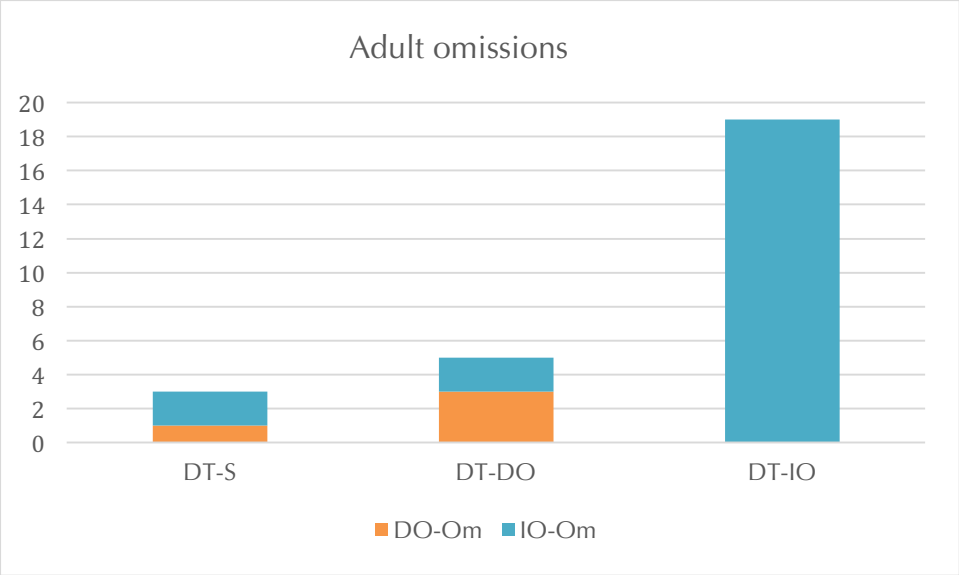

Figure 8: Proportion of omissions per condition in the adult data.

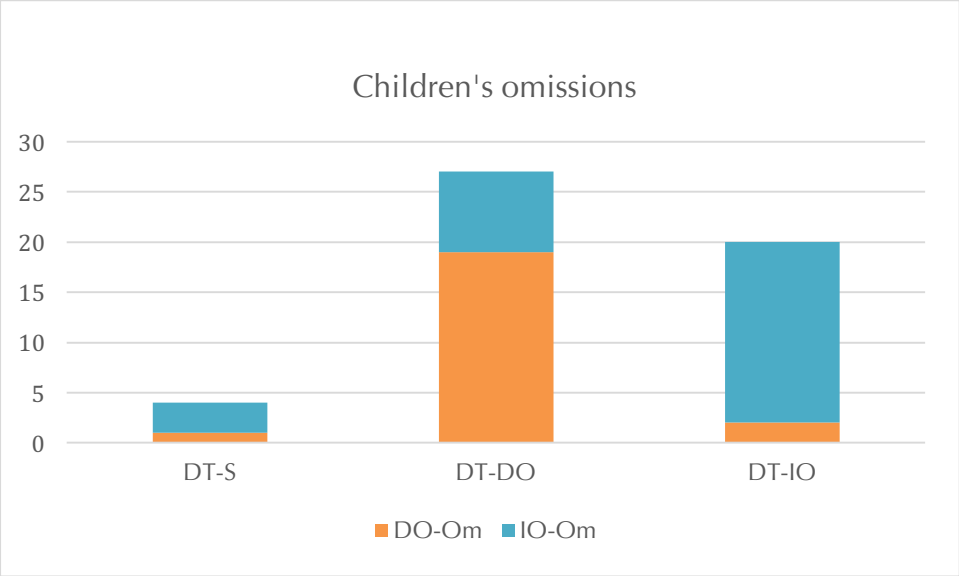

Figure 9: Proportion of omissions per condition in the child data.

In the DT-S condition, objects are rarely omitted by both adults and children. This is not a surprise, as they were both new in the discourse. In the other two conditions, the omission rate is higher for children than for adults. Children omit the DTs more than the other arguments. The IO seems to be more prone to omission than the DO, in both adults and children. This indicates that children

take DT into account, not by placing the DT object first, but by omitting it more frequently.

The DT seems to have a greater impact on the word order choice of adult speakers (the DT tends to precede the other object), while, for children, the influence of the DT is manifested by the omission of the DT object. The next section discusses how the DT affects all the types of RE that were encountered in the task more thoroughly.

5.5 Impact of DT on REs

In this section, we analyze how the RE of an argument changes when it is the DT, or when compared to the conditions where it is not the DT. The following figures provide an overview of RE for each grammatical function. The circled bar signals the DT.

