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Research Article

Number Dissimilarity Effects in Object-Initial Sentence Comprehension by German-Speaking Children With Specific Language Impairment

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Purpose: This study examines the contribution of number morphology to language comprehension abilities among children with specific language impairment (SLI) and age-matched controls. It addresses the question of whether number agreement facilitates the comprehension accuracy of object-initial declarative sentences. According to the predictions of the structural intervention account for German, number agreement should assist the correct interpretation of object-initial sentences.
Method: This study examines German-speaking children with SLI and a control group of age-matched typically developing children on their sentence comprehension skills for auditory presented subject–verb–object and object–verb–subject (OVS) sentences. The sentences were manipulated with respect to the number properties of the noun phrases (e.g., one plural and one singular, or both singular) and the number agreement of the verb.
Results: The group of children with SLI demonstrated poorer comprehension accuracy in comparison to controls. Comprehension difficulty was limited to OVS sentences among children with SLI. In addition, children with SLI comprehended OVS sentences in which number agreement (with plural subject and verb inflection) indicated the noncanonical word order more accurately than OVS sentences with two singular noun phrases and therein did not differ from controls.
Conclusion: The study suggests that number agreement helps alleviate the difficulty with OVS sentences and enhances comprehension accuracy, despite the finding that children with SLI exhibit lower comprehension accuracy and more heterogeneous interindividual differences, relative to controls.
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Consistent difficulty with the comprehension of complex sentences is a hallmark of children with specific language impairment (SLI). Children with SLI present with language disorder in the absence of known causes (Leonard, 2014). In this study, the label *SLI* indicates children with language impairment but intellectual abilities within the normal range. However, it should be noted that the sample characteristics of the children with SLI also meet those of children referred to as having *developmental language disorder* (Bishop et al., 2017). Sentences with noncanonical word order as derived from object movement are consistently difficult for children with SLI (e.g., Adani et al., 2014; Friedmann & Novogrodsky, 2004, 2007, 2011; Jensen De López et al., 2014; Stavrakaki, 2001; Stavrakaki et al., 2015; van der Lely et al., 2011). As a consequence of their difficulty with object movement, children with SLI have difficulty assigning thematic roles in complex sentences (Friedmann & Novogrodsky, 2007). For German, noncanonical word order sentences are intrinsically disambiguated by case marking and optionally disambiguated by number agreement. For German-speaking children with SLI, while a morphosyntactic impairment is well documented for sentence production (e.g., Adani et al., 2016; Clahsen, 1989; Clahsen et al., 1997; Hamann et al., 1998; Rice et al., 1997), the same does not hold for comprehension (see Hamann, 2015, for a summary). This study aims to fill this gap by examining the contribution of number agreement to the comprehension of complex sentences in children with SLI.

The article is organized as follows. First, we review the literature on the acquisition of complex transitive sentences in German and provide an overview of the development of number agreement in SLI. We then present our

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experiment on the comprehension of subject–verb–object (SVO) and object–verb–subject (OVS) sentences in German that was carried out with children with SLI and a control group of age-matched typically developing (TD) children. In a nutshell, the study shows that, although children with SLI exhibit lower comprehension accuracy relative to age controls, number agreement helps alleviate the difficulty with OVS sentences and enhances comprehension accuracy.

Properties of OVS Sentences in German, Their Development, and the Role of Number Agreement

Various standardized test batteries used to assess receptive syntactic abilities in German such as *Test zum Satzverstehen von Kindern* (TSVK; Siegmüller et al., 2011), *TROG-D* (Fox, 2006), and *Passiv & Co* (Lorenz et al., 2017) contain test sentences with OVS order, such as (1b), being the noncanonical counterpart of (1a), which exhibits SVO order.

(1) a Der Mann winkt dem Kind.
the.SG.NOM man waves the.SG.DAT child
"The man waves to the child."
b Dem Kind$_i$ winkt der Mann _$_i$.
the.SG.DAT child waves the.SG.NOM man
"The man waves to the child."
c Dem Kind$_i$ winken die Männer _$_i$.
the.SG.DAT child wave.PL the men
"The men wave to the child."

