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

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This study investigates the impact that discourse topic 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 discourse topic argument is expected to be placed before the rest of the sentence, thus complying with the (discourse) topic-comment order (Gundel 1988). The discourse topic argument is also 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 discourse topics (subject, direct object and indirect object). The study consisted of an elicitation task aided by storybooks, with the targeted structures being ditransitives: either direct object-indirect object (DO-IO) or the indirect object-direct object order (IO-DO). The results reveal that, for adult speakers, discourse topic has an impact both on the choice of referring expressions and on word order (discourse topic-comment order), while for child speakers, the effect of discourse topic is limited to referring expressions, as the children use the IO–DO order 75% of the time regardless of discourse topic condition. This is in line with previous studies that find that children mark givenness/newness first on local and then on global markings (Hickmann, Hendriks, Roland, and Liang 1996; Mykhaylyk, Rodina, and Anderssen 2013; Anderssen, Rodina, Mykhaylyk, and Fikkert 2014). 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; Croatian; acquisition of ditransitives

1 Introduction

This study examines how Croatian monolingual children and adults use global markings (object order) and local markings (different referring expressions) to signal givenness. Givenness here is expressed though discourse topic which can be considered a more specific representation of the notion of givenness, as the discourse topic argument is repeatedly given and is also the center of attention of the discourse. However, if all the referents are visually available to the interlocutors, no referent can be considered new. Nevertheless, the contrast between discourse topic and non- discourse topic arguments is straightforward even in a setup with visual availability of all referents.

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 Gundel (1988), the topic precedes the rest of the sentence, which is referred to as comment. The local marking under consideration here is how the referent denoting the discourse topic is expressed. The use of referring expressions is guided by the accessibility theory proposed by Ariel (1990) and by the givenness

hierarchy proposed by Gundel et al. (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.

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; whereas children had no problem grasping it if the language had a specific syntactic mechanism for marking topic (Chien and Lust 1985; De Cat 2009). On the other hand, it has been shown that discourse cues are reflected in children's referring expressions from early on (Matthews, Lieven, Theakston, and Tomasello 2006; Tedeschi 2008; Gundel and Johnson 2013).

The importance of the current study extends to the general area of information structure and it also adds to our knowledge on Croatian, a language for which contrastive indications regarding to the effect of givenness on information structure have been made. It is claimed in the literature that Croatian follows the given-new/topic-comment order (Siewierska 1988; 1998; Browne 1993) but a recent empirical study found no effect of givenness on word order in Croatian adult and child speakers (Velnić forthcoming b). Thus, this task aims to shed light on whether givenness is a pragmatic factor that influences information structure in Croatian by setting up the contrast more explicitly between discourse topic and other referents rather than a simple given/new contrast as what is new to the listener might not always be straightforward. This methodology should make givenness more available to the child and we can expect it to be implemented also in their object order.

Discourse topic is itself understudied in its relation to information structure, as studies usually conducted on this matter are on languages in which topic is marked syntactically, such as Chinese (Chien et al. 1985) and French (De Cat 2009). However, as this study shows, discourse topic is a discourse-pragmatic factor that affects word order, maybe even more clearly so than givenness, and it can thus provide inspiration to be used as a relevant factor in future studies on information structure.

This study also investigates referring expressions in relation to discourse topic due to previous research that has shown that children tend to mark givenness on local markers before they do with word order (Hickmann et al. 1996). By setting up a free descriptive task in which the participants are free to refer to the referents as they find best, the task also explores if children mark the given argument with a less informative referring expression.

Summarizing, this study makes a contribution to extending our knowledge of the implementation of pragmatics into discourse, it also adds to our knowledge of Croatian, a rather understudied language especially in the field of language acquisition. This type of setup allows us to observe how, when everything is part of the common ground but with different degrees of salience, both children and adults adapt the pragmatic conditions to their discourse.

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 discourse topic (subject = baseline, DO, and IO). The task made use of storybooks, in which one of the arguments was the discourse topic, while all the other arguments were considered accessible, since they were visually available to the participant and experimenter. The discourse topic was expected to precede the other object, and to be expressed with a pronoun, a clitic, or a null form. Thus, in a storybook about a cat whose friends give her presents to cheer her up (IO = DT), we expect productions like *Miš **joj** baca bombon* (Translation: 'The mouse is throwing **her**-CL a candy'). Conversely,

in a story about a bell that is passed from one character to another (DO = DT), we expect structures such as *Žaba daje **to** ježu* (Translation: '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 referring expressions than with word order.

We have found that Croatian preschoolers are attentive to the discourse properties as they choose the referring expressions accordingly. However, they are not adult-like yet as they overproduce NPs when compared to adults and, more importantly, the discourse pragmatics has no effect on their word order, as the children produce mostly IO-DO utterances throughout the task. Discourse topic has an effect on word order and referring expressions in adults. Like in the studies on other languages, we have found that children are attentive to the discourse but mark givenness more readily through referring expressions. This adds to the indication that children universally start out by marking discourse properties of the argument on the argument itself and in a later stage (not revealed by this study) the pragmatic properties of the argument will affect also information structure.

The paper is structured as follows: section 2 is dedicated to the background, specifically to defining the discourse topic and referring expressions, followed by summaries of the research conducted on the acquisition of the topic-comment structure, and the use of referring expressions in children. Section 3 defines the current study along with our research questions and predictions. Section 4 is dedicated to the methodology. 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).

We adopt somewhat different markers in the current study: for global markers, we focus only on the object order with regard to the topic-comment structure (section 2.1), while for local markers, we extend the list of referring expressions to NPs, pronouns, clitics, and omissions (section 2.2). 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. 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).

A similar result was obtained by two studies conducted on ditransitives, one on Russian and Ukrainian, and the other one on Norwegian, by Mykhaylyk et al. (2013) and Anderssen et al. (2014), respectively. 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), in a corpus study of German child language, found that children are more attentive to their referring expressions than to the object order.

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

In our own study, we have chosen to use ditransitive structures because the impact of ordering the arguments should be greater when two objects are used, than when the subject and an object are compared. This is due to thematic role biases, according to which the subject has been found to be more accessible than the other thematic roles (Arnold 2001).

In Croatian ditransitives, 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. All word orders are attested, and some of them are displayed in example (1); we will only be analyzing the results in terms of IO-DO (1a–c) vs. DO-IO (1d–f).

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

        b.   Marlon   je   Stigu   dao igračku.
            Marlon.NOM is.AUX Stig.DAT gave toy.ACC

        c.   Stigu   je   Marlon   dao igračku.
            Stig.DAT is.AUX Marlon.NOM gave toy.ACC
            'Marlon gave Stig a toy.'

        d.   Marlon   je   dao igračku Stigu.
            Marlon.NOM is.AUX gave toy.ACC Stig.DAT

        e.   Marlon   je   igračku dao Stigu.
            Marlon.NOM is.AUX toy.ACC gave Stig.DAT

        f.   Igračku je   Marlon   dao Stigu.
            toy.ACC is.AUX Marlon.NOM gave Stig.DAT
            'Marlon gave a toy to Stig.'

The referring expressions 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 NPs are considered full expressions, while we will consider the rest of the referring expressions displayed as reduced. In (2), we provide some examples of the sentence in (1), modified with different referring expressions instead of full NPs. The NPs used are either the pronoun or an omission for the subject and a combination of pronouns and clitics for the two objects. Of course, as more factors are added, the possible structures grow exponentially; thus, not all possible variations are displayed. The examples in (2) would all roughly translate to 'He gave it to him' in English, with the arguments being Marlon, a/the toy, and Stig from example (1).

(2)   a.   On   mu   je   dao to   / nju.
            he.NOM him.DAT.CL is.AUX gave it.ACC.PR.N / it- ACC.PR.F

        b.   On   je   njemu   dao to   / nju.
            he.NOM is.AUX him.DAT.PR gave it.ACC.PR.N / it- ACC.PR.F

        c.   On   mu   ju   je   dao.
            he.NOM him.DAT.CL it.ACC.CL is.AUX gave

        d.   Dao mu   ju   je.
            gave him.DAT.CL it.ACC.CL is.AUX

        e.   Dao je   to   njemu.
            gave is.AUX it.ACC.PR him.DAT.PR

        f.   Dao ju   je   njemu.
            gave it.ACC.CL is.AUX him.DAT.PR
            'He gave it to him.'

Thus, while the specific and concrete goal of the current study is to determine whether children and adults integrate the discourse topic in the same way in ditransitive sentences, the big-picture goal is to contribute to the understanding of how information structure, specifically givenness expressed through discourse topic, shapes word order. Additionally, this study provides a better understanding on the acquisition of Croatian, as there currently are no studies on the acquisition of ditransitives or information structure in this language. Therefore, we hope that our research will provide a crucial starting point for future studies on Croatian in this domain.

2.1 (Discourse) topic-comment structure and its acquisition

Givenness and topicality are rather similar notions, as they both relate to something old in the discourse. 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. In the setup of the current study, all arguments can be considered given or at least accessible, thus we need not to worry about the pragmatic overlap of topicality with givenness.

Reinhart (1981) introduced the term *pragmatic aboutness* to address what the topic of a sentence is. The current study focuses on the continuity of a referent as the discourse topic, i.e., what Frascarelli and Hinterhölzl (2007) define as *familiar topics*. We refer to it as discourse topic, 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 discourse topic that we are exploring in the current study: discourse topic is seen as a salient form of givenness, as the discourse topic-referent is constantly given and at the center of attention.