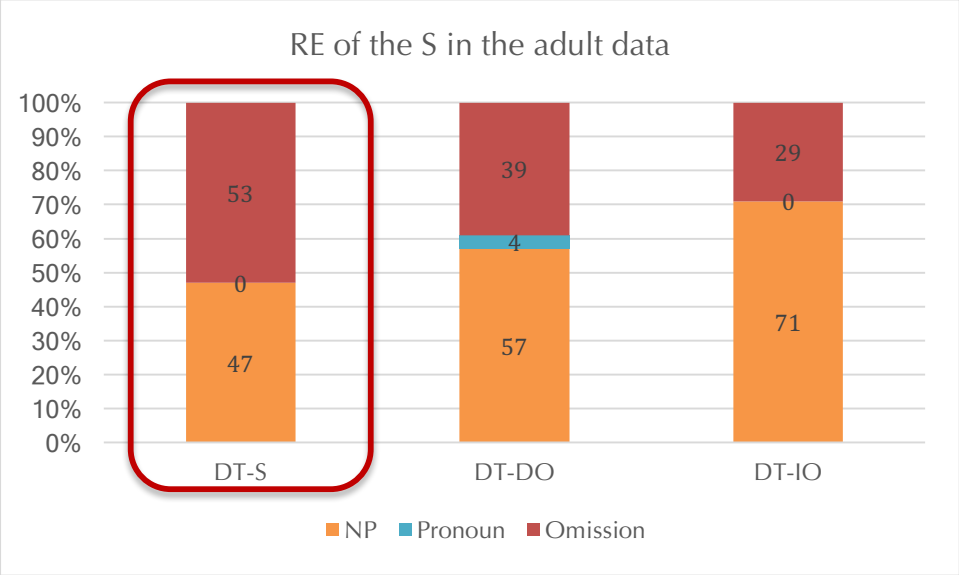

Figure 10a: REs used by adults to realize the S in the different DT conditions.

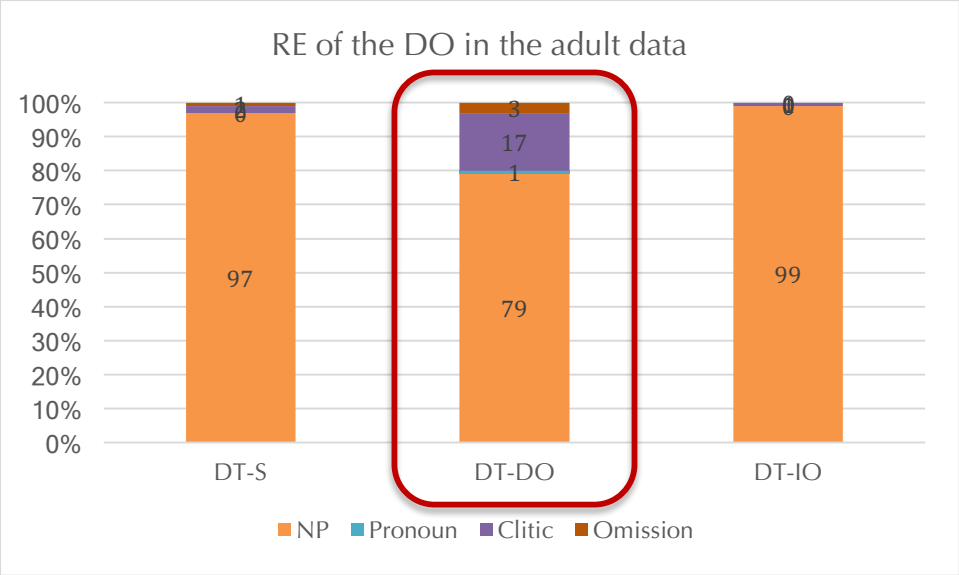

Figure 10b: REs used by adults to realize the DO in the different DT conditions.

