

# A Filled Gap Stage in German Relative Clause Acquisition

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## 1. Introduction

The understanding of the structure of relative clauses across languages is an important, and still much debated topic (Cinque 2015, Clauss 2017, Mendia 2017, Salzmann 2017, Schuurman 2017, and others). Children's acquisition data in this domain can also provide evidence that constrain the theories of adult grammar, in addition to insights on the acquisition process. In this paper, we present data from the production of relative clauses in German. The data show that German children for a prolonged time produce relative clauses where the head of the relative clause also is pronounced in a position internal to the relative clause. Since the sentences produced are grammatical in most other respects and are intelligible to adults, we surmise that children that produce such structures have learned the grammar of relative clauses except for the requirement to elide some material in the relative clause. The existence of this *Filled Gap Stage* supports therefore accounts of relative clauses where the head also occurs relative clause internally.

A relative clause in languages like English consists of the head of the relative clause, relative pronoun (optional in (1)), and the relative clause, as illustrated in (1). Note that, following for example Heim and Kratzer (1998), we assume that the head of a restrictive relative clause does not include the determiner (*the* in (1)). In German and English, relative clauses must contain a gap (indicated by      in (1)) and the head and the relative pronoun are associated with this gap position both semantically via a variable binding relationship and to some extent also morphosyntactically.

- (1)      the  $\overbrace{\text{girl}}$   $\overbrace{\text{(which)}}$   $\overbrace{\text{the teacher praised \_\_\_}}$

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As far as we know, three syntactic analyses of relative clauses are currently debated in the syntactic literature: the operator analysis of e.g. Chomsky (1977), the raising analysis of Schachter (1973), Vergnaud (1974), Kayne (1994), and the matching analysis of Sauerland (1998, 2000, 2003), Hulsey and Sauerland (2006), Cinque (2015). The three analyses are sketched for (1) in (2a), (2b), and (2c):<sup>1</sup>

- (2) a. the girl (which<sub>x</sub> / Op<sub>x</sub>) the teacher praised t<sub>x</sub>
- b. the girl [which t<sub>girl</sub>] the teacher praised t<sub>girl</sub>
- c. the girl [(which) girl] the teacher praised t<sub>which girl</sub>

According to the operator movement analysis in (2a), a (possibly covert) operator is base-generated in the gap position, and moves to the Specifier position of CP. There is no direct syntactic or semantic relation between the head of the relative clause and the gap position in the relative clause. According to the raising analysis in (2b), the head NP of the relative clause is base-generated in the gap position, and raises to the head position by syntactic movement.<sup>2</sup> The lower copy of the raised NP gets deleted, producing the gap position, although it is also interpreted in the base-generated position. Finally according to the matching analysis, a full DP moves to the Specifier position of the CP, but a second copy of the head NP is base-generated external to the relative clause. The NP in the moved DP internal to the relative clause must undergo ellipsis, stranding the determiner *which* or leaving no determiner at all (Hulsey and Sauerland 2006). In this paper, we compare the production of two types of relative clauses, contrasting how the relative clause is disambiguated.

## 2. Previous Studies on Children's Relative Clause Comprehension and Production

When comparing relativization between subject and object, it is by now well known that those involving extracting from the subject position (subject relative clauses) is easier to comprehend, compared to those involving extracting from the object position (object relative clauses). This is true for both adults and children and found across many languages and also with questions (Bader and Meng 1999, Arosio et al. 2012, Sauerland et al. 2016 among many others.)

There are different accounts of processing difficulties proposed to explain why the extraction from the object position is harder for adults than that from the subject

<sup>1</sup>Note that the sketches in (2) are simplified, schematic, and don't reflect the different variants of each proposal that have been developed.

<sup>2</sup>We use the term *Movement* metaphorically, and are open to the possibility of this process reflecting re-merger or multi-dominance based syntactic structures (see Starke 2001, Johnson 2012, and others).

position (Frazier and Flores d'Arcais 1989, Gibson and Pearlmutter 1998, De Vincenzi 1991). As for children, Friedmann et al. (2009) propose that the reason young children have difficulties with the object relative clauses is due to the Relativized Minimality.