No differences in the positioning of topics and discourse topics have been observed, so we will report both on studies regarding the topic > comment and the discourse topic > comment order. The studies in acquisition rarely relate discourse topic to word order but rather explore how children acquire the grammatical principles for marking the topic in the target language.

Dimroth et al. (2012) is one of the rare studies that explicitly investigated the effect of discourse topic 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 made it the discourse topic). These data were compared to their previous study (Narasimhan and Dimroth 2008), in which the discourse topic was not a variable. The results did not differ, as the children preferred the new > given order regardless of topicality.

Chien et al. (1985) conducted an experiment on Chinese, which is a topic-prominent language. The aim of the task was to investigate if children can access the concepts of grammatical subject and pragmatic topic. In Chinese, the subject and the topic are marked differently in certain constructions, even if they can be co-referential. The study consisted of an 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 coordinate sentences which do not require reference to the subject in Chinese (i.e. "*Grandfather, his beard is very white and (his beard) is also very long*"). The results revealed that the children (age range = 2;6–5;0) did not omit the topic in equi sentences, but they omitted the topic in coordinate constructions. With regard to subject omission, the children omitted it both in equi-type and coordinate sentences. The results thus found that Chinese children

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

are already sensitive to the distinction between subject and topic. However, Chien et al. (1985) state that since the youngest group (2;6–3;0) of children did not omit many subjects or topics, thus leaving the question open whether at this age children have different sensitivity to the subject and topic.

De Cat (2009) investigated how preschool children at different ages (means: 2;11, 4;0, and 5;2) 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 (i.e. *Les cochons, ils, se sont enfuis* – 'The pigs$_i$, they$_i$ have fled.'), which is different from how a non-topicalised subject is expressed (i.e. *Les cochons se sont enfuis* – 'The pigs have fled'). The author tested the children in a topic and a focus condition. The former involved a group of target referents that were introduced simultaneously, after which the child had to describe what each of the targets was doing, making it so that a clitic was not enough to identify the referent. In the focus condition, all referents were new, so the dislocated structure was not expected. The results showed 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 (De Cat 2009), concluding that French children use word order to signal (sentence) topic.

To summarize, previous studies found different effects of (discourse) topic: from no effect (Dimroth et al. 2012), to omission (Chien et al. 1985) or dislocation (De Cat 2009) to signal topichood. However, these latter two mechanisms are specific to the target languages of the respective experiments. It would seem, from the studies cited here, that if the language provides the speaker with a specific mechanism to deal with topics, such as Chinese and French, then the children have no difficulty acquiring it. However, if the mechanisms for topic placement are not explicitly grammaticalized, such as in German (Narasimhan et al. 2008; Dimroth et al. 2012), and thus speakers rely only on pragmatic principles only, children will take more time to acquire the correct placement of topics. Croatian does not provide the speaker with specific mechanisms for signaling topic; and thus the children have to take pragmatics into account, and consequently might incorporate it into their productions significantly less than adults.

2.2 The accessibility of referring expressions

In this study, the choice of referring expressions is used to test for local markers of discourse topics (section 1). A coherent discourse typically includes reference to previously mentioned referents that can be made with different forms (Almor and Nair 2007), and a referring expression is the way a speaker chooses to express a referent in a certain context. This choice is largely dependent on the level of givenness of the said referent in the current stage of the discourse. Thus, speakers use pronouns for already evoked referents; conversely, new referents are introduced with more descriptive forms (Arnold 2010). Approaches like the accessibility theory (Ariel 1988; 1990) and the givenness hierarchy (Gundel et al. 1993) deal with the usage and appropriateness of the referential form in contexts of the discourse. These approaches display various similarities, but they will be outlined in turn. According to Ariel (1988), the degree of accessibility of the antecedents is a crucial factor for choice of referring expression. Accessibility has three hierarchically ordered context types: general knowledge, physical surroundings, and previous linguistic material (Ariel 1988). These are directly related to referring expressions as she designates the contexts having low, intermediate, or high accessibility respectively. Thus, to refer to entities related to general knowledge, referents with low accessibility will be used; these forms have to be informative, and they include proper names and definite descriptions. Referents in the immediate physical surroundings will be expressed with intermediately

accessible forms such as a demonstrative with a noun or a bare demonstrative. Finally, referents that have a linguistic antecedent are preferably expressed with high accessibility markers such as pronouns or omissions. Almor et al. (2007) refer to it as the inverse relation of referring expression and salience of the referent. Ariel (1990) also states that topics have a privileged standing when it comes to the possibility of being accessed by high accessibility expressions. The form to function mapping of the referring expressions is dependent of the expressions that are available in a language, but the inverse proportion of accessibility and informativeness should hold universally. For example, if a language does not allow omissions, pronouns have the highest accessibility, but if omissions are allowed, pronouns will take the lower position with respect to omissions (Ariel 1988).

A very similar view of the issue regarding the choice of referring expressions comes from the givenness hierarchy (Gundel et al. 1993). The proposed idea is that the givenness hierarchy represents cognitive statuses, and not linguistic forms, in which the latter encode the former and provide information on how to access the referent (Gundel et al. 2013). Like the accessibility theory, the referring expressions used in the givenness hierarchy are dependent on the availability of the language. In table 1 the mapping of the referring expressions to the respective cognitive status is presented for English and Russian from Gundel et al. (1993), whereas the mapping for Croatian is approximated based on the Russian distribution of referring expressions. We can assume that the scale for using the referring expressions in Croatian will resemble Russian, since both languages are Slavic, do not have articles, and are subject-drop languages. For the Croatian hierarchy, we take into consideration the accessibility marking scale (Ariel 1990) according to which clitics are more highly accessible than the pronouns resulting in the following scale (of referring expression present in Croatian): Ø > Clitic > Pronoun > Proximal Demonstrative + NP > Distal Demonstrative + NP > Proximal Demonstrative > Distal Demonstrative > Name/Noun. Importantly, In Croatian the clitic is obligatorily placed in second position (Schütze 1994), while the pronoun is freely ordered.

A key aspect of the givenness hierarchy is that higher statuses entail lower statuses, but not vice versa as using an expression for a mental status higher up in the scale leads to unsuccessful communication (Gundel et al. 1993). This means that speakers could 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. However, according to Grice's

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

	High end			Low end		
Cognitive status	In focus	Activated	Familiar	Uniquely identifiable	Referential	Type identifiable
English	Pronoun (*it*)	Dem[3] (*that, this*), Dem proximal + N (*this N*)	Dem distal + *N* (*that* N)	Definite article + *N* (*the* N)	Indefinite *this* + N	Indefinite article + *N* (*a* N)
Russian	Omission, *Pronoun* (*on* 'he'),	Pronoun *(on)*, Dem (*eto* 'this', *to* 'that')	Dem + N (*Eto* N, *to* N)	Noun		
Croatian[4]	Omission, Clitic[5] (on/mu, ga)	Pronoun/Clitic *(on/ mu,ga)*, Dem (*taj, ovaj, onaj*)	Dem + N (*taj/ ovaj/ onaj + N*)	Noun		

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[3] Dem = Demonstrative.

[4] Not provided by Gundel (1993), but an approximation based on what has been claimed for Russian in Gundel (1993) and the ordering of referential expressions in Ariel (1990).

[5] The clitic is not available for the Nominative case (subject).

Maxim of Quantity, speakers make their contribution as informative as required, but not more informative than required (Grice, Cole, and Morgan 1975). Along these lines, Almor et al. (2007) also argue against the over-specificity of discourse by claiming that referring expressions that are more informative are more difficult to process and thus do not serve their purpose when the referent is already salient. The hierarchy in table 1 does not specify the appropriate referring expression 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 discourse topic (Gundel et al. 1993). Therefore, we can safely assume that discourse topic is placed on the highest point of the givenness hierarchy.

The null expression/omission is a special kind of referring expression 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.

Previous studies have shown, the use referring expressions such as pronouns can be related to grammatical functions. For example, Arnold (2001) investigated the use of pronouns in subjects and IOs and 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 recipient (IO), and the present study focuses also on the different referring expressions 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 referring expression is related to grammatical function, so that the IO is preferably expressed as a clitic: in the Croatian Double Object Database[6] (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 (1stSG, 2ndSG, 1stPL, 2ndPL, or reflexive) most of the time (396/430). Note that there is no clitic in the nominative case, so the expression of the discourse topic with a clitic will be limited to non-subject discourse topics in our task.

When it comes to acquiring the system of referring expressions, there are two possible ways in which children can use referring expressions incorrectly: either by being under-informative and thus use pronominal forms when an NP is required, or by being over-informative and use NPs when the use of pronouns is expected. The former is a much stronger violation of the givenness hierarchy, since the hierarchy allows a higher cognitive status to be expressed with a referring expression designated for a lower cognitive status, but not vice versa. Being under-informative can thus lead 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). Consequently, more studies find the over-informative violation.

Most of the studies here employed methods of general and specific questions. The context included a general ("What happened?") and a specific ("What did you do with the ball?") question and the researchers observed the difference in choice of referring expressions in these two conditions. The task in the current study relies both on discourse (i.e. previous mention) and physical presence (available referents in the storybooks); additionally, the narration setting provides the children with a more naturalistic setting for using for using referring expressions.

Campbell, Brooks, and Tomasello (2000) investigated how these two types of questions influence the production of referring expressions in English-speaking children (mean ages: 2;6 and 3;6). The results indicated 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

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

the specific questions. However, the results also point towards an overuse of pronouns, because the responses to the general questions were more frequently pronouns than NPs in both age groups. Tedeschi (2008) also applied this methodology on Italian children aged 2;6–6;5. Her results show a progression from under-informativeness to an almost adult-like use of referring expressions.

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. Matthews et al. (2006) expanded the methodology and added the conditions of *perceptual availability* and *prior mention*. This relates much more closely to the accessibility theory, namely the distinction that Ariel (1988) postulated between physical surroundings and previous linguistic material. 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 mention had more effect on the referring expression choice than visual accessibility, confirming the hierarchy between the two context postulated by Ariel (1988).

From these studies, we can conclude that children are rather over-specific than under-specific in their use of referring expressions, 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 referring expression choice.

3 The current study

In the previous sections we have outlined how children have been cross-linguistically found to mark givenness with local markers before they do so with global markers. The current research considers discourse topic a manifestation of givenness. The research conducted on (discourse) topic is rare and usually centered on the mechanisms for topic specific to that language and not general information structure principles according to which topic should precede comment. The current research does exactly that: we are testing how the discourse topic shapes information structure (i.e. object order/global marker). The purpose of this study is two-fold: revealing whether a pragmatic notion such as givenness shapes information structure in Croatian and if yes, are Croatian preschoolers adult-like in accommodating the pragmatically more felicitous order. We need to check this for Croatian adults as previous claims and findings are divergent, and we need to have a good baseline. If children do not do this, two explanations are possible: either they are not attentive to this pragmatic factor or simply fail to implement it.

The present study takes into consideration also the local markers, expressed through referring expressions, and tests how discourse topic affects both of these markers in child language. If children express the discourse topic through a less descriptive expression, it entails that they take givenness into account, but fail to mark it at a syntactic level.

Thus, this task provides crucial insight for the comparison of the two types of markers in children, but also explores the effect that givenness has on the general mechanisms of information structure. Since in the task all the referents are visually available to the interlocutors (section 4), the setup of the task levels the grounds for the concept of non-shared assumptions (Schaeffer 1999). Thus, the child did not have to make assumptions of a referent

known only to them as part of the common ground. This allowed us to observe how children implement givenness without having to consider what they consider to be the common ground of the discourse along with the possible mis-judgments of the listener's assumptions.

Additionally, the data from the adult control also shed light on the dynamics of information structure in Croatian on which so far divergent effects were reported.

3.1 Research questions and predictions

Our task was guided by the following research questions:

1. Do Croatian children use the discourse topic > comment order to express the topic?
2. Are Croatian children more likely to express the discourse topic argument with a high accessibility Referring expression?
3. Is the use of a Referring expression related to grammatical function (S/DO/IO) by the Croatian speakers?
4. Are there any differences between Croatian children and adults?

Our first prediction relates to what has been already pointed out in the literature, mainly that children integrate local markers more readily than global markers (Hickmann et al. 1996; Mykhaylyk et al. 2013; Anderssen et al. 2014). We have no reason to postulate that Croatian children will behave differently, but an overall preference for the discourse topic-comment order is generally expected. However, more consistency is expected in the adults than in the children, as previous research has shown that children might struggle with the correct topic placement (Dimroth and Narasimhan 2010).

For our second research question, in light of previous findings on the children's use of referring expressions, we predict that the discourse topic object will be expressed with a high accessibility marker (pronoun or clitic) in both types of speakers. The discourse topic is also more likely to be omitted, based on the given object omission results obtained by Mykhaylyk et al. (2013) and Anderssen et al. (2014). If the children do not use referring expressions 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 2.1.1), children are more likely to over-use NPs. We make no predictions whether Croatian children will fit this general pattern.

We expect to find a relation between referring expression 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 discourse topic; 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 forthcoming a). 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.

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 discourse topic with object order, but they will use more reduced expressions to express it.

Thus, the combination of argument order and their respective referring expressions gives us eight possible outcomes in the target structures. These are summarized in table 2. 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.

The majority of occurrences are expected to fall within the discourse topic-comment order; we also expect the discourse topic to be expressed as a pronoun or clitic, because

Table 2: Possible combinations of object order and referring expressions.

Discourse topic-comment	Comment-discourse topic
Reduced-reduced	Reduced-reduced
Reduced-full	Reduced-full
Full-full	Full-full
Full-reduced	Full-reduced

it is introduced in the context before the target utterance; consequently, we expect that the majority of occurrences to be reduced-full and reduced-reduced combinations. We do not expect to find full-reduced combinations in the discourse topic-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-discourse topic 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-discourse topic order depends on what the speakers pay more attention to: the discourse topic (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 discourse topic. If the speakers pay more attention to the latter, however, the pronoun will precede the full expression due to harmonic alignment (Gundel et al. 1993; Collins 1995; Bresnan, Cueni, Nikitina, and Baayen 2007), and this will result in a discourse topic that follows the comment and is expressed with an NP, thus making its salient status in the discourse very opaque. Overall, we do not expect many of these combinations to occur, because the full-reduced (comment- discourse topic) order violates pronominality order, while the reduced-full (comment- discourse topic) order completely fails to signal the discourse topic.

An additional factor most likely affecting productions is animacy. The task in this study did not balance animacy, more precisely the two objects never have the same animate/inanimate value as all the targets had the prototypical animacy configuration (IO-animate, DO-inanimate). A recent study by Velnić (Forthcoming b) found a strong influence of animacy on object order in ditransitives in Croatian, more so in children than in adults, causing the animate IO to be placed first irrespective of whether it was given or not. Thus, we may expect to find that children prefer the IO-DO order in the current task due to the animacy of the IO. This also means that there might be less deviation from the expected object order when the IO is the discourse topic, than when the DO is the discourse topic. 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, since the results indicate a possible effect of animacy, this will also be discussed in the results section.

4 Methodology

The experiment was a semi-controlled elicitation task, using three storybooks, each one with a different grammatical function as the discourse topic: the subject (S), the IO, and the DO. Since we are interested in how discourse topics influence the ordering of the objects in ditransitive structures, the DT-S condition is used to establish a baseline order of IO and DO, when neither object is the discourse topic and both of them are new in every target image. Because the storybooks were 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) according to which 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 referring expression with which an argument is expressed depends, among other factors, on contextual saliency. Thus, the discourse topic should be the most salient argument, as this is what the discourse is about.

The animacy values of the arguments were constant in all three discourse topic conditions. The main reason for not balancing animacy in the task was that IO-animate and DO-inanimate is the most naturally occurring situation, which we wanted to maintain throughout the task. This posed a limit to the task, as animacy has been found to have a decreasing effect with age (Snyder 2003), and thus children of preschool age included in this study were likely to pay a lot of attention to animacy. Nevertheless, the inclusion of a fairly high number of child participants (n = 58), the investigation of the effects of discourse topic on two levels (local and global), and setting the discourse topic both as the animate (S,IO) and inanimate referent (DO), have provided us with clear tendencies of how children integrate discourse topics in their discourse.

4.1 Materials

The task consisted of three storybooks, each with a different argument as the discourse topic (S, IO, and DO). The storybooks were specifically designed for this task. The referents were different in each story, in order not to allow referencing across the stories.[7]

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 discourse topic is the subject, the IO and the DO, respectively. The target images are shaded in grey.

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

Table 3: Subject as discourse topic (baseline condition): *Bob the generous squirrel.*

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.

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[7] The materials for the task can be found openly available at https://marta.velnic.net/downloads/story-books-eliciting-ditransitives-different-arguments-discourse-topic, please refer to this paper if you wish to use them.

Table 4: Indirect object as discourse topic: *Mina the grumpy cat.*

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.[8]
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 5: Direct object as discourse topic: *The story of the lost bell.*

| 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.

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.

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[8] 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.
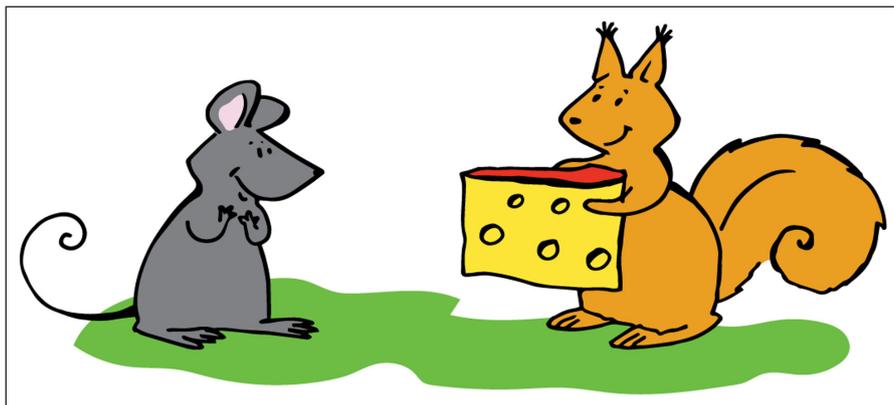
Figure 1: Bob the squirrel gives some cheese to a mouse (DT-S condition).
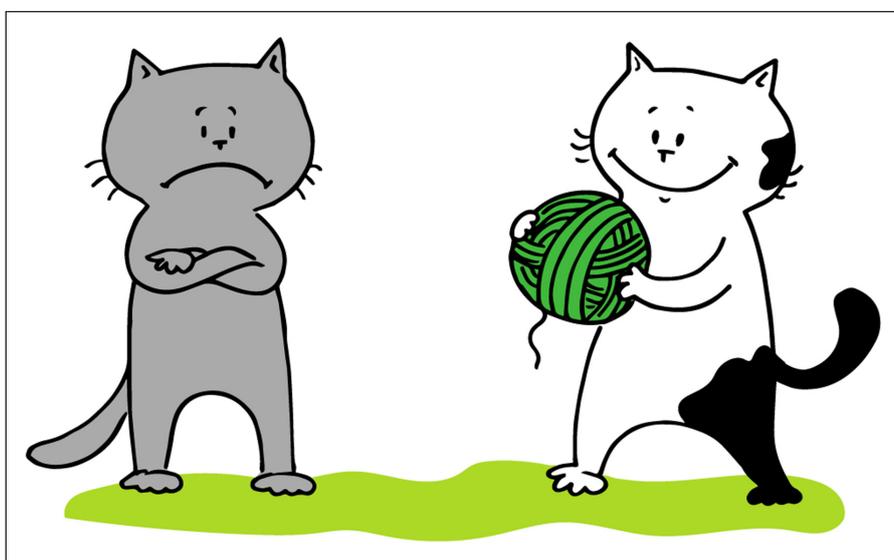
Figure 2: A cat gives Mina a yarn (DT-IO condition).
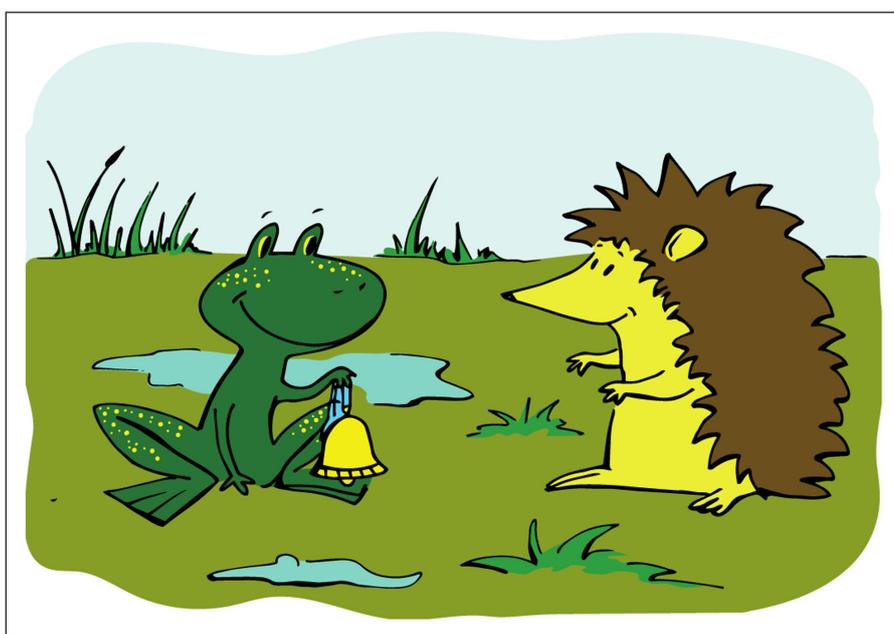
Figure 3: The frog gives the bell to the hedgehog (DT-DO condition).

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 audio recordings 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 3–5); 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, Machler, Bolker, and Walker 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 referring expressions with regard to the discourse topic. In each of these models, the participant and image order were set as random effects. The order of the story 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 discourse topic condition and the group (children vs. adults) were the dependent variables.

From these models, we learned that the discourse topic 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.

(3)   DT-S condition (Child #36)
        a. 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.'

        b. 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.'

        c. I   maci   je   dao[9] mlijeko.
            and cat.DAT is.AUX gave milk.ACC
            'And to the cat he gave some milk.'

        d. I   majmunu   je   dala bananu.
            And moneky.DAT is.AUX gave banana.ACC
            'And to the monkey he gave a banana.'

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

(4)   DT-DO condition (Child #16)
        a. 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.'

        b. Vrana   je   uzela zvono   psu.
            crow.NOM is.AUX took bell.ACC dog.DAT
            'The crow took the bell from the dog.'

        c. 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.'

        d. Ona   to   daje njemu.
            she.NOM it.ACC gives him.DAT
            'She is giving it to him.'

        e. Onda je   ježić   to   dao maci.
            then is.AUX hedgehog.NOM it.ACC gave cat.DAT
            'Then the hedgehog gave that to the cat.'

(5)   DT-IO condition (Child #4)
        a. Miš   joj   je   dao slatkiše.
            mouse.NOM her-CL.DAT is.AUX gave sweets.ACC
            'The mouse is giving her sweets.'

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[9] 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.

b. Kako je   druga   mačka je   poklonila od uža
   how is.AUX other.NOM cat.NOM is.AUX gifted   of rope.GEN
   lopticu.
   ball.ACC (it was a yarn)
   'How the other cat is giving her a ball of yarn as a gift.'

c. I   sad joj   je pas   poklonio stablo.
   and now her.CL.DAT is.AUX dog.NOM gifted   tree.ACC (it was a branch)
   'And now a dog is giving her a tree as a gift.'

d. Poklonila joj   je za košarku   loptu.
   gifted   her- CL.DAT is.AUX for basketball.ACC 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 discourse topic 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 discourse topic*

Our first step in the analysis of the data is to see how the discourse topic affected word order, without considering referring expression. Figures 4 (adults) and 5 (children) show the distribution of IO-DO and DO-IO word orders in the three discourse topic conditions. Naturally, structures in which one of the objects has been omitted do not yield object
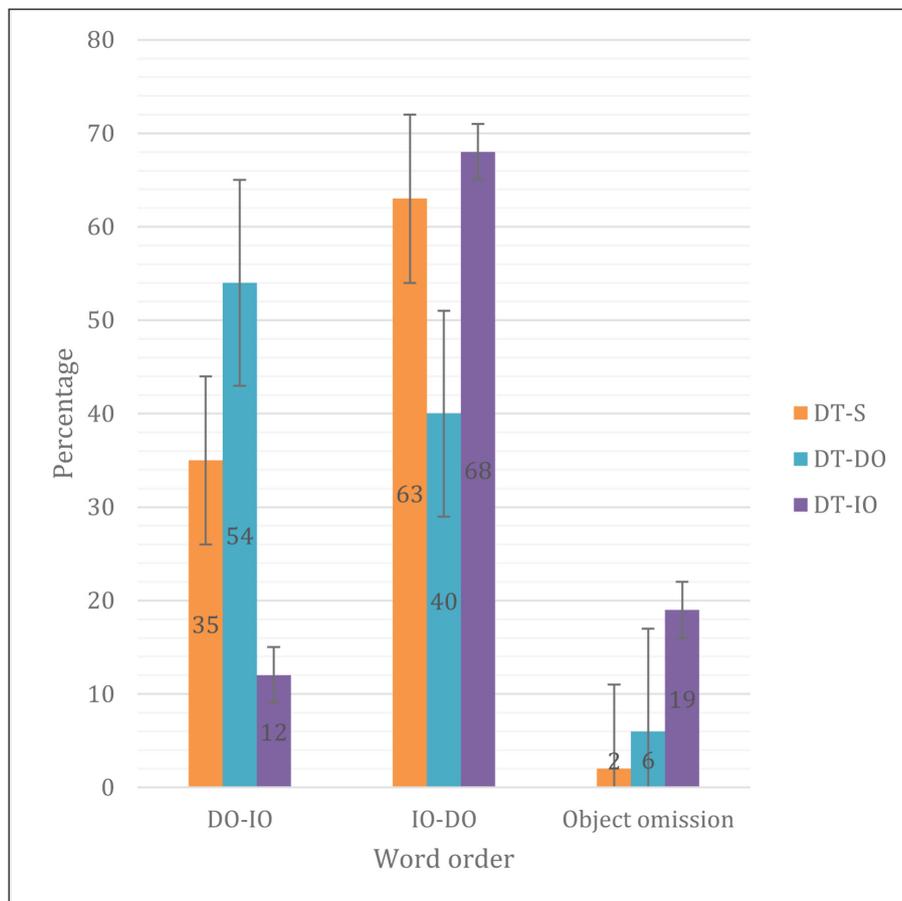
Figure 4: Adult word order distribution (all REs).
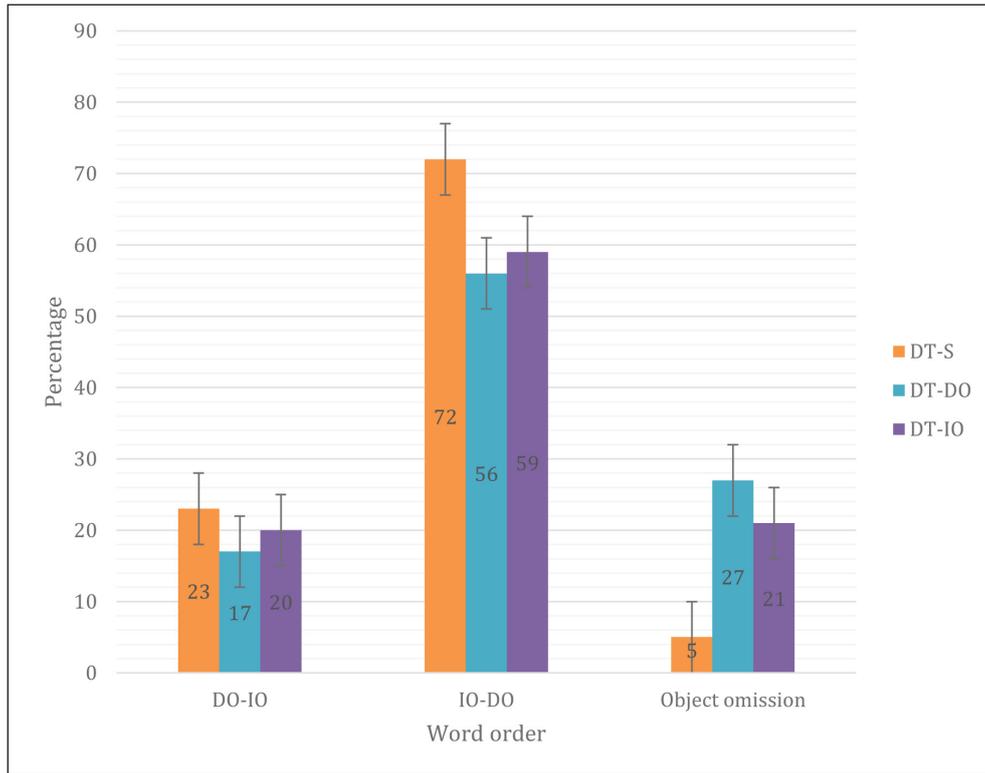
Figure 5: Children's word order distribution (all REs).

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

	Odds. ratio	Standard error	z-ratio	p.value
DT-S vs. DT-IO	0.188	0.07	−4.395	<0.001
DT-S vs. DT-DO	3.684	1.33	3.611	<0.001
DT-IO vs. DT-DO	19.594	9.014	6.467	<0.001

order. Nevertheless, the proportions in figures 4 and 5 are represented by taking into consideration all responses, including omissions. This provides a full overview of the adult and child productions. Omissions are discussed in section 5.4. The raw data can be found in the Appendix (tables A4–A5). The standard errors in the figures in the following sections were obtained by conducting least squares means on the respective models.

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 discourse topic 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).

The data from table 6 shows that the distribution of word order is significantly different for each condition, entailing that the discourse topic 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 discourse topic, and it decreases when the IO is the discourse topic.

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

	Odds. ratio	Standard error	z-value	p.value
DT–S vs. DT–IO	1.16	0.351	0.509	NS[10]
DT–S vs. DT–DO	0.800	0.292	−0.610	NS
DT–IO vs. DT–DO	0.686	0.275	−0.939	NS

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

	AIC	BIC	p.value
Without Group	1125.2	1165.3	<0.05
With Group	1122.4	1167.5	

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 object order in the two target conditions 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 discourse topic. We now move on to observing what the pairwise comparison revealed for 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 discourse topics. 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.

Nevertheless, clitics in Croatian are syntactically fixed in second position, which dictates word order, therefore the effect of the discourse topic on word order will be best observed if we only take NPs into consideration (figures 5 and 7). Note that, in the following figures, the proportions are calculated based only on NPs; other referring expressions (including omissions), were not taken into consideration.

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.

From table 9, we can see that the difference between DT-S and DT-IO is less pronounced. This is due to the exclusion of the omissions, which were significantly more numerous in the DT-IO condition than in the baseline. Consequently, the distribution of IO-DO in the DT-IO 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 while table 11 confirms that the word order is still significantly different in adults and children.

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[10] Non-significant.
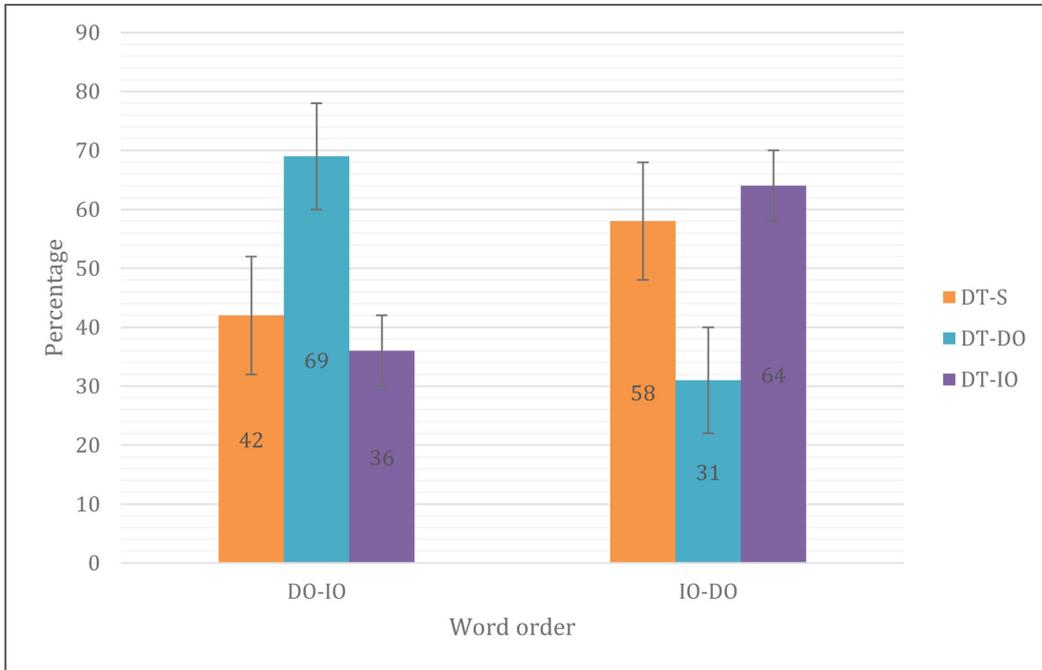
Figure 6: Adult word order distribution (only NPs).

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

|	Odds. ratio	Standard error	z-ratio	p.value
DT-S vs. DT-IO	0.288	0.149	−2.404	<0.05
DT-S vs. DT-DO	7.169	3.26	4.332	<0.001
DT-IO vs. DT-DO	0.04	0.255	−5.051	<0.001
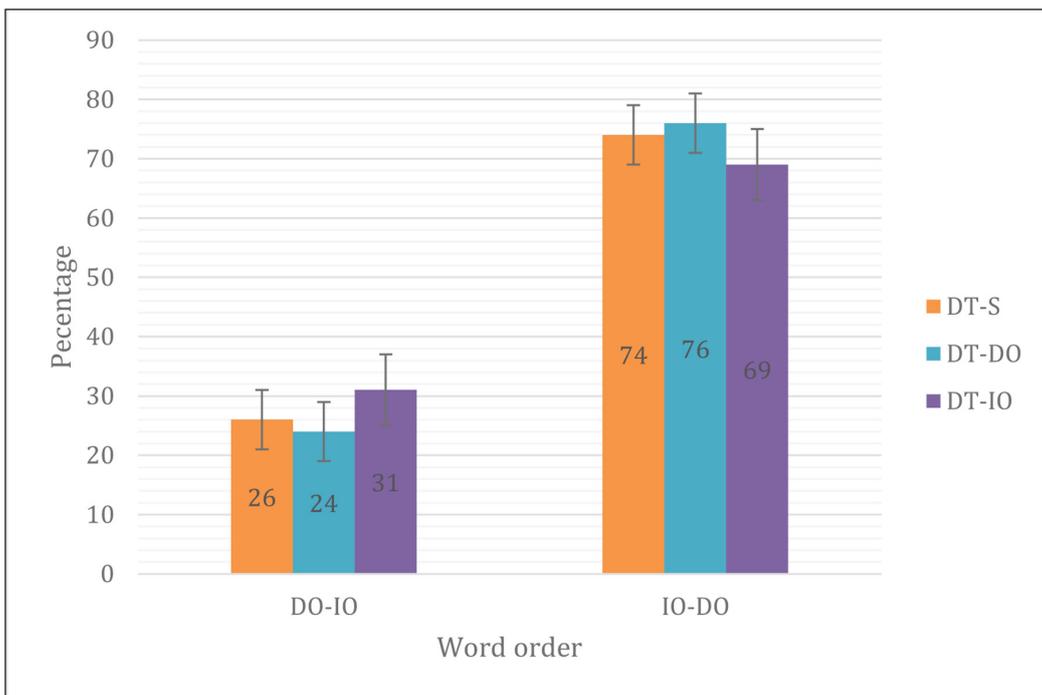
Figure 7: Children's word order distribution (only NPs).

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

	Odds. ratio	Standard error	z-value	p.value
DT-S vs. DT-IO	1.29	0.453	0.750	NS
DT-S vs. DT-DO	0.888	0.341	−0.308	NS
DT-IO vs. DT-DO	1.461	0.653	0.848	NS

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

	AIC	BIC	p.value
Without Group	825.18	867.38	<0.01
With Group	818.11	865.01	

As the results in table 10 illustrate, the children do not display any object order difference between the three conditions. This means, as is obvious from figure 5, that the children's tendency to use IO-DO does not vary depending on which argument is the discourse topic (givenness). Possible reasons for this will be discussed in section 6.

The results in this section have revealed that the discourse topic 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 discourse topic, but the effect is most pronounced in the DT-DO condition, because the adults also tend 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.

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 referring expressions.

5.4 Distribution of omissions with regard to discourse topic

In figure 5 in the previous subsection, 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. The error bars are not displayed here as this is merely a graphical representation of the data and no statistical analysis has been conducted on the dataset on omissions only. Like for figures 4 and 5, the whole dataset is taken into consideration for the totals.

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 discourse topic 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 discourse topic into account and they omit it more frequently.
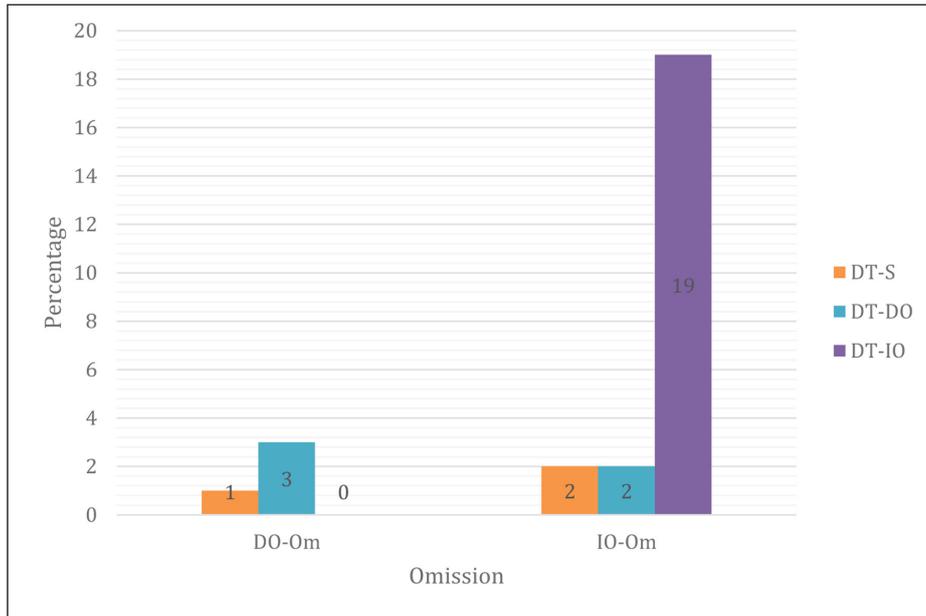
**Figure 8:** Proportion of omissions per condition in the adult data.
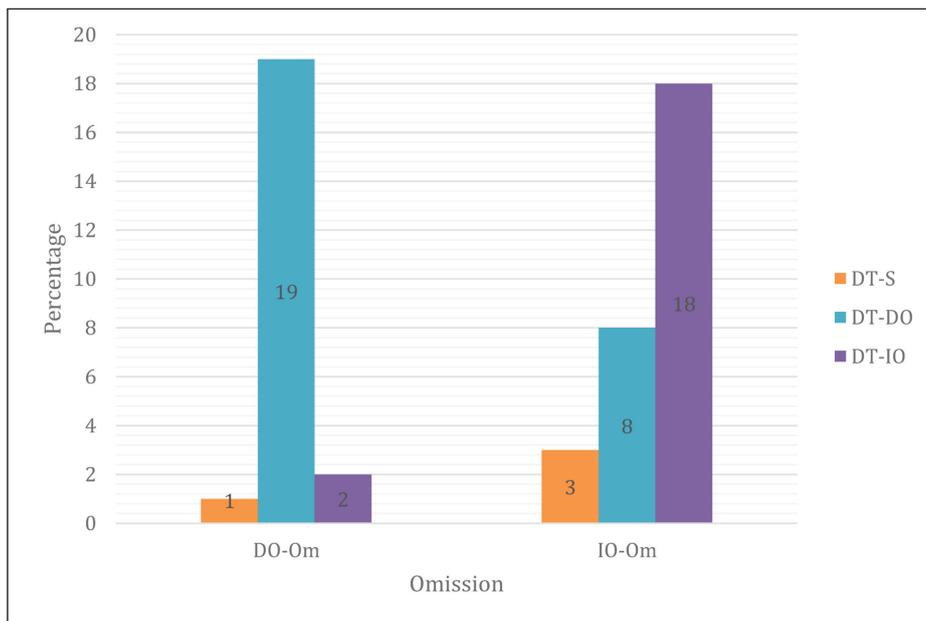
Figure 9: Proportion of omissions per condition in the child data.

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

5.5 Impact of discourse topic on referring expressions

In this section, we analyze how the referring expression of an argument changes when it is the discourse topic, or when compared to the conditions where it is not the discourse topic. The following figures provide an overview of referring expressions for each grammatical function and the circled bars signal the discourse topic.

Figures 10a–10c clearly show both how each grammatical function is preferably expressed with a certain referring expression, and also that the referring expression is less likely to be expressed as an NP, when it is referring to the discourse topic. Thus, the S is expressed either as an NP or is omitted, but omissions happen more often when the S is the discourse topic.
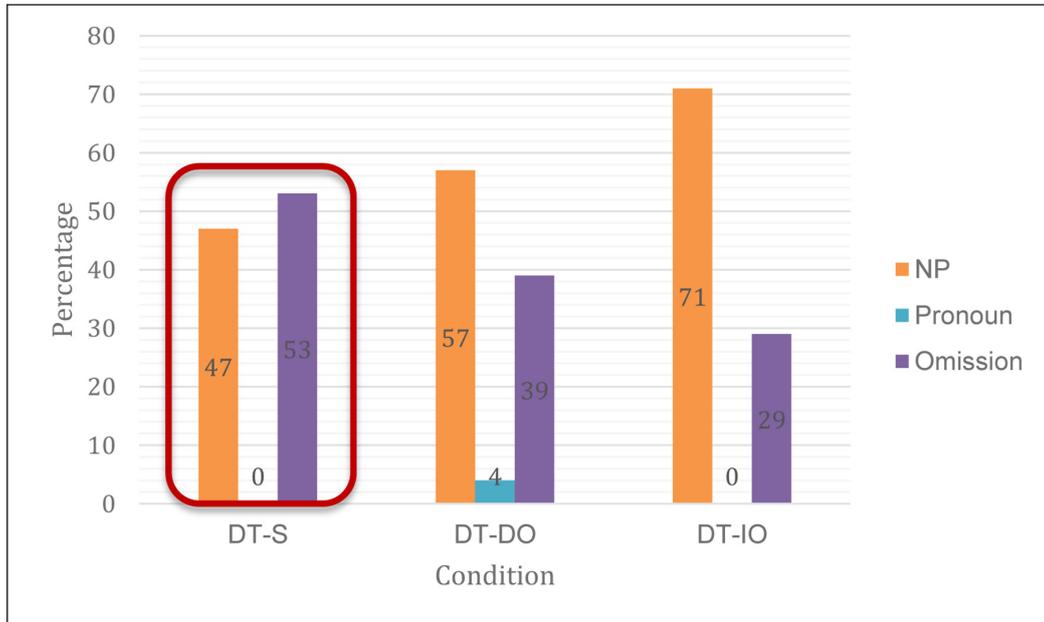
Figure 10a: Referring expressions used by adults to realize the S in the different discourse topic conditions.[11]
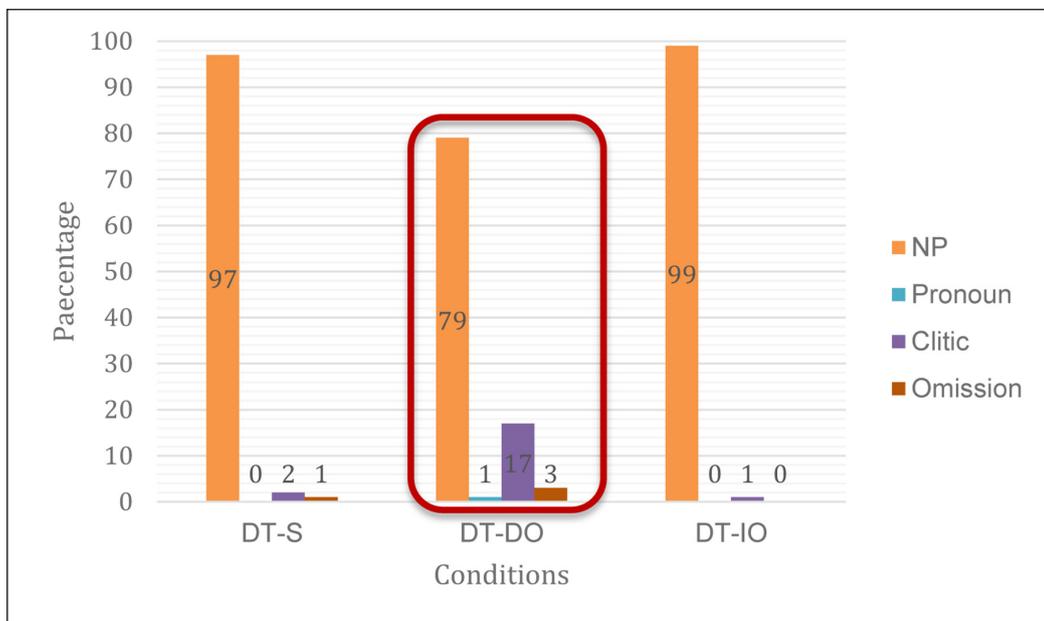
Figure 10b: Referring expressions used by adults to realize the DO in the different discourse topic conditions.
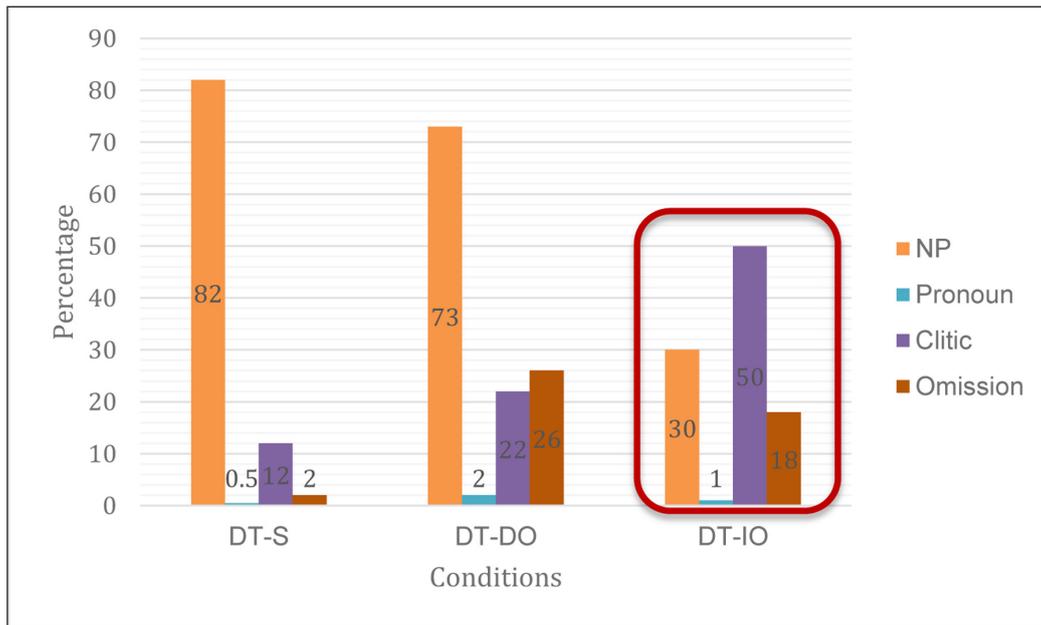
Figure 10c: Referring expressions used by adults to realize the IO in the different discourse topic
conditions.

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

	Odds. ratio	Standard error	z-ratio	p.value
DT–S vs. DT–IO	1.081	0.350	3.088	<0.01
DT–S vs. DT–DO	−1.949	0.529	−3.681	<0.001
DT–IO vs. DT–DO	−3.030	0.412	−7.341	<0.001

Similarly, the DO is also most preferably expressed as an NP, but less so when it is the discourse topic, 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 discourse topic, as it is frequently expressed with a reduced expression (pronoun, clitic, omissions). The statistical analysis is provided in table 12; the model is set up with the referring expression 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.

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 discourse topic. The comparison between the S and DO being discourse topics 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 discourse topic. 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 discourse topic. The statistical analysis shows that all of these differences are significant.

Now we will move on to consider the use of referring expressions in the child data. Figures 11a–11c provide an overview of referring expressions used for each grammatical function. The circled bars signal the discourse topic.
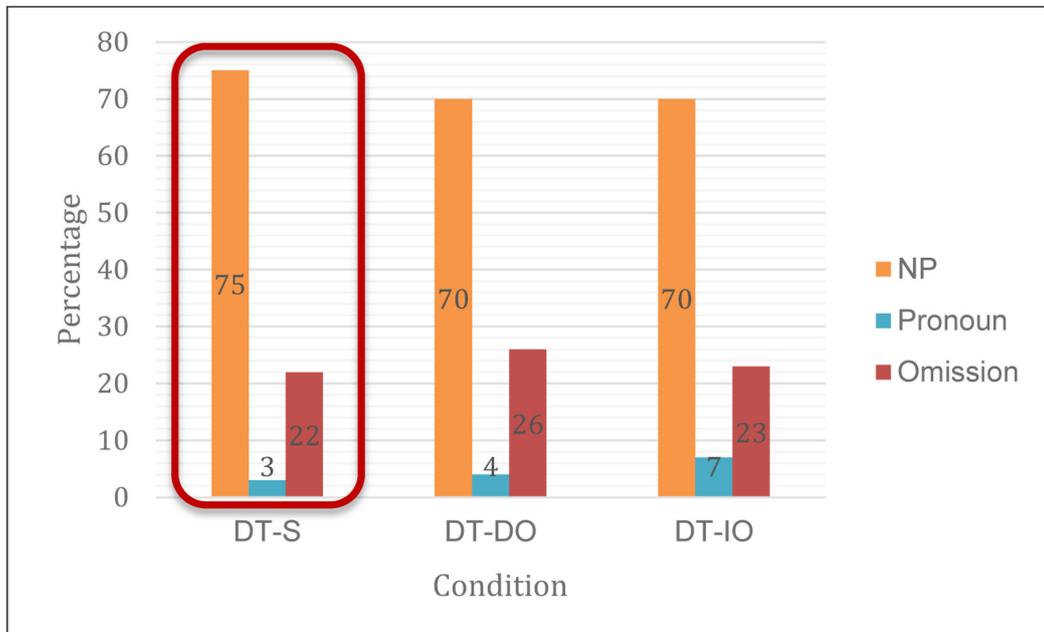
Figure 11a: Referring expressions used by children to realize the S in the different discourse topic conditions.
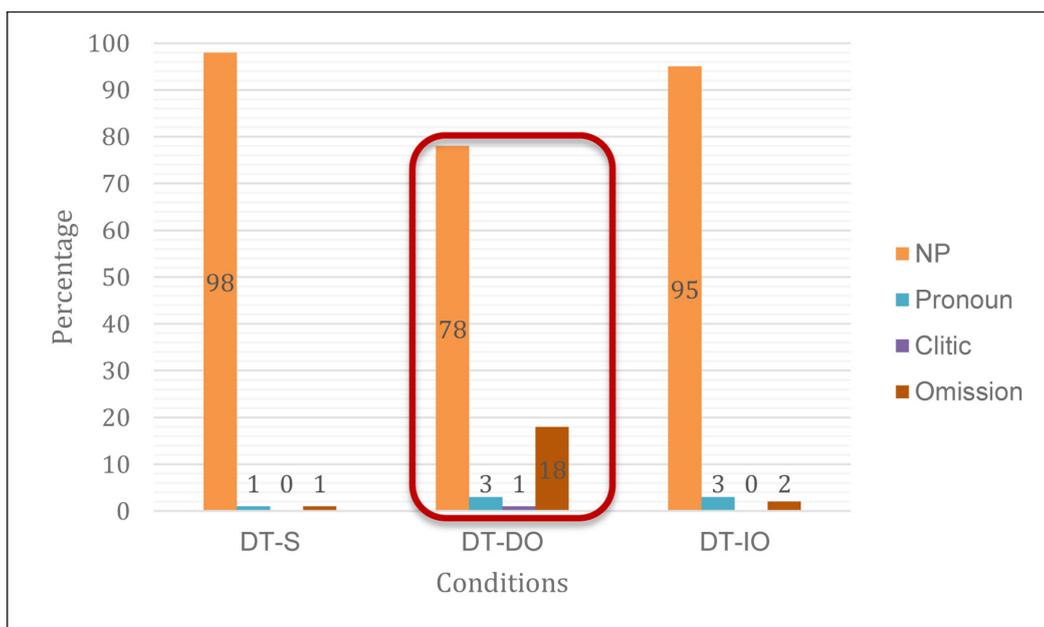
Figure 11b: Referring expressions used by children to realize the DO in the different discourse topic conditions.

The children do not seem to be sensitive to whether the subject is the discourse topic or not, since there is no change in the referring expressions with respect to the discourse topic condition (figure 11a). As in adults, the DO is mostly expressed with an NP, but again it is less likely to be expressed by an NP when it is the discourse topic (figure 11b). Finally, the IO is expressed much more frequently by a reduced form when it is the discourse topic (figure 11c), 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 referring expressions 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.
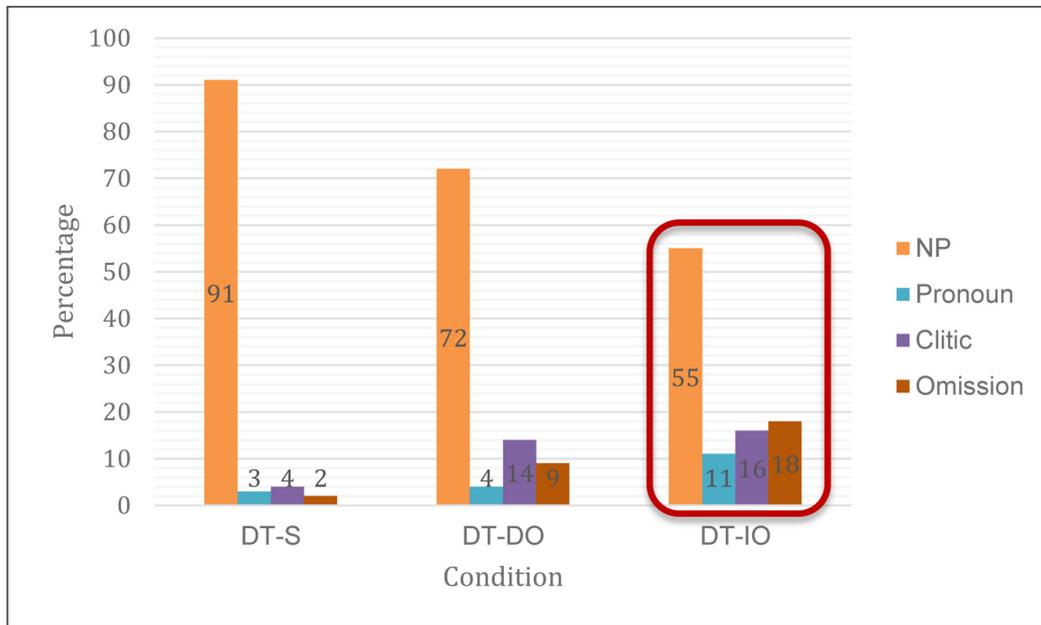
Figure 11c: Referring expressions used by children to realize the IO in the different discourse topic conditions.

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

	Odds. ratio	Standard error	z-value	p.value
DT-S vs. DT-IO	1.349	0.314	4.296	<0.001
DT-S vs. DT-DO	−0.040	0.498	−0.081	NS
DT-IO vs. DT-DO	−1.389	0.345	−4.027	<0.01

Just as in the case of the adults, a pairwise comparison within group was conducted (table 13), on the likelihood of each grammatical function to be expressed as an NP when it is the discourse topic.

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 discourse topic. This analysis examines the type of referring expression only when the argument in question is the discourse topic. However, figures 11a and 11b show that, even though NPs are used at the same proportion for the subject discourse topic and the DT-DO, the DO is reduced more in the DT-DO condition with respect to the other conditions. This does not happen to the S, 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 discourse topic. This entails that both children and adults express the DO significantly less with NPs when the DO is the discourse topic.

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

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

	AIC	BIC	p.value
Without Group	1399.7	1441.0	<0.001
With Group	1390.0	1436.5	

Children and adults obviously use referring expressions 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 referring expressions 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 discourse topic status of the subject, but they decrease the use of NPs of the DO when it is the discourse topic, thus reaching the same proportion of referring expressions 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 surfaces from the figures and most likely has influenced the result in the table 14, is that children, unlike adults, do not express the DO with a clitic. This could be related to the inanimacy of the DO, as Fukumura et al. (2011) found a correlation between animacy and referring expressions 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

Overall, we have found key differences between adults and children. Croatian children were found to behave in line with previous results obtained for other languages thus this task adds to the body of research according to which marking givenness through referring expressions before doing so with information structure is cross-linguistically stable. Thus, the reason for this might be universal. A possible explanation is that children use a certain syntactic structure in a language due to it being more economical, underlying, or more frequent and need to learn to deviate from it in specific contexts. The rearranging of a structure is complex, whereas using a certain referring expression instead of another is not in comparison. More investigation is needed to see how the alternate orders emerge, whether it is more readily in conditions when the use of different referring expressions is not an option, or do they emerge as a consequence of taking pronominality and weight into account as factors affecting information structure.

We will address our research questions posed in section 3 in turn, but discuss research question 4 (the differences between children and adults) as a part of each research question.

Our first question was regarding the use of object order by Croatian children to mark the discourse topic. We predicted that, due to what has been previously reported, children would be more consistent in marking the discourse topic through referring expressions than through object order, while we expected adults to be consistent with both types of markers. The study found that discourse topic 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. Thus, no local marking of discourse topic was found in the Croatian children. 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 forthcoming b).

The second question regarded the referring expression of the discourse topic. The results confirmed our prediction: the discourse topic argument was more likely to be reduced in the child data. Naturally, the adults also singled the topic with high accessibility expressions. Nevertheless, there were some differences between children and adults, as the children were not sensitive to the discourse topic 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. The results also found that children produce more NPs than adults overall, but simultaneously they omit more objects (figures 4 and 5). 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 referring expression. The use of the extremes of the scale should be sought in and compared to other studies in order to see whether this is a cross-linguistic phenomenon thus entailing that children firstly employ the extremes and start developing the scale at a later point.

Research question three was regarding the preference of expressing a grammatical function with a specific referring expression. The prediction was that there would be a relation, more precisely that the discourse topic subject would have a tendency to be omitted, while the discourse topic 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 it is the discourse topic. The subject 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. A surprising finding related to referring expressions is that pronouns are almost never used, especially in the adult data. Pronominal use was expected to occur for the reduced subject, since the clitic is not an option, but for both speaker groups, the productions were divided between full NPs and omissions. The subject has the highest omission rate, very 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. 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 referring expressions 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). Thus, the form-to-function mapping of referring expressions in Croatian is dependent on the accessibility of the referent, as proposed by the accessibility theory (Ariel 1988; 1990), but also on the grammatical function of the argument (Arnold 1999). Croatian children take both of these levels into consideration, but are not adult-like in either: they are over-specific in their referring expressions with respect to adults, and do not use clitics for expressing the DO, whereas the adults do. This could also be related to animacy as Fukumura and van Gompel (2012) suggested that animate entities are more likely to be expressed with pronouns, in our case clitics.

Overall, the study found a difference between Croatian children and adults with regard to marking the discourse topic, as Croatian adults used both means available in the task, while the children did not use object order to signal the discourse topic. As predicted, adults were more consistent with object order marking than children, and children were more attentive to referring expressions. A possible reason for the general tendency for children to start marking givenness locally is that the choice of the referring expression

depends only on the status of that referent, whereas the global marker, information structure, takes all the arguments into account as saliency us a competitive property (Arnold 1999).

The possible object order (discourse topic-comment/comment- discourse topic) and referring expression (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 discourse topic-comment order, and that the discourse topic would be reduced, with the non-discourse topic object being expressed with either an NP or a reduced expression. The occurrences that are realized with the comment- discourse topic order are expected to have both full-full and reduced-reduced referring expressions. Both full-reduced and reduced-full combinations within the comment-discourse topic order are expected to be rare. Nevertheless, these combinations could provide an understanding into whether the speakers pay more attention to the status of the discourse topic (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 discourse topic both through form and position). Tables 15 to 18 depict the answers, divided by group and discourse topic-condition. The word order and referring expression's combinations that show a (complete) disregard for the discourse status of the discourse topic are marked by shaded cells.

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

	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 16: Adult answers in the DT-IO 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 17: Children's answers in the DT-DO 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 18: Children's answers in the DT-IO 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

Again, we can see that the adults use more discourse topic-comment constructions than comment-discourse topic 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 7 in the previous section already indicated that children do not vary their word order production according to what the discourse topic is, but they are more prone to signaling this by omitting the discourse topic object.

As predicted, when speakers use the discourse topic-comment structure, they do not produce the comment with the reduced form and the discourse topic 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 discourse topic-comment order, while children do this rarely (n = 6).

When the comment-discourse topic 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-discourse topic order. This kind of production is, however, only present in the DT-DO 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.

It was previously mentioned how animacy is a relevant factor for object ordering in Croatian (Velnić Frothcoming b), and in tour task 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 forthcoming a). Moreover, as Velnić (forthcoming b) 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 referring expression (Fukumura et al. 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 study found that Croatian children do not use word order to signal givenness, in our case manifested as discourse topic, and instead they use mostly the IO-DO order, which entails that they are not using global markers to signal givenness. Of course, the use of this structure might be attributed to the IO being animate across the task. The effect of discourse topic is, however, seen in adults, as the discourse topic-comment structure is used most of the time, but adults also over-use the IO-DO structure when the DO is the discourse topic. Thus, we can say that the adult controls are also sensitive to the animate-inanimate order, but nevertheless accommodate the topic-comment structure. The fact that children do not conform to the topic-comment structure could be an effect of their stronger sensitivity to animacy.

Nevertheless, Croatian children were found to signal what is given in the discourse by expressing the discourse topic with a referring expression with high accessibility. This is most obvious from the omissions, as children omit the discourse topic more than the other arguments. Children omit much more than adults (figures 8 and 9), but these omissions are related to discourse topic.

We can conclude that, in Croatian, the referring expression 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 for other languages (Hornby 1971; Dimroth et al. 2012). Croatian children use IO-DO with the same proportion throughout the task, but mark what is given (the discourse topic) 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 givenness hierarchy and to what is accessible in the discourse, but are still in the process of acquiring the fine-grained distinctions, and are for the moment just using the two extremes of the givenness hierarchy. They are, nevertheless, sensitive to the various referring expressions that can be used for different arguments, as they follow the same reduction pattern as the adult controls. Therefore, the effect of discourse topic and the pragmatic functions related to it, such as givenness, are first expressed through referring expressions, 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 in Croatian.

Abbreviations

ACC = Accusative case, AUX = Auxiliary, CL = Clitic, DAT = Dative case, DEM = demonstrative, DO = Direct object, IO = Indirect object, N = Noun, NP = Noun Phrase, NOM = Nominative case, PR = Pronoun

Additional File

The additional file for this article can be found as follows:

- **Appendix.** Preliminary statistical results and raw data. DOI: https://doi.org/10.5334/gjgl.529.s1

Competing Interests

The author has no competing interests to declare.

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