The Acquisition of Verb-argument Structure in German-speaking Children

Barbara Stumper & Gisela Szagun

University of Oldenburg, Germany

Abstract
Valian (1991) proposes that children’s use of verb-argument structure is based on abstract knowledge of verb categories and limited by shortcomings of performance. Theakston, Lieven, Pine & Rowland (2001) provide evidence that children’s transitive and intransitive verb use is learnt gradually and influenced by verb use in the input. The present study examines the acquisition of verb-argument structure in German-speaking children aged 1;6 to 2;10 and is based on longitudinal spontaneous speech data of a sample of six children, four girls and two boys, and their mothers (Szagun, 2004). Children’s verb use was analysed at two MLU levels (MLU1: M = 1.89, MLU2: M = 2.86). On average, 171 child verb utterances (SD = 68) per child at level 1 and 333 child verb utterances (SD = 147) per child at level 2 were used. The influence of adult speech was analysed on the basis of 25 verb types. The present results suggest that children’s acquisition of verb-argument structure develops gradually and is sensitive to adult use of verbs.

1 Introduction
Most of the children learning German utter a first word between the age of 12 and 20 months. At the beginning they use individual nouns, particles, demonstratives, verbs, and intonation to mark questions (Szagun, 2006). After that they combine these elements into linguistic constructions. Linguistic constructions are composed of four types of symbolic elements: words, a more or less given word order, morphological marking, and intonation contour/prosody (Bates & MacWhinney, 1982). The more elements are involved and the more these elements are interrelated, the more complex the linguistic construction becomes. For example, the English regular plural construction is relatively simple (noun + -s), whereas the German plural system is a complex one consisting of multiple regularities (Szagun, 2006). But both are abstract because they are symbolic.

1.1 Verbs and their Arguments in German

All elements in a sentence – apart from the verb – which can be exchanged or moved as a whole are called arguments. The valence of a verb is its ability to structure the syntactic field (Bußmann, 2002). The German verb begrüßen (to greet) for example needs at least two arguments, a nominative and an accusative argument: Ich begrüße meinen Nachbarn (I greet my neighbour). So verbs vary in number and character of their arguments. But the valence of a verb only depicts the “potential of verb meaning” (Schuchmacher, Kubczak, Schmidt & de Ruiter, 2004). The actual usage of a verb in conversation can differ from it. For example, the
German verb *schenken* needs – as defined by grammar – three arguments: a nominative, an accusative and a dative argument: *Ich schenke dir einen Schokoriegel* (*I give you a chocolate bar*). But the potential must not be fully expressed during conversation.

Kid: Schenkst Du mir einen Schokoriegel? (Do you give me a chocolate bar?)
Mother: Ja, schenk ich dir. (*Yes, I give you.)

The valence of a verb is not determined by verb usage in certain situations but reflects the ability of a verb to structure the syntactic field (Schumacher et al., 2004).

Broadly speaking, German verbs can be transitive, intransitive, and mixed. Transitive verbs take obligatory direct object arguments, intransitive verbs do not take direct object arguments and mixed verbs can do either.

Transitive: *Ich brauche neue Schuhe.* (*I need new shoes.*)
Intransitive: *Mama geht nach Hause.* (*Mom is going home.*)
Mixed: *Ich esse. Ich esse eine Banane.* (*I'm eating. I'm eating a banana.*)