Relativized Minimality accounts for a prohibition of movement by certain item over another item with similar features (Rizzi 1990). It explains why a *wh*-phrase does not move across another *wh*-phrase (*wh*-island): when the unlicensed [+*wh*] feature in *C* triggers a movement of a *wh*-phrase with a matching [+*wh*] feature, and if both the subject and the object is a *wh*-phrase with [+*wh*] feature, the object cannot move, because there is a *wh*-phrase with a closer matching feature, namely, the subject.

According to Friedmann et al. (2009), children and adults differ in what counts as distinct for the purpose of Relativized Minimality. For children, the Relativized Minimality requires that the features meet a stricter disjointness requirement, whereas it does not for adults. Specifically, Friedmann et al. (2009) propose that when [+NP] feature of object moves over subject with [+NP] feature, the Relativized Minimality is violated for children, and therefore, it results in ungrammaticality. When the subject does not have [+NP] feature (e.g., when it is a pronoun), it does not block the movement by the object, and as a result, children can move object across subject without violating the Relativized Minimality.

This account of children's difficulties with object relative clauses assumes that there is a movement of the object of the relative clause, from its base-generated position, over the subject of the relative clause.

More recent studies have shown that different features, such as number and gender, influence the comprehension of relative clauses (Adani et al. 2010). This suggests that [+NP] feature may be too broad to account for children's difficulties with the object relative clauses, and different phi-features, such as [+/- plural/singular], for example, may be relevant for the relativized minimality effect.

In this paper, we show that children use different strategies to avoid producing adult-like object relative clauses, depending on whether the intervening subject has the same number feature as the object (and hence, head of the relative clause). We observe (i) that older children, compared to younger children, produce more ungrammatical structures, and (ii) that whether the head of the relative clause and the subject share the number feature influences the production of object relative clauses. We will argue that certain type of ungrammatical structures are children's attempt at producing object relative clauses, and hence, exhibit that their structures are more similar to the target object relative clauses than some other types of errors.

### **3. Our Study**

#### **3.1. German Relative Clauses**

The structure of German relative clauses is quite similar to that of English (see Haider 2010, Salzmann 2017 among others). Some differences arise from the fact that the German has the SOV rather than SVO word order. As a result,

German relative clauses can be temporarily (or globally) ambiguous. Consider the following examples. Relevant characteristics of German language are shown below.

- (3) a. German is a verb final language, and hence, the finite verb occurs at the end of a relative clause.  
 b. Nominative and Accusative determiners share the morphological form for singular feminine (*die*) and singular neuter (*das*).  
 c. Relative pronouns and definite determiners share the same form for Nominative and Accusative for all gender and number combinations.

Because of these characteristics, some relative clauses are temporarily/globally ambiguous. For example, when the head of the relative clause is a singular neuter noun, the relative pronoun will be *das*, whether the extraction is from the subject or the object position. As a result, the relative clause is ambiguous at least until the first relative clause internal argument is uttered, as shown in (4a). The disambiguation may happen when the head of the relative clause-internal argument is a singular masculine noun, and hence, the determiner takes either distinctly Nominative or distinctly Accusative form.

The relative clause may not be disambiguated until the relative clause final finite verb, when both the head of the relative clause or the head of the relative clause internal argument are feminine-singular, neuter-singular, or plural, but they mismatch in number (one in singular, and the other plural.) In this case, the disambiguation is done by the verbal morphology, as shown in (5) and (6).

- (4) a. Ich möchte das Mädchen sein, das **der** Vater umarm-t.  
 I want the girl be that.the.NOM father hug-SG  
 'I want to be the girl that the father hugs.'  
 b. Ich möchte das Mädchen sein, das **den** Vater umarm-t.  
 I want the girl be that.the.ACC father hug-SG  
 'I want to be the girl that hugs the father.'
- (5) a. Ich möchte das Mädchen sein, das die Frauen umarm-t  
 I want the girl be that the women hugs-SG  
 'I want to be the girl that hugs the women.'  
 b. Ich möchte das Mädchen sein, das die Frauen umarm-**en**  
 I want the girl be that the women hug-PL  
 'I want to be the girl that the women hug.'
- (6) a. Ich möchte bei den Frauen sein, die das Mädchen umarm-t.  
 I want with the women be that the girl hug-SG  
 'I want to be with the women that the girl hugs.'  
 b. Ich möchte bei den Frauen sein, die das Mädchen umarm-**en**.  
 I want with the women be that the girl hug-PL  
 'I want to be with the women that hug the girl.'

