The Effects of Animacy and Givenness on Object Order in Croatian Child Language

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Abstract: This study investigates how givenness and animacy influence object order (IO-DO vs. DO-IO) in ditransitive constructions in Croatian child language. We have conducted an elicitation task with 59 monolingual Croatian children (mean age = 4;4) and 36 adult controls (mean age = 21), in which the participants were asked to describe images depicting ditransitive actions. These actions differed with regard to givenness (DO given, or IO given) and animacy (IO animate, or both IO and DO animate). Both groups demonstrated an animacy effect, manifested as a significant increase of DO-IO productions when both objects were animate, compared to when only the IO was; adults presented DO-IO preference at ceiling level. Givenness had a statistically significant effect (p-value < 0.01) only in adults, but both groups were affected by the givenness of the DO. This paper supplies arguments to support previous indications that (1) DO-IO is the underlying order in Croatian ditransitives, and (2) that children do not have an IO-DO preference as has been reported by previous studies conducted on case-marking languages.

1. Introduction

This study investigates how a semantic and a pragmatic factor, animacy and givenness respectively, are reflected in object order in ditransitive structures in Croatian pre-schoolers and adults. In ditransitive structures in Croatian, both object orders—indirect-direct object (IO-DO) and direct-indirect object (DO-IO)—are grammatical and attested. However, word order is sensitive to animacy and givenness, and thus IO-DO and DO-IO are used in different contexts. According to the principles of information structure, the animate argument should precede the inanimate argument, while given (old) information should come before new information (Birner and Ward 2009). IO-DO has been found to be frequently produced in corpus data by adult speakers (Velnić 2018, forthcoming), but adult speakers of Croatian were nevertheless found to have a preference for DO-IO when animacy and givenness were controlled for (Velnić 2019).

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We have tested 59 monolingual Croatian children (mean age = 4;4) and 36 adult controls (mean age = 21) with an elicitation task in which ditransitive sentences were elicited through images. The givenness of the recipient (IO) and the theme (DO) were manipulated throughout the occurrence of the respective referents in the target pictures, and reinforced with pictures of the same referent, before presenting the next target picture. The subject and IO were always animate, while the animacy of the DO was manipulated (inanimate vs. animate). This setup provided two animacy conditions: the prototypical animacy condition (IO-animate and DO-inanimate), and the balanced animacy condition (both objects animate).

The results show that both children and adults were sensitive to animacy, as the occurrence of DO-IO order was considerably increased when both objects were animate, compared to the condition in which only the IO was animate. Givenness was not found to be a statistically significant factor in the child data, but it had an effect on the adults' productions. This givenness effect was confined to the condition of the given DO, as the givenness of the IO did not affect object order production. A closer look at the child data also suggests that children pay more attention to the givenness of the DO. We found a marginal significance when applying a test different than for the adults. Children displayed a new > given preference in the prototypical animacy condition, but the trend of responses changed when the animacy was balanced and showed an inclination towards given > new.

The paper is structured as follows: in the background section, we describe ditransitive structures in Croatian, and provide a summary of the animacy-first order and the given-before-new principle, along with previous child language studies. Next, we formulate our research questions and lay out the predictions. The methodology and the results sections follow. In the discussion section, the results are examined in relation to our predictions. A brief summary concludes the paper.

2. Background

In this section we outline the literature necessary for formulating the research questions and predictions. We focus on ditransitive structures, animacy, and givenness.

2.1. Ditransitive Structures

Ditransitive structures are comprised of three arguments: the subject, the direct object (DO), and the indirect object (IO). The main interest of this study is the relationship between the DO and the IO. Various languages have different strategies for arranging the two objects. If a language has overt case marking,

such as Croatian, both object orders are possible, as shown in example (1). Croatian uses the accusative case to express the theme (DO) and the dative case to express the recipient (IO). Languages with no overt case marking, like English, have two different structures used to convey the different object orders, like in example (2).

(1) a. Marlon daje Stigu jabuku.
Marlon$_{NOM}$ give$_{PRES.3SG}$ Stig$_{DAT}$ apple$_{ACC}$
'Marlon is giving Stig an apple.'

b. Marlon daje jabuku Stigu.
Marlon$_{NOM}$ give$_{PRES.3SG}$ apple$_{ACC}$ Stig$_{DAT}$
'Marlon is giving an apple to Stig.'

(2) a. Marlon gave Stig an apple. (Double Object Dative—DOD)

b. Marlon gave an apple to Stig. (Prepositional Dative—PD)[1]

Corpus data have revealed that both adults and children use IO-DO more frequently than DO-IO (Velnić forthcoming).

A structural variation in ditransitives is present in a very limited portion of the Croatian lexicon, appearing only with three verbs: (*po*)*nuditi* 'offer', (*po*)*služiti* 'serve' and *pokloniti* 'give as a gift' (Zovko-Dinković 2007). The alternative expresses the recipient with the accusative and the theme with the instrumental case. An example of the two structures using 'offer' is presented in example (3).

(3) a. Marlon je ponudio Stigu jabuku.
Marlon$_{NOM}$ AUX offer$_{PST.SG}$ Stig$_{DAT}$ apple$_{ACC}$

a′ Marlon je ponudio jabuku Stigu.
Marlon$_{NOM}$ AUX offer$_{PST.SG}$ apple$_{ACC}$ Stig$_{DAT}$

b. Marlon je ponudio Stiga jabukom.
Marlon$_{NOM}$ AUX offer$_{PST.SG}$ Stig$_{ACC}$ apple$_{INS}$

b′ Marlon je jabukom ponudio Stiga
Marlon$_{NOM}$ AUX apple$_{INS}$ offer$_{PST.SG}$ Stig$_{ACC}$
'Marlon offered an apple to Stig.'

[1] Croatian also allows PP constructions, but only in cases where it is intended as a change of location, and not a change of possession (e.g., *Ivan je bacio loptu prema Ani* 'John$_{NOM}$ threw ball$_{ACC}$ towards Anna$_{DAT}$', in which case we do not expect Anna to catch the ball). These structures are not elicited in the current task but have occurred when both objects were animate, most likely due to an interpretation of a caused motion (Levin 2008). These occurrences were excluded due to the weight of the PP.

This possibility of case alternation is why 'offer' was chosen as one of the verbs to be elicited in our task.[2]

Gračanin-Yuksek (2006) includes three word orders in her analysis by also taking into consideration the location of the verb (V). We have displayed the VID order in (1a) and VDI in (1b); the third order analyzed by Gračanin-Yuksek (2006) is when the IO precedes the verb (*Marlon Stigu*$_{DAT}$ *daje loptu*$_{ACC}$). Gračanin-Yuksek (2006) suggests that VDI (1b) and IVD are base-generated orders, while VID (1a) is structurally ambiguous. Thus, both IO-DO (IVD) and DO-IO (VDI) are underlying under this analysis. However, a contextual approach used in Velnić (2019) has found that DO-IO is strongly preferred when the two factors are controlled for.

Conversely, as we will see in section 2.3 regarding the literature review on ditransitive structures in child language, children have been shown to have an IO-DO preference (Höhle et al. 2014; Mykhaylyk, Rodina, and Anderssen 2013), which differs from what has been found for the adults of the respective languages (Røreng 2011; Titov 2017) and Croatian adults (Velnić 2019). The aim of our study is to control for animacy and givenness and observe the effect they have on object order, as well as to determine which is the most used order when these two factors are neutral.

2.2. The Effect of Animacy on Word Order and its Acquisition

As previously mentioned, the animacy of a referent does not vary based on the context of discourse: if a referent designates an animate being, it will be animate, regardless of whether it has already been given or whether it is in focus. It is a semantic, not a pragmatic, property that shapes information structure. Animate entities are conceptually highly accessible and thus easier to retrieve (Branigan, Pickering, and Tanaka 2008). Animate entities are also more likely to be prominent in the discourse because discourse prominence is related to the speakers' empathy, and animate entities are more eligible than inanimate entities to be prominent (Malchukov 2008).

There is a vast body of research that indicates that animacy influences word order in the direction of animacy-first, which means that animate arguments precede inanimate ones. However, few studies have investigated it in relation to ditransitives, which is our focus here.

Kempen and Harbusch (2004) conducted a corpus study on German di transitive sentences. In German the theme and the recipient are marked as in Croatian. The authors checked the order of each of the possible pairs of gram-

[2] The alternating structure (accusative-instrumental) in example (3b) failed to be elicited in the children, most likely due to the low frequency of this structure; the adult controls had only produced it twice in the task. Thus, this structure is disregarded for the rest of the analysis.

matical functions included in a ditransitive structure (S & DO, S & IO, DO & IO) in relation to animacy, and they found a direct influence of animacy on word order: An inanimate IO was unlikely to precede the subject, but when both subject and IO were animate, the distribution of S-IO and IO-S was at chance level. This observation was made for the subject and the IO in ditransitives, as the DO was not animate.

In ditransitive structures, animacy is closely linked to the IO, as prototypically the recipient is animate, and the theme is not (henceforth, prototypical animacy). Thus, the IO should be in a privileged position, appearing as the first object. However, if animacy were the only factor at play, we would rarely see realisations of the DO-IO order in any language. But that is not what happens, as DO-IO occurrences were found in Croatian corpora (Kovačević 2004; Kuvač Kraljević and Hržica 2016), albeit to a lesser extent than IO-DO.