### 1.2 Acquisition of Verb-argument Structure

The literature presents two lines of evidence about how children combine nouns and verbs into linguistic constructions. One line of evidence suggests that children’s early knowledge of syntax is of an abstract and general nature and is limited by shortcomings of performance (Valian, 1991; Wexler, 1994; Pinker, 1996). Valian (1991) proposes that children understand the distinction between obligatory and facultative direct objects right from the beginning. So children are expected to produce direct objects much more frequently with transitive than with mixed verbs. Furthermore, she predicts that children produce transitive verbs only later in development because “one way the beginning speaker can lighten the burden of producing objects for verbs is to produce more verbs that do not require objects” (p.70). Valian (1991) examined cross-sectional spontaneous speech data of a sample of 21 children aged 1;10 to 2;8 who were learning American English. They were divided into four groups based on their mean length of utterance (MLU). As the largest changes occurred between Group 1 and Group 2 (MLU 1: M = 1.77; MLU 2: M = 2.49), only these stages are examined in the following analyses. There were five children in both groups. 47 to 274 verb utterances per child were analyzed. Valian (1991) found that at both MLU levels, the children provided objects much more frequently for transitive (M > 90 %) than for mixed verbs (M = 49 % in group 1; M = 66 % in group 2) and they produced few objects with intransitive verbs (M < 10 %). In addition, she found a proportional increase in the use of transitive verbs between group 1 and group 2 (M = 45 % in group 1; M = 59 % in group 2). She assumes that children “do not use a verb unless they know how it subcategorizes with respect to objects” (p.74). The increase in direct object provision with mixed verbs to the second MLU level is seen as support for a decrease in performance limitations. The longer the utterances were the more optional objects were produced. The increase in their use of transitive verbs only later in development is seen as a strategy. Valian (1991) assumes that ‘the child has the option of using more intransitive and mixed verbs to get around the cognitive load that additional constituents would appear to impose’ (p.75).

The other line of evidence assumes that, initially, children do not possess fully abstract syntactic schemas but learn ‘concrete pieces of language’, – i.e. words, complex expressions, and constructions which are both concrete and abstract (Tomasello, 2006, p. 263). Several studies with either naturalistic data or in
experimental settings have shown that children’s early knowledge of verb-argument structure is learnt on a verb-by-verb basis and represents only gradually more general word order patterns (for an overview, see Tomasello, 2000). Furthermore, it is assumed that all linguistic structures are acquired through ‘normal’ learning and abstraction (Tomasello, 2006). Theakston et al. (2001) provide evidence that children’s transitive and intransitive verb use is learnt gradually and influenced by verb use in the input. They suggest that Valian’s (1991) data could also be viewed as evidence in support of a performance-limited learning account. According to the learning account, the transitive frame is expected to be more difficult for the child to acquire. So the intransitive frame will prevail at the beginning. They further suggest that the early acquisition of verb-argument structure depends on the frequency of particular lexical items and verb frames in the input. Theakston et al. (2001) investigated longitudinal spontaneous speech data of a sample of nine children learning British English who were matched on MLU to the children in Valian’s (1991) study (MLU 1: M = 1.66; MLU 2: M = 2.84). On average, 353 verb utterances per child at MLU level 1 and 1504 verb utterances per child at MLU level 2 contributed to the analyses. In accordance with Valian’s (1991) findings and their own predictions, the use of intransitive verbs prevailed and children’s use of transitive verbs increased between MLU level 1 and 2. However, at stage 1 the children did not use a direct object with a transitive verb as consistently as did the children in Valian’s study (M = 79 %). This suggests that these children may not ‘know’ the abstract category of these verbs at such an early stage. Theakston et al. (2001) found a shift towards greater proportional transitive use with mixed verbs, but an analysis at the lexical level revealed that at both MLU levels the majority of the children’s mixed verbs (MLU 1: M = 70.5 %; MLU 2: M = 65.9 %) were produced either in the transitive or the intransitive frame. Moreover, for those mixed verbs where the children produced both frames, the transitive frame prevailed. Thus, Theakston et al. (2001) do not see evidence to suggest that children ‘chose’ to produce the intransitive frame for performance reasons. The proportional increase in the use of the transitive frame with mixed verbs is explained with the late acquisition of a number of mixed verbs used predominantly or exclusively in the transitive frame.

The present paper aims at answering the question of how German-speaking children combine nouns and verbs into linguistic constructions at an early age and whether they are influenced by the input. It is assumed here that they learn the grammatical categories gradually, and that they are influenced by the use and the frequency of verbs in the input.

2 Method

2.1 Design and Participants

The present analyses are based on longitudinal spontaneous speech data of a sample of six children, four girls and two boys, and their mothers (Szagun, 2004). These children were recorded during a two hourly free play situation with a parent at a five- or six-week-sequence between the ages of 1;4 and 3;8. Twenty-two speech samples per child and four data points per parent were analyzed. The children had no diagnosed developmental delays and they demonstrated age-appropriate object permanence knowledge at the start of data collection at age 1;4 (Sarimski, 1987). The children were growing up in monolingual environments and were resident in Oldenburg, Northern Germany. They were recruited from two day-care-centres and a paediatrician’s practice in Oldenburg.