Number is marked on nouns and verbs in German, and the finite verb is morphologically marked for number agreement, either singular or plural. This is exemplified in (1a and 1b) where the verb stem *wink* is inflected with *–t* to agree with the singular subject *der Mann*, while in (1c), the plural inflection *–en* on the verb marks agreement with the plural subject *die Männer*. Number agreement optionally disambiguates between word order variants in the case of OVS sentences, and it may occur together with case marking. An overview of the German case marking system of definite determiner forms is provided in Appendix A.

During language development, the correct comprehension of semantically reversible OVS sentences requires the interpretation of the morphological markers, for instance, case marking and/or number agreement, in particular, when children cannot rely on prior discourse, world knowledge, or animacy (e.g., Brandt et al., 2016; Schaner-Wolles, 1989; Schipke et al., 2012). German-speaking children have difficulty with the correct comprehension of OVS sentences, such as (1b), in particular before the age of 7 years (Biran & Ruigendijk, 2015; Dittmar et al., 2008; Schipke et al., 2012; Stegenwallner-Schütz & Adani, 2017; see also Schouwenaars et al., 2018).

Number agreement is processed effectively later than case (Arosio et al., 2012; Schouwenaars et al., 2018), even though children as young as 3 years of age are already sensitive to number agreement in simple German sentences with subject–verb order (Brandt-Kobele & Höhle, 2010). For OVS sentences, Sorokovska (2017) showed that German-speaking 4-year-olds comprehend sentences with unambiguous case marking more reliably correct than sentences that were disambiguated by number agreement. Moreover, Sorokovska's data also indicated a number asymmetry among OVS sentences with disambiguating number agreement, rendering more correct interpretations of OVS sentences with a singular object and a plural subject (and verb) than OVS sentences with a plural object and a singular subject (and verb). These studies indicate that German-speaking preschoolers have difficulty comprehending noncanonical sentences that are disambiguated by number agreement alone, despite their substantial knowledge of subject–verb agreement in simple declarative sentences. Noun–verb–noun sequences that are disambiguated by number agreement alone are typically temporarily ambiguous between a subject- and an object-first interpretation. The temporal ambiguity can impede comprehension because German-speaking children have been shown to adopt a subject-first interpretation for ambiguous transitive sentences (Brandt et al., 2016).

When number agreement occurs together with unambiguous case marking, there is evidence that number agreement enhances German-speaking children's comprehension of movement-derived sentences (Adani et al., 2017; Stegenwallner-Schütz & Adani, 2017). This finding is expected according to the *competition model* (Bates & MacWhinney, 1987), which states that case marking and number agreement differ in terms of their assignability. In this framework, number agreement should be used later in development than case marking as a cue to guide sentence comprehension in German, because number agreement represents a distributed cue of the subject and the inflected verb. Under the assumption that children can readily interpret number agreement, cue coalition, for example, when both case marking and number agreement can be interpreted to arrive at the intended interpretation, should boost comprehension accuracy in comparison to when only the case marking cue is available.

The facilitating effect of number agreement that rendered the comprehension of noncanonical sentences with a number mismatch more accurate than noncanonical sentences with two singular noun phrases (NPs) can also be explained by various psycholinguistic accounts that capitalize on the impact of morphological feature overlap as a source of comprehension difficulties (Belletti et al., 2012; Grillo, 2009; Lewis et al., 2006; Van Dyke & McElree, 2006, 2011). Although the predictions of these approaches largely overlap, this study will be framed within the *structural intervention* account as proposed by Belletti et al. (2012), given the central role attributed to morphological features that are inflected on the verb, such as number in German. Building up on Grillo (2009) and Rizzi (2013), the structural intervention account attributes the difficulty of OVS sentences in which both the subject and object NP show the same number value (e.g., they are both singular as in 1b) to the complete overlap of the number features and, as a consequence, a difficulty for the developing parser to identify the correct assignment of theta roles. In contrast, a number (or gender) dissimilarity between the moved object and the intervening subject will facilitate children's comprehension

accuracy, as long as these distinguishing features are expressed on the verb morphology (Adani et al., 2010; Belletti et al., 2012; Biran & Ruigendijk, 2015; Haendler & Adani, 2018).

