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Word order in German child language and child-directed speech: A corpus analysis on the ordering of double objects in the German middlefield

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We report two corpus analyses to examine the impact of animacy, definiteness, givenness and type of referring expression on the ordering of double objects in the spontaneous speech of German-speaking two- to four-year-old children and the child-directed speech of their mothers. The first corpus analysis revealed that definiteness, givenness and type of referring expression influenced word order variation in child language and child-directed speech when the type of referring expression distinguished between pronouns and lexical noun phrases. These results correspond to previous child language studies in English (e.g., de Marneffe et al. 2012). Extending the scope of previous studies, our second corpus analysis examined the role of different pronoun types on word order. It revealed that word order in child language and child-directed speech was predictable from the types of pronouns used. Different types of pronouns were associated with different sentence positions but also showed a strong correlation to givenness and definiteness. Yet, the distinction between pronoun types diminished the effects of givenness so that givenness had an independent impact on word order only in child-directed speech but not in child language. Our results support a multi-factorial approach to word order in German. Moreover, they underline the strong impact of the type of referring expression on word order and suggest that it plays a crucial role in the acquisition of the factors influencing word order variation.

Keywords: German; word order; corpus study; language acquisition; information structure; referring expression

1 Introduction

Languages vary considerably concerning their flexibility in the ordering of verbs and their arguments. Some languages, like for example English, have a rather fixed order with the subject preceding and the objects following the verb. In many other languages, arguments can appear in multiple orders, with semantic (e.g., definiteness, animacy), phonological (e.g., stress/accentuation) or information structure properties (e.g., givenness, focus) being relevant for their linearization in an actual utterance (e.g., Lenerz 1977; Müller 1999; Bresnan et al. 2007). Acquiring and disentangling the factors influencing the word order in their ambient language may present a challenging task for children, especially since these factors typically show a high degree of interaction.

To date, studies on the acquisition of word order in first language acquisition have mostly dealt with areas in which a language shows rather strict and stable word order properties. Examples of this kind of research are studies on the acquisition of verb placement in German or the acquisition of SVO order in English. These fundamental word order properties seem to be acquired rather early, by the age of two to three years (German:

Rothweiler 1989; Poeppel & Wexler 1993; Weissenborn 1994; Höhle et al. 2001; English: Hirsh-Pasek & Golinkoff 1996; Gertner, Fisher & Eisengart 2006; but Dittmar et al. 2008).

Less is known about when and how children acquire word order in areas that show variation within a language. The current study focuses on the effects of information structure (i.e., givenness) and the type of referring expression on the linearization of the direct and the indirect object in ditransitive constructions in the spontaneous speech production of children learning German – a language that shows considerable variation in word order. We conducted two analyses using German corpora from the CHILDES database. The first one considered the effects of several factors that have previously been suggested to affect this order (animacy, definiteness, givenness and type of referring expression). The second, more fine-grained, analysis distinguished different types of pronouns in order to disentangle the effects of givenness and type of referring expression. Our analyses included utterances from child-directed speech, also taken from the CHILDES database, to compare children's linearizations with the adult system. In the following, we will first introduce some basics on the properties of ditransitive constructions in German and on the factors that have been discussed as relevant for the linearization of their objects. Then we will give an overview of what is known about the linearization of objects in children's production of double object constructions and outline the goals and questions of our study.

1.1 The ordering of double objects in German

In German, the order of objects is flexible if both are realized by lexical NPs: the indirect object can either precede or follow the direct object (IO-DO, (1a) vs. DO-IO, (1b)). Grammatical functions can be identified by case marking. As illustrated in example (1), the indirect object (*dem Jungen* 'the boy') is marked by dative case whereas the direct object (*das Buch* 'the book') is marked by accusative case.¹

- (1) a. Der Mann hat dem Jungen das Buch gegeben. (IO-DO)
 the.NOM man has the.DAT boy the.ACC book given
 'The man gave the boy the book.'
- b. Der Mann hat das Buch dem Jungen gegeben. (DO-IO)
 the.NOM man has the.ACC book the.DAT boy given
 'The man gave the book to the boy.'

Various factors have been proposed to account for this word order variation in German. They underline the relevance of concepts like definiteness (e.g., Lenerz 1977; Müller 1999), length of the NPs (Behagel 1909; Lenerz 1977), animacy (e.g., Lenerz 1977; Müller 1999; Pappert et al. 2007; Røreng 2011) or information status, such as givenness (e.g., Lenerz 1977; Abraham 1992) and focus (Höhle 1982; Uszkoreit 1987; Haider & Rosengren 1998;

¹ It is also possible to place the subject in the middlefield, e.g., before the objects as in (i) and (ii) but also between the objects (iii). However, in our paper we focus on the order of the indirect and direct object ignoring the relative position of the subject.

- (i) Gestern hat der Mann dem Jungen das Buch gegeben. (IO-DO)
 yesterday has the.NOM man the.DAT boy the.ACC book gegeben
 'Yesterday, the man gave the boy the book.'
- (ii) Gestern hat der Mann das Buch dem Jungen gegeben. (DO-IO)
 yesterday has the.NOM man the.ACC book the.DAT boy gegeben
 'Yesterday, the man gave the book to the boy.'
- (iii) Gestern hat dem Jungen der Mann das Buch gegeben. (IO-SBJ-DO)
 yesterday has the.DAT boy the.NOM man the.ACC book gegeben
 'Yesterday, the man gave the boy the book.'

Müller 1999; Røreng 2011). In general, these factors predict a preference for placing definite before indefinite, animate before inanimate, long before short, given before new, or non-focused before focused constituents. Elicited production studies and corpus analyses on (written) adult language provide support for the predicted effect of focus and animacy (Uszkoreit 1987; Pappert et al. 2007; Røreng 2011) whereas the impact of definiteness is less clear (Pappert et al. 2007; Røreng 2011).

From a psycholinguistic perspective on incremental sentence production (e.g., Kempen & Hoerenkamp 1987; Levelt 1989), given and animate concepts, which are usually referred to by pronouns, may be produced earlier in a sentence because they are early available (i. e., they are usually activated and easier to retrieve) during the production process (e.g., Bock & Irwin 1980; Kempen & Harbusch 2003; Jaeger & Tily 2011).

Theoretical approaches explaining word order variation in the German middlefield, i.e., scrambling, differ mainly in their assumptions concerning the question whether there is an underlying word order from which the other word order is derived (e.g., Lenerz 1977; Haider & Rosengren 1998; Müller 1999; Fanselow 2006), and in the factors proposed to influence word order, i.e., whether word order variation may be reduced to information structure factors (e.g., Meinunger 2000; Lenerz 2001; Hinterhölzl 2006) or whether several interacting factors may play a role (e.g., Lenerz 1977; Müller 1999; Struckmeier 2014; see Haider 2006 for a review).

In addition, theoretical models differ in their assumptions whether different principles underly the ordering of nominal and pronominal NPs, i.e., scrambling vs. pronoun movement (e.g., Müller 1999; Meinunger 2000; Müller 2001; vs. Haider & Rosengren 1998; Gärtner & Steinbach 2000), but there is agreement that less optionality occurs when pronouns are involved (cf., Lenerz 1977; Uszkoreit 1987; Haider & Rosengren 1998; Müller 1999). In contrast to a general preference for an IO-DO order (see above), this order is clearly more marked than the DO-IO order or is even ungrammatical ((2a), (2b)) when both objects are pronominal. The indirect object must precede the direct object ((2c), (2d)) when it is realized as an (unstressed) personal pronoun and the direct object as a lexical NP. However, the direct object may follow the indirect object (2e) when it is realized as a demonstrative pronoun *das* ('that'/IT') and thus behaves more similarly to a lexical NP.

- (2) a. Der Mann hat es ihm gegeben. (DO-IO)
 the.NOM man has it.ACC him.DAT given
 'The man gave it to him.'
- b. */?Der Mann hat ihm es gegeben. (IO-DO)
 the.NOM man has him.DAT it.ACC given
 'The. man gave him it. (= The man gave it to him.)'
- c. Der Mann hat ihm das Buch gegeben. (IO-DO)
 the.NOM man has it.HIM the.ACC book given
 'The man gave him the book.'
- d. */?Der Mann hat das Buch ihm gegeben. (DO-IO)
 the.NOM man has the.ACC book him.DAT given
 'The man gave the book him. (= The man gave the book to him.)'
- e. Der Mann hat ihm das gegeben. (IO-DO)
 the.NOM man has him.DAT it.ACC given
 'The man gave him that. (The man gave that (book) to him.)'

Results from adult speech corpora confirm that pronouns typically precede full lexical NPs and that the indirect object typically follows the direct object when both objects are

realized as personal pronouns (Kempen & Harbusch 2005). The sources of these specific restrictions for pronouns are disputed: there may be prosodic constraints that require unstressed elements to occur at the left edge of the middlefield (e.g., Müller 1999; 2001) and prevent them to be placed in the default stress position (as in (2b)) (cf., Gärtner & Steinbach 2000). This holds especially for pronoun *es* ('it'). Alternatively, differences in the information status of pronominal referents may influence their order (e.g., Lenerz 1992; Haider & Rosengren 1998). Crucially, pronouns are not a homogeneous class with respect to information status. For instance, personal pronouns usually refer to referents that are highly salient in the discourse and demonstrative pronouns to less salient referents (e.g., Gundel, Hedberg & Zacharski 1993; Ariel 2001). Theoretical accounts differ in the exact implementation of the relationship between different types of referring expression and their salience; but it is usually assumed that shorter NPs (e.g., personal pronouns) are used for referents that are more salient in the discourse model and longer NP for less salient referents (cf., Gundel et al. 1993). In this way, personal pronouns may refer to referents which are in the "focus of attention" whereas demonstrative pronouns may refer to referents that have been previously mentioned or are visually given but are not in the focus of attention. Moreover, the information status may be considered on a gradual scale which is determined not only by linguistic but also extralinguistic factors (e.g., the non-verbal situative context). Notably, given these differences in the information status between different pronouns, they may also differ with respect to their typical position in an utterance.

There is – at least to the best of our knowledge – no comprehensive empirical study on the impact of different pronoun types on word order in German but a corpus analysis from written Dutch underlines the relevance of pronoun types for word order variation. Van der Beek (2004) showed that the order of two pronominal objects was highly predictable from the pronoun type realizing the direct object: direct objects that were personal pronouns were more likely to precede pronominal indirect objects while direct objects that were demonstrative pronouns tended to follow pronominal indirect objects. The present paper will shed more light on the question whether empirical support for these specific ordering principles for pronouns can also be found in German child-directed and child speech.

1.2 *Word order in children's production of double object constructions*

So far, research on the acquisition of word order variation in ditransitive sentences has focused on the Dative alternation in English- or Norwegian-learning children. The Dative alternation concerns the alternation between the prepositional dative construction in which the direct object precedes the prepositional indirect object (3a), and the double object construction in which the indirect object precedes the direct object (3b).

- (3) a. Peter gave the book to Mary. (prepositional dative construction)
 b. Peter gave Mary the book. (double object construction)

The same factors that have been reported above to influence the order of double objects in German also account for the choice of the construction in English: animate, definite, pronominal, shorter and given arguments preferably appear in the first object position; however, verb-specific ordering preferences also occur (Gropen et al. 1989; Arnold et al. 2000; Bresnan et al. 2007; Stephens 2010; de Marneffe et al. 2012).

Only a few studies have investigated whether children's choice of the construction is affected by these factors as well. Stephens (2010) tested the effect of givenness and type of referring expression using an elicitation task in four-year-old English-learning children. Overall, new constituents mostly followed given constituents in the children's

productions; however, the strength of this effect varied across the two constructions. The given-before-new order occurred only in 40% of the prepositional dative constructions whereas the majority (67%) of double object constructions followed this order and it was consistently chosen when the indirect object was both given and pronominal. The same pattern showed up in a similar study with Norwegian-learning four- to six-year-olds (Anderssen et al. 2014).

In both studies, the typical order of pronouns preceding full NPs was observed with pronouns mostly being given which makes the specific impact of givenness or the type of referring expression on word order hard to disentangle. This was considered in a corpus analysis by de Marneffe et al. (2012) which investigated the spontaneous speech of two- to five-year-old English-learning children and the child-directed speech produced by their mothers. Logistic linear mixed-effects models were used to identify the relevant factors that influenced the choice of the construction. In line with the previous findings, an effect of the type of referring expression was observed: indirect and direct objects that were realized as pronouns were placed directly after the verb. The models did not show an effect of givenness in addition to the effect of type of referring expression in the adult data. However, an interaction between givenness and type of referring expression was observed in the child data: a pronominal direct object was more likely to follow the indirect object when it was new (*?Peter gave him [it]_{new}*), but it was more likely to precede the indirect object when it was given (*Peter gave [it]_{given} to him*). This interaction only occurred in the child data because the double object construction involving pronominal direct objects is rarely produced by adults (Stephens 2010; de Marneffe et al. 2012) and because children more often use pronouns to refer to new referents than adults. Nevertheless, the results demonstrate that givenness and the type of referring expression had an independent impact on word order in child language and that givenness may have a stronger impact on children's word order than the type of referring expression in case of a conflict between both factors (e.g., the positioning of new pronominal objects).

So far, research on the factors that influence the placement of objects in ditransitive constructions by German-learning children is scarce and restricted to the impact of a small set of factors on object order (lexical vs pronominal NP, focus, definiteness). Drenhaus and Féry (2008) provide evidence that the type of referring expression affects the linearization of double objects in German-speaking three- to six-year-olds. They used a sentence imitation task in which all sentences were provided in the direct object before indirect object (DO-IO) order – an order that is less frequently produced by German speakers (cf., Eisenbeiß 1994; Drenhaus & Féry 2008). Children reproduced this order more often when the direct object was realized as a personal pronoun while they reversed the order more often when the direct object was a lexical NP.

Höhle et al. (2014) also conducted a sentence imitation task to investigate the impact of focus and definiteness on the ordering of objects (full NPs) in German-learning four- to five-year-olds. They found that IO-DO and DO-IO sentences wherein non-focused information preceded focused information and definite NPs preceded indefinite NPs were more often literally reproduced than sentences wherein these orders were violated. However, the effect of definiteness was restricted to the IO-DO order. These results suggest that German-learning children consider the information status and to some extent definiteness in their ordering of objects by the age of five years.

1.3 The current study

In the present study, we further investigated the order of objects in ditransitive sentences in German. Compared to English and Norwegian, German is characterized by a much higher flexibility with respect to the placement of arguments (objects but also subjects)

as well as adjuncts (see also Haider 2006). Therefore, German-learning children may – in general – be exposed to a larger extent of word order variability than children acquiring English or Norwegian which may hinder their detection of the principles that are relevant for word order. In addition, German has very specific ordering principles based on the type of referring expression with less flexibility for pronominal than lexical NPs and reversals in the preferred orders of nominal and pronominal NPs. However, the simple differentiation between nominal and pronominal elements is still not sufficient to cover their word order as demonstrative pronouns behave more similar to nominals than to personal pronouns.

Our study considers spontaneous utterances from children as well as from adult German speakers. Accordingly, the results may not only contribute to our understanding of how German-learning children acquire word order variability but also broaden the empirical basis on word order in German. Thus, they may contribute to the theoretical discussion about the factors influencing word order in the middlefield and to the question whether several factors influence word order or whether these factors may be reduced to information structure or discourse factors (cf. Lenerz 1977; Müller 1999; Struckmeier 2014; vs. Meinunger 2000; Lernerz 2001; Hinterhölzl 2006). Therefore, we tried to cover a maximal range of different factors in our analyses that were discussed as being relevant for the ordering of objects in the German middlefield in previous research.

Our data were submitted to two analyses. In the first analysis, the effects of animacy, definiteness, givenness and the type of referring expression (pronouns vs. lexical NPs) were investigated by modelling their impact on the production of the DO-IO order, similar to the procedure employed by de Marneffe and colleagues (2012). Givenness (but not focus) was included for two reasons. First, we only had access to the written transcripts of the corpus so that we could not use prosodic characteristics for the identification of focus. Notably, definitions of focus and givenness often overlap because focus may be considered as new information (e.g., Halliday 1967; Jackendoff 1972). However, following Krifka (2008), we consider focus to highlight the presence of alternatives and givenness as the degree to which a referent is present in the common ground. The second reason for including givenness was that this factor had been considered in the previous studies on the English Dative alternation and thus allowed for a cross-linguistic comparison with the results for English. However, the restriction to written transcripts influenced our definition of givenness, i.e., we considered givenness only with respect to the linguistic discourse and not with respect to the non-verbal situative context.

The second corpus analysis complemented the first one by considering different pronoun types. This analysis was intended to disentangle the effects of givenness and type of referring expression on word order by going beyond the binary categorization of lexical NPs vs. pronouns that has been applied in previous studies on language acquisition. It tested the assumption that givenness is correlated with specific pronoun types (Gundel et al. 1993; Gundel & Johnson 2013) and that word order is highly predictable from the pronoun type (cf., van der Beek 2004) in child language and in child-directed speech.

2 Corpus analysis 1

The first corpus analysis investigated the effects of animacy, definiteness, givenness and type of referring expression on word order.

2.1 Data extraction and data basis

The data were taken from four corpora of typically developing German-speaking children (Miller 1979; Wagner 1985; Szagun 2001; Rigol 2007) provided by the CHILDES database (MacWhinney 2000). The written transcripts of the utterances of children aged between 2;0 and 4;11 and their mothers (child-directed speech) were analysed.

Data were extracted manually using the CLAN system (MacWhinney 2000). As there were no part of speech annotations for the selected German corpora, we first extracted the words that were produced by every child and his/her mother during the age range considered. From these words, we selected the 20 most frequent ditransitive verbs and searched for utterances that included them. The data set was then narrowed down according to exclusion criteria as described in the following.

First, we excluded questions and sentences that did not realize both objects. Second, we excluded literal repetitions of utterances that had occurred in the preceding 10 utterances. Utterances were kept if they differed at least in either the argument realization (e.g., type of referring expression) or the verb. Then the data were restricted to subordinate and main clauses in which the indirect and direct objects occurred in the middlefield and were realized as non-clausal, continuous constituents. The middlefield was defined as the domain following the finite verb (*gab* ‘gave’ in (4a)) or between the auxiliary (*hat* ‘has’) and the non-finite verb (*gegeben* ‘given’ in (4b)) in main clauses. Sentences with exposed DPs (occurring after the middlefield) were not considered. In subordinate clauses, the middlefield was defined as the domain preceding the finite verb (*gab* ‘gave’ in (4c)) but following C-elements, e.g., the overt complementizer *dass* ‘that’ (in (4c)).

- (4) a. Der Mann gab dem Jungen das Buch.
 the.NOM man gave the.DAT boy the.ACC book
 ‘The man gave the boy the book.’
- b. Der Mann hat dem Jungen das Buch gegeben.
 the.NOM man has the.DAT boy the.ACC book given
 ‘The man gave the boy the book.’
- c. (Hans glaubt, dass) der Mann dem Jungen das Buch gab.
 (Hans believes that) the.NOM man the.DAT boy the.ACC book gave
 ‘(Hans believes that) the man gave the boy the book.’

The data set included only utterances in which the direct and indirect object could unambiguously be identified on the basis of case marking and/or animacy. Moreover, it was restricted to utterances with verbs that occurred in both object orders (IO-DO and DO-IO) and that occurred more than five times in each data set, i.e., in the child data and the adult data. This was the case for nine verbs: *bringen* ‘bring’, *erzählen* ‘tell’, *geben* ‘give’, *holen* ‘bring’, *nehmen* ‘take’, *sagen* ‘say’, *schicken* ‘give as a present’, *vorlesen* ‘read’ and *zeigen* ‘show’. Overall, the data consisted of 1135 utterances (300 child and 835 adult utterances) produced by 12 children and their mothers.

The annotation of the word order only considered the position of the two objects, that is, indirect object before direct object (IO-DO) and direct object before indirect object (DO-IO). It ignored the position of the subject, which could occur in the prefield as in (4a) or in the middlefield as in (4c) or could be missing.² Only utterances in which both objects occurred in the middlefield were analysed because word order in the prefield is assumed to be influenced by factors like focus or topic (e.g., Frey 2010). Following Krifka (2008), (aboutness) topics are the part of an utterance what the sentence is about. Topic status may also be a factor influencing word order in the middlefield (Meinunger 2000; Frey 2004) but we considered givenness as the only information structure factor in the present

² We excluded seven (adult) utterances in which the subject was positioned between the objects (six utterances in the IO-SBJ-DO order and one in the DO-SBJ-IO order). Children did not produce utterances in which the subject was placed between both objects. We considered only the impact of the characteristics of the objects on word order in our analyses. Additional analyses showed that the characteristics of the subject (definiteness, givenness, type of referring expression) did not influence the order of the objects.

Table 1: Relative frequency (in per cent, total numbers in brackets) of the two object orders for children and adults.

	IO-DO	DO-IO	Total
Children (Age two)	89.74 (35)	10.26 (4)	39
Children (Age three)	82.54 (104)	17.46 (22)	126
Children (Age four)	75.00 (27)	25.00 (9)	36
Children (Overall)	82.59 (166)	17.41 (35)	201
Adults	78.69 (624)	21.31 (169)	793

study (see Sauermann 2016 who showed that topic status was not a better predictor for word order of the child and adult data presented in this study).

The subsequent analyses considered the data (201 child and 793 adult utterances) of only those speakers (seven children and nine adults) who produced both word orders (IO-DO and DO-IO) to ensure that children had acquired both word orders with these specific verbs.³

Table 1 shows the frequency of each word order for children and adults. The data of the children are displayed in age steps of one year. Note that data were not available for the entire age range for all children. Children and adults used the IO-DO order more frequently than the DO-IO order, with the proportion for the two word orders being almost equal for both groups (around 80% vs. 20%). The children's data suggest an increasing proportion of DO-IO linearizations from 10% in two-year-olds to 25% in four-year-olds, however, a chi-square test assessing age differences in the distribution of the word orders showed no significant effect ($\chi^2(3) = 3.99, p = .2626$). For this reason and due to the low amount of data when the children were two and four years old, age differences between the children were not considered as a separate factor in the subsequent analyses.

2.2 Annotations

The direct and indirect objects of each sentence were annotated by the first author for animacy, definiteness, givenness and type of referring expression, based on an adapted version of the annotation guidelines in Dipper, Götze & Skopeteas (2007). The annotations were cross-checked by at least one of three independent annotators, with discrepancies between the annotators being discussed. Discrepancies mainly concerned the givenness annotation of the direct object (5.8% of the data) and were resolved with the help of further inspection of the transcript.

Animacy. Animacy annotations distinguished “animate” and “inanimate” referents. All humans and animals were annotated as “animate” whereas all other referents were “inanimate”. “Inanimate” referents included toys (dolls, toy animals), which in principle may be seen as “animate” in a playing situation. However, subsequent analyses showed that the basic pattern of results was not affected by coding toys as either “animate” or “inanimate”. Four animacy orders were distinguished: “animate > inanimate”, “inanimate > animate”, “animate > animate” and “inanimate > inanimate”.

Definiteness. Definiteness distinguished “definite” from “indefinite” referents and was defined by the type of referring expression. Expressions that included a definite article or were realized as proper names (e.g., *Frau R.* ‘Mrs R.’ in (5a)), as well as noun phrases that included universal quantifiers (e.g., *alle Sachen* ‘all things’, (5a)) were annotated as “definite” (cf., Prince, 1992). Pronouns were also annotated as ‘definite’ (e.g., *dir* ‘you’ in (5b)), unless they were indefinite pronouns (e.g., *ein(e)s* ‘one’ in (5b)).

³ The general pattern of the results did not change when children and adults were included who produced only the IO-DO word order.

All other noun phrases (including bare noun phrases and noun phrases with indefinite articles) as well as indefinite pronouns were coded as “indefinite”. Definiteness distinguished between “definite > indefinite”, “indefinite > definite”, “definite > definite” and “indefinite > indefinite” orderings.

- (5) a. definite > definite (Cosima, 3;04.22)
 Ich will mal [Frau + R.]_{def} hier [alle Sachen]_{def} zeigen.
 I.NOM want once Mrs. R.DAT here all.ACC things show
 ‘I want to show Mrs R. all things.’
- b. indefinite > definite (Pauline, 3;11.09)
 Mutti, jetzt geb ich [eins]_{indef} [dir]_{def}
 mum now give I.NOM one.ACC you.DAT
 ‘Mum, now I give one to you.’

Givenness. Givenness was defined on the basis of (discourse-)givenness and determined in terms of a co-reference relation between a referring expression and an antecedent in the previous linguistic context (cf., Dipper et al. 2007). Following the suggestions by Allen, Skarabela & Hughes (2008), expressions were “given” when their antecedent had occurred in the previous four utterances of one of the speakers. Expressions without an antecedent in the preceding four utterances were annotated as “new”, except for personal pronouns referring to the speaker or hearer (i.e., forms of *you* and *I*), which were always annotated as “given” (see (6)).

- (6) a. given > new (Sebastian, 3;11.03)
 Nee, ich will [(e)s]_{given} [der]_{new} nicht erzähle(n).
 no I.NOM want it.ACC her.DAT not tell
 ‘No, I don’t want to tell it to her.’
- b. new > given (Pauline, 3;11.09)
 Mutti, jetzt geb ich [eins]_{new} [dir]_{given}.
 Mum now give I.NOM one.ACC you.DAT
 ‘Mum, now I give one to you.’

The demonstrative pronoun *der* ‘her’ in (6a) and the indefinite pronoun *eines* ‘one’ in (6b) illustrate that not all pronouns were “given”. The referents of the pronouns in these examples were available in the visual context (e.g., *der* ‘her’ refers to a person present in the scene but not mentioned in the linguistic discourse) or inferable from the previous discourse (*eines* ‘one’ is inferable from a set of referents) (cf., Prince 1992; Götze et al. 2007), but there was no antecedent in the linguistic context. Four givenness orderings were determined: “given > new”, “new > given”, “given > given” and “new > new”.

Type of referring expression. Type of referring expression distinguished between “pronouns” and “lexical NPs”⁴ (including proper names and bare noun phrases), resulting in “pronoun > NP” (7a), “NP > pronoun” (7b), “pronoun > pronoun” and “NP > NP” orderings.

- (7) a. pronoun > NP (Emely, 2;05.07)
 ich schenk [dir]_{pronoun} [ein eis]_{np}
 I.NOM give you.DAT an.ACC ice-cream
 ‘I give you ice-cream’

⁴ Although strictly speaking NPs and DPs differ (e.g., Abney 1987), we use the term NP (noun phrase) for NPs and DPs because we focus on the distinction between pronouns vs. NPs, i.e., between short vs. long constituents. Differences within NPs were not considered because the NPs usually just contained one or two constituents.

- b. NP > pronoun (Simone, 3;04.07)
 aber ich will [dem Maxe]_{np} [die]_{pronoun} bringen
 but I.NOM want the.DAT Max they.ACC bring
 'but I want to bring them to Max'

2.3 Data analysis

Logit linear mixed-effects (LME) models (Baayen 2008; Baayen, Davidson & Bates 2008; Jaeger 2008) were calculated, using the `glmer` function (family *binomial*) of the `lme4` package (Bates et al. 2015) provided in the R environment (R Development Core Team 2015). These models correspond to multiple logistic regressions and assess the effects of the predictors (fixed effects) but also take into account the individual speaker as a random factor. They are particularly appropriate for dealing with the unbalanced data resulting from differences in the overall frequency of each word order and from differences in the data contributed by children and adults.

2.4 Results

2.4.1 Ordering patterns

Table 2 shows the proportions of the ordering patterns with respect to animacy, definiteness, givenness and type of referring expression of the indirect and the direct object in the IO-DO and DO-IO word order, separately for the child language (CL, left panel) and child-directed speech (CDS, right panel). We focused on those cases in which the two objects contrasted in these factors (first two rows of each factor) – although the number of cases without any contrast are reported in the table as well.

Animacy. In both CL and CDS, the animate object almost always preceded the inanimate one in the IO-DO order while the animacy order was consistently reversed in the DO-IO order. This reflects the fact that the verbs considered in the analyses typically occur with animate indirect objects and inanimate direct objects.

Definiteness. In both CL and CDS, definite objects preceded indefinite ones in the IO-DO order while some reversed orders were found in the DO-IO order. However, the DO-IO order was characterized by a high amount of cases in which both objects were definite (91% in CL, 99% in CDS).

Givenness. The given > new order was the dominant pattern in the IO-DO order in both CL and CDS (78%, 77%). The new > given pattern was rare in this order (1%). More new > given instances occurred in the DO-IO word order (37%, 25%); but both objects were given (60%, 55%) in the majority of the DO-IO orders.

Type of referring expression. Almost 60% of the IO-DO orders showed pronoun > NP orderings in both CL and CDS. Reversed orders were rare. In the DO-IO order, the pronoun > NP ordering occurred to some extent in CDS (39%) but less often in CL (9%). Most of the DO-IO utterances involved two pronominal objects, especially in CL (86%).

So far, the results suggest similar patterns for CL and CDS. The animate, definite, given and pronominal object preceded the inanimate, indefinite, new and non-pronominal object in most of the utterances, especially in those with IO-DO order. Reversed orderings were relatively rare and mainly observed in the DO-IO order (except for NP > pronoun in CDS). The majority of DO-IO orders involved objects without any contrast on the relevant dimensions, i.e., where both objects were definite, given or pronominal.

Table 3 presents the relative frequency of animate, definite, given and pronominal indirect and direct objects in each word order. Overall, indirect objects tended to be animate, definite, given and pronominal in both word orders (over 90%), but adults produced less

Table 2: Relative frequency (in per cent, total numbers in brackets) of the ordering patterns in each word order (IO-DO, DO-IO) in child language (CL, left panel) and child-directed speech (CDS, right panel).

	CL		CDS	
	<i>IO-DO</i> (N = 166)	<i>DO-IO</i> (N = 35)	<i>IO-DO</i> (N = 624)	<i>DO-IO</i> (N = 169)
Animacy				
Animate>inanimate	95.18 (158)	0	94.87 (592)	0
Inanimate>animate	0	100 (35)	0	96.44 (163)
Animate>animate	0	0	1.92 (12)	1.78 (3)
Inanimate>inanimate	4.82 (8)	0	3.21 (20)	1.78 (3)
Definiteness				
Definite>indefinite	52.41 (87)	0	57.27 (358)	0
Indefinite>definite	0	8.57 (3)	0.16 (1)	1.18 (2)
Definite>definite	46.39 (77)	91.43 (32)	42.31 (264)	98.82 (167)
Indefinite>indefinite	1.20 (2)	0	0.16 (1)	0
Givenness				
Given>new	78.31 (130)	2.86 (1)	77.40 (483)	14.79 (25)
New>given	0.60 (1)	37.14 (13)	0.80 (5)	24.85 (42)
Given>given	16.87 (28)	60.00 (21)	16.03 (100)	55.62 (94)
New>new	4.22 (7)	0	5.77 (36)	4.73 (8)
Type of referring expression				
Pronoun>NP	57.23 (95)	8.57 (3)	57.05 (356)	39.05 (66)
NP>pronoun	4.22 (7)	5.71 (2)	3.69 (23)	1.18 (2)
Pronoun>pronoun	33.73 (56)	85.71 (30)	28.37 (177)	58.58 (99)
NP>NP	4.22 (8)	0	10.90 (68)	1.18 (2)

given indirect objects in the DO-IO word order (80%) and pronominal indirect objects (85% in IO-DO and 60% in DO-IO). Direct objects were almost always inanimate, but their frequency in each word order was affected by their other properties. Definite, given and pronominal direct objects were less frequent in the IO-DO order (17–46%) but more frequent in the DO-IO order (63–99%). This suggests that the characteristics of the direct object rather than the indirect object influenced word order variation. In order to assess the impact of these characteristics on word order we calculated a statistical model predicting word order variation.

2.4.2 Statistical model identifying the factors influencing word order variation

Logit LME models were calculated to predict the probability of the DO-IO word order based on the definiteness, givenness and type of referring expression of the indirect and direct object. Animacy was not included in the models because it did not vary within indirect and direct objects. The models indicate whether a difference in the level of a factor (e.g., given vs. new direct object) changes the probability of the DO-IO word order. The DO-IO word order was chosen as the predicted variable because this word order occurred less frequently in the data.

Model fitting took place in two steps. First, we calculated a model which included the Type of referring expression of the indirect object (IO_RefExpr) and the direct object

Table 3: Relative frequency (in per cent, total numbers in brackets) of animate, definite, given and pronominal indirect and direct objects in each word order for child language (CL) and child-directed speech (CDS).

	CL			CDS		
	<i>IO-DO</i> (<i>N</i> = 166)	<i>DO-IO</i> (<i>N</i> = 35)	<i>Sum</i> (<i>N</i> = 201)	<i>IO-DO</i> (<i>N</i> = 624)	<i>DO-IO</i> (<i>N</i> = 169)	<i>Sum</i> (<i>N</i> = 793)
Indirect Object						
Animate	95 (158)	100 (35)	96 (193)	96 (604)	98 (166)	97 (770)
Definite	99 (164)	100 (35)	99 (199)	100 (622)	100 (169)	100 (791)
Given	95 (158)	97 (34)	96 (192)	93 (583)	80 (136)	91 (719)
Pronominal	91 (151)	91 (32)	91 (183)	85 (533)	60 (101)	80 (634)
Direct Object						
Animate	0 (0)	0 (0)	0 (0)	2 (12)	2 (3)	2 (15)
Definite	46 (77)	91 (32)	54 (109)	42 (264)	99 (167)	54(431)
Given	17 (29)	63 (22)	25 (51)	17 (105)	70 (119)	28 (224)
Pronominal	38 (63)	94 (33)	48 (96)	32 (200)	98 (165)	46 (365)

(DO_RefExpr), the Definiteness of the direct object (DO_Definiteness) and the Givenness of the direct object (DO_Givenness) as fixed factors and Speaker as a random factor.⁵ The fixed factors distinguished the levels “definite” vs. “indefinite” (Definiteness), “given” vs. “new” (Givenness) and “pronoun” vs. “NP” (Type of referring expression). Interactions were not included in the model because they led to convergence errors due to lack of data.

In a second step, we employed a fitting procedure in which the predictors were included in a step-wise fashion, based on the z-values. That is, starting with a model that included only the predictor with the highest z-value (e.g., DO_RefExpr), we used log-likelihood comparisons (cf., Baayen 2008) to compare the simpler model to a model that also included the predictor with the next highest z-value (e.g., DO_RefExpr and DO_Definiteness). A predictor (e.g., DO_Definiteness) was kept in the model if the model including this predictor provided a better fit of the data than the model excluding it. Then the interaction between the factors in the model and subsequently the next factor was considered in the model comparison.

Table 4 displays the statistics of the fixed effects of the final logit LME models for CL (left panel) and CDS (middle panel) and for the conjoined model (right panel) that was calculated to assess differences in the strength of the predictors between both groups. The predictor names (e.g., DO_RefExpr_pronoun) indicate the name of the predictor (“DO_RefExpr” for type of referring expression of the direct object) and the level of the predictor (“pronoun” for pronominal direct object vs. full NP direct object). Positive values of the estimates of the predictors (*b*) indicate an increase in the probability of the DO-IO word order.

Child language (CL). Type of referring expression, Givenness and Definiteness of the direct object were significant predictors. The probability of the DO-IO order was increased when the direct object was realized as a pronoun rather than as an NP (DO_RefExpr),

⁵ Random intercepts for participants were considered in the model, taking the (overall) variance due to participants into account. Random slope adjustments, which account for individual differences with respect to the strength of the fixed effects, were not considered because their inclusion either led to convergence errors in the models, especially in CL data, and/or did not lead to a better fit of the data and change the results. Random effects for verb types were not included in the analyses because including them did not change the pattern of results.

Table 4: Statistics of the fixed effects of the final logit LME models assessing the probability of the DO-IO word order in child language (CL, left panel), child-directed speech (CDS, middle panel) and the conjoined model comparing child language and child-directed speech (CL vs. CDS, right panel). (*b*: estimate, *SE*: standard error, *z*: z-score, *p*: p-value). Significant effects are in bold face.

	CL				CDS				CL vs. CDS			
	<i>b</i>	<i>SE</i>	<i>z</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>z</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>z</i>	<i>p</i>
(Intercept)	-5.75	0.92	-6.219	<.001	-8.58	1.08	-7.971	<.001	-8.44	1.03	-8.152	<.001
DO_RefExpr_pronoun	3.11	0.77	4.035	<.001	5.66	0.71	7.983	<.001	5.60	0.70	7.992	<.001
DO_Definiteness_definite	2.06	0.71	2.932	.003	5.64	0.90	6.265	<.001	5.56	0.89	6.258	<.001
DO_Givenness_given	1.06	0.52	2.057	.04	0.75	0.31	2.401	.016	0.74	0.31	2.395	<.017
IO_RefExpr_pronoun					-3.07	0.56	-5.462	<.001	-3.04	0.56	-5.437	<.001
Group									2.39	1.60	1.487	.117
Group × DO_pronoun									-2.47	1.05	-2.347	.019
Group × DO_definite									-3.34	1.14	-2.940	.003
Group × DO_given									0.27	0.62	0.444	.657
Group × IO_pronoun									3.19	0.97	3.280	.001

when it was given rather than new (DO_Givenness) and when it was definite rather than indefinite (DO_Definiteness).

Child-directed speech (CDS). Four predictors were significant. The probability of the DO-IO word order was increased when the direct object was realized as a pronoun rather than as an NP (DO_RefExpr), when it was given rather than new (DO_Givenness) and when it was definite rather than indefinite (DO_Definiteness). In addition, the probability of the DO-IO word order was decreased when the indirect object was a pronoun rather than an NP (IO_RefExpr, *negative* estimate).

Child language vs. child-directed speech (CL vs. CDS). The baseline is the CDS such that the effects of the Type of referring expression, Givenness and Definiteness of the direct object (DO_RefExpr, DO_Givenness, DO_Definiteness) and that of the Type of referring expression of the indirect object (IO_RefExpr) resemble the effects for the adult data. Of particular interest are the interactions between Group and the other predictors.

The interaction between Group and DO_Givenness was not significant, indicating that Givenness of the direct object had the same effect in both the groups. However, the interactions between Group and DO_RefExpr, between Group and DO_Definiteness and the interaction between Group and IO_RefExpr were significant. The first two interactions indicate that the effect of Type of referring expression and Definiteness of the direct object were weaker in CL than in CDS. The third interaction mirrors the fact that the Type of referring expression of the indirect object influenced word order only in CDS.

2.5 Discussion

Overall, our results show remarkable parallels between children's and adults' ordering of objects in utterances with ditransitive verbs. First, the majority of these utterances followed the IO-DO order in both groups with stable proportions across age. Second, there were also high similarities between children's and adults' production concerning the dimensions that are relevant for the ordering of the objects. Most utterances of children and adults followed the pattern of placing a given, definite or pronominal object in the first object position. If reversed orders occurred, these were mainly observed in the overall less frequent DO-IO order. These findings were reflected by our statistical models, which revealed that the probability of using the DO-IO order increased when the direct

object was definite, given or a pronoun, with the effects of definiteness and the type of referring expression being stronger in adults than in children. A major difference between the children and adults was observed in the effect of the type of referring expression of the indirect object. When the indirect object was realized as a lexical NP, the proportion of the DO-IO order increased only in the adult data. In the following, we will briefly discuss the main findings separately.

First, the general dominance of the IO-DO order resembles previous findings of a preference for this order in German-speaking children and adults (Eisenbeiß 1994; Drenhaus & Féry 2008). Nevertheless, the less frequent DO-IO order occurred in the transcripts of more than half of the children in the age range between 2 and 4 years. Hence, our data are the first to show that German-learning children can variably place the objects of ditransitive verbs in the middlefield from age 2 onwards by obeying the same ordering principles as found in adult speech.⁶

Children and adults show a very similar impact of the factors influencing word order. Differences between them only concerned the strength of the effect of definiteness and the type of referring expression of the direct object, and the presence of an impact of the type of referring expression of the indirect object. Differences in the strength of the predictors (e.g., type of referring expression) have also been reported by de Marneffe and colleagues (2012). The missing impact of the type of referring expression realizing the indirect object in the children in contrast to the adults may merely result from the fact that children rarely uttered lexical NPs as indirect objects.

Concerning the factors affecting the ordering of the two objects, the results show an asymmetry between the IO-DO and the DO-IO order in both child language and child-directed speech. This asymmetry was specifically strong with respect to animacy as all IO-DO orders that involved a contrast on this dimension followed the expected orderings while almost all DO-IO utterances showed the reverse order in children and adults. This pattern was due to the fact that almost all indirect objects in the corpus were animate while the direct objects were inanimate – therefore the DO-IO word order automatically led to an inanimate > animate pattern.

The other ordering principles (definiteness, givenness and type of referring expression) were also satisfied in the IO-DO word order but most utterances in the DO-IO word order showed no contrast with respect to the ordering principles. In the DO-IO word order, violations of the ordering preferences were less common in both groups, especially for definiteness and the type of referring expression, although indefinite > definite and NP > pronoun orders were produced slightly more often by children (9%, 6%) than adults (1%). The given > new preference was also violated more often in the DO-IO order in both children and adults with a considerable amount of new > given orderings in this word order.

This may suggest that givenness had a weaker effect on word order than definiteness and type of referring expression in our data. However, before suggesting that givenness per se has only a weak impact on word order, it should be pointed out that our database

⁶ As pointed out by a reviewer, the pattern of results may be influenced by effects of syntactic priming (e.g., Bock 1986; Branigan et al. 1995). Indeed, experimental studies revealed priming effects in children (e.g., Savage et al. 2003; Huttenlocher, Vasilyeva & Shrimpi 2004) and the study by de Marneffe et al. (2012) on the dative alternation in English revealed a priming effect (i.e., the presence of an IO-DO utterance in the previous ten utterances increased the production of IO-DO utterances in the children). To check for the impact of syntactic priming in our child data, we annotated the presence and the word order of a ditransitive sentence in the previous 10 utterances (not_present vs. IO-DO vs. DO-IO). Syntactic priming had only a marginal effect on word order in the statistical models that included only syntactic priming as a predictor: children produced slightly higher proportions of DO-IO utterances when the previous utterances occurred in the DO-IO utterance ($b = 1.05$, $SE = 0.58$, $z = 1.809$, $p = .071$). When the other predictors (pronominality, definiteness and givenness) were included in the model, the effect of priming was also not significant.

was spontaneous speech from natural interactions between an adult interlocutor and a child from daily situations like playing or eating in which many of the referents were present in the non-verbal context and thus accessible.

In addition, we employed a rather strict criterion for givenness, with given referents requiring an antecedent within the previous four utterances. Indeed, when accessible items that were inferable or accessible from the visual context were considered as given elements or the boundary for givenness was extended to the previous 19 utterances, the number of new-given orderings was reduced in the DO-IO order (CL: 8/35 = 23%; CDS: 14/168 = 8%). However, in this case, the number of given-new occurrences in the IO-DO order was also reduced (CL: 90/166 = 54%; CDS: 303/625 = 48%).

The asymmetries between the IO-DO and DO-IO order were also reflected by the statistical models. They showed that mainly the characteristics of the direct object influence word order. The properties of the indirect object, however, hardly affected word order variation— except that adults produced the DO-IO order more frequently when the indirect object was realized as a lexical NP rather than as a pronoun. The weak impact of the characteristics of the indirect object probably resulted from a correlation between grammatical function and definiteness, givenness and type of referring expression: indirect objects tended to be definite, given and pronominal whereas direct objects showed more variation with respect to these properties.

The low variability of the characteristics of the indirect object may contribute to the relatively high amount of definite > definite, given > given and pronoun > pronoun orders, i.e., constraint-neutral orders in which in principle both word orders are equally possible. Especially children produced a considerable proportion of utterances in which both objects were realized as pronouns.

As mentioned in the introduction, it is argued in the theoretical literature that the word order of personal pronouns may differ from the order of other argument types (Müller 1999; Meinunger 2000; Müller 2001; Haider 2006). In particular, the preferred (or even basic word order) of personal pronouns is DO-IO which explains the high proportion of pronoun > pronoun cases in this order. However, not all pronominal arguments are personal pronouns, so the occurrence of pronominal objects in the DO-IO or IO-DO word order may be due to different pronoun types. Hence, we investigated whether the type of pronoun realizing the indirect and direct objects has an influence on word order variation in a second corpus analysis.

3 Corpus analysis 2

The second corpus analysis complements the first one by providing a finer distinction of the types of pronouns. First, we investigated the relationship between the different pronoun types realizing the indirect and direct objects and word order. Then, we assessed again the impact of givenness, definiteness and type of referring expression on word order variation using the finer distinction of the type of referring expression of the direct object.

3.1 Annotations

The annotations of givenness and definiteness were the same as in the first analysis. The annotation of the type of referring expression was expanded to include different pronoun types. It distinguished between demonstrative pronouns (8a), indefinite pronouns (8b), personal pronouns (8c), clitics (8d), reflexive pronouns (8e) and lexical NPs. Noun phrases were defined as in the first corpus analysis. Clitics were determined on the basis of the written transcripts (as indicated by brackets (see (8d)) or apostrophes). Demonstrative pronouns were usually realized as forms that are identical to the German determiners, such as *der*, *die*, *das* ('the'). Reflexive pronouns (8e) that refer to the subject may be

expressed by the form *sich* ('self'), which is restricted to the third person singular or plural, or by personal pronouns in the first or second person if the subject is first or second person (e.g., Dudenredaktion 2009). We considered both types as reflexive pronoun.

- (8) a. IO-DO (Pauline, 2;04.28)
 du (s)oll mir das vorlesen
 you.NOM should I.DAT that.ACC read
 'you should read that to me'
- b. IO-DO (Rahel, 2;09.07)
 ich kauf dir einen
 I.NOM buy you.DAT one.ACC
 'I buy one for you'
- c. DO-IO (Pauline, 3;07.14)
 ja, du sollst sie mir holen
 yes you.NOM should they.ACC I.DAT bring
 'yes, you should bring them to me'
- d. DO-IO (Cosima, 2;10.14)
 ich zeig (e)s dir ma(l)
 I.NOM show it.ACC you.ACC once
 'I show it to you'
- e. IO-DO (Falko, 3;06.14)
 un dann holn die sich die baumstämme
 and then take they.NOM self.DAT the.ACC trunks
 'and then they take the trunks for themselves'

3.2 Results

3.2.1 Relation between type of referring expression of the indirect object and word order

Table 5 shows the proportions of the type of referring expression realizing the indirect object in each word order for CL and CDS. The results for CL indicate that children mostly realized the indirect object as a personal pronoun and to a much lesser degree as a reflexive pronoun or a lexical NP. Clitics, demonstrative pronouns and indefinite pronouns were relatively rare.

Separate logit LME models assessing the impact of each type of referring expression on the probability of the DO-IO word order in CL did not reveal significant effects, although reflexive pronouns occurred slightly more often in the IO-DO word order ($b = -1.33$, $SE = 0.76$, $z = -1.749$, $p = .080$). This indicates that the type of referring expression realizing the indirect object did not influence word order.

The distribution of the different types of referring expression in CDS looked very similar except that the adults used more lexical NPs as indirect objects than the children. LME models for CDS confirmed that personal pronouns and reflexive pronouns occurred more often in the IO-DO order (personal pronouns: $b = -0.36$, $SE = 0.18$, $z = -2.049$, $p = .041$; reflexive pronouns: $b = -1.34$, $SE = 0.33$, $z = -4.053$, $p < .001$), whereas lexical NPs occurred more often in the DO-IO order ($b = 1.33$, $SE = 0.20$, $z = 6.540$, $p < .001$).

3.2.2 Relation between type of referring expression of the direct object and word order

Table 6 shows the proportions of the type of referring expression realizing the direct object in each word order in CL and CDS. The data confirm a larger variability in the types of referring expression for the direct object compared to the indirect object for CL and CDS. Especially the dominance of personal pronouns was not present for the direct object and more lexical NPs were produced by both groups.

Table 5: Relative frequency (in per cent, total numbers in brackets) of referring expressions realizing the indirect object in the IO-DO and DO-IO word order for child language (left panel) and child-directed speech (right panel).

	CL		CDS	
	<i>IO-DO</i> (<i>N</i> = 166)	<i>DO-IO</i> (<i>N</i> = 35)	<i>IO-DO</i> (<i>N</i> = 624)	<i>DO-IO</i> (<i>N</i> = 169)
Clitic pronoun	0	0	0.16 (1)	0.59 (1)
Personal pronoun	72.29 (120)	80.00 (28)	62.18 (388)	52.07 (88)
Reflexive pronoun	16.87 (28)	5.71 (2)	21.64 (135)	6.51 (11)
Demonstrative pronoun	0.60 (1)	5.71 (2)	1.12 (7)	0.59 (1)
Indefinite pronoun	1.20 (2)	0	0.32 (2)	0
Noun phrase	9.04 (15)	8.57 (3)	14.58 (91)	40.24 (68)

Table 6: Relative frequency (in per cent, total numbers in brackets) of referring expressions realizing the direct object in the IO-DO and DO-IO word order for child language (left panel) and child-directed speech (right panel).

	CL		CDS	
	<i>IO-DO</i> (<i>N</i> = 166)	<i>DO-IO</i> (<i>N</i> = 35)	<i>IO-DO</i> (<i>N</i> = 624)	<i>DO-IO</i> (<i>N</i> = 169)
Clitic pronoun	3.01 (5)	54.29 (19)	3.37 (21)	64.50 (109)
Personal pronoun	0	14.29 (5)	0.64 (4)	23.08 (39)
Demonstrative pronoun	13.25 (22)	20.00 (7)	8.81 (55)	8.88 (15)
Indefinite pronoun	21.69 (36)	5.71 (2)	19.07 (119)	1.18 (2)
Noun phrase	62.05 (103)	5.71 (2)	68.11 (425)	2.36 (4)

Logit LME models were calculated to investigate the relation between the type of expression realizing the direct object and word order. Converging patterns were found for children and adults: direct objects realized as clitics⁷ and personal pronouns occurred more frequently in the DO-IO order than in the IO-DO order (clitics: CL: $b = 3.64$, $SE = 0.57$, $z = 6.428$, $p < .001$; CDS: $b = 4.10$, $SE = 0.29$, $z = 14.010$, $p < .001$; personal pronouns: CDS: $b = 4.10$, $SE = 0.55$, $z = 7.483$, $p < .001$; CL: no analysis was calculated as personal pronouns only occurred in the DO-IO order). In contrast, direct objects realized as indefinite pronouns and lexical NPs were more often produced in the IO-DO word order (indefinite pronouns: CL: $b = -1.64$, $SE = 0.76$, $z = -2.165$, $p = .030$; CDS: $b = -3.01$, $SE = 0.72$, $z = -4.192$, $p < .001$; NPs: CL: $b = -3.31$, $SE = 0.75$, $z = -4.407$, $p < .001$; CDS: $b = -4.47$, $SE = 0.51$, $z = -8.724$, $p < .001$). No preference for any word order was found for demonstrative pronouns (CL: $b = 0.60$, $SE = 0.51$, $z = 1.203$, $p = .229$; CDS: $b = 0.02$, $SE = 0.31$, $z = 0.062$, $p = .951$).

Additional logit LME models were calculated to assess whether the positioning of direct objects realized as demonstrative pronouns was influenced by the type of referring expression of the indirect object or the givenness of the direct object. The models revealed that in CDS, their positioning was influenced by the type of referring expression of the indirect object ($b = -5.84$, $SE = 1.30$, $z = -4.496$, $p < .001$) but not by givenness: demonstrative pronouns were more likely to be placed before the indirect object (DO-IO order) when the

⁷ It has been argued that clitics are not subject to pronoun movement and that their positioning is influenced by phonological factors (Müller 1999; 2001). Nevertheless, in our data clitics occur mainly in the DO-IO word order in which case they are always either cliticized to an auxiliary, or a finite or a modal verb. In the cases, the clitic occurs in the IO-DO word order it is always cliticized to the pronominal indirect object. In this way, in both orders they occur towards the left edge of the middlefield.

indirect object was realized as a lexical NP but were more likely to appear after the indirect object (IO-DO order) when it was realized as pronoun. In CL, no factors influencing the positioning of demonstrative pronouns could be identified.

3.2.3 Statistical model identifying the factors influencing word order

Similar to the first corpus analyses, logit LME models were calculated to assess the impact of definiteness, givenness and the type of referring expression on the probability of the DO-IO word order in CL and CDS. The same model fitting procedure for the inclusion of the predictors was employed. First, we calculated a model that included all predictors to assess their strength. Then, we considered the predictors in a model fitting procedure that included the relevant predictors in a step-wise fashion.

However, the models differ from those of the first corpus analysis in that the Type of referring expression of the direct object (DO_RefExpr) now consisted of more than two levels. Hence, one level had to be chosen as the baseline for the comparisons with the other levels. Demonstrative pronouns were chosen as the baseline as they did not show a preference for any word order. The four sub-predictors DO_RefExpr_NP, DO_RefExpr_indPr, DO_RefExpr_cliPr and DO_RefExpr_perPr captured the differences between demonstrative pronouns and lexical NPs (NP), indefinite pronouns (indPr), clitics (cliPr) and personal pronouns (perPr). The model for CL did not include direct objects realized as personal pronouns because they did not occur in the IO-DO word order in CL and considering them in the analyses led to convergence problems. The other predictors were the same as in the first corpus analysis (DO_Givenness, DO_Definiteness, IO_RefExpr, IO_Givenness, IO_Definiteness). The Type of referring expression of the indirect object (IO_RefExpr) did not distinguish between pronoun types because pronominal indirect objects were almost always realized as personal pronouns. Thus, pronouns were compared to lexical NPs as in the first corpus analysis. Positive values of the estimate of the predictors again indicate an increase in the probability of DO-IO order. **Table 7** displays the statistics of the models.

Child language (CL). Three sub-predictors of the Type of referring expression of the direct object were significant: the probability of the DO-IO word order was decreased when the direct object was realized as a lexical NP or an indefinite pronoun (DO_RefExpr_NP, DO_RefExpr_indPr) and increased when it was realized as a clitic (DO_RefExpr_cliPr). The other predictors, especially the Givenness or Definiteness of the direct object, did not show significant effects on the occurrence of the DO-IO order.

Child-directed speech (CDS). All sub-predictors of the Type of referring expression of the direct object were significant. The probability of the DO-IO word order was reduced when the direct object was realized as a lexical NP or an indefinite pronoun (DO_RefExpr_NP, DO_RefExpr_indPr) and increased when it was a clitic (DO_RefExpr_cliPr). The Givenness of the direct object (DO_Givenness_given) was also significant and reflected an increase in the probability of the DO-IO order when the direct object was given. Moreover, the significant effect of the Type of referring expression of the indirect object indicated a decrease in the DO-IO order when the indirect object was realized as a pronoun rather than as a lexical NP (IO_RefExpr_pronoun).

Child language vs. child-directed speech (CL vs. CDS). CDS was taken as the baseline so that the results for Type of referring expression and Givenness of the direct object and for Type of referring expression of the indirect object reflect the effects of the model for the adult data. The results showed a significant interaction between Group and Type of referring expression of the indirect object (Group_CDS \times IO_pronoun). This interaction reflects that the Type of referring expression of the indirect object influenced word order only in adults. The lack of further interactions indicates that the remaining factors had the same impact on word order in both groups. Notably, an interaction between Group and

Table 7: Statistics of the fixed effects of the final logit LME models assessing the probability of the DO-IO word order in child language (CL, left panel), child-directed speech (CDS, middle panel) and the conjoined model comparing child language and child-directed speech (CL vs. CDS, right panel). (b: estimate, SE: standard error, z: z-score, p: p-value). Significant effects are in bold face.

	CL				CDS				CL vs. CDS			
	b	SE	z	p	b	SE	z	p	b	SE	z-score	P
Intercept	-1.15	0.43	-2.639	.008	0.88	0.78	1.126	.260	0.84	0.72	1.159	.246
DO_RefExpr_NP	-2.80	0.84	-3.347	<.001	-4.17	0.81	-5.145	<.001	-4.03	0.79	-5.091	<.001
DO_RefExpr_indPr	-1.75	0.85	-2.062	.039	-3.51	1.02	-3.444	<.001	-3.38	0.99	-3.379	<.001
DO_RefExpr_cliPr	2.48	0.66	3.735	<.001	4.08	0.59	6.904	<.001	3.96	0.57	6.948	<.001
DO_RefExpr_perPr					4.54	0.76	5.947	<.001	4.46	0.74	5.967	<.001
DO_Givenness_given					0.82	0.41	1.990	.047	0.79	0.40	1.951	.051
IO_RefExpr_pronoun					-4.08	0.71	-5.720	<.001	-3.99	0.69	-5.686	<.001
Group_CDS									-1.80	1.11	-1.622	.105
Group_CDS × DO_NP									1.58	1.21	1.303	.192
Group_CDS × DO_indPr									1.98	1.38	1.435	.151
Group_CDS × DO_cliPr									-1.26	0.95	-1.317	.188
Group_CDS × DO_perPr									12.80	1384	0.009	.993
Group_CDS × DO_given									-0.04	0.75	-0.050	.960
Group_CDS × IO_pronoun									3.11	1.08	2.888	.004

the Givenness of the direct object might be expected because the separate models show an effect of Givenness in CDS but not in CL. This interaction may not occur because there was a non-significant tendency for the effect in CL.⁸

3.3 Discussion

Our second corpus analysis added two main results to the findings from the first analysis. First, the type of referring expression of the direct object had a major effect on its position in children's and adults' utterances: if the direct object was a clitic or a personal pronoun, it mostly preceded the indirect object whereas it followed the indirect object when it was an indefinite pronoun or a lexical NP. Second, distinguishing a larger set of referring expressions as predictors for the occurrence of the DO-IO order reduced the effects of definiteness and givenness in our models.

Our first main result suggests that the relative order of the direct and indirect objects in German-speaking children's language and their speech input can largely be predicted by the type of referring expression realizing the direct object. An exception to this were direct objects realized as demonstrative pronouns, which showed no preference for either word order. In child-directed speech, the positioning of demonstrative pronouns was influenced by the type of referring expression of the indirect object. That is, more DO-IO orderings occurred when the indirect object was realized as a lexical NP.

Different from our first corpus analysis, the models of the second analysis did not reveal effects of definiteness. A reason for this may be that definiteness was highly correlated

⁸ Note that the conjoined model included personal pronouns in the data. Given that personal pronouns always occurred in the DO-IO word order in child language, the interaction between Group and direct objects realized as personal pronouns (DO_perPr) cannot be interpreted (this is also reflected by the high SEs in the model). Nevertheless, the conjoined model also did not reveal an interaction between Group and the Givenness of the direct object when direct objects realized as personal pronouns were excluded from the data analysed by the conjoined model.

with the type of referring expression: clitics and personal pronouns were always definite, indefinite pronouns were indefinite (per definition), noun phrases were definite around half of the time and demonstrative pronouns were always definite. Thus, the impact of definiteness on word order could be captured by the distinction between clitics and personal pronouns, which mainly occurred in the DO-IO word order, and indefinite pronouns, which mainly occurred in the IO-DO word order.

In contrast to the first analysis, givenness of the direct object was no longer a significant predictor for the occurrence of the DO-IO order in child language and showed a reduced effect in adults. We assume that a correlation between type of referring expression and givenness caused the decrease in the givenness effect: indefinite pronouns (97–99% in CL and CDS) and lexical NPs (84%) were mostly new while the majority of clitics and personal pronouns were given (68–69%). Hence, the effect of givenness on word order was mostly captured by the distinct referring expressions.

However, givenness still had a significant impact on word order in addition to the type of referring expression in adults but not in children. Our conjoined model did not reveal an interaction between Group and the Givenness of the direct object possibly because the givenness effect was not very strong in adults and there was a non-significant tendency for the effect in children. Nevertheless, the type of referring expression seemed to be a better predictor of word order than givenness in children, possibly because – in general – they produced more new > given orders in the DO-IO word order than adults. It might be that they were more likely to place clitics and personal pronouns before the indirect object regardless of their givenness status.

The strong correlation we observed between givenness and type of referring expression in our data adds to previous findings that two- to three-year-old children are sensitive to the impact of the information status on referential choice (e.g., Campbell, Brooks & Tomasello 2000; Wittek & Tomasello 2005; Matthews et al. 2006; Serratrice 2008; see Allen, Hughes & Skarabela 2015 for a review), even though they use pronouns or definite NPs for new referents or referents that are not uniquely identifiable from the context in situations that require them to consider the perspective of the hearer (e.g., Maratsos 1976; Emslie & Stevenson 1980; Campbell et al. 2000; Wittek & Tomasello 2005; Matthews et al. 2006; Serratrice 2008; De Cat 2011, see also Karmiloff-Smith 1981; Hendriks, Koster & Hoeks 2014).

Our findings extend these studies by showing that children are also sensitive to word order variation that is connected to referential choice; but the question remains why givenness did not show up as a factor predicting word order in children when different pronouns were considered in the analysis. This point will be considered in more detail in the general discussion.

4 General discussion

In general, our corpus analyses revealed highly overlapping patterns between children and adults with respect to the frequency and the properties of the linearization of the direct and indirect objects in double object constructions. Children and adults showed almost the same distribution of the two word orders and very similar patterns with respect to the factors influencing the word order. Word order in children and adults was influenced by definiteness, givenness and in particular the type of the referring expression. Most importantly, our study showed that the inclusion of a finer distinction of the type of referring expression diminished the effect of givenness. As our study was the first one that included this finer distinction of the type of referring expression, we will focus on this aspect in more detail in the following. In the following, we first discuss the role of

the type of referring expression in the acquisition of word order and then implications of our findings for models of children's acquisition of word order and for theoretical models explaining word order variation in German.

4.1 The impact of the type of referring expression vs. givenness on word order

Our first corpus analysis indicated that givenness had an impact independent of the type of referring expression when the type of referring expression only made a binary distinction between pronouns and lexical NPs; however, givenness showed no separate effect as soon as the type of referring expression differentiated among several pronoun types, as in our second corpus analysis.

Variability in the givenness status of pronominal referents in child language and an impact of the givenness of pronouns on word order was also found in the study by de Marneffe et al. (2012). They found that English-speaking children placed a pronominal and given direct object before a pronominal indirect object but a pronominal and new direct object after a pronominal indirect object. This suggests that givenness had a stronger impact on word order than the type of referring expression when both factors are in conflict (as in the case of new pronouns). In contrast to the findings by de Marneffe et al. (2012), our second corpus analysis showed that, at least for the children, the type of referring expression was a stronger predictor than givenness for producing the less frequent DO-IO order when the type of referring expression distinguished different pronoun types. These divergent outcomes for German and English may be related to differences in structural properties of the two languages, but also to the fact that de Marneffe et al. (2012) did not consider the potential effects of specific pronoun types.

However, our finding of a rather fragile effect of givenness on children's word order fits in with the divergent results from previous studies. In children's earliest utterances, new-before-given as well as given-before-new preferences have been observed (e.g., Bates 1976; Baker & Greenfield 1988; Narasimhan & Dimroth 2008; Dimroth & Narasimhan 2012). Specifically, the results from Narasimhan and Dimroth (2008) demonstrate that even five-year-old German-speaking children do not consistently follow a given-before-new preference when the type of referring expression is controlled for. They elicited coordinated NPs (*an egg and a ball*) from three- and five-year-olds and adults. Most importantly, the referent of one of the NPs had been mentioned before and thus was discourse-given while the other one was new. Adults showed the expected pattern in their productions by mentioning the given NP before the new one. However, both groups of children mainly used the reverse order with the new NP before the given one. Even though we cannot exclude that coordinate NPs underlie different ordering principles than double object constructions in child language, these results support our assumption that the type of referring expression may have a strong impact on word order in young children. Therefore, further experimental studies are required which control for both the effects of givenness and the type of referring expression and clarify the impact of givenness on word order variation.

We do not want to argue that givenness does not have an impact on word order in children in general. As mentioned above, previous research has indicated that children around age 2 to 3 years are sensitive to the impact of givenness on referential choice. Most of these studies investigated the realization of pronouns compared to lexical NPs, but a corpus study by Gundel and Johnson (2013) showed that English-speaking two-and-a-half- to three-year-olds are also sensitive to the correlation between information status and different types of pronouns, that is, the children tended to use personal pronouns for given referents that were in the focus of attention, but demonstrative pronouns for given referents that were "activated" but not in the focus of attention. This suggests that

children (like adults) have a gradient concept of givenness that guides their choice of the specific pronoun type. Transferred to our German data, this may suggest that the children's choice of pronoun was guided by a more gradient concept of givenness than was reflected by our binary given-new distinction for the givenness factor.

The strong impact of the type of referring expression in our analyses probably results from the distribution of pronominal and lexical NP referents in our data. In most utterances, at least one object, usually the indirect object, was realized as a pronoun while there were only very few in which both objects were realized as a lexical NP. Moreover, most lexical NPs were direct objects, and only in child-directed speech were some indirect objects realized as lexical NPs.

These patterns converge with previous studies on German-speaking children's spontaneous speech that showed an increase in the use of pronominal referents (Behrens 2006) and specifically a high number of pronominal referents used to realize the indirect object in two- to three-year-olds (Eisenbeiß 1994).

Taking into consideration that most pronouns were given and that the indirect objects showed less variation with respect to the analysed dimensions, our results are also compatible with cross-linguistic studies on adult and child speech that argue for a Preferred Argument Structure (PAS, Du Bois 1987; 2003). This account emphasizes the strong correlation between givenness, type of referring expression and grammatical role and predicts that the occurrence of more than one lexical and new argument is avoided in an utterance. In transitive sentences, this restriction leads to a majority of given and pronominal subjects (whereas the direct object shows more variability); and in ditransitive sentences, this restriction extends to indirect objects, which are also expected to be given and pronominal (e.g., Du Bois 2003). Crucially, cross-linguistic corpus results on child language demonstrated that two- to three-year-olds follow the PAS principles (e.g., Allen & Schröder 2003; Clancy 2003). This suggests that two- to three-year-old children are not only sensitive to the correlation between information status and referential choice (e.g., Maratsos 1976; Campbell et al. 2000; Wittek & Tomasello 2005; Matthews et al. 2006; Serratrice 2008; De Cat 2011; Gundel & Johnson 2013) but also to the correlation of these factors with the grammatical role. The data from our corpus analysis provide further support that children's utterances follow the PAS principles from a very early age on. Indeed, a high reliance on the PAS principles may explain why children tended to avoid realizing indirect objects as lexical NPs (cf., Allen & Schröder 2003; Clancy 2003; Theakston 2012; Allen et al. 2015; but see Eisenbeiß 1994; Drenhaus & Féry 2008 for alternative explanations).

4.2 Implications for the acquisition of word order variation

Our results tell us that German-speaking children adhere to the principles that guide the linearization of double objects from early on, but what do they tell us about how children acquire these principles? First of all, our data confirm that German-speaking children's input contains variability with respect to the ordering of indirect and direct objects but that there are systematic ordering patterns for specific pronoun types. From this observation, one may conclude that children's input provides them with cues that indicate stable ordering patterns and thus reduces the problem of how to deal with variability in the input (e.g., Hudson Kam & Newport 2005). Pronouns belong to the class of functional morphemes, which typically have a high frequency of occurrence in their language. There is converging evidence that infants can detect highly frequent elements, including functional morphemes, in their input (Höhle & Weissenborn 2003; Shi, Marquis & Gauthier 2006; Shi, Werker & Cutler 2006; Hallé, Durand & de Boysson-Bardies 2008) and already have some knowledge about their distributional properties at a very young

age (Santelmann & Jusczyk 1998; Höhle et al. 2004; Höhle et al. 2006; Shi & Melancon 2010; Van Heugten & Johnson 2010). Therefore, we assume that different types of referring expressions and their distributional properties must be easily accessible for the young child. With respect to word order, two studies are of particular importance. Gervain et al. (2008) found that infants as young as 8 months already show knowledge about the typical ordering patterns of high- vs. low-frequency elements in their language. Soderstrom et al. (2007) found that English 16-month-olds only detected a change of word order in a sentence when a functional morpheme was involved. These results suggest that even infants at a young age are sensitive to positional restrictions for functional morphemes. Thus, we propose that children initially learn the positional restrictions of specific pronoun types from their input. This then may aid the learner in bootstrapping more general word order principles by for example exploiting the correlation between type of referring expression and information status to deduce the more comprehensive impact of information status on ordering patterns.⁹

Our account does not suggest that dimensions like animacy, givenness and definiteness are not relevant for word order at all, as they must be considered to account for the ordering of lexical NPs. However, our acquisition scenario could suggest that the effect of these constraints may emerge based on the principles detected for the ordering of functional morphemes, i.e., pronouns in our case. This hypothesis might be supported by the observation that children seem to acquire the impact of the different dimensions that affect word order only gradually. For instance, previous research has demonstrated that children appear to acquire the effect of definiteness on word order later than the impact of prosodic focus on word order (e.g., Höhle et al. 2014; see also Schaeffer 2000). Moreover, previous research on referential choice suggests that children may have problems keeping track of the information status of a referent in discourse (e.g., De Cat 2011). Hence, acquiring word order principles on the basis of the information status of a referent may be difficult, especially in a discourse setting in which almost all referents are given and differ only minimally in their givenness status. Thus, referring expressions may initially influence the ordering patterns in children's utterances to a large extent (see also Theakston 2012) and more abstract principles like given-before-new might only be acquired by children later (cf., Bates 1976; Dimroth & Narasimhan 2012; Narasimhan & Dimroth 2008).

4.3 Implications for models of word order in German

First, our data support the well-known observation in the theoretical literature that the distinction between different pronoun types is crucial to account for word order variation (e.g., Müller 1999; Meinunger 2000; Müller 2001). Personal pronouns (but also clitics) occur towards the left edge of the middlefield.

Second, our results of the child directed speech show that givenness as well as definiteness and the type of referring expression influence word order and thus support multifactorial accounts (e.g., Müller 1999; Struckmeier 2014) rather than models reducing the factors influencing word order to information structure or discourse factors (e.g.,

⁹ A reviewer pointed out, an alternative account of our data may be that children (and adults) rely on the frequencies of given, definite, animate, and pronoun referents and that speakers may produce what is more frequent at first. It is possible that the high overall frequency of animate, given, definite and pronominal indirect objects and the overall low frequency of animate, given, definite and pronominal direct objects may explain the dominance of the IO-DO word order. However, the overall frequency does not explain the production of DO-IO word orders. Rather, it seems that children consider the different frequencies of the properties of the direct object in each word order, especially the type of referring expression as the second corpus analysis demonstrated. We agree that children may rely on the relative frequency of the type of the referring expression (of the direct object) to produce and possibly acquire word order variation (as we mention in the main text), but our data suggest that they distinguish between the properties of the direct and indirect object.

Meinunger 2000; Lenerz 2001; Hinterhölzl 2006). Further, this supports proposals (e.g., Müller 1999) that assume that the positioning of personal pronouns and clitics may result from syntactic and prosodic factors whereas scrambling, i.e., the positioning of lexical NPs and indefinite and demonstrative pronouns, may be influenced by other factors (e.g., definiteness, animacy, information structure). Indeed, most indirect objects in IO-DO utterances were personal or reflexive pronouns (83.82% in CDS, 89.16% in CL, cf. **Table 5**) and most direct objects in DO-IO utterances were clitics or personal pronouns (87.58% in CDS, 68.58% in CL, **Table 6**). Accordingly, pronoun movement and other syntactic (reflexive pronouns) or phonological factors (clitics) may determine the word order in these cases and may explain a high proportion of DO-IO utterances, i.e., utterances in which the (scrambling) word order constraints did not apply or were violated.

Children were also sensitive to the impact of the type of referring expression, but givenness and definiteness had no impact that was independent from the type of the referring expression. This may suggest that German children of the age range tested have already acquired pronoun movement but may still be in process of acquiring the impact of additional factors like definiteness (see Höhle et al. 2014) and givenness (e.g., Bates 1976; Narasimhan & Dimroth 2008), i.e., the factors that trigger scrambling.

With respect to the debate concerning the underlying word order of German double object constructions, our data can only provide tentative suggestions. If the derived word order is produced to satisfy the word order constraints (e.g., Lenerz 1977, see also Müller 1999), violations of the word order constraints or constraint-neutral word orders may be expected to occur more often with the underlying basic word order (see also Snyder 2007; Westergaard 2009). Our data show that the word order constraints were more often satisfied in the IO-DO word order than in the DO-IO word order and thus they may support the assumption that the DO-IO word order is the underlying one in German. However, as mentioned above, most DO-IO utterances (87.58% in CDS, 68.58% in CL, **Table 6**) may result from pronoun movement and other syntactic or phonological factors. Therefore, only the DO-IO utterances in which the direct object is a lexical NP, demonstrative or indefinite pronoun allow for variation in the ordering patterns and, therefore, should be considered further. In adults, the positioning of the demonstrative pronouns was influenced by the referring expression of the indirect object, that is, DO-IO utterances involving demonstrative pronouns satisfied the pronoun-before-NP preference. Accordingly, there are only few DO-IO utterances, i.e., those in which the direct object was an indefinite pronoun or lexical NP, that are left unexplained because they violate the constraints or involve constraint neutral-orders (3.54%, **Table 6**).

In the child data, however, the positioning of direct objects that were demonstrative pronouns was not influenced by the referring expression of the indirect object. Thus, the word order constraints do not only fail to explain the DO-IO utterances in which the direct object was an indefinite pronoun or lexical NP but also the DO-IO utterances in which the direct object was a demonstrative pronoun (all together 31.42%, **Table 6**). If constraint violations or constraint-neutral orders are expected to occur more often in the underlying/basic word order, as suggested above, our child data would support accounts that assume the DO-IO word order as underlying word order (e.g., Müller 1999).

5 Conclusions

We conducted two corpus analyses to investigate the impact of givenness, definiteness, animacy and type of referring expression on word order variation in child language and child-directed speech. In particular, we were interested in the impact of the type of referring expression, which has been proposed to play a crucial role in the ordering of pronominal referents (e.g., Lenerz 1977; Müller 1999; Müller 2001). Our studies show that in both child language and child-directed speech word order was largely predictable from

the type of referring expression, especially when different pronoun types were considered. With respect to theoretical models, this suggests that the type of referring expression, i.e., formal categories, can override functional factors such as givenness, in influencing word order and supports multi-factorial approaches to word order in German (e.g., Müller 1999; Fanselow 2006; Struckmeier 2014). With respect to language acquisition, our results indicate that the referring expression as a cue to word order was available in the input and that children may pick up the statistical regularities underlying word order, i.e., the distributional properties of different types of referring expressions, from quite early on. We suggest that children may use the type of referring expression as a cue to acquire the regularities related to information status that license word order variation in the middlefield.

Abbreviations

The following abbreviations are used: CDS = child-directed speech, CL = child language, DO-IO = direct object before indirect object (word order), IO-DO = indirect object before direct object (word order), DO-SBJ-IO = direct object before subject before indirect object (word order), IO-SBJ-DO = indirect object before subject before direct object (word order), > = before (used for orderings), def = definite, indef = indefinite, cliPr = clitic pronouns, DP = determiner phrase, indPr = indefinite pronoun, NP = (lexical) nominal phrase, perPr = personal pronoun, RefExpr = type of referring expression. The following abbreviations are used for reporting the statistics: b = estimate (of the linear mixed-effects models), LME = linear mixed-effects (models), p = p-value, SE = standard error, z = z-value. Moreover, the following abbreviations are used for glossing: ACC = accusative, DAT = dative, NOM = nominative.

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Competing Interests

The authors have no competing interests to declare.

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