Studies on animacy in child language suggest that animacy is acquired rather early, since children from around the age of two are able to distinguish animate from inanimate NPs in an adult-like manner (de Marneffe et al. 2012). Like in adults, an obvious effect of animacy is noticed in the studies of active/passive use, with preference for passive sentences when only the patient is animate (Lempert 1989).

With regard to the effect on ditransitive structures, Cook (1975) conducted an act-out task with a wide age range of English-speaking children (ages 5–10), and presented evidence that the comprehension of ditransitive sentences is better when the animacy is prototypical than when it is not.[3] Moreover, both configurations with unbalanced animacy (IO-animate/DO-inanimate and DO-animate/IO-inanimate) were better comprehended than the constructions with balanced animacy (both objects animate, or both inanimate).

Snyder (2003: 56) has shown that young children (around the age of three) are very attentive to animacy in their choice of ditransitive structure and rely less on animacy as they grow older. Snyder's (2003) corpus data (from English and Tahitian French) suggest that, as children rely less on animacy, other factors influence their word order choices. She argues that children use animacy as a stand-in for information status, until they are able to grasp what constitutes given information for the interlocutor. The fact that animacy is more relevant at a young age suggests that there will be a difference between children and adults regarding the relevance of this factor in determining word order.

[3] The configuration of inanimate IO and animate DO was constructed by a simple rotation of the 'giving' relation of the test objects, such as 'give the man to the book', a sentence that would have been very unlikely outside the experimental setting.

2.3. The Effect of Givenness on Word Order and its Acquisition

Many languages are subject to the given-before-new principle (henceforth given > new), which entails that if all other factors are equal speakers will prefer to place the information that is familiar to the listener first and place the new information later in the sentence (Birner and Ward 2009).

The given > new principle originated for the Slavic languages with the Prague school of linguistics (Firbas 1964), and the effects of this factor are still debated. More precisely, divergent implications were made on how strict the principle is in the case of Czech: strict (Kučerová 2012) or less strict (Šimík, Wierzba, and Kamali 2014). Kučerová (2007) suggests that in Czech only SVO, the basic word order, can be used in a variety of contexts, while other word orders must be used only in contexts that relate to the givenness values of their elements. In Kučerová (2012), the research is expanded to Russian and Serbo-Croatian;[4] her claim is that in these languages givenness is always marked, with given elements preceding new ones, and a new > given order is argued to be ungrammatical. The analysis provided by Šimík, Wierzba, and Kamali (2014) for Czech is less strict, and the authors claim that given objects can occur anywhere in the sentence, excluding the final position, which receives default main sentence stress.

More specifically for Croatian, Velnić (2019) found a givenness effect in an acceptability-judgment task on word order choice conducted on adult speakers. In this experiment, IO-DO structures were considered more acceptable when the IO was given, while the DO-IO order was judged better in conditions when the DO was given or when neither object was given. Note that both of these orders are perfectly well-formed and their acceptance depended solely on the context which they appeared in. Conversely, the data from Velnić (2014) indicate that IO-DO is predominant in oral communication, with many fewer cases of the DO-IO order being attested (child directed speech: 60/304 occurrences were DO-IO; children: 19/258 occurrences were DO-IO). Velnić (forthcoming) analysed a portion of these data and found limited occurrences of new > given in the child data (2/12 of DO-IO occurrences); the adult data displayed only the given > new order.

Ditransitive structures can accommodate given > new with the DO-IO order when the theme is given, and with the IO-DO order when the recipient is given. Clifton and Frazier (2004) and Brown, Savova, and Gibson (2012) (for English) along with Kizach and Balling (2013) (for Danish) have shown that having a given > new order facilitates sentence processing for DOD but not for the PD—examples (2a) and (2b) above. It has been suggested that discourse information is incorporated into the structure of the DOD, but not into that of the PD, and thus the DOD has constraints on how the given and new infor-

[4] Kučerová's (2012) term.

mation is ordered, allowing only for given > new (Brown, Savova, and Gibson 2012). Kizach and Mathiasen (2013) have also found that native Polish speakers learning Danish as a second language acquire the native Danish pattern quickly, implying that Polish has the same givenness asymmetries between DOD and PD as Danish. In languages that do not have different structures for dative alternation, such as German and Russian, it has been found that DO-IO is the canonical order (Røreng 2011 for German; Titov 2017 for Russian), due to its wide contextual applicability, while the IO-DO is either contextually motivated (Røreng 2011) or signals a meaning not available to the DO-IO (Titov 2017). While both of these studies dealt with the background/focus distinction rather than the given/new distinction, their findings are still applicable in terms of which word order is the underlying one.

Studies conducted on the effect of givenness on child language have reached divergent results, and there is still no general consensus regarding the age when givenness is in place. According to Schaeffer and Matthewson (2005), children have difficulty with implementing givenness in word order, because they lack a pragmatic concept that allows them to systematically distinguish between their own beliefs and the beliefs of the interlocutor. They refer to this as the concept of Non-Shared Assumptions.[5]

However, there is a clear division in the research conducted on the givenness effect in ditransitive sentences, and it is dependent on some key characteristics of the target language: whether the language has dative alternation, that is, two syntactic structures such as the English double object dative and prepositional dative (example 2a–b), or whether it has case marking, for example accusative for the theme and dative for the recipient like Croatian. Studies on languages with dative alternation have found an effect of givenness, whereas studies in the latter group have found a preference for IO-DO. We will provide a description of each of these studies in turn.

One of the studies on a dative alternating language, English, has already been mentioned in section 2.2 with regard to its results on animacy: in a corpus study Snyder (2003) found a progressive effect of givenness on word order in ditransitive sentences. Before the age of seven, the givenness effect is noticeable, but other factors—such as animacy and weight—are more important in determining word order, and the corpus even contains new IOs being placed before the DO at ages six and seven (Snyder 2003: 53). At age seven, givenness becomes the most relevant factor for object placement, but the children are not adult-like yet. The author does not state explicitly in which proportion the two object orders are attested in the corpus, so we cannot conclude which word order is preferred.

A clearer effect of givenness was obtained by Stephens (2015) with elicited production tasks. She found that four-year-olds tend to produce given > new

[5] Referred to also as Non-Shared Knowledge in Schaeffer (1999).

orderings in their dative constructions. In conditions with given themes (DO), children consistently produced the PD (DO-IO order); when the recipient (IO) was given, the participants were more likely to produce a DOD (IO-DO order) (2015: 416). The same pattern was found in the adult controls (2015: 424). This is consistent with the studies on adult language referred to above, which found a stronger givenness effect on given themes compared to given recipients (Clifton and Frazier 2004; Kizach and Balling 2013).

Anderssen et al. (2014) conducted a semi-spontaneous production task on Norwegian children (ages 4–6). Like English, Norwegian exhibits the DOD and PD distinction. The authors find a givenness effect: the theme-given context yielded the PD structure most of the time, while the recipient-given condition was divided among PD and DOD productions, with the latter still being produced much more than in the theme-given conditions.

Among the studies that found a preference for IO-DO, Mykhaylyk, Rodina, and Anderssen (2013) analysed the distribution of IO-DO/DO-IO in ditransitive structures in Russian and Ukrainian three- to six-year-olds. The responses with no omissions were mostly expressed in the IO-DO order with very little variation across the two givenness conditions. Nonetheless, there was an observable difference with age, as the older children used more DO-IO in the theme-given condition, but IO-DO was still the generally preferred object order. This suggests that Russian and Ukrainian children did not integrate the context in their ditransitive productions.

Höhle et al. (2014) conducted a test on German five-year-olds in which they checked how faithfully the children reproduced ditransitive structures that violated word order (*ACC-DAT)[6] or definiteness (*indef-def) constraints. They found that children faithfully reproduced sentences with no violations, but in the case of violations they reproduced definiteness violations more readily than word order violations. This means that they faithfully reproduced the constraint-respecting IO-DO sentences, but the constraint-violating DO-IO sentences were also often reproduced as IO-DO. This shows that keeping IO-DO is more relevant than having the definite NP precede the indefinite NP. Givenness is not identical to definiteness, but they are related properties, as the given argument can be expressed with a definite NP while a new argument is not likely to be expressed with a definite NP. However, the target sentences were provided in isolation, and a wider context might have strengthened the givenness effect as opposed to only marking it with a definite/indefinite article.

None of the studies above balanced animacy, using only the prototypical animacy configuration: IO-animate and DO-inanimate.

Croatian is like Russian, Ukrainian, and German regarding how the theme and recipient are marked. The predominance of the IO-DO order is

[6] They assume that IO-DO is the unmarked order.

evident from the corpus data, as an analysis of the Double Object DataBase (Velnić 2014), based on (Kovačević 2004), shows a predominant use of the IO-DO order in both children and child-directed speech. Velnić (forthcoming) analysed this database and found that children use both given > new and new > given word orders. However, the corpus data had limited instances of combinations of given and new objects, as most of the objects were accessible. An overview of these studies is provided in Table 1 on page 94.

Since Croatian marks the theme and the recipient like the languages in the latter group, i.e., by case marking and no dative alternation, we should expect that IO-DO would also be the preferred word order amongst Croatian children, and they might choose to produce it even when the givenness context is set up against it.

3. Research Questions and Predictions

The purpose of this study is to reveal which object order is the underlying one. By neutralising givenness and animacy, we can also establish whether these factors are triggers for movement. The study will also provide insight into which object order adult speakers use in set conditions. We will be able to compare adults and children, and thus observe whether they have the same tendency in neutral conditions and whether the two factors affect object order to the same extent.