Children’s verb use was analysed at two MLU levels (M1 = 1.89, M2 = 2.86) using four to seven data points per child. At these data points, children were aged 1;6 to
2;10 with a median of 1;10 at MLU level 1 and a median of 2;2 at MLU level 2. At each of the following data points 500 parental utterances were transcribed: 1;4, 1;8, 2;1 and 2;5. These were the first 500 utterances of the sessions. Usually, the mother was the child's conversational partner, but sometimes the father.

2.2 Coding of Utterances with Lexical Verbs

All main verbs in child and adult language were coded for the presence and absence of a direct object argument. Excluded from the analyses were: utterances containing forms of the copula, self-repetitions and imitations, incomplete utterances, partially intelligible utterances and routines. The verb *gucken* (to look) was excluded from the analysis as it predominantly occurred in the fixed phrase *Guck mal! (Look!)* which we classified as a routine. Verbs in periphrastic constructions were included. According to Schumacher et al. (2004) the use of a modal does not affect the valence of the lexical verb. However, we did not analyze the use of modals without lexical verb. Verbs with detachable prefixes counted as tokens for the main lemma. For example, the type *fahren* (to drive) comprised the verbs *runterfahren* (*to drive down*), *rauffahren* (*to drive up*) or *wegfahren* (*to depart*).

Verbs in the input were then categorized as transitive, intransitive, and mixed based on the mother's use of these verbs. We categorized verbs as transitive if the mother used them more than 80 % of the time with a direct object argument. Verbs were coded as intransitive if they were used by the mother in less than 10 % of the utterances with a direct object argument. All other verbs were coded as mixed verbs. By choosing the 80 %-limit for transitive verbs we took into account that in a conversation an obligatory direct object argument can be left out. The 10 %-limit for the intransitive verbs allowed us to pool verbs with inseparable prefixes (e.g. *lächeln* (to smile) and *belächeln* (to smile at)) and it permitted single erroneous assignments for grammatical case in child directed speech. All coding was carried out by the first author. An additional coder coded 22.87 % of all verb utterances for reliabilities. Interrater reliability was 90.23 %, Cohen's Kappa = .814.

Only those child utterances contributed to the analysis that contained a verb categorized as transitive, intransitive, or mixed. An average of 171 utterances with verbs per child (SD = 68) were used at MLU level 1 and an average of 333 utterances with verbs per child (SD = 147) were used at MLU level 2. At the level of individual verbs, 28 verb types (SD = 6) at MLU level 1 and 39 verb types (SD = 7) at MLU level 2 contributed to the analysis. Verb use was coded as unclear in 139 utterances as grammatical case of the argument was unclear. On average 696 parental verb utterances (SD = 101) and 69 verb types (SD = 2) contributed to the analysis. We analyzed whether the mothers' proportional transitive verb use was comparable over the four data points. For each mother, each data point and each verb, we calculated the relative frequencies of transitive verb use. The correlations between these four frequency distributions per mother ranged from \( r_s = .486 \) (\( p < .05, N = 25 \)) to \( r_s = .870 \) (\( p < .01, N = 31 \)). Only one correlation did not reach significance, but pointed in the same direction. Maternal verb use was regarded as consistent over time. We therefore summed up the four data points per mother in order to have one sample per mother.

3 Results

3.1 Child Verb Use

Figure 1 shows the average relative frequencies (\( N = 6 \)) of transitive and intransitive sentences at each MLU level calculated with respect to verb tokens. It is
clear that intransitive verb frames are more frequent overall. But relative frequencies of transitive verb frames increase significantly from the first to the second MLU level, while intransitive verb frames decrease (Wilcoxon, \( p = .028, Z = -2.201 \)). The increase of direct object arguments is accounted for by an increase of transitive and mixed verb use and a decrease of intransitive verb use. Anyway, the dominance of the intransitive frame corresponds to mean length of utterance in child speech. At MLU level 1, 45 % (SD = 14 %) of the intransitive frames consist of only one word. This proportion decreases to 19 % (SD = 4 %) at MLU level 2.