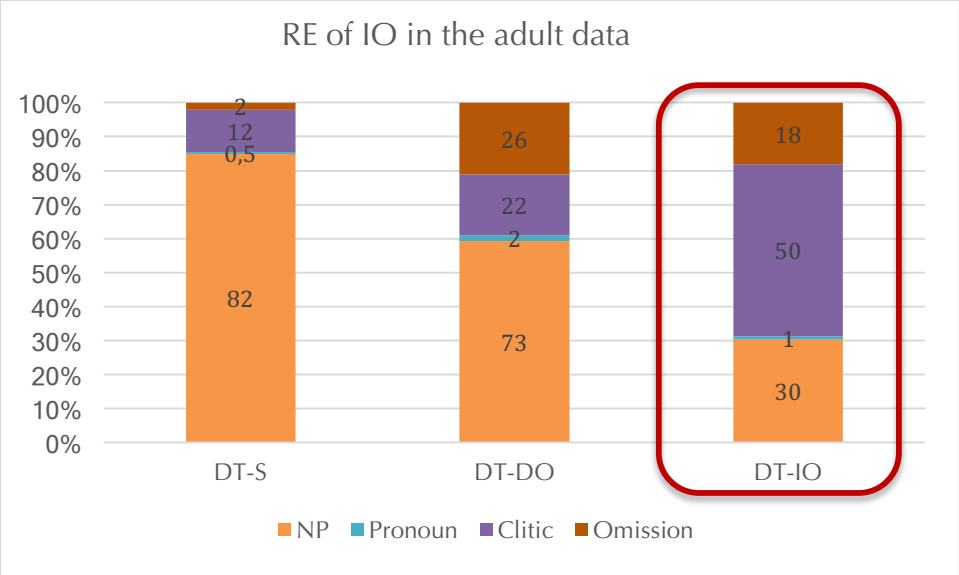

Figure 10c: REs used by adults to realize the IO in the different DT conditions.

Figures 10a-10c clearly show both how each grammatical function is preferably expressed with a certain RE, and also that the RE is less likely to be expressed as an NP, when it is referring to the DT. Thus, the S is expressed either as an NP or is omitted, but omissions happen more often when the S is the DT.

Similarly, the DO is also most preferably expressed as an NP, but less so when it is the DT, as in this case it can also be expressed by a clitic. Finally, the IO has the lowest proportion of NP usage when it is the DT, as it is frequently

expressed with a reduced expression (pronoun, clitic, omissions). The statistical analysis is provided in Table 12 below; the model is set up with the RE as a binary value, between full expressions (NP) and reduced expressions. The positive value indicates that the left-most condition is more likely to be expressed with a full expression, while the negative value indicates the same for the right-most condition.

	Odds. ratio	**Standard error**	**p.value**
DT-S vs. DT-IO	1.081	0.350	0.0057
DT-S vs. DT-DO	-1.949	0.529	0.0007
DT-IO vs. DT-DO	-3.030	0.412	<0.0001

Table 12: Pairwise comparison of the likelihood of each argument to be expressed as an NP when it is the DT (adults).

The pairwise comparison in Table 12 indicates that the subject is significantly more likely than the IO to be realized as a full NP when it is the DT. The comparison between the S and DO being DTs shows that the DO is more likely to be expressed with an NP. The last row indicates that the DO is much more likely than the IO to be an NP, when it is the DT. This means that the IO is the least prone to be expressed with an NP. The figures clearly show how likely an argument is to be reduced (expressed by a clitic or omitted): the IO is the most likely, followed by the S, and then by the DO, which is mostly expressed with an NP, even when it is the DT. The statistical analysis shows that all of these differences are significant.

Now we will move on the consider the use of RE in the child data. Figures 11a-11c provide an overview of RE for each grammatical function. The circled bar signals the DT.

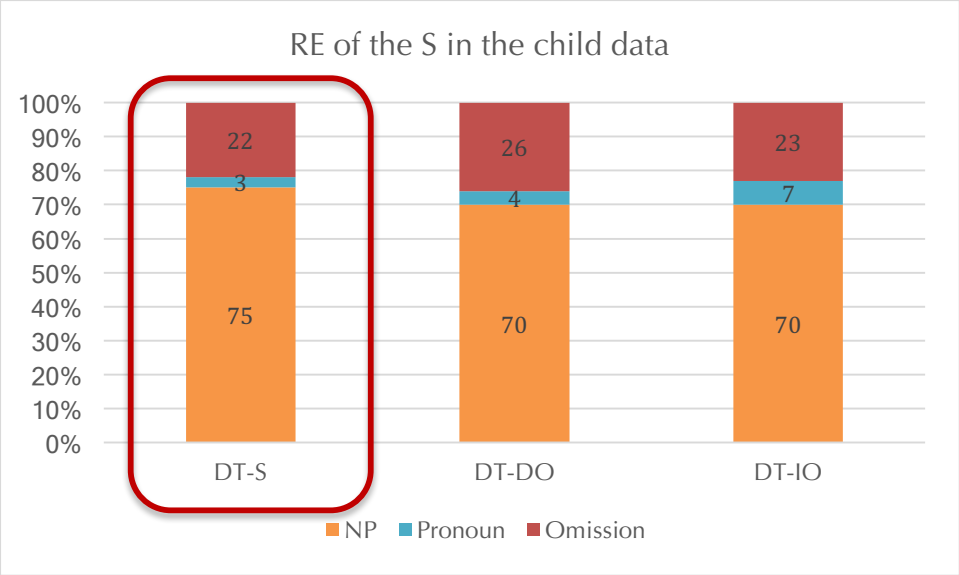

Figure 11a: REs used by children to realize the S in the different DT conditions.