With regard to the development of German noncanonical word order, number dissimilarity has been shown to enhance the comprehension of object relative clauses (Adani et al., 2017). What is appealing about number agreement is that it has been shown to facilitate not only children's comprehension across sentence types and languages (English: Adani et al., 2014; Cilibrasi et al., 2019; Contemori & Marinis, 2014; German: Adani et al., 2017; Italian: Adani et al., 2010) but also language processing in adults (Nicenboim et al., 2018; however, findings are inconsistent [see Jäger et al., 2017, for an overview]). In summary, number agreement plays a prominent role in sentence comprehension, which equips these features with the power to facilitate comprehension even of complex sentence structures among preschool children.

Morphosyntactic Abilities of Children With SLI

Despite the heterogeneity of language abilities that is inherent in this population, a common characteristic of children with SLI is their severe difficulties using grammatical morphemes (see Hamann, 2015, and Leonard, 2014, for an overview of SLI in the German language). A number of studies investigated the comprehension of complex sentence structures in morphologically rich languages that use morphological markers, such as number and case, rather than word order to indicate noncanonical word order. These studies consistently show that children with SLI have difficulty comprehending complex sentences, in comparison to TD children (German: Lindner, 2003; Roesch & Chondrogianni, 2015; Russian: Rakhlin et al., 2016; Greek: Stavrakaki, 2001; Stavrakaki et al., 2015). Such findings have led authors to assume general weak morphological processing abilities among children with SLI (Rakhlin et al., 2016).

In keeping with the account that the processing of morphological markings is vulnerable in SLI, Stavrakaki et al. (2015) found that 5- to 8-year-old children with SLI, unlike younger TD controls with a comparable language age, do not show a higher comprehension accuracy of object relative clauses that are disambiguated through unambiguous case marking, as opposed to those that are disambiguated by number agreement (see also Stavrakaki, 2001).

Further studies on the comprehension of number morphology in SLI have revealed difficulty that is consistent with the production of similar inflection errors, despite evidence showing that children with SLI acquire considerable knowledge of the number agreement paradigms of their language. For instance, English-speaking children with SLI identify the correct number of referents when this information is indicated through nominal plural morphology, but they are unable to do so through processing the number information on the inflected verb (Leonard et al., 2000), or they need more time to do so (Deevy & Leonard, 2018).

Evidence from grammaticality judgment tasks suggests that children with SLI have difficulty noticing number agreement violations on the verb, because they tend not to notice omissions of the agreement morpheme on the finite verb (e.g., Maillart & Schelstraete, 2005; Rice et al., 1999), or they accept violations that consist of substitutions, when a morpheme is substituted on a finite lexical verb that mismatches in number (Greek: Lalioti et al., 2016; Italian: Moscati et al., 2020; Dutch: Rispens & Been, 2007). In summary, while the comprehension of number marking on NPs does not pose particular problems for children with SLI, the processing of number morphology on inflected verbs seems to be more problematic.

Moving to production, German-speaking children with SLI frequently mark agreement incorrectly, including number agreement (Clahsen, 1991; Clahsen et al., 1997; Penke & Rothweiler, 2018; Rothweiler et al., 2012; however, findings have been inconsistent [see Rice et al., 1997]). One prominent account that has been developed to account for these expressive difficulties is the *agreement deficit hypothesis*. According to this hypothesis, German-speaking children with SLI have specific difficulty with the "agree" operation for semantically uninterpretable features, such that are involved in verbal agreement marking in German.

In a recent study with Italian-speaking 4- to 6-year-old children with SLI, Moscati et al. (2020) observed that children with SLI had less difficulty detecting number agreement violations in local determiner noun configurations compared to number agreement violations in SOV configurations. The authors maintain that, during sentence processing, children with SLI are guided by the same syntactic rules as TD children but they show enhanced difficulties with the computation of agreement, which depends on the syntactic complexity of the configuration.