Figure 1. Average relative frequencies of transitive and intransitive verb frames in child language (\( N = 6 \)). ★ \( p = .028 \) (Wilcoxon, \( Z = -2.201 \)); ★ ★ \( p = .028 \) (Wilcoxon, \( Z = -2.201 \))

3.2 Comparison with the Input

In child directed speech, transitive verb frames were as frequent as intransitive verb frames with respect to verb tokens (\( M = 50 \% \), SD = 5).

Figure 2 shows the children’s average proportional use of direct objects with each verb type that was used in a reasonable number of utterances (\( N \geq 6 \)). As predicted by Valian (1991), children produced a lower proportion of direct object arguments with their mixed verbs than with transitive verbs and there was an increase in the proportional use of direct objects with mixed verbs between MLU level 1 and 2 (see Fig. 2). The increase in direct object provision between MLU level 1 and 2 was significant for transitive verbs (Wilcoxon, \( Z = -2.845, p < .05 \)) but not for mixed verbs. However, at both MLU levels children’s use of transitive verb types did not correspond to the grammatical category of a transitive verb. Furthermore, at MLU level 1, 69 % of the mixed verb types are used in a single frame only. At MLU level 2, still 18 % of the mixed verb types are used in a single frame only. Thus, the children showed little evidence that they know that these verbs are in fact mixed in adult language.
As predicted by Valian (1991), the children in our corpora used more mixed verbs than transitive verbs. But there was a close correspondence between relative frequencies of transitive, intransitive, and mixed verbs with respect to verb tokens in adult and child speech (see Fig. 3). Mann-Whitney tests showed no differences between the mean relative frequencies of transitive, intransitive, and mixed verb tokens in child speech (both MLU levels) and adult speech.

### 3.3 Influence of Child Directed Speech

In order to examine the effects of the use of verb frame in the input on children’s use of verb frame we analyzed verb use for each mother-child dyad separately. An average of 9 verb types (SD = 4) at MLU level 1 contributed to the analysis. An average of 13 verb types (SD = 4) was analyzed at MLU level 2. The correlations...
between the average proportional use of the transitive frame with individual verbs in the input and in the child’s speech were found to be significant for all mother-child dyads at MLU level 2 but only for two mother-child dyads at MLU level 1 (see Table 1). Thus, in principle, the more often the mothers used a verb with a direct object argument the more often the children used a verb transitively and vice versa.

Table 1. Correlations between the average proportional use of the transitive frame with individual verbs within individual mother-child dyads.

<table>
<thead>
<tr>
<th>Dyad</th>
<th>MLU level 1</th>
<th>MLU level 2</th>
<th>Dyad</th>
<th>MLU level 1</th>
<th>MLU level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child 1 –</td>
<td>r_s</td>
<td>.573</td>
<td>Child 4 –</td>
<td>r_s</td>
<td>.638</td>
</tr>
<tr>
<td>Mother</td>
<td>p</td>
<td>.020</td>
<td>Mother</td>
<td>p</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>16</td>
<td></td>
<td>N</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Child 2 –</td>
<td>r_s</td>
<td>.928</td>
<td>Child 5 –</td>
<td>r_s</td>
<td>.201</td>
</tr>
<tr>
<td>Mother</td>
<td>p</td>
<td>.008</td>
<td>Mother</td>
<td>p</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>6</td>
<td></td>
<td>N</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Child 3 –</td>
<td>r_s</td>
<td>.426</td>
<td>Child 6 –</td>
<td>r_s</td>
<td>.364</td>
</tr>
<tr>
<td>Mother</td>
<td>p</td>
<td>NS</td>
<td>Mother</td>
<td>p</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>8</td>
<td></td>
<td>N</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

Furthermore, the child data were scanned for all verbs used at MLU level 1 and for all verbs occurring as new verbs at MLU level 2. Eight verbs are used by all children at MLU level 1: essen (to eat), gehen (to go), haben (to have), holen (to catch), machen (to make), stehen (to stand), ziehen (to pull). We found no verb occurring as new verb and used by all children at MLU level 2. But there were six verbs (baden – to bath, bringen – to bring, glauben – to think, lesen – to read, räumen – to clear, stellen – to put) that were used by at least three of the children not until MLU level 2. First, we examined whether the mothers differ with respect to the relative frequency of the use of individual verbs. For each mother we therefore calculated the relative frequency of the above mentioned 14 verbs. The majority of pairwise correlations (73 %) was found to be significant (p < .01; p < .05) with coefficients ranging from r_s = .687 to r_s = .917. We therefore calculated the average frequency for each verb across the input data. A Mann-Whitney test showed that the eight verbs used by the children at MLU level 1 were significantly more frequent in mothers’ speech than those verbs children used from MLU level 2 onwards (p < .05).

4 Discussion

The present study was aimed at answering the question of how German-speaking children aged 1;6 to 2;10 combine nouns and verbs into linguistic constructions. It is assumed here that children learn the grammatical categories gradually, and that they do not use verbs in abstract syntactic schemas right from the beginning. We analyzed child directed speech as an influencing factor.

As in the studies by Valian (1991) and Theakston et al. (2001), children of the Oldenburg corpora used more transitive verb frames at the second than at the first MLU level. At the same time, at both MLU levels intransitive verb frames prevailed. Children increased their use of direct objects with transitive verbs significantly from the first to the second MLU level. These results seem to support the limited-learning
account. In addition, there is evidence for the influence of adult input. This concerns verbs use at the lexical level and frequencies.

The present results show that children do not seem to differentiate between obligatory and facultative direct objects. Although they provide direct objects more often with transitive verbs than with mixed verbs, verb usage is still far away from being grammatically correct with the transitive category. Moreover, many of the mixed verb types are produced in only one single frame providing little evidence that children know the direct object to be facultative. There was also little evidence to suggest that the children avoid ungrammatical utterances by producing more verbs with facultative than obligatory direct objects. While they used more mixed verb tokens than transitive and intransitive verb tokens, the reason for this may not be because they prefer verbs with facultative objects in order to avoid ungrammatical sentences. Such verb use simply reflects adult use, as relative frequencies of transitive, intransitive, and mixed verb tokens in child directed and child speech corresponded closely.

The results show clearly that children seem to be sensitive to verb use in the input. The verbs the children used at the first MLU level were significantly more frequent in adult speech than those verbs which they did not use until the second MLU level. So, the relative frequencies of particular lexical items seem to play a role in the acquisition of linguistic constructions. However, adult and child verb use with respect to frequency of direct object use did not correlate for every mother-child dyad at the first MLU level but only for two mother-child dyads. At the second MLU level, the children's verb use correlated significantly with that of their mothers.

Perhaps, it is useful to consider that, whether a verb is produced in the intransitive or transitive verb frame is not only affected by the grammatical category of the verb. As was pointed out earlier in the introduction, the discourse context of the utterance is another determining factor of whether an intransitive verb use is acceptable or not. Using a transitive verb without the obligatory direct object highlights verb meaning and might prevail in situations where action is in the centre of attention. Moreover, as discussed by Theakston et al. (2001), the choice of verb frame with mixed verbs is determined by the speaker’s intention to convey general or specific information. In this sense, differences in verb use between adults and children may be due to differences in the roles adults and children play in a conversation.

In contrast to the findings of Valian (1991) and Theakston et al. (2001), the children of our corpora were much more reserved with respect to direct object use for both transitive verbs and mixed verbs. They were no way near the level of direct object use the English learning children showed in both studies. One explanation could be that children in the two languages were matched on MLU. As German is a moderately inflecting language, German-speaking children's MLU level may be higher due to use of inflections, although their overall grammatical development may be less advanced than that of English-speaking children. In particular, they may be less advanced at the syntactic level and this would affect their use of direct objects and sentence frames with direct objects.

Other reasons for the differences in results are of a methodological nature. Thus, we included imperatives and verbs taking sentential complements, whereas Valian (1991) did not. In comparison to the study by Theakston et al. (2001) our study is based on less verb use by the children.
5 Conclusion

The present results show that, initially, German-speaking children have limited knowledge of verb-argument structure. They do not differentiate between obligatory and facultative direct object arguments, and contrary to Valian’s (1991) findings, they do make mistakes with transitive verbs. Thus, the conclusion that children have abstract knowledge of verb categories seems unwarranted. Our results show clearly that children are sensitive to the patterns of verb use in the input. This is so on the lexical and the frequency level. Thus, it appears that verb-argument structure is acquired gradually by children and under the influence of adult use of verbs and sentence frames.

Acknowledgements

We are deeply grateful to Sarah M. Deutscher for providing assistance with coding.

References