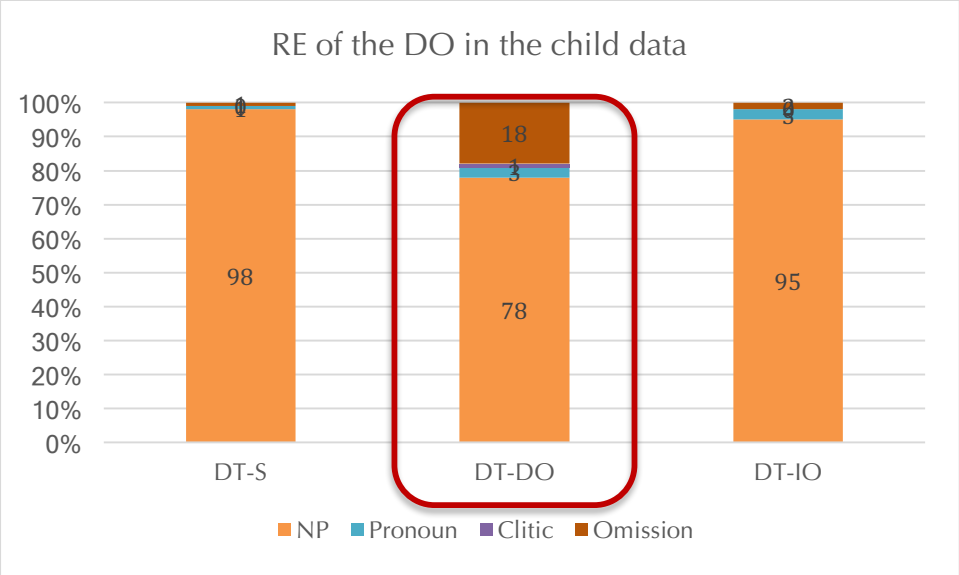

Figure 11b: REs used by children to realize the DO in the different DT conditions.

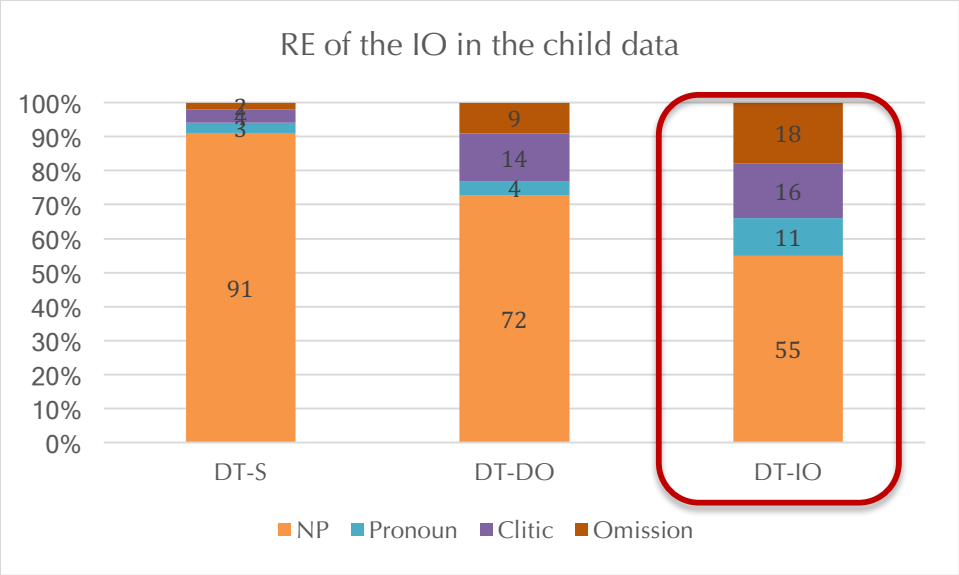

Figure 11c: REs used by children to realize the IO in the different DT conditions.

The children do not seem to be sensitive to whether the subject is the DT or not, since there is no change in the REs with respect to the DT condition. As in adults, the DO is mostly expressed with an NP, but again it is slightly less likely to be expressed by an NP when it is the DT. Finally, the IO is expressed much more frequently by a reduced form when it is the DT, since the proportion of NPs amounts to 54% in the DT-IO condition (compared to 91% and 72% in the other two conditions). Overall, the children reduce their REs to a lower degree than adults, and predominantly use NPs in the task. The data from Figures 10 and 11 indicate that children are more explicit than adults when expressing the referents in the task.