This finding is consistent with the claim that number agreement is vulnerable in SLI, despite the fact that a sensitivity to number agreement in comprehension may emerge nevertheless. This conclusion is further supported by Adani et al. (2014), who showed that number agreement can facilitate comprehension accuracy of relative clauses among English-speaking children with SLI between 9 and 16 years of age. However, this study does not explain whether children with SLI were sensitive to the difference in number marking on the NPs and/or to the agreement morphology on the auxiliary.

In summary, previous research has shown that number morphology can be affected to various degrees in SLI. Number agreement between the subject and the verb appears to be more vulnerable in SLI than number marking on nouns. This is notwithstanding that children with SLI develop considerable knowledge about the number inflection paradigms, both in production and in comprehension. These findings are consistent with the assumption that number marking can constitute an area of relatively spared morphological abilities in SLI.

Research Questions for the Current Study

The current study aims at identifying comprehension abilities among children with SLI in German. First, the

study addresses the question of whether children with SLI have a selective difficulty interpreting the syntactically complex OVS word order in German, in comparison to the canonical SVO word order.

In line with previous accounts on the comprehension asymmetry between SVO and OVS sentences (Biran & Ruigendijk, 2015; Dittmar et al., 2008; Schipke et al., 2012), we expect that children with and without SLI find OVS sentences harder than SVO sentences. This word order effect should be greater among children with SLI relative to the performance of age-matched controls, reflecting their difficulty of processing movement-derived sentences (van der Lely, 2005).

Moreover, this study then addresses the question of whether children with SLI deploy number agreement to enhance comprehension of OVS sentences. As predicted by the structural intervention account and supporting evidence thereof in typical (Adani et al., 2017; Cilibrasi et al., 2019; Contemori & Marinis, 2014; Stegenwallner-Schütz & Adani, 2017) and atypical (Adani et al., 2014) language acquisition, number agreement is hypothesized to enhance the performance of children with and without SLI on OVS sentences. Specifically, the accuracy level of OVS sentences with different number markings on the subject and object NP (i.e., one singular, one plural) is expected to increase relative to the accuracy level of OVS sentences with two singular NPs. If number agreement facilitates sentence comprehension among children with SLI, this finding will imply that children with SLI process the agreement relation between the sentential subject and the inflected verb in OVS sentences.

Method

Participants

Fifty-four German-speaking monolingual children participated in the study. Twenty-seven of them (15 boys and 12 girls) were assigned to the group of children with SLI. They had a mean age of 6;9 (years;months; *SD* = 1;8, range: 5;0–10;11). These children were identified via a thorough language assessment procedure that was carried out in the university laboratory at the University of Potsdam, as well as in day care centers, in speech-and-language therapy centers, or at their family homes in the greater Berlin and Brandenburg areas of Germany. The participating children were all reportedly free of accompanying sensory or neurocognitive impairments, had intellectual abilities within the normal range,[1] and met the inclusion criterion of performing −1 *SD* below age expectation on at least two standardized tests of an elaborate test battery. Individual scores of the SLI group are presented in Appendix B. It should be noted that the performance on the TSVK Subtest 3 was not part of the inclusion criteria.

Another 27 children (13 boys and 14 girls) were assigned to the control group of TD children that was matched on chronological age to the SLI group (see Table 1 for more information and group comparisons on age and language standard scores). These children were randomly sampled according to age groups from a pool of TD children who had all completed the experimental test. Parents confirmed via parental questionnaires that all children had normal hearing, normal or corrected-to-normal vision, and no history of language therapy. We also obtained written informed consent from all parents.

Materials

The children completed a sentence–picture matching task. Two factors were manipulated, the word order of the sentence and the number features of the NPs and verb, resulting in two levels for *word order* (SVO and OVS) and three evels for *number features* (singular–singular [SG–SG], singular–plural [SG–PL], and plural–singular [PL–SG]). The six resulting conditions are exemplified in (3a–3f); underscores mark unambiguous number marking.