The prediction is that children should make fewer mistakes when the head of the relative clause and the relative clause internal argument do not share the number feature, as in (5).

We conducted an elicited production task, adapted from the experimental design of Novogrodsky and Friedmann (2006). We created two lists, one list with a singular head noun, and the other list with a plural head noun. For both lists, the relative clause internal argument was a singular noun.

### 3.2. Participants

82 monolingual German speaking children (4;6=8;7,  $M=6;6$ ) and 40 adult speakers of German participated in the study. Children were recruited from two day care centers and two public schools in Berlin, Germany.

37 children (12 4- & 5-year-olds, 7 6-year-olds, 18 7- & 8-year-olds) were tested with list 1 (with the singular head noun), and 45 children (24 5-year-olds, 21 7- & 8-year-olds) were tested with list 2 (with the plural head noun). There was no significant difference in age between the two lists (t-test:  $p=.793$ .)

Children were tested individually in a quiet room at the day care center/school they normally attended. 20 adult speakers each were tested with list 1 and 2. None of the participants participated in both lists. All the comparisons, hence, were across participants.

### 3.3. Method

The elicitation took place as follows. Participants were told that they would hear a story about two girls/two boys/two groups of children. One girl/boy/group of children would do different things from the other girl, boy, or group of children respectively. The task of the participant is to choose which girl/boy they want to be, or which group of children they'd rather be with. They were instructed to start their response with *Ich möchte lieber das Mädchen/der Junge/bei der Kindern sein ...* 'I want to be the girl/boy/with the children...'. Consider an example story in (7a) and (7b), and the expected response in (8a) and (8b).

- (7) a. There are two girls. One girl hugs a father, and one girl hugs a grandpa. Which girl would you rather be? Please start with *I want to be the girl...*  
 b. I'd rather be the girl that hugs a father.
- (8) a. There are many children. some children hug the father, and some children hug the grandpa. With which children would you rathe be? Please start with *I want to be with the children...*  
 b. I want to be with the children that hug the father.

There were 10 items that targeted to elicit subject relative clauses, and 10 items that elicited object relative clauses.

### 3.4. Material

We selected 22 transitive verbs. Some of the verbs were irreversible because of their semantics (*drink, receive, give, eat*), whereas some verbs were irreversible because of the nouns used (*Movie scares a boy, Shower warms/cool the girl, elephant carries some children*)<sup>3</sup>. Reversible verbs included *photograph, draw, film, invite, meet, visit, comb*. There were eight irreversible contexts (4 eliciting SR) and 12 reversible contexts (6 eliciting SR) for each participant.

The order of the items were pseudo-randomized in order to avoid the target relative clause being presented more than three times in a row. The items using the same verb were separated by items using other verbs.

### 3.5. Data Collection

The utterances produced by the participants were written on paper by the experimenter, whether the utterance represented the target type of relative clause or not. At the same time, the whole session was audio-recorded, using a digital audio-recorder. After the data collection was finished, each utterance was transcribed on an excel spreadsheet. Afterwards, one native speaker listened to the audio-recorded utterances and checked whether the utterances were correctly transcribed.

After the verification of the transcription, three native speakers of German checked whether the produced sentences were grammatical, whether it had the target form/structure or not. One native speaker then went through the data and checked (i) whether the response was appropriate, and (ii) enter the type of error that the speaker made (for example, when the target object relative clause is “the girl that the father hugs”, and the child produced “the girl that hugs the father”, it was marked as grammatical, but with a theta-role reversal error.) Some utterances involved more than one error; e.g., theta-role reversal error and filled-gap error. They were coded on a separate columns.