Just as in the case of the adults, a pairwise comparison within group was conducted, on the likelihood of each grammatical function to be expressed as an NP when it is the DT.

	Odds. ratio	Standard error	p.value
DT-S vs. DT-IO	1.349	0.314	0.0001
DT-S vs. DT-DO	-0.040	0.498	0.9964
DT-IO vs. DT-DO	-1.389	0.345	0.002

Table 13: Pairwise comparison of the likelihood of each argument to be expressed as an NP when it is the DT (children).

The statistical analysis indicates that the S is more likely than the IO to be expressed by an NP, but the S and the DO show no difference in their likelihood to be expressed as NPs. The IO is also less likely than the DO to be expressed as an NP. Thus, unlike adults, children express the DO and the S in the same way when they are the DT. This analysis examines the type of RE only when the argument in question is the DT. However, Figures 11a and 11b show that, even though NPs are used at the same proportion for the subject DT and the DO-DT, the DO is reduced more in the DT-DO condition with respect to the other conditions. This does not happen to the subject as the level of NP/omission use remains stable in all conditions. Unfortunately, the pairwise comparison cannot establish whether the use of NPs is significantly reduced in the DT-DO condition, with respect to the other conditions. However, the preliminary linear mixed effect model (table A3 in the appendix) showed that the adults and children are sensitive to the same manipulation when the DO is the DT. This entails that both children and adults express the DO significantly less with NPs when the DO is the DT.

The summary of the ANOVA comparing the use of reduced and full expressions in the two groups is presented in table 14.

	AIC	BIC	p.value
Without Group	1399.7	1441.0	0.0006347
With Group	1390.0	1436.5	

Table 14: ANOVA comparing the use of REs in adult and child data.

Children and adults obviously use REs in a different manner. So far, we have seen from the figures in this section that children use more full expressions than adults. Also, adults express all three grammatical functions differently, unlike children, who express the DT-IO differently from the other two functions but use the same REs to refer to the DT-S and DT-DO. We can see from the figures that, when compared to the adults, children do not pay attention to the DT status of the subject, but they decrease the use of NPs of the DO when it is the DT, thus reaching the same proportion of REs as the adults. With regard to the expressions of the IO, both types of speakers use the least NPs, as this argument is the most likely one to be omitted or expressed as a clitic. Another issue that comes out from the figures and most likely influenced the result in the table above, is that children, unlike adults, do not express the DO with a clitic. This could be related to the DO being inanimate as Fukumura and van Gompel (2011) found a correlation between animacy and RE choice.

In the following section, we discuss the result in relation to how they answer our research questions, and how this research correlates with previous studies discussed in the Background section.

6. Discussion

In this section, we will consider how the results can answer our research questions and how they relate to the predictions that we have made. We will focus on each research question in turn, but discuss the difference between children and adults (research question 6) as a part of the discussion for each research question.

To summarize the main findings, the DT has an effect on object order in adults, but not in children, as children show a constant IO-DO preference in all conditions. Whether an object is omitted is also dependent on whether it is a DT or not. However, the IO is more likely to be omitted than the DO in both adult and child data, but the children omit more objects than the adults overall. The results related to other REs reveal that children use reduced expressions to refer to DT-objects, but not DT-subjects. Furthermore, they tend to be over-explicit and use more NPs than adults.

Our first question was about the use of object order to mark the DT. We predicted that there should be an overall preference for the DT>comment order, but more consistently in adults. The study found that DT has an effect of object order in adults but not in children, as they use the same proportion of IO-DO in both target conditions. The high frequency of the IO-DO in the children's data is most likely caused by the unbalanced animacy that the task had, as previous research has found that Croatian children have a strong tendency to place animate object before inanimate ones (Velnić Submitted).

The second question was whether it is more likely for the DT to be expressed with a reduced RE. We have predicted that children should be more similar to the controls in expressing their arguments, than in their object order choice. The results confirmed this prediction: the DT argument was more likely to be reduced in the child data. Nevertheless, there were some differences between children and adults, as the children were not sensitive to the DT status of the subject, and omitted it at the same rate in all three conditions, even though they were sensitive to the same discourse manipulations for the objects.

Research question three was about the possible overuse of a certain RE type. The results found that children produce more NPs than adults overall, but simultaneously they omit more objects (Figures 1 and 2). This suggests that children understand that discourse has an effect on how we refer to the arguments, but they have not yet pinned down the fine-grained differences, and are using the two extremes of the scale. However, the overuse of full expressions also suggests that children take the listener's perspective into account, but are yet unable to assess the most appropriate RE.