(3) a SVO: SG–SG
Die Oma hilft der Frau.
the grandmother helps the.DAT.SG woman
"The grandmother helps the woman."
b SVO: SG–PL
Die Oma gratuliert den Kindern.
the grandmother congratulates the.DAT.PL children
"The grandmother congratulates the children."
c SVO: PL–SG
Die Kinder winken dem Mann.
the children wave.PL the.DAT.SG man
"The children wave to the man."
d OVS: SG–SG
Dem Kind winkt der Mann.
the.DAT.SG child waves the.NOM.SG man
"The man waves to the child."
e OVS: SG–PL
Der Oma winken die Polizisten.
the.DAT.SG grandmother wave.PL the.NOM.PL policemen
"The policemen wave to the grandmother."
f OVS: PL–SG
Den Mädchen gratuliert die Mutter.
the.DAT.PL girls congratulates the.NOM.SG mother
"The mother congratulates the girls."

The factors were manipulated between a total of 13 items. All test sentences and picture materials are from Subtest 3 of the German TSVK, a standardized assessment of receptive grammatical abilities (Siegmüller et al., 2011; see Appendix A). The following verbs were used: *treten* (kick), *tragen* (carry), *ziehen* (pull), *schieben* (push), and *zeichnen* (draw), which require an accusative-marked object, and *winken* (wave), *folgen* (follow), *helfen* (help), and *gratulieren*

[1]All children of the SLI group had nonverbal IQ scores of the Coloured Progressive Matrices > 80, except for one child (SLI25). However, we have reasons to maintain his inclusion in the group of children with SLI, because he obtained a full-scale IQ of 91 in an extended cognitive test battery (Intelligence and Developmental Scales; Grob et al., 2009), which makes intellectual impairment an unlikely condition for this child.

Table 1. Comparisons between groups.

Characteristic	SLI *n* = 27	TD *n* = 27	Group comparisons
Age, *M* (*SD*), years;months	6;9 (1;8)	6;9 (1;7)	*ns* (β = 0.062, *SE* = 5.459, *p* = .991)
Range	5;0–10;11	5;0–10;10	
TSVK 5 (binding)			
Mean standard score (*SD*)	49 (10)	56 (4)	TD > SLI (β = 6.444, *SE* = 2.169, *p* < .01)
Range	19–60	47–64	
TSVK 6 (relative clauses)			
Mean standard score (*SD*)	35 (10)	60 (10)	TD > SLI
Range	20–69	42–77	(β = 24.960, *SE* = 2.600, *p* < .001)

Note. We used the standard scores of the oldest available norm group in cases when the participant was actually older. Standard scores are provided on the *t* scale with *M* = 50, *SD* = 10. TD > SLI indicates that the TD group scored higher than the SLI group according to a linear model that specified group as a sliding differences contrast (SLI: −1, TD: 1). SLI = specific language impairment; TD = typically developing; *ns* = not significant.

(congratulate), which require a dative-marked object. All conditions were balanced for accusative and dative objects, with the exception of an additional dative verb in the OVS SG–PL condition.[2] Each item was paired with three pictures that represented a target picture and two foils. Examples of the picture materials and all stimulus sentences are provided in Appendix C. The target picture displayed the correct interpretation of the test sentence. One foil displayed an interpretation of the sentence with reversed thematic role assignment, and another foil displayed characters with different number properties. We refer to the last type of foil as the number error because it pictured the agent or patient characters of the target action with number properties that differed from the correct interpretation of the target sentence.

Procedure

The task was administered to the participants together with a number of other language tasks as part of larger research projects. The session took place either in a laboratory at the University of Potsdam or in a quiet room in the child's nursery, language therapy center, or family home. All participants were rewarded 7.50 € and a small gift, such as stickers or a children's magazine. The task was administered as a paper-and-pencil version. Children sat in front of the test book, which displayed three pictures per page, and were instructed to point to the picture that matched best what the experimenter said. The task usually took up to 7 min. All reactions were scored on a protocol sheet by hand and later entered into a digital format.

[2]An anonymous reviewer pointed out that the number of NPs with unambiguous case marking varies between conditions. The reviewer's concern pertains to two items in particular (Items 5 and 12; see Table C1). In order to address the homogeneity of the items, we conducted an internal consistency analysis (see Supplemental Material S1). Following this analysis, Items 5 and 12 were not attested to differ from the other items.