### 3.6. Overall Results

Let us first consider the list with the singular head noun. We know from previous literature on German and other languages that children produce subject relative clauses without a problem, and that children (and adults) use different strategies to avoid producing object relatives.

There were 370 items that aimed to elicit subject relative clauses, and 370 items for object relative clauses. Among the 370 subject relative eliciting items, 303 of them were of the target form (81.9%). There were different types of errors that children made, including filled-gap error, some structural changes, verb placement error, theta-role reversal error, among others. Some of the errors made the response ungrammatical (filled-gap errors), whereas others might have been

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<sup>3</sup>*The doctor examines a girl, a boy finds a ball* was included in the irreversible category because it is doctors, not a child, examines the other, under normal circumstances.

grammatical, but differed in meaning from the target (theta-role reversal errors).<sup>4</sup>

(9) Target Active responses

- a. Ich möchte lieber der Junge sein, der einen Polizisten malt.  
 I want better the boy be, who a policeman draws  
 'I would rather be the boy who draws a policeman.' (boy, 4;11)

(10) Theta-role reversal responses

- Ich möchte lieber das Mädchen sein, das der Papa umarmt.  
 I want better the girl be, the.NEUT the papa hugs.  
 'I would rather be the girl who daddy hugs.' (girl, 5;5)

(11) Filled-gap responses: with relative pronoun

- Ich möchte lieber das Mädchen sein, das das Mädchen  
 I want better the girl be, the.NEUT the.NEUT girl  
 Freund malt.  
 friend draws  
 'I would rather be the girl who draws (a) friend.' (girl, 4;4)

(12) Filled gap responses: with *wo*

- a. Ich möchte lieber der Junge sein, wo der ein Freund trifft.  
 I would better the boy be where the.MASC a friend meets  
 'I would rather be the boy who meets a friend.' (boy, 5;5)
- b. Ich möchte lieber das Mädchen sein, wo das Mädchen einen  
 I would better the girl be, where the girl a  
 Freund trifft.  
 friend meets  
 'I would rather be the girl who meets a friend' (girl, 7;2)

Let us now consider items that were designed to elicit object relative clauses. Among the 370 production, there were only 69 tokens of target object relative clauses (18.6%), 51 of passives with a by-phrase, and 13 of passives without a by-phrase. These responses represented grammatical responses with the intended interpretation. Some examples are shown below.

(13) Target Active responses

- a. Ich möchte das Mädchen sein, das der Vater umarmt.  
 I want the girl be the.NEUT the.NOM father hugs  
 'I want to be the girl who the father hugs.' (girl, 7;3)

<sup>4</sup>Here and in the following we gloss *lieber* as the comparative form of *good*, *better*, though it is actually derived from *lieb* ('kind'). See e.g. Gehrke and Castroviejo 2016 for discussion of the semantics of positive evaluative modifiers.

- b. Ich möchte der Junge sein den der Gestank stört.  
 I want the boy be who the.NOM smell bothers.  
 'I want to be the boy who the smell bothers.' (boy, 7;1)

(14) Full Passive responses

- a. Ich möchte lieber der Junge sein, der vom Arzt untersucht wird.  
 I want better the boy be, who by.the doctor examined  
 wird.  
 is  
 'I want to be the boy who is examined by the boy.' (boy, 7;1)
- b. Ich möchte lieber das Mädchen sein das vom Vater umarmt wird.  
 I want better the girl be the.NEUT by-the father  
 umarmt wird.  
 hugged is  
 'I want to be the girl who is hugged by the father.' (girl, 5;8)

Short Passive responses

- (15) a. Ich möchte lieber der Junge sein, der umarmt wird.  
 I want better the boy be, who.NOM hugged be  
 'I want to be the boy who is hugged.' (boy, 7;10)
- b. Ich möchte das Mädchen sein, das mit Wasser besprüht werden.  
 I want the girl be who.NEUT with water sprayed  
 werden.  
 are.  
 'I want to be the girl who is sprayed with water.' (girl, 7;4)

The non-target responses included the following (the number in the parentheses indicates the number of tokens):

- (16) Theta-role reversal responses (94): the theta-roles of arguments are reversed
- a. Ich möchte der Junge sein, der den Opa fotografiert.  
 I want the boy be who.NOM the.ACC grandpa photographs  
 'I want to be the boy who photographs grandpa.'
- b. Ich möchte lieber das Mädchen sein, das den Saft wärmt.  
 I want better the girl be who.NEUT the.MASC.ACC juice  
 wärmt.  
 warms  
 'I would rather be the boy who warms the juice.'

Filled-gap responses: adding an argument in the position expected to have a gap (78)



- (17) Filled-gap with expected relative pronoun
- a. Ich möchte der Junge sein, der seinen Vater sein Jungen  
 I want the boy be who.NOM his father his boy  
 kämmt.  
 combs  
 'I want to be the boy who his father combs his boy.'
- b. Ich möchte lieber das Mädchen sein, das der Opa  
 I want better the girl be who.NEUT the.NOM grandpa  
 das Mädchen fotografiert.  
 the girl photographs  
 'I want rather be the girl who the grandpa photographs the girl.'
- (18) Filled-gap with *wo*
- a. Ich möchte das Mädchen sein, wo der Opa das  
 I want the girl be where the.NOM grandpa the  
 Mädchen fotografiert.  
 girl photographs  
 'I want to be the girl who the grandpa photographs the girl.'
- b. Ich möchte das Mädchen sein, wo der Onkel sie  
 I want the girl be where the.NOM uncle her  
 fotografiert.  
 photographs  
 'I want to be the girl where the uncles photographs her.'
- (19) Head reversal responses: relative head is replaced by the relative clause-internal argument, and the expected head appears relative clause-internally
- (13)
- a. Ich möchte der Onkel sein, der den Jungen malt.  
 I want the uncle be who.NOM the.ACC boy draws  
 'I want to be the uncle who draws the boy.'
- b. Ich möchte das Vater sein, das ein Mädchen umarmt.  
 I want the father be who.NEUT a girl hugs.  
 'I want to be the father that hugs a girl.'

Next let us consider the list with the plural head noun. There were 450 tokens each, eliciting subject and object relative clauses. Among the 450 tokens that targeted the subject relative elicitation, 342 were target subject relative clauses (76%). As with the list with the singular head noun, the errors included filled gap, placing verbs at the wrong place, among others.

## (20) Target Active responses (plural head)

- a. Ich möchte bei den Kindern sein, die den Mann  
I want among the children be the.PL the.ACC man  
fotografieren.  
photograph  
'I want to be among the children who photograph the man.'
- b. Ich möchte bei den Kindern sein, die den Polizisten  
I want among the children be the.PL the.ACC police  
malen.  
draw  
'I want to be among the children who draw the police.'

## (21) Theta-role reversal responses

Ich möchte bei den Kindern sein, die die Mama umarmt.  
I want among the children be who.PL the mama hugs  
'I want to be among the children who the mama hugs.'

(22) Filled-gap responses with *wo*

- a. Ich möchte bei den Kindern sein, wo die ein Geschenk  
I want among the children be where they a present  
bekommen.  
receives  
'I want to be among the children where they receive a present.'
- b. Ich möchte bei den Kindern sein, wo die Kinder die  
I want among the children be where the children the  
Oma umarmen.  
grandma hug.PL  
'I want to be among the children where the children hug the grandma.'

Finally, the object relative eliciting items with the plural head noun. Among the 450 tokens, 81 of them were the target object relatives (18%), 70 of them were passives with a by-phrase (15.6%), and 27 of them were passive without a by-phrase (6%). These represented the grammatical utterances with the intended meaning. The rest of the responses all included some type of errors, as shown below:

## (23) Full Passive

- a. Ich möchte bei den Kindern sein, die von einer  
I want among the children be the.PL by a  
Erzieherin fotografiert werden.  
educator-FEM photographed be  
'I want to be among the children who are photographed by a daycare  
teacher.' (boy, age 5;5)

- b. Ich möchte bei den Kindern sein, die von den Elefant  
 I want among the children be the.PL by the elephant  
 nassgespritzt werden.  
 wet-sprayed are  
 'I want to be among the children who are sprayed by the elephant.'  
 (boy, age 5;5)

## (24) Short Passive

- a. Ich möchte bei den Kindern sein, die nassgespritzt werden.  
 I want among the children be who wet-sprayed are  
 'I want to be among the children who are sprayed wet.' (boy, 5;10)
- b. Ich möchte bei den Kindern sein, die fotografiert werden.  
 I want among the children be who photographed are  
 'I want to be among the children who are photographed.' (boy, 5;10)

The non-target responses that are ungrammatical or with wrong meaning are as follows:

## (25) Filled-gap responses (with full DP in the gap position) (184)

- a. Ich möchte bei den Kindern sein, die die Oma die  
 I want among the children be who.PL the grandma the  
 Kinder malt.  
 children draws.sg  
 'I want to be among the children who the grandma draws the children.'  
 (girl, 6;5)
- b. Ich möchte bei den Kindern sein, die die Tante die Kinder  
 I want among the children be who.PL the aunt the children  
 anmalt.  
 paints.sg  
 'I want to be among the children who the aunt paints the children.'  
 (girl, 5;10)

## (26) Filled-gap responses with only the determiner in the gap position

- a. Ich möchte bei den Kindern sein, wo die Mutter die  
 I want among the children be where the mother them  
 umarmt.  
 hugs.  
 'I want to be among the children where the mother hugs them.' (boy,  
 6;3)
- b. Ich möchte bei den Kindern, wo der Opa die sucht.  
 I want among the children where the grandpa them searches  
 'I want to be among the children where the grandpa searches them.'  
 (boy, 6;7)

(27) Filled-gap responses with *wo* and full DP

Ich möchte bei den Kindern sein, wo das Radio die Kinder  
 I want among the children be where the radio the children  
 weckt.  
 awakes  
 'I want to be among the children where the radio awakes the chil-  
 dren.' (girl, 7;10)

## (28) Theta role reversal responses (16)

- a. Ich möchte bei den Kindern sein, die der Papa  
 I want among the children be who.PL the.NOM papa  
 fotografiert.  
 photographs  
 'I want to be among the children who the papa photographs.' (boy,  
 6;7)
- b. Ich möchte bei den Kindern sein, die der Arzt  
 I want among the children be the.THAT the.NOM doctor  
 untersucht.  
 examines  
 'I want to be among the children who the doctor examines.' (boy,  
 8;7)

Comparing the results from two lists, one observation is that the ratios between the filled-gap error and theta-role reversal error seem quite different from each other. A preliminary count of this comparison is summarized in the following table:

	Singular head	Plural head
filled-gap	21.1%	40.9%
theta-role reversal	25.4%	3.6%

This result could be summarized as follows: When the relative head is singular, the distribution of errors between filled-gap and theta-role reversal are similar. When the relative head is plural, on the other hand, most of the errors are due to the filled-gap. This indicates that the relativized minimality constraints constrains the availability of the filled-gap structure. This corroborates our contention that the filled-gap structures produced by children should be analyzed in the same vain as regular movement structure where the gap isn't filled.

#### 4. Conclusion

We have shown using data from a production experiment that German children between ages 4 and 8 produce relative clauses where the relative clause internal

gap position is filled. In this paper, we could not include a quantitative discussion of our results for reasons of space. The qualitative results and a rough quantitative estimate indicate that the filled gapped relative clauses represent a sizeable proportion of German children's relative clause productions, and not only occasional errors.

The presence of filled gaps in child production is in our view only expected if the head of the relative clause is derivationally related to the relative clause internal gap position, either directly as in the raising analysis or indirectly as in the matching analysis introduced in the introduction. We propose specifically an account in terms of the matching analysis based on the assumption that children may not have fully acquired one provision of that analysis, namely that the relative clause internal head must be elided. We assume that furthermore pronunciation in the gap position over pronunciation in the derived position with the relative pronoun is preferred by children because the requirement not to pronounce the head in the higher position is a separate condition. As far as we can see, this account is simpler than any account of the filled gapped stage based on the raising or operator analysis, but it will be interesting to test the predictions made from the assumption that a raising analysis of children's relative clauses with a filled gap is not available.

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