Research question four was about the way different arguments were expressed, i.e. whether there is preference of expressing a grammatical function with a specific RE. The prediction was that there would be a relation, more precisely that the DT subject would have a tendency to be omitted, while the DT object would be expressed as a clitic. For the adults, the IO is the most likely argument to have a reduced expression, and it is very frequently expressed as a clitic or omitted when the it is the DT. The S is the second most likely argument to be reduced, and its expression is divided between NPs and

omissions, as there is no clitic for the nominative form in Croatian. The DO is the least likely argument to be reduced. The children also cliticise the IO quite often, and the IO is the argument with most reduction in the child data. Children were different than adults in the way they expressed the DO: while adults used the clitic 17% of the time, children's RE were divided between NPs and omissions. Thus, children have a three-way distinction for expressing the IO (NP, clitic, null) and a two-way distinction for the DO and the S (NP and null).

The next question was whether speakers used one strategy more than the other (object order or type of RE) to mark DT. The study found a difference between child and adults with regard to marking the DT, as adults use both means available in the task, while children do not use object order to signal the DT. As predicted, adults were more consistent with object order marking than children, and children were more attentive to REs. The possible object order (DT-comment/comment-DT) and RE (NP, pronoun, clitic, omissions) combinations were laid out in Table 2 in section 3 and we expected that most of the productions would have the DT-comment order and that the DT would be reduced, with the non-DT object being expressed with either an NP or a reduced expression. The occurrences that are realized with the comment-DT order are expected to have both full-full and reduced-reduced REs. Both full-reduced and reduced-full combinations within the comment-DT order are expected to be rare. Nevertheless, these combinations could provide an insight into whether the speakers pay more attention to the status of the DT (and thus use a reduced form even if it is placed in the second position), or to pronominality (in which case the pronominal form should precede the NP, and failing to signal the DT both through form and position). Tables 15 and 16 depict the answers, divided by group and DT-condition. The word order and RE combinations that show a (complete) disregard for the discourse status of the DT are marked by shaded cells.

	DT-comment DO-IO	Comment-DT IO-DO
Pr-Pr	0	6
Pr-NP	22	28
NP-NP	61	28
NP-Pr	0	0
Total	83	62

Table 15a: Adult answers in the DT-DO condition.

	DT-comment IO-DO	Comment-DT DO-IO
Pr-Pr	0	2
Pr-NP	83	0
NP-NP	30	17
NP-Pr	0	1
Total	113	19

Table 15b: Adult answers in the DT-IO condition.

	DT-comment DO-IO	Comment-DT IO-DO
Pr-Pr	2	2
Pr-NP	4	27
NP-NP	35	109
NP-Pr	2	0
Total	43	138

Table 16a: Children's answers in the DT-DO condition.

	DT-comment IO-DO	Comment-DT DO-IO
Pr-Pr	4	0
Pr-NP	53	3
NP-NP	92	41
NP-Pr	1	8
Total	150	52

Table 16b: Children's answers in the DT-IO condition.

Again, we can see that the adults use more DT-comment constructions than comment-DT constructions, in both target conditions. However, the difference between the two orders is greater in the DT-IO condition (113 vs. 19) than in the DT-DO condition (83 vs. 62), indicating that animacy is responsible for the high proportion of IO-DO orders in the DT-DO condition, also in the adult data. Conversely, children produce more IO-DO orders in both target conditions in the same proportion (76% and 74%). The data from Table 8 in the previous section already indicated that children do not vary their word order production according to what the DT is, but they are more prone to signaling this by omitting the DT object.

As predicted, when speakers use the DT-comment structure, they do not produce the comment with the reduced form and the DT with the full form:

there are no instances of this happening in the adult data, and only a handful in the child data (n=3). Adults also do not produce reduced-reduced combinations with the DT-comment order, while children do this rarely (n=6).

When the comment-DT structure is used, the full-full structure is the most frequent combination in both children (79%) and adults (56%), while the reduced-reduced combinations are not very frequent (1% for children and 10% for adults). Both types of speaker prefer the reduced-full combinations to full-reduced combinations in the comment-DT order. This kind of production is, however, only present in the DO-DT condition. The reason for this is two-fold: firstly, the IO-DO is an attested object order in this condition due to the animacy of the IO; secondly, the IO is reduced more readily than the DO. Thus, this combination is due to the speakers' attentiveness to animacy and the tendency in Croatian to express the IO as a clitic.

A surprising finding related to REs is that pronouns are almost never used, especially in the adult data. Pronominal use was expected to occur for the reduced S, since the clitic is not an option, but for both speaker groups, the productions were divided between full NPs and omissions. The S has the highest omission rate, most likely because Croatian is a subject-drop language. Overall, the adults used a surprisingly low number of pronouns, making us question the actual use of pronouns in natural language. The children use more pronouns than adults throughout the task, but are still more prone to using clitics.

In the Predictions (Section 2), it was also mentioned how animacy is a relevant factor for object ordering in Croatian (Velnić Submitted), and in the Methodology Section, we state how all the IOs were animate and all DOs inanimate, as it typically occurs in naturalistic speech. This animacy conformation had an impact on our results, and we can see that mostly in the children, as IO-DO (animate-first) is the predominately used object order; this also had an impact on the adults, as they showed a preference for IO-DO in the DT-S condition, although less pronounced than the children. The adults also used more target deviant word orders in the DT-DO condition than in the DT-IO condition. This is related to a higher usage of IO-DO orders overall, which is

also what is found in Croatian naturalistic speech (Velnić 2014, Kuvač Kraljević and Hržica 2016) and it is due to the animacy of the IO (Velnić Submitted). Moreover, as Velnić (Submitted) has claimed that children are more sensitive to animacy than adults, it would seem that this sensitivity to animacy is reflected also on the choice of RE (Fukumura and van Gompel 2011) as children do not cliticise the DO (inanimate), while adults do. This needs further investigation to check whether it is related to the grammatical function of the DO or to the fact that the DO was inanimate in our task.

7. Conclusions

The results found that children do not use word order to signal givenness, in our case manifested as DT, and instead they use mostly the IO-DO. The effect of DT is seen in adults, as the DT-comment structure is used most of the time, but adults also over-use the IO-DO structure when the DO is the DT. The most likely cause of over-usage is animacy, as the IO was animate and the DO was not.

Nevertheless, children signal what is given in the discourse by expressing the DT with a reduced RE. This is most obvious from the omissions, as children omit the DT more than the other arguments. Children omit much more than adults (Figures 5 and 6), but these omissions are related to DT.

The RE is related to the argument type: Subjects are expressed either with a full NP or with a null element, IOs have a high proportion of clitics, while DOs are mostly expressed with NPs. Adults also express DO with clitics, but children do not. Pronouns were not used in the task, except a few times by the children. This opens some interesting questions on whether pronouns are even used in Croatian when they do not have a contrastive connotation.

We thus conclude that topics are not marked by word order in Croatian preschoolers, a result already found in a number of studies (Hornby 1971, Dimroth and Narasimhan 2012). The children use IO-DO with the same proportion throughout the task, but mark what is given (the DT) by omitting it more easily. Overall, children use more full expressions than adults, which means that they are over-specific on the Givenness Hierarchy. This, in addition

to the fact that they omit more than adults, suggest that children are sensitive to the GH, but still in the process of acquiring the fine-grained distinctions, and are for the moment just using the two extremes of the GH. They are, nevertheless, sensitive to the various REs that can be used for different arguments, as they follow the same reduction pattern as the adult controls. Therefore, the effect of DT and the pragmatic functions related to it, such as givenness, are first expressed through REs, and through word order at a later stage. More research is needed to test when children stop overusing NPs and when they start using word order in an adult-like manner.

Abbreviations

ACC – Accusative case
AUX - Auxiliary
CL - Clitic
DAT – Dative case
DO – Direct object
IO – Indirect object
N - Noun
NP – Noun Phrase
NOM – Nominative case
PR - Pronoun

Appendix

	Estimate	**Std. Error**	**Z value**	**p.value**	**Significance**
(Intercept) Ad DT-S	0.8508	0.4182	2.034	0.041	p<0.05
Ad DT-DO	-1.3042	0.3611	-3.611	0.000304	p<0.001
Ad DT-IO	1.671	0.3802	4.395	$1.11e^{-05}$	p<0.001
Ch DT-S	0.8244	0.4582	1.799	0.072003	p<0.1
Ch DT-DO	1.5274	0.4149	3.682	0.000232	p<0.001
Ch DT-IO	-1.8247	0.4515	-0.042	$5.31e^{-05}$	p<0.001

Table A1: Statistical results of object order distribution in the different DT conditions in both participant groups.

	Estimate	Std. Error	Z value	Pr (>z)	Significance
(Intercept) Ad DT-S	0.6774	0.4901	1.382	0.1669	
Ad DT-DO	-1.9698	0.4547	-4.332	$1.48e^{-05}$	p<0.001
Ad DT-IO	1.2443	0.5176	2.404	0.0162	p<0.05
Ch DT-S	1.1344	0.5628	2.016	0.043848	p<0.05
Ch DT-DO	2.0878	0.5386	3.877	0.000106	p<0.001
Ch DT-IO	-1.5058	0.6069	-2.481	0.013092	p<0.05

Table A2: Statistical results of object orders of NP-NP occurrences.

	Estimate	Std. Error	Z value	Pr (>z)	Significance
(Intercept) Ad DT-S	-0.1765	0.4556	-0.387	0.6983	
Ad DT-DO	1.9494	0.5296	3.681	0.000232	p<0.001
Ad DT-IO	-1.0815	0.3503	-3.088	0.002018	p<0.01
Ch DT-S	-1-8494	0.4124	4.485	$7.30e^{-06}$	p<0.001
Ch DT-DO	-1.9088	0.3816	-5.002	$5.68e^{-07}$	p<0.001
Ch DT-IO	-0.2679	0.3555	-0.753	0.4512	

Table A3: Statistical results of RE variation according to DT.

Adults	DT-S	DT-DO	DT-IO
DO-IO	35% (63)	54% (83)	12% (20)
IO-DO	63% (113)	40% (62)	68% (113)
Object omission	2% (4)	6% (9)	19% (32)
Total	180	154	165

Table A4: Adult word order distribution in the task.

Children	DT-S	DT-DO	DT-IO
DO-IO	23% (71)	17% (43)	20% (52)
IO-DO	72% (224)	56% (138)	59% (150)

Object omission	5% (15)	27% (66)	21% (53)
Total	311	247	255

Table A5: Children's word order distribution in the task.

Adults	**DT-S**	**DT-DO**	**DT-IO**
DO-IO	42% (60)	69% (61)	36% (17)
IO-DO	58% (82)	31% (28)	64% (30)
Total	142	89	47

Table A6: Adult word order distribution of NP-NP combinations.

Children	**DT-S**	**DT-DO**	**DT-IO**
DO-IO	26% (64)	24% (35)	31% (41)
IO-DO	74% (185)	76% (109)	69% (92)
Total	249	144	133

Table A7: Children's word order distribution of NP-NP combinations.

Adults	**DT-S**	**DT-DO**	**DT-IO**
DO-om	0,06% (1)	3% (5)	0%
IO-om	2% (3)	2% (4)	19% (32)
Total:	180	154	165

Table A8: Adult omission distribution in the task.

Children	**DT-S**	**DT-DO**	**DT-IO**
DO-om	1% (5)	19% (46)	2% (6)
IO-om	3% (10)	8% (20)	18% (47)
Total:	311	247	255

Table A9: Children's omission distribution in the task.

Adult	**NP**	**Pronoun**	**Omission**
DT-S	47% (84)	0%	53% (96)
DT-DO	57% (89)	4% (6)	39% (61)

DT-IO	71% (117)	0%	28% (46)

Table A10: RE of the S in the adult data.

Adults	**NP**	**Pronoun**	**Clitic**	**Omission**
DT-S	97% (175)	0%	1% (2)	0,6% (1)
DT-DO	79% (123)	0,6% (1)	17% (27)	0,3% (5)
DT-IO	99% (164)	0%	1% (1)	0%

Table A11: RE of the DO in the adult data.

Adults	**NP**	**Pronoun**	**Clitic**	**Omission**
DT-S	82% (147)	0,5% (1)	12% (21)	2% (3)
DT-DO	73% (114)	2% (3)	22% (34)	26% (4)
DT-IO	30% (49)	1% (2)	50% (84)	18% (30)

Table A12: RE of the IO in the adult data.

Children	**NP**	**Pronoun**	**Omission**
DT-S	75% (213)	3% (8)	22% (62)
DT-DO	70% (174)	4% (11)	26% (65)
DT-IO	70% (178)	7% (18)	23% (58)

Table A13: RE of the S in the child data.

Children	**NP**	**Pronoun**	**Clitic**	**Omission**
DT-S	98% (278)	1% (2)	0%	1% (3)
DT-DO	78% (194)	3% (7)	0,4% (1)	18% (46)
DT-IO	95% (243)	3% (8)	0%	1% (3)

Table A14: RE of the DO in the child data.

Children	NP	Pronoun	Clitic	Omission
DT-S	91% (257)	3% (8)	4% (11)	2% (7)
DT-DO	72% (181)	4% (10)	14% (36)	9% (22)
DT-IO	55% (140)	11% (29)	16% (4)	18% (47)

Table A15: RE of the IO in the child data.

Competing Interests

The authors declare that there are no competing interests.

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