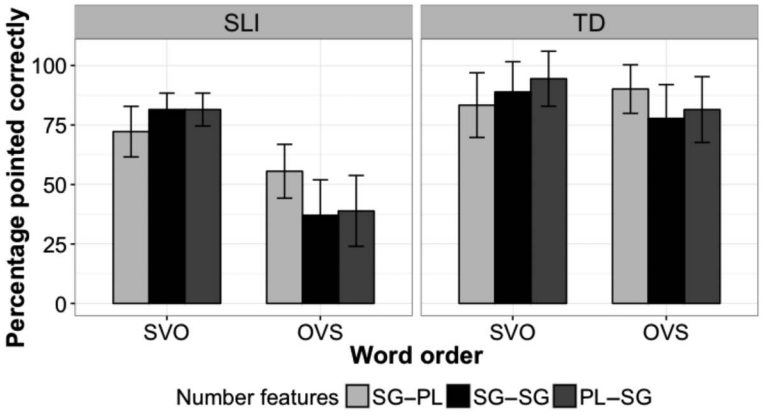
Analysis

We analyzed the accuracy of the pointing reaction by scoring 1 when the child pointed to the target picture and 0 otherwise. The accuracy data were analyzed with a generalized linear mixed model in R (Version 4.0.2; R Core Team, 2020) by using the lme4 package (Bates et al., 2015) and specifying a binomial distribution for the binary response data. The model contained *age* (as continuous *z* scores of the participants' ages that were centered on the mean) and *group* (TD group coded as −1, SLI group coded as 1) as between-subjects fixed factors and *word order* (SVO coded as −1, OVS coded as 1) and *number features* (first, comparison SG–PL coded as −1, SG–SG coded as 1, and PL–SG coded as 0; second, SG–PL coded as 0, SG–SG coded as −1, and PL–SG coded as 1) as within-subject and between-items fixed factors. We specified varying intercepts for subjects and items, after dismissing more complex random effects structures according to the procedure described in Matuschek et al. (2017). We present the significant effects in the following Results section. The complete model specification and model outputs can be found in Tables D1–D3 in Appendix D. Appendix D also contains a display of individual item accuracies.

Results

Figure 1 illustrates the accuracy of the children's pointing reactions for each tested structure grouped according to the word order of the sentences. The effect of age ($p < .001$) showed that older children performed increasingly more accurate than younger children on the experimental task. There was a main effect of group ($p < .001$) that showed that children with SLI ($M_{SLI} = 61\%$) pointed overall less often to the target picture than age-matched controls ($M_{TD} = 86\%$). There was also a main effect of word order ($p < .001$), rendering more correct pointing when children listened to SVO sentences ($M_{SVO} = 84\%$) than to OVS sentences ($M_{OVS} = 65\%$). Furthermore, there was a significant interaction of

Figure 1. Accuracy of the pointing reactions by the group of children with specific language impairment (SLI) and their age-matched controls (typically developing [TD]), in each condition. Error bars represent 2 *SE*s. OVS = object–verb–subject; SVO = subject–verb–object; SG–PL = singular–plural; SG–SG = singular–singular; PL–SG = plural–singular.



the group and word order factors (p = .004). Further post hoc nested comparisons showed that only the SLI group found OVS sentences more difficult to comprehend compared to the SVO sentences ($M_{SLI/SVO}$ = 78%, $M_{SLI/OVS}$ = 46%; p < .001), whereas this has not been observed for the control group ($M_{TD/SVO}$ = 89%, $M_{TD/OVS}$ = 84%; p = .153). In addition, the model revealed an interaction of word order and number features that was restricted to the comparison of singular–singular and singular–plural among the number features (p = .026). Figure 1 illustrates that both groups performed more accurately on OVS sentences with a sentence-initial singular NP followed by a plural NP, compared to OVS sentences with only singular NPs, which was supported by a post hoc comparison ($M_{OVS/SG–SG}$ = 57%, $M_{OVS/SG–PL}$ = 73%; p = .032). This pattern could not be seen for SVO sentences ($M_{SVO/SG–SG}$ = 85%, $M_{SVO/SG–PL}$ = 78%; p = .281).