The research questions are the following:

1. Do adults have a DO-IO preference in production as well?
2. What is the underlying object order in child language?
3. Are givenness and animacy triggers for movement in child language?
4. Do the triggers have an equal effect in the two groups of speakers?

In relation to our first research question, adults were found to have a preference for DO-IO when givenness and animacy were neutral. In the study reported on here, the role of adults is mainly as a comparison group for the children. In comparison to the acceptability judgment task from Velnić (2019), the results will provide insight on whether their preferences are the same in a production task. We thus expect a majority of DO-IO orders when animacy is balanced; nevertheless, the various givenness conditions are still expected to play a role in this setting.

With regard to the second research question, in a number of previous studies (section 2.3) a preference for the IO-DO order was noticed in children's productions. The languages that this was noticed for were case-marked, as

Table 1. Overview of the findings from this section

Study	Language	Dative Alternation	Case Marking	Age Range	Task	Givenness Effect on Word Order	Object Order Preference
Anderssen et al. (2014)	Norwegian	Yes	No	4–6	Production	Yes	PD (DO-IO)
Stephens (2015)	English	Yes	No	3;10–5;4	Production	Yes	PD (DO-IO)
Snyder (2003)	English	Yes	No	3;3–8;1	Corpus	Yes, increasing with time	NA
Höhle et al. (2014)	German	No	Yes	4;5–5;6	Production	Yes, but weaker than the word order effect[7]	IO-DO
Mykhaylyk Rodina, and Anderssen (2013)	Russian and Ukrainian	No	Yes	3–6	Production	Weak	IO-DO
Velnić (forthcoming)	Croatian	No	Yes	0;10–3;2	Corpus	No	IO-DO preference

[7] The sentences that violated the definiteness order were reproduced faithfully more frequently than the sentences that violated the DAT(IO)-ACC(DO) order, so there was an effect of givenness, but children were more likely to keep the preferred word order than to violate the definiteness order.

is Croatian, and as a result we might expect the same outcome in our task. However, as animacy was not balanced in the aforementioned studies but it is in a subset of our data, we mainly expect a majority of IO-DO productions when the IO is animate; whereas when both objects are animate we expect the children to be more adult-like.

Our prediction for the third question relates to the literature in sections 2.2 and 2.3. Since children were found to be very attentive to animacy in previous studies, we expect this to be a strong factor for movement. Givenness on the other hand might not be as strong due to the concept of non-shared assumptions (Schaeffer and Matthewson 2005) described in section 2.3.

Finally, the predictions for the last two research questions are intertwined. In light of previous discussions we expect children to be more attentive to animacy than adults (Snyder 2003) and their grasp of givenness not to be adult-like yet (Schaeffer and Matthewson 2005). In terms of object order, this will result in children producing more IO-DO orders in conditions of prototypical animacy. However, in relation to the condition where both objects are animate, we are unable to make any sound predictions. If the preference for IO-DO holds, then children should still produce a majority of IO-DO also when the DO is animate. Conversely, if they are aware of the underlying status of DO-IO, they will produce DO-IO more often, compared to the prototypical condition. The former outcome would confirm the preference for the IO-DO order, while the latter would be in favour of the high status of animacy as a trigger for movement. We expect adults to be more attentive to givenness throughout the task.

4. Methodology

In this section we outline the setup of the task used in our study.

4.1. Design

Our experiment tests two conditions of animacy and four conditions of givenness in order to check the effect of these factors as well as their interaction resulting in different object orders.

As mentioned before, I refer to the two animacy conditions as prototypical animacy (IO-animate and DO-inanimate) and balanced animacy (both animate). Animacy is set up as a binary feature, animate/inanimate: the referents of the task were either anthropomorphic animals or inanimate objects (e.g., a cat or an apple).

The four possible givenness conditions are the following: none of the characters are given (No-G); the DO is given (DO-G); the IO is given (IO-G); or all arguments are given (All-G). A referent is considered given if it has

been mentioned in the discourse. Thus in any first image of an experimental set, nothing is given, because none of the referents had the opportunity to be mentioned before. Following that, if the DO from the previous image is present again, this creates the DO-G condition; if the IO from a previous image is repeated, we have the IO-G condition. The conditions were each illustrated by one action image, with the exception of the No-G condition, which consisted of two images: one in which no argument was given and another in which the subject was given. They were merged under the No-G condition because in both of these conditions neither object is given and the givenness of the subject is not relevant for the current study.

This experimental design was inspired by the puzzle task developed by Eisenbeiss (2011) for eliciting a broad range of case-marked forms including double objects in German. Eisenbeiss's (2011) method consisted of a puzzle board with cut-outs containing images depicting various actions and puzzle pieces with the corresponding pictures to be put in the cut-outs. The children had to ask for the puzzle pieces corresponding to the pictures on the board and, since the pictures contrasted minimally one form the other, they were encouraged to mention all of the characters present in each picture. This method has proven to be successful, as it was engaging for the child and target structures were easily obtained. In order to control for givenness and animacy, we hereby adapt the method by setting up the conditions mentioned in the previous paragraph. The main difference from the original task is that here the participants begin with an empty puzzle board, and the images are provided by the experimenter.

The task consisted of a repeated-measures design, as for each value of animacy there is a variation of the four givenness types (2 x 4 = 8), and the aim of the task is to observe the interaction of the two factors. This was obtained through different sets of images, each one aiming to elicit a different verb. The set had either prototypical animacy (verb = *give*, *offer*) or balanced animacy (verb = *send*). Each set contained all givenness conditions presented, in the order as specified above (1. No-G; 2. DO-G; 3. IO-G; 4. All-G). The sets depicted a ditransitive action with the verbs *dati* 'give', *nuditi* 'offer', and *slati* 'send', respectively. The rationale behind the choice of verbs is that the verb 'give' is the most frequent ditransitive verb both in adult and child language (Kovačević 2004; Velnić 2014); the verb 'offer' was chosen because it can yield structural dative alternation of case (Zovko-Dinković 2007),[8] as briefly described in section 2.1. Lastly, 'send' was chosen in order to allow for balanced animacy, since it can accommodate an animate DO. Thus, the factor "verb" is not a variable of the design but merely a factor that allows us to set the animacy conditions of prototypical and balanced. By including also the possibility of dative alter-

[8] This alternation was not present in the children and had only two instances in the adult data.

nation, we have unfortunately rendered our design unbalanced, since in this configuration we have two sets of images with prototypical animacy and only one where animacy is balanced. An outline of the conditions is displayed in Table 2.

Table 2. Overview of the conditions in the task

Given DO	Given IO	Animate DO[9]
–	–	–
+	–	–
–	+	–
+	+	–
–	–	+
+	–	+
–	+	+
+	+	+

Object order is the dependent variable of the design, as the responses were labelled and analysed based on the object orders produced in the respective conditions. We will discuss the findings regarding our research questions based on this result.

4.2. Participants

A total of 59 monolingual Croatian children between the ages of 3;7 and 5;2 (mean age = 4;4, 26 males) were included in the task. We chose this age range because it is similar to the range used in previous studies that tested ditransitives (Anderssen et al. 2014; Höhle et al. 2014; Mykhaylyk Rodina, and Anderssen 2013; Stephens 2015). The children were recruited from four kindergartens in Rijeka, all part of a larger kindergarten group under the same administration. The parents had to sign an informed consent form in order for the children to participate.

The adult group functions as a background comparison group. It consisted of 36 participants aged 19–28 (mean age = 21, 8 males). The participants were required to have been born to Croatian speaking parents and to have 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 at

[9] The IO was always animate.

a local bookstore for their participation. The participants were recruited at the Psychology and Law department of the University of Rijeka.

4.3. Materials

The materials for the experiment consist of the images depicting ditransitive actions (action images), images of single characters that are meant to fortify the givenness effect (single images), and the image board. All the images were printed on white Plexiglas. An example of the images is depicted in figures 1 below and 2 on the following page.

The action images depicted actions of transfer, and were divided into the three sets as already mentioned. Each set (n = 3) contained five action images (total = 15),[10] one for each givenness condition. The images were shaped differently from one another, and each set had one image corresponding to one shape on the board. We have also controlled for directionality: the order in which the referents (e.g., the agent and the recipient) are drawn varies (either left to right, or right to left), with the DO always placed in the middle in order to provide a clear depiction of the referents' interactions.

The single images depicted one of the referents present in the action images. Their role was to reinforce the givenness condition, as they were presented in-between action images and contained a referent present in the

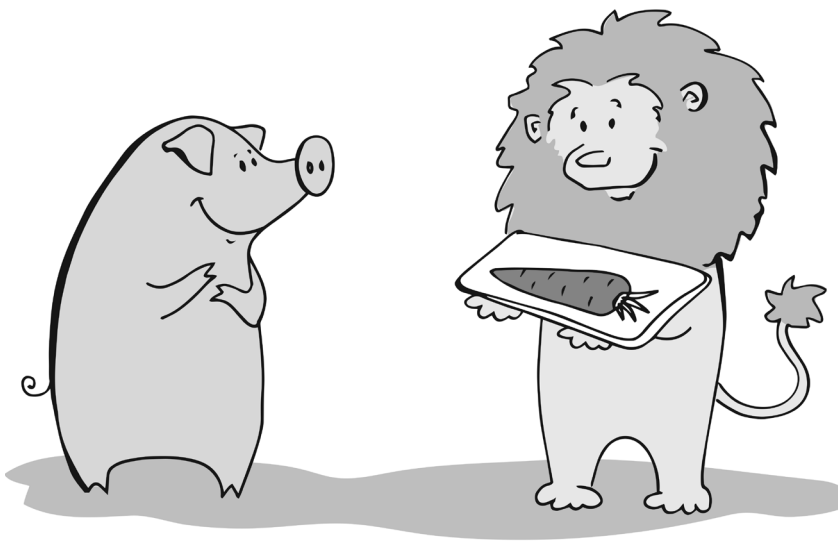

Figure 1. Action image (from the 'offer' set)

[10] Recall from section 4.1 that the No-Given condition consisted of two images.

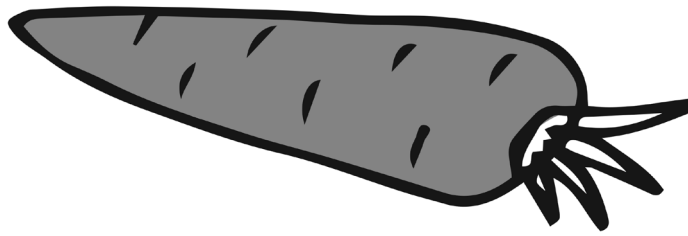

Figure 2. Single image (from the 'offer' set)

previous and in the following action image. Each set contained four single images (total = 12).

All these images had to be placed on the board. The image board consisted of two wood planks attached to one another, with the top one containing five differently-shaped slots, one for each action image. At the bottom of the board there was a small shelf designated for the single images (subject, theme, or recipient) that reinforce which one is given in the following action image. An example of the board with some images placed on it is provided in figure 3 below.

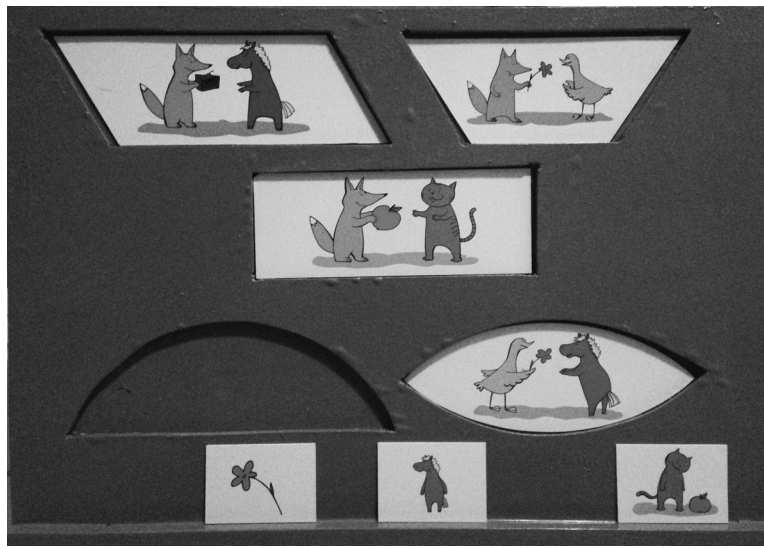

Figure 3. Photograph of the image board with some images on it.[11]

[11] NB: The way the images are placed on the board in the photograph does not exemplify a real situation in the experiment

4.4. Procedure

All the sessions were audio recorded. The recordings took place in a room on the kindergarten premises, where the child and the researcher could remain undisturbed. For the adults, the testing was conducted either in the psychology lab or in a classroom at the university of Rijeka. An audio recorder (model: Sony lcd-px333) was placed on the table, and the experimenter also manually recorded the children's responses as the testing proceeded. This was then used to facilitate the transcription process. The responses were not manually recorded for the adult controls because the testing proceeded very smoothly, and the on-line transcription would have slowed down the task.

The distribution of the previously-mentioned shapes was different for each set. The shapes are not relevant for the study; their function was to make the task more entertaining for the child and also to add more cognitive load to the task so there is less chance for auto-priming. The images had the same order of givenness conditions across the sets: No-G, DO-G, IO-G, and All-G. There were two possible orders in which the images of a set could be presented, but the order of the givenness conditions remained unvaried. One of the orders in which the images were presented to the participants is shown in Tables 3–5 for each verb. The referents (animals and objects) are different in every set so as to avoid cross-condition givenness effects. Note that the descriptions in the tables below are merely describing what is drawn on the action image and do not reflect our expectations or the actual productions of the participants.

Table 3. One possible order of images for 'give'

	Given	Action	Direction
1	**No given**	Fox gives apple to cat.	S > DO > IO
2	**No given**	**Fox** gives flower to duck.[12]	S > DO > IO[13]
3	**S & DO**	**Duck** gives **flower** to horse.	S > DO > IO
4	**S & IO**	**Fox** gives cake to **horse.**	S > DO > IO
5	**All**	**Duck** gives **apple** to **cat.**	IO < DO < S

[12] In this image the subject is given, but, as in the former condition neither object is given, and they are thus counted under the same condition. The layout is the same for all the sets.

[13] This image was originally supposed to have the IO < DO < S order, and it was illustrated that way, but during the printing process it was reversed and printed as a mirror image, which resulted in the inverse orders of the characters.

Table 4. One possible order of images for 'offer'

	Given	Action	Direction
1	**No given**	Lion offers lollipop to zebra.	S > DO > IO
2	**No given**	**Lion** offers carrot to pig.	IO < DO < S
3	**S & DO**	**Pig** offers **carrot** to monkey.	IO < DO < S
4	**S & IO**	**Lion** offers sandwich to **monkey.**	S > DO > IO
5	**All**	**Pig** offers **lollipop** to **zebra.**	IO < DO < S

Table 5. One possible order of images for 'send'

	Given	Action	Direction
1	**No given**	Bunny sends puppy to elephant.	IO < DO < S
2	**No given**	**Bunny** sends parrot to turtle.	S > DO > IO
3	**S & DO**	**Turtle** sends **parrot** to snail.	IO < DO < S
4	**S & IO**	**Bunny** sends mouse to **snail.**	IO < DO < S
5	**All**	**Turtle** sends **puppy** to **elephant.**	S > DO > IO

The second order in which the images could be presented to a participant is provided in the appendix. Thirty-four of the children received the images in order 1 (presented in Tables 3–5), while 24 were presented with order 2. This imbalance is due to the fact that the two orders of images were presented on alternating days and on some days, there were more children tested than on other days. In the control group, 18 participants were given the images in order 1 and 18 in order 2. Figure 4 on page 102 illustrates the task of presenting the images to the participants according to order 1 of 'give'.

The task proceeded as follows. The experimenter and the participant sat opposite each other. The image board was located in front of the participant, positioned in such a way that the experimenter could not see what was being placed on it. The participant was instructed to receive the images, describe them, and place them in the appropriately-shaped slot. At the beginning of each puzzle set, the experimenter prompted the verb by saying "these images are about giving/sending/offering". The sets were given in a random order.

The images were given to the participant from a bag, facing down, so that the participant was the only one to see the image. The action images depicted the actions regarding the respective verb and involved three referents: the agent, the theme, and the recipient. They were thus targeted to elicit a ditransitive structure, which appropriately describes the interaction of the referents.

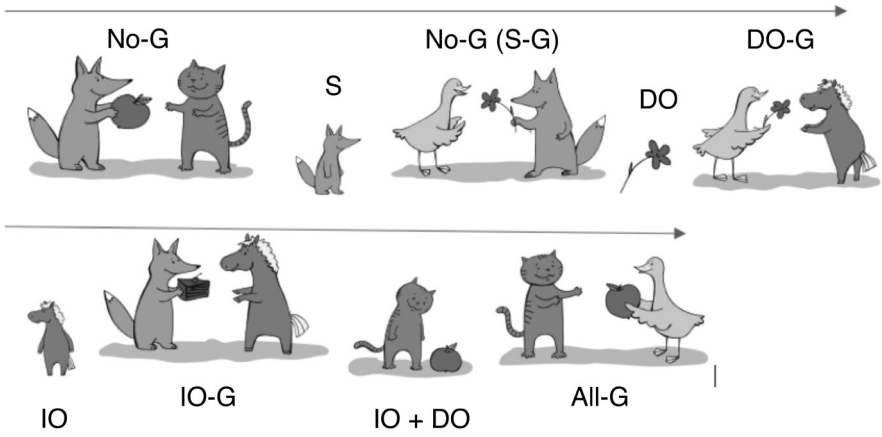

Figure 4. Order 1, in which the images were given to the participant to elicit 'give'.

After each action image the participant received a single image of the referent that was present in the previous image, and that was about to also appear in the next action image. The experimenter and participant exchanged a few sentences about it before proceeding to the next action image. The conversation usually consisted of the experimenter asking the participant whether this referent was the same one as seen in the action image or asking the participant whether they liked the referent on the single image. The latter strategy was more successful with children than with adults; the adults were not keen on expressing their liking for a referent. This was repeated until all five images of a set had been described and placed on the board. Once the board was complete, the experimenter and the participant took out all the images, the board was placed in front of the participant once more, and they proceeded with the next set of images. This was repeated for all three verb sets. At the end of the task the child was accompanied back to the kindergarten group, while the adult was given the reward.

As noted above, the sets were supposed to be given in a random order. However, after a few runs we noticed that the 'send' set had less data loss in the children's productions if presented last. This set was harder than the other two, most likely due to an unprototypical situation of sending an animate referent to another animate referent. By having this set as the last one, the child was familiar with the procedure and thus described the images more easily. We therefore proceeded by randomly giving one of the two IO-animate sets as first and second, while the both-animate set was given last.

5. Results

The results will be reported separately for children and adults, and the two groups will be compared in the discussion. We start by accounting for the non-applicable data and then we will continue by describing the results with their respective statistical analyses, separately for the two groups. The statistical analysis includes linear mixed effects (Bates et al. 2015), used to establish the various models: a null model with no special attention to either factor and a separate model focusing on animacy and givenness respectively. ANOVAs were used to establish the significance of a factor model with respect to the null model and also to observe the potential interaction of the two factors. The analysis then proceeds with a pairwise comparison of the givenness conditions, separately for the two animacy conditions. This way of approaching the data provides us with an in-depth understanding of how animacy and givenness affect word order: the effect of the individual factors, their interaction, and how each condition shapes word order. Additionally, for the child data we have set up a linear mixed effect on the full data set in order to observe the effects of the two factors more thoroughly.

5.1. Non-Applicable Data: Production Exclusions

The adult controls had 540 possible responses (5-targets x 36-adults x 3-sets), and we were able to use 439 of them. The NA data were due to the following: no ditransitive action (n = 19), inverted referents (n = 6), the use of clitics (n = 6), and the use of a PP (n = 70), which was excluded due to end-weight affecting the object order. An example of each of these NA responses is given in the examples below:

(4) No ditransitive action:

Zec tjera neku drugu životinju a
rabbit$_{NOM}$ chase$_{PRES.3SG}$ some$_{ACC}$ other$_{ACC}$ animal$_{ACC}$ and
kornjača to gleda.
turtle$_{NOM}$ that watch$_{PRES.3SG}$

'The rabbit is sending away some other animal, while the turtle is watching.'

(5) Inverted referents:

Kornjača pokazuje slona psu.
turtle$_{NOM}$ show$_{PRES.3SG}$ elephant$_{ACC}$ dog$_{DAT}$

'The turtle is showing the elephant to the dog.'
Target: The image depicted the turtle sending the dog to the elephant.

(6) Use of clitics:

Ovdje je slon i zec mu šalje
here is elephant$_{NOM}$ and rabbit$_{NOM}$ him$_{CL.DAT}$ send$_{PRES.3SG}$
psića još jednog.
doggy$_{ACC}$ more one$_{ACC}$
'Here is the elephant and the rabbit is sending him another doggy.'

(7) Use of a PP:

Zec šalje pticu kod kornjače.
rabbit$_{NOM}$ send$_{PRES.3SG}$ bird$_{ACC}$ at turtle$_{GEN}$
'The rabbit is sending the bird to the turtle.'

The children strongly overused the verb 'give' across all conditions, which still yielded a ditransitive. We are not excluding these data, as we were not interested in testing the word order with a particular lexical verb but in the effect of animacy and givenness on object order combinations. Out of 885 responses (5-targets x 59-children x 3-sets), we were able to use 625. The NA child data are categorized as follows: no response (n = 5), no ditransitive action (n = 74), use of subordinate clause (n = 39), case error with non-intelligible roles (n = 6), referent inversion (n = 67), omission of an object (n = 58), use of a pronoun or clitic (n = 10), and experimenter's mistake (n = 1). An example of no ditransitive action and case error with non-intelligible roles is provided below, as these are straightforward and will not be discussed any further, whereas the other examples will be provided along with an explanation of the error.

(8) Lav uzme lizajku onda donese kući.
lion$_{NOM}$ take$_{PRES.3SG}$ lollipop$_{ACC}$ then bring$_{PRES.3SG}$ home
'The lion took the lollipop and brought it home.'

(9) Lav daje mrkvu svinju
lion$_{NOM}$ give$_{PRES.3SG}$ carrot$_{ACC}$ pig$_{ACC}$

In (9), since both objects are given in the accusative, there is no morphosyntactic way of telling the roles of theme and recipient apart. The roles could be disambiguated through animacy, and we can assume that the pig is meant to be the recipient, but we nevertheless decided to exclude examples like these. As can be seen from the very limited number of these errors, the children we tested had acquired case and had no problem marking the two objects distinctly with the appropriate morphology.

Since PPs and subordinate clauses are more likely to be heavy and thus be placed at the end of the sentence, we have decided to exclude them from

the dataset being analyzed. An example of a sentence with both a subordinate clause and a PP is displayed in (10).

(10) Šalje zec da tamo ode kod slona.
send$_{PRES.3SG}$ bunny$_{NOM}$ that there go$_{OPT.3SG}$ at elephant$_{GEN}$
'The bunny is sending it (the dog) to go there to the elephant.'

The referent inversion occurs when the child inverts the IO and DO roles, by assigning the dative case to the target DO and the accusative to the target IO. This was not a case mistake, since the children use the cases correctly in the other sets. Even though we have accepted deviations from the intended verb, the inversion of the theme and recipient is a description of a different event entirely, and also influences the givenness conditions. All of the referent inversions were confined to the both-animate condition, where it was possible to invert the DO and the IO. An example, along with the target description is given in (11).

(11) Ovdje zec pokazuje mišiću puža.
here rabbit$_{NOM}$ show$_{PRES.3SG}$ mouse$_{DAT}$ snail$_{ACC}$
'Here the rabbit is showing the mouse the snail.'
Target: The image depicted the rabbit sending the mouse to the snail.

Even though the use of a pronoun or a clitic is an indication of givenness, we have decided to exclude these forms, because they also influence word order, as a pronoun is usually placed before an NP, while clitics are syntactically fixed in second position. An example of the use of the clitic is provided in (12).

(12) Konj mu je dao cvijet.
horse$_{NOM}$ him$_{CL.DAT}$ AUX gave flower$_{ACC}$
'The horse gave him a flower.'

The children's object omissions will be discussed separately, in section 5.5.

5.2. Intended Givenness vs. Actual Givenness

During the test, the child would often take an image, say what was on it, and then describe the action. In such cases, all the referents have to be counted as given. This problem only occurred infrequently in adults, as they typically did not mention anything prior to the ditransitive target.

A crucial part of the data analysis is to observe how word order changes in relation to givenness. We thus had to account for what was actually given and re-categorize the occurrences accordingly. Table 6 shows the final count

of responses in each condition. Although adults did not deviate from the intended givenness condition, their number of responses is nevertheless provided in Table 7. This is the final distribution of the data that will be analysed and discussed in the next section.

Table 6. Distribution of responses in the actual state of givenness in the child data

Condition	**No-G**[14]	**DO-G**	**IO-G**	**All-G**
N. responses	180	127	149	169
Total		625		

Table 7. Distribution of responses in the adult data

Condition	**No-G**	**DO-G**	**IO-G**	**All-G**
N. responses	177	86	91	85
Total		439		

5.3. Adults' Responses

We will first outline the responses obtained by the adult participants. From a look at the raw data it is evident that adults produce more DO-IO orders, especially in the presence of balanced animacy. Some examples follow.

(13) DO-G Prototypical animacy

a. Patka daje cvijet konju.
duck$_{NOM}$ give$_{PRES.3SG}$ flower$_{ACC}$ horse$_{DAT}$
'The duck is giving the flower to the horse.'

[14] Recall that the No-G condition includes two images for each set: No-G and Subject-G, because neither object is given in both of those conditions.

(13) b. Svinja nudi mrkvu majmunu.
pig$_{NOM}$ offer$_{PRES.3SG}$ carrot$_{ACC}$ monkey$_{DAT}$
'The pig is offering the carrot to the monkey.'

(14) IO-G Prototypical animacy

a. Lisica daje konju čokoladnu tortu.
fox$_{NOM}$ give$_{PRES.3SG}$ horse$_{DAT}$ chocolate cake$_{ACC}$
'The fox is giving the horse some chocolate cake.'

b. Lav nudi kekse majmunu.
lion$_{NOM}$ offer$_{PRES.3SG}$ cookies$_{ACC}$ monkey$_{DAT}$
'The lion is offering some cookies to the monkey.'

(15) DO-G Balanced animacy

Tu kornjača šalje papigu pužu.
here turtle$_{NOM}$ send$_{PERS.3SG}$ parrot$_{ACC}$ snail$_{DAT}$
'Here the turtle is sending the parrot to the snail.'

(16) IO-G Balanced animacy

Zec šalje miša pužu.
bunny$_{NOM}$ send$_{PRES.3SG}$ mouse$_{ACC}$ snail$_{DAT}$
'The bunny is sending the mouse to the snail.'

The general reasoning behind the choice of statistical analysis has been outlined in section 5. Tables 8–10 provide a summary of the ANOVAs of the null model with the animacy and givenness model respectively, along with the ANOVA conducted on the interaction.

Table 8. ANOVA of the null and animacy model in the adult data

Model	Df	AIC	BIC	Chisq	Significance
Null	2	469.40	477.59	53.416	$p < 0.001$
Animacy	3	417.98	430.28		

Table 9. ANOVA of the null and givenness model in the adult data

Model	Df	AIC	BIC	Chisq	Significance
Null	2	469.4	477.59	14.193	p < 0.01
Givenness	5	461.2	481.69		

Table 10. ANOVA of the interaction of animacy and givenness in the adult data

	Df	AIC	BIC	Chisq	Significance
Interaction	6	406.55	431.14	1.821	No
	9	410.73	447.61		

The data clearly show that both factors have an effect on word order, but animacy is stronger. This is evident from the fact that there is no interaction, and from the depiction of the data displayed in figure 5 on the following page. Thus, animacy shapes object order, and the effect of givenness influences the object order within the animacy condition. A possible reason for this may be the design, as there was only one image set with balanced animacy. Another reason might be data loss from that set causing the two animacy conditions to have an unbalanced number of observations. This is of course the limit of our task, but it is nevertheless obvious that animacy is a stronger factor than givenness in affecting object order choice.

The next step is to look into the effect of the individual conditions (total = 8), and we will do so by conducting a pairwise comparison of the givenness conditions, separated into two animacy conditions. The results of the statistical analysis are displayed in Tables 11 below and 12 on the following page.

Table 11. Pairwise comparison of the givenness conditions in adults when animacy is prototypical

Contrast	Estimate	SE	Z-ratio	Significance
ALL-NO	0.335	0.369	0.910	No
ALL-DO	-1.238	0.462	-2.679	p > 0.05
ALL-IO	0.120	0.421	0.286	No
NO-DO	-1.574	0.408	-3.859	p < 0.001
NO-IO	-0.215	0.356	-0.505	No
DO-IO	1.359	0.454	2.991	p > 0.05

Table 12. Pairwise comparison of the givenness conditions in adults when animacy is balanced

Contrast	Estimate	SE	Z-ratio	Significance
ALL-NO	-0.848	1.507	-0.563	No
ALL-DO	-16.753	111.757	-0.150	No
ALL-IO	-16.614	106.787	-0.156	No
NO-DO	-15.905	111.771	-0.142	No
NO-IO	-15.766	106.794	-0.148	No
DO-IO	0.138	156.321	0.001	No

The statistical results presented in Table 11 clearly show that the condition with the given DO stands out, as it is significantly different when compared to the three remaining conditions. Figure 5 also highlights the DO-given condition, as the participants produce significantly more DO-IO orders than in the rest of the task. Conversely, when animacy was balanced there is no difference between the conditions. This is due to the fact that DO-IO is used at ceiling level, and consequently there is no variation in the responses—a fact evident from the negative values of the results, which signal a DO-IO preference over IO-DO.

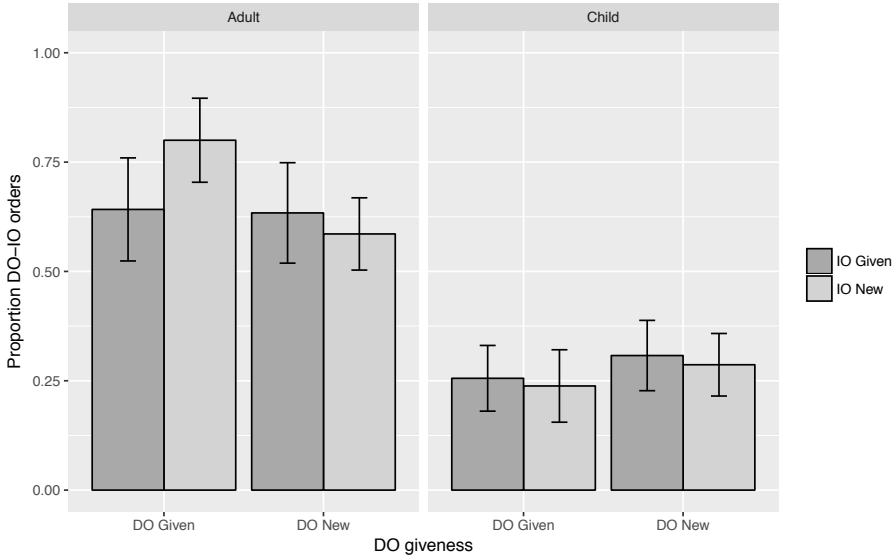

Figure 5. Proportion of DO-IO orders used by adults in the task

Figure 5 clearly shows a great difference of object order distribution between the two animacy conditions; it also surprisingly shows that DO-IO productions are at ceiling level when both objects are animate. This might, however, be a task effect, which will be elaborated on in the discussion. The givenness effect of the DO-given is also evident for the prototypical animacy condition, given that we can clearly see how the production of the DO-IO is increased when compared to the other givenness conditions. Overall, the adults produce more DO-IO occurrences than IO-DO, even when only the IO is animate. This means that even if the animacy effect has been found to be strong (based on the comparison of object order productions in the two animacy conditions), there is still the preference to have the DO precede the IO, even when only the latter is animate.

5.4. Children's Results

In contrast to the adults children have a preference for IO-DO when animacy is prototypical, but the two word orders are at chance level when it is balanced. Some examples follow.

(17) DO-G prototypical animacy

a. A onda prase daje majmunu mrkvu.
and then pig$_{NOM}$ give$_{PRES.3SG}$ monkey$_{DAT}$ carrot$_{ACC}$
'And then the pig is giving the monkey the carrot.'

b. Patka je dala cvijet konju.
duck$_{NOM}$ AUX gave flower$_{ACC}$ horse$_{DAT}$
'The duck gave the flower to the horse.'

(18) IO-G Prototypical animacy

a. Tu je lav i pokazuje majmunčiću keksiće.
here AUX lion$_{NOM}$ and show$_{PRES.3SG}$ monkey$_{DAT}$ cookies$_{ACC}$
'Here is the lion and he is showing the monkey some cookies.'

b. Lisica dava konju tortu.[15]
fox$_{NOM}$ give$_{PRES.3SG}$ horse$_{DAT}$ cake$_{ACC}$
'The fox is giving the horse a cake.'

c. Vjeverica je dala kolač konju.
squirrel$_{NOM}$ AUX give$_{PST.3SG}$ cake$_{ACC}$ horse$_{DAT}$
'The squirrel gave a cake to the horse.'

[15] *Dava* is an inflection mistake, the correct form would be *daje* as used in the other examples. Nevertheless, this kind of error does not affect our results.

(19) DO-G Balanced animacy

a. Tu je kornjača dala papigu pužu.
here AUX turtle$_{NOM}$ give$_{PST.3SG}$ parrot$_{ACC}$ snail$_{DAT}$
'Here the turtle gave the parrot to the snail.'

b. A kornjača pužu daje pticu.
and turtle$_{NOM}$ snail$_{DAT}$ give$_{PRES.3SG}$ bird$_{ACC}$
'And the turtle is giving a snail the bird.'

(20) IO-G Balanced animacy

a. Zec dava pužu miša.
bunny$_{NOM}$ give$_{PRES.3SG}$ snail$_{DAT}$ mouse$_{ACC}$
'The bunny is giving the snail a mouse.'

b. Zec želi dati miša pužu.
bunny$_{NOM}$ want$_{PRES.3SG}$ give$_{INF}$ mouse$_{ACC}$ snail$_{DAY}$
'The bunny wants to give a mouse to the snail.'

The same setup has been used for the child data as well. The ANOVAs of the null model with the animacy and givenness model, respectively, are reported in Tables 13 and 14, along with the interaction in Table 15 on the following page.

Table 13. ANOVA of the null and animacy model in the child data

Model	Df	AIC	BIC	Chisq	Significance
Null	2	701.01	709.92	33.421	$p < 0.001$
Animacy	3	669.59	682.95		

Table 14. ANOVA of the null and givenness model in the child data

Model	Df	AIC	BIC	Chisq	Significance
Null	2	701.01	709.92	1.9959	No
Givenness	5	705.01	727.28		

Table 15. ANOVA of the interaction of animacy and givenness in the child data

	Df	AIC	BIC	Chisq	Significance
Interaction	6	672.43	699.15	2.9151	No
	9	675.51	715.60		

From the data in these tables we can see that animacy affects word order very strongly. However, there is no effect of givenness on word order in the child data. As in the adult data, an interaction between animacy and givenness has not been found.

Thus here we have already found a relevant difference between children and adults, as children seem to be unaffected by givenness in realizing object order. This also fits with previous findings and with our predictions: animacy was claimed to be easily acquired, while opinions were divided regarding givenness and its visibility in the effect of word order.

A pairwise comparison was also conducted with the child data for each givenness condition, separately for when animacy is balanced and prototypical. No significant differences were found between any two conditions. This is to be expected, as we have found no effect of givenness with the previous test. The tables containing the full results of the pairwise comparison can be found in the appendix. The distribution of DO-IO orders per condition is depicted in Figure 6 on the following page.

It is strikingly evident that children use DO-IO to a much lesser degree than the adults overall, but it is also evident that the proportion of DO-IO increases when animacy is balanced. The animacy effect we observed is shown in Table 13. The statistical analysis found no effect of givenness, and we can see that within each animacy condition the distribution of DO-IO is roughly the same and does not change based on what is given. The givenness effect was isolated to the DO-given condition within the adult data. If we take a closer look at the distribution of DO-IO within this condition, we can see that there is a decrease in the number of occurrences of this order, which indicates a new > given preference. However, when animacy is balanced, the DO-G condition has an increased production of DO-IO, as we would expect. We have thus set up a model using linear mixed effects consisting of the two animacy conditions taking the givenness conditions into account (Table 16 on page 113). The givenness contrasts were set up based on the givenness of the DO: DO-G and All-G on the one hand and No-G and IO-G on the other were grouped together in groups, which are tagged as DO-GG and DO-nG respectively. The intercept is the children's responses in the prototypical animacy condition.

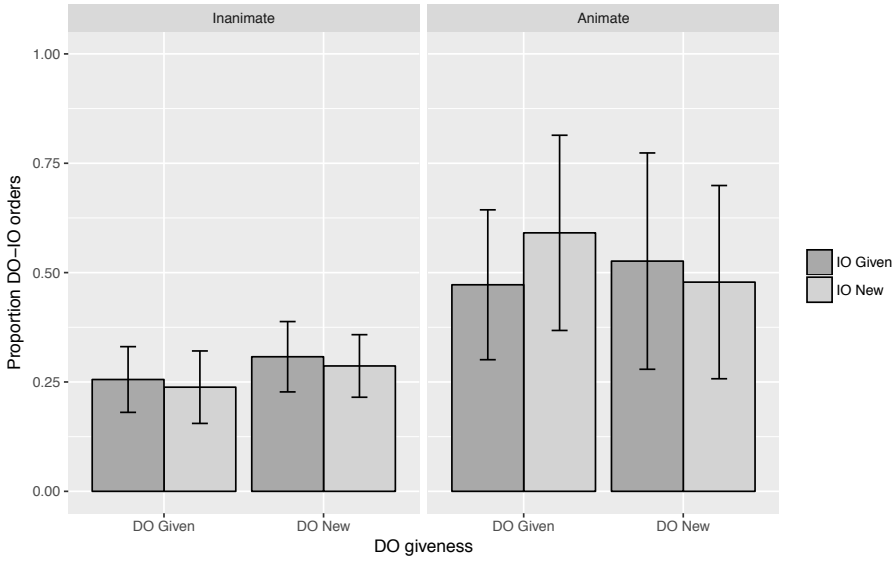

Figure 6. Proportion of DO-IO orders used by children in the task

The significance in the intercept indicates a preference for one object order in the IO-animate condition. This preferred object order is IO-DO, as the estimate has a (–) sign. Furthermore, we can see that the production of DO-IO significantly decreases when we compare the conditions with a given DO to

Table 16. Summary of the model for children's responses in the two animacy conditions, with relation to givenness

	Estimate	Standard error	p-value	Significance
IO-animate (Intercept)	-1.4135	0.26244	7.20e-08	$p < 0.001$
IO-animate DO-GG vs DO-nG	-0.9289	0.4725	0.0493	$p < 0.05$
IO-animate DO-G vs All-G	-0.2025	0.3531	0.5663	No
IO-animate IO-G vs No-G	0.3472	0.3103	0.2632	No
Both-animate	1.6436	0.3106	1.22e-07	$p < 0.001$
Both-animate DO-GG vs DO-nG	2.0227	1.1289	0.0732	$p < 0.1$
Both-animate DO-G vs All-G	0.6487	0.773	0.4013	No
Both-animate IO-G vs No-G	0.0057	0.8124	0.9943	No

the conditions where DO is not given ($p < 0.05$). The givenness of the IO does not seem to be of any relevance, as the two subsequent comparisons do not come out as significant. The comparison of the data in the two animacy conditions reveals that children use significantly more DO-IO when both objects are animate. Moreover, the comparison of the DO-GG and DO-nG is almost significant ($p < 0.1$), entailing that the DO-IO increases in conditions of given DO, contrary to what happens when only the IO is animate. The reason why this interaction is not significant might be the reduced amount of data elicited for the both-animate condition. Thus if the conditions had been comprised of an equal amount of sets, the result of this interaction would most likely have been significant. The givenness of the IO does not seem to play a role.

5.5. Omissions in the Child Data

Previous studies, such as Mykhaylyk, Rodina, and Anderssen (2013) and Anderssen et al. (2014), found a significant amount of data related to givenness in the omissions. Since the production of object order does not signal sensitivity to givenness in the child data, we decided to check if the omissions are related to it.

Overall, the children have 58 object omissions, 42 of omitted elements being given. The adults did not have any omissions in the task. Table 17 on the following page shows this omission by element across the givenness conditions; the shaded values signal that the argument is given. Some of the omission examples are displayed in (21).

(21) a. Ovaj daje čokoladni kolač.
this$_{NOM}$ give$_{PRES.3SG}$ chocolate cake$_{ACC}$
'This one is giving a chocolate cake.'

b. Prasac je dao majmunu.
pig$_{NOM}$ AUX give$_{PST.3SG}$ monkey$_{DAT}$
'The pig gave the monkey.'

Most omissions occur in the All-G condition, and the IO has the highest omission rate (n = 44). The most relevant omissions are DO and IO omissions in the DO-G and IO-G conditions, as these can signal whether the omission is related to givenness. Table 18 on the following page shows the distribution of these omissions along with the occurrences containing both objects. The shaded values signal an appropriate construction or omission in relation to givenness.

Table 17. Distribution of omissions in the child data

	No-G	DO-G	IO-G	All-G	Total
DO	1	2	2	9	14
IO	9	4	10	21	44
Total (omitted+overt)	154	108	126	171	559

Table 18. Distribution of word orders and omissions in DO-G and IO-G

	IO-animate		Both animate	
	DO-G	IO-G	DO-G	IO-G
DO-IO	23	38	12	10
IO-DO	60	56	4	5
Om DO	2	2	0	0
Om IO	1	7	3	3
Total appropriate productions	25	63	12	8

We can see that the omissions are marginal in the key conditions for this study, and we can make very few observations on the omission pattern. Firstly, the IO is much more prone to omission than the DO. Overall, children omit slightly more given objects than new objects (12 vs. 6). However, these data are too scarce to suggest that children mark givenness through the omission of the given object rather than through word order, as both strategies (the IO-DO order and the omission of the IO) show non-context-related preferences.

6. Discussion

The task in our study was to reveal the underlying order in ditransitives in child language and to explore whether animacy and givenness were triggers for movement and how that compares to the adults' productions.

Our first question was whether DO-IO surfaced as the underlying order for adults in this production task, as it has been found in an acceptability judgment task (Velnić 2019). And indeed it did, as we found DO-IO being produced at ceiling level when animacy was balanced. The ceiling level was not the expected result, but it points quite strongly to the status of DO-IO as underlying. When compared to the acceptability judgment task, animacy seems to trigger a majority of DO-IO in both settings. This result provides cumulative evidence to the body of research so far on Croatian ditransitives that

DO-IO is the underlying order. When animacy was prototypical, the DO-IO proportions were roughly at chance level, which is still quite different from what was found in the corpus data (Velnić forthcoming). A more thorough examination is needed to reveal whether the cause of this is the exclusive use of NPs to express the objects (compared to the corpus data, which contain pronouns and clitics). The givenness effect was confined to the condition of given DO, which indicates that the givenness of the IO is not relevant for ordering the two objects. More investigation is needed to find out why.

The production of DO-IO was at ceiling level when both objects were animate. A possible reason for finding a limited givenness effect in the adult controls is that the task may have failed to distinguish between given and new elements. Perhaps the adults did not believe that the experimenter did not know which images she was taking out of the bag. In that case, they might have perceived everything as given and thus did not have the need to mark givenness distinctly. Either way, the results of the statistical analyses have shown that both animacy and givenness have an effect on object order in the adult language.

The second research question was related to the underlying word order in the child data. Previous studies have found, as outlined in section 2.3, that children have a preference for IO-DO. This is of course true if we look at only prototypical animacy. Nevertheless even when animacy is prototypical, the children do not produce their preferred order at ceiling level but somewhat stably at around 70% of the time (all givenness conditions averaged). However, when animacy is balanced, the productions of DO-IO and IO-DO reach a chance level, and thus there is no longer a preference for IO-DO. It would seem that since the previous studies discussed in the literature review did not balance for animacy, the tendency to produce IO-DO was caused by the animacy of the IO. We can safely say that our prediction of a majority of IO-DO productions related to animacy has been borne out. However, children are not more adult-like when animacy is balanced, even though the increase of DO-IO is considerable. This is due to the fact that adults produced DO-IO at ceiling level, which was not an expected outcome. We have already suggested that this is probably a task effect, so it is likely that children are indeed more adult-like when animacy is balanced. Unfortunately this task is not able to show it.

This brings up the discussion regarding animacy and givenness as triggers for movement (research question 3). The fact that there is a significant difference in the proportion of object orders in the two animacy conditions means that animacy is a strong factor for ordering the two objects. But we found no general effect of givenness. This matches our predictions, as previous studies have shown time and time again how children are attentive to animacy, whereas their attentiveness to givenness was mixed. However, when the child data are analysed more closely, we can see that the givenness of the

DO is more relevant than the givenness of the IO. This was also found in the adult data but with a more prominent degree.

However, what does this mean in relation to the underlying word order in Croatian children? We have stated in the predictions that if children had a preference for IO-DO, this order should be produced more often regardless of the animacy or givenness condition. But if they were aware of the underlying status of the DO-IO in Croatian, there should be a significant increase of this order when animacy is balanced. Our results clearly point in the direction of the latter conclusion, even if the underlying word order is not as clearly available as for the adults (DO-IO), which could mean that children are not adult-like yet. In the balanced condition, the children were more adult-like, as they produced DO-IO 52% of the time. However, it is obvious that IO-DO is not the underlying order, because if it were it could be used at ceiling level in both conditions. Since we have established that givenness is not a trigger for movement, animacy favours IO-DO in the prototypical condition. But it is not a factor when balanced. Thus if children were guided by a combination of animacy and what for them is underlying, IO-DO could be predicted across the task. The fact that DO-IO is produced significantly more when animacy is balanced shows a tendency for children to prefer this order; in turn, it could potentially also indicate that they are sensitive to the same factors as the adults are, but not to the same extent.

Our last research question is about the comparison of adults and children. Animacy is obviously a trigger for movement in both groups, but to a greater extent in the children's group, as they use IO-DO significantly more than the adults when the IO is animate. The data also reveal that givenness has an effect on object order in the adult group. While the overall effect of givenness was not seen in the child data, we find that the givenness of the DO is more relevant than the givenness of the IO in both groups.

In relation to the underlying word order, it is obvious that it is DO-IO in the adult group. The children also show a tendency for this order, but it is not as pronounced as in the adults. What the data have definitely shown is that the children do not have a tendency for IO-DO, as reported for some other languages, but that their preference for IO-DO is limited to the condition of prototypical animacy, which is the one found in naturalistic data. With regard to our predictions, children seem to be more attentive to animacy than the adults, which is obvious from the proportions of IO-DO when the IO is animate. Children are also less attentive to givenness than adults, as we found no significant effect of givenness on object order, whereas the adults have an effect confined to the given DO. We have predicted that, if for the children the DO-IO is underlying, they should produce it more when animacy is balanced. And this is indeed the case. This outcome supports the high status of animacy as a trigger for movement.

The results suggest that animacy is a strong factor for determining word order in both types of speaker, more significantly in children. The results can also be discussed in light of the interaction of animacy with the different object order preferences in adults and children. More precisely, and in light of the other data on Croatian, such as the acceptability judgments obtained by Velnić (2019), it is obvious that the preferred word order of adult speakers is DO-IO. Therefore, since animacy influences object order choice, when the IO is animate the adults produce their preferred order and the animate-first order in equal proportions. The production of DO-IO is increased with givenness in favour of the DO (DO-G condition). It then returns to the initial distribution, which is the interaction of word order preference and the animacy of the IO. The givenness of the IO does not seem to be a factor.

When animacy is no longer a factor (the objects are both animate), adults produce DO-IO at ceiling level, as their word order preference is the only ordering mechanism that surfaces. The reason for this is open to discussion, since we expected adults to be the group that takes more factors (in our case givenness and animacy) into consideration when ordering the arguments. It nevertheless seems, contrary to any prediction, that adults choose based on the pragmatic availability of their preferred order, and that once free from animacy constraints they use that order exclusively. It is peculiar that givenness is completely ignored here, but we have already mentioned that this might be due to a task effect in which the adults considered all referents as given. If that is the case, animacy is the only factor tested on adults, and it has an effect that we have already discussed.

For the children, naturalistic data from Croatian suggests that IO-DO is the more frequently produced object order (as per the corpus and experimental studies discussed in sections 2.2 and 2.3). This is not strictly an indication of their preference for this order, since child-directed speech also contains a majority of IO-DO (Velnić 2014).

Let us, then, first outline the children's behavior in our task and see whether there really is a preference for IO-DO. In the IO-animate condition, children produced mostly IO-DO because it is the more appropriate object order from an animacy perspective, to which we know children are attentive. The production of DO-IO significantly increases when animacy is balanced, entailing that it is a very relevant factor. If IO-DO was really their preferred order, it could have been used unvaryingly across the task, since its use is still appropriate from an animacy perspective. Here, the children also show a givenness effect similar to that observed in adults for the prototypical animacy condition, as the DO-G condition has more DO-IO productions than the other givenness conditions. Perhaps, once animacy is balanced, children have more cognitive capacity to integrate givenness in their word order choice. This is only speculation, and there is no way of proving it based on the available data.

However, children do not reach ceiling level in any condition, as adults do in the balanced animacy condition. The data suggest that children do not prefer IO-DO and are aware of the underlying status of DO-IO, but are not yet adult-like. If they relied only on the appropriateness of IO-DO, they could have used it consistently throughout the task. Thus, the predominant productions of IO-DO seen in the naturalistic data and in some of the experimental studies cited here are due to the animacy imbalance and children being very sensitive to it. Once that is removed, children speakers are freer to vary their productions and be more similar to the adults.

To conclude, the object order choice we see in the task is the interaction of preferred object order and animacy. Animacy seems to have a stronger effect on children than on adults, which is in line with what Snyder (2003) had found.

7. Conclusion

This study set out to explore the underlying order of direct and indirect objects and the effects of givenness and animacy as triggers of movement in the ditransitive sentences of Croatian pre-school children.

Although we found a strong animacy effect in both groups of speakers, we concluded that children rely on animacy more than adults. An effect of givenness was found only in the adult group, and it was limited to the condition in which the DO was given. Children were also more attentive to the DO being given, but this was statistically marginal, as seen in the stable distribution of IO-DO in the condition of prototypical animacy. This was a predicted result for the children (but not for the adults), as we expected them to take the givenness of all the arguments into consideration. The reasons for why the givenness of the IO does not trigger an effect of word order are yet to be investigated.

We have also confirmed that adults prefer DO-IO in production as well, while children tend to use more IO-DO but do not have a strong preference for that object order. In the child data there is an over-production of IO-DO when the IO is animate, but once animacy is balanced the proportion of the two word orders is in favor of DO-IO. The predominance of IO-DO productions in naturalistic data is due to the IO being animate and the DO being inanimate. This study shows that once animacy is no longer a factor, the DO-IO preference surfaces. This suggests that children are very attentive to animacy but that their word-order preference is underlyingly adult-like. If their preference for IO-DO were as strong as the adults' preference for DO-IO, IO-DO would be the only object order produced in the task. We thus conclude that children are more attentive to animacy than adults.

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Appendix

Table A1. Second possible order of images for 'give'.

	Given	Action	Direction
1	No given	Fox gives flower to duck	S > DO > IO[16]
2	S	**Duck** gives apple to cat	IO < DO < S
3	S and DO	**Duck** gives **flower** to horse	S > DO > IO
4	S and IO	**Fox** gives cake to **horse**	S > DO > IO
5	All	**Fox** gives **apple** to **cat**	S > DO > IO

Table A2. Second possible order of images for 'offer'.

	Given	Action	Direction
1	No given	Lion offers carrot to pig	IO < DO < S
2	S	**Pig** offers lollipop to zebra	IO < DO < S
3	S and DO	**Pig** offers **carrot** to monkey	IO < DO < S
4	S and IO	**Lion** offers sandwich to **monkey**	S > DO > IO
5	All	**Lion** offers **lollipop** to **zebra**	S > DO > IO

Table A3. Second possible order of images for 'send'.

	Given	Action	Direction
1	No given	Bunny sends parrot to turtle	S > DO > IO
2	S	**Turtle** sends puppy to elephant	S > DO > IO
3	S and DO	**Turtle** sends **parrot** to snail	S > DO > IO
4	S and IO	**Bunny** sends mouse to **snail**	IO < DO < S
5	All	**Bunny** sends **puppy** to **elephant**	IO < DO < S

[16] This image was originally supposed to have IO < DO < S order and it was illustrated that way, but during the printing process it was reversed and printed as a mirror image, resulting in the inverse orders of the characters.

Table A4. Distribution of the adult responses in the IO-animate condition.

	No-G	DO-G	IO-G	All-G
DO-IO	59% (82)	80% (56)	63% (45)	64% (43)
IO-DO	41% (58)	20% (14)	37% (26)	36% (24)
Total	348			

Table A5. Distribution of the children's responses in the IO-animate condition.

	No-G	DO-G	IO-G	All-G
DO-IO	29% (45)	24% (25)	31% (40)	26% (34)
IO-DO	71% (112)	76% (80)	69% (90)	74% (99)
Total	525			

Table A6. Distribution of the adult responses in the both-animate condition.

	No-G	DO-G	IO-G	All-G
DO-IO	97% (36)	100% (16)	100% (20)	100% (18)
IO-DO	3% (1)	0%	0%	0%
Total	91			

Table A7. Distribution of the children's responses in the both-animate condition.

	No-G	DO-G	IO-G	All-G
DO-IO	48% (11)	59% (13)	53% (10)	47% (17)
IO-DO	52% (12)	41% (9)	47% (9)	53% (19)
Total	100			

Table A8. Pairwise comparison of the givenness conditions in children when animacy is prototypical

Contrast	Estimate	SE	Z.ratio	Significance
ALL-NO	-0.298	0.311	-0.96	No
ALL-DO	0.141	0.349	0.404	No
ALL-IO	-0.556	0.325	-1.711	No
NO-DO	0.439	0.333	1.321	No
NO-IO	-0.257	0.306	-0.841	No
DO-IO	-0.697	0.348	-2.004	No

Table A9. Pairwise comparison of the givenness conditions in children when animacy is balanced

Contrast	Estimate	SE	Z.ratio	Significance
ALL-NO	0.360	0.656	0.549	No
ALL-DO	-0.427	0.686	-0.623	No
ALL-IO	0.004	0.692	0.006	No
NO-DO	-0.788	0.728	-1.082	No
NO-IO	-0.356	0.729	-0.488	No
DO-IO	0.431	0.753	0.573	No