In addition to the statistical analysis at the group level, we identified patterns in children's individual performances in the OVS: SG–SG relative to the OVS: SG–PL or OVS: PL–SG conditions in order to evaluate post hoc to which extend children's individual performances comply with the group performances. The individual performances were grouped as falling into one of the following four categories: (a) consistently high performance, when children scored 2/2 correct in the OVS: SG–SG and 3/3 or 2/3 correct in the OVS: SG–PL, or 2/2 correct in the OVS: PL–SG, respectively; (b) consistently low performance, when children scored 1/2 or 0/2 correct in the OVS: SG–SG and OVS: SG–PL or OVS: PL–SG conditions, respectively; (c) number facilitation, when children scored 1/2 or 0/2 in the OVS: SG–SG condition, but 3/3 or 2/3 in the OVS: SG–PL condition, or 2/2 in the OVS: PL–SG condition; and (d) number disruption, when children scored 2/2 in the OVS: SG–SG condition, but 1/3 or 0/3 in the OVS: SG–PL condition, or 1/2 or 0/2 in the OVS: PL–SG condition. The structural intervention account would only predict the occurrence of pattern (c). Inspection of Table 2 reveals that at least 16 of 27 TD children performed consistently accurately on all types of OVS sentences, while 13 of 27 children with SLI performed with low accuracy on OVS sentences regardless of number dissimilarity. The pattern of number disruption was not attested when comparing the performance in the OVS: SG–PL and OVS: SG–SG conditions (and only 4 times in the comparison of the OVS: PL–SG vs. OVS: SG–SG conditions). In contrast, a number facilitation was found among the performance patterns of 10 of 27 children of the SLI group and eight of 27 children of the age-matched control group in the OVS: SG–PL in comparison to the OVS: SG–SG condition. These children exhibit an individual performance pattern in the two conditions, which is in accordance with the finding at the group level, namely, a relatively more accurate performance in the OVS: SG–PL condition relative to the OVS: SG–SG condition.

Moreover, we conducted a post hoc analysis of the type of foil that the children selected relative to all other responses (for the analysis of the thematic role reversals, coding thematic role reversals as 1 and number errors and correct responses as 0; for the analysis of the number errors, coding number errors as 1 and thematic role reversals and correct responses as 0). The relative error rates are displayed in Figure D2 in Appendix D. By inspection, we see a higher but statistically nonsignificant increase of number errors in the SLI group in the OVS: PL–SG condition, which can be related to our discussion of the number asymmetry in the next section. Children with SLI differed only in their selection of the thematic role reversal foil from the TD children, which the children with SLI selected more often than the TD group (see Tables D4 and D5 in Appendix D for the model outputs).

Discussion

This study examined the comprehension of SVO and OVS sentences in German-speaking children with SLI, concentrating on how number agreement marking can affect comprehension accuracy. First, we address the research

Table 2. Number of participants that can be grouped according to their individual performances in the OVS: SG–SG and OVS: SG–PL or OVS: PL–SG conditions.

	Consistently high performance		Consistently low performance		Number facilitation		Number disruption	
Relevant comparison	**SLI**	**TD**	**SLI**	**TD**	**SLI**	**TD**	**SLI**	**TD**
OVS: SG–SG vs. OVS: SG–PL	4	18	13	1	10	8	0	0
OVS: SG–SG vs. OVS: PL–SG	2	16	20	7	3	2	2	2

Note. SLI = specific language impairment; TD = typically developing; OVS = object–verb–subject; SG–SG = singular–singular; SG–PL = singular–plural; PL–SG = plural–singular.

question of whether German-speaking children with SLI have difficulty interpreting OVS sentences. The study shows that children with SLI and their age-matched controls comprehend noncanonical OVS sentences more poorly than the canonical SVO sentences. This result replicates many reported findings that show that German-speaking TD children younger than 7 years of age have difficulty with interpreting OVS sentences (e.g., Biran & Ruigendijk, 2015; Dittmar et al., 2008; Sauermann & Höhle, 2016; Schipke et al., 2012; Sorokovska, 2017). In addition, children with SLI also showed marked difficulties with the correct comprehension of German OVS sentences that distinguished their performance from age-matched TD controls. Our findings suggest that the grammatical impairment of children with SLI, as evinced by the standardized tests of syntactic abilities, manifests itself in a poorer comprehension of OVS sentences, as compared to their age controls. While the reduced comprehension accuracy can be the result of difficulty with object movement operations when processing hierarchically complex structures (van der Lely, 2005) or assigning thematic roles (Friedmann & Novogrodsky, 2007), it can also be interpreted to reflect difficulties with the correct interpretation of case marking (Rakhlin et al., 2016; Stavrakaki, 2001; Stavrakaki et al., 2015). Irrespective of the exact nature of the syntactic difficulty, these accounts predict that the syntactic difficulty of German-speaking children with SLI does not only apply to OVS sentences. They corroborate the evidence from German-speaking children with SLI, who show impaired comprehension of various noncanonical structures that are derived via object movement (e.g., object *wh*-question: Roesch & Chondrogianni, 2015; object relative clauses: Haendler et al., 2020; Tuller et al., 2018).

We now turn to the role of number agreement in the comprehension of noncanonical word order in German in order to address the research question of whether number agreement can enhance comprehension of OVS sentences in German-speaking children with SLI. Our data showed that not all OVS sentences were equally hard to comprehend for children with SLI and controls; OVS sentences with a singular object and a plural subject were easier, that is, more accurately comprehended, than OVS sentences with two singular NPs. These results parallel the ones of Adani et al. (2014) who reported a facilitated comprehension of movement-derived structures, relative clauses, through number agreement in children and adolescents with SLI. When comparing this study to Adani et al. (2014), our findings suggest that number agreement improves comprehension not only of English relative clauses but also of German OVS sentences in children with SLI. In addition to the sensitivity to number agreement on auxiliaries as reported by Adani et al. (2014), our study indicates that children with SLI are also sensitive to number agreement on lexical verbs.

In line with the predictions of the structural intervention approach (e.g., Belletti et al., 2012), the number facilitation in our study is tied to movement-derived sentences. A similar pattern was also observed in a cross-sectional study on the typical comprehension of these structures in German among children with the age of 5–6 years (Stegenwallner-Schütz & Adani, 2017). In older children, the number facilitation disappeared given that, from 7 years of age onward, children started to perform very accurately on OVS without number mismatch as well. This finding is corroborated by our analysis that included age as a predictor of more accurate performance on SVO and OVS sentences. In Supplemental Material S2, we provide a reanalysis of this cross-sectional study, in which two locally ambiguous items are excluded. The new analysis reveals a very similar pattern of effects to the published one, namely, that OVS sentences with singular object and plural subject NPs are understood more accurately than OVS with two singular NPs. The number facilitation can be explained with the reduction of feature similarity between the subject and the object (cf. Adani et al., 2017; Belletti et al., 2012). According to the structural intervention account, the number dissimilarity of subject and object in noncanonical sentences assists the integration of the subject–verb agreement relation and accordingly enhances comprehension accuracy.

Inspection of individual performances revealed that 13 of 27 children with SLI performed with low accuracy on OVS sentences regardless of number dissimilarity, while the majority of TD children performed relatively accurately on all types of OVS sentences. This latter finding is in line with the current literature already discussed in which, after 7 years of age, the comprehension difficulties of OVS sentences are significantly reduced. Moreover, approximately one third of the children in each group actually displayed an individual performance pattern that is represented at the group level, complying with the number facilitation that we report for the children with and without SLI. Overall, there is considerable variability to what extent individual

children with SLI deploy number agreement to guide sentence comprehension. While we cannot say whether the children who scored lowly or highly in both the OVS: SG–SG and OVS: SG–PL conditions were sensitive to the number agreement, the inspection of individual performances in these conditions did not identify a single individual who performed in opposition to the prediction of the structural intervention account. The observation that two of three children in the SLI group do not reflect the effect that is attested at the group level indicates that the sensitivity to and ability to deploy number agreement information is heterogeneous at the individual level.

Moreover, children with SLI selected predominantly the thematic role reversal foil, when producing an incorrect response to an OVS sentence, even to a greater extent than TD children. Within the framework of structural intervention, the predominant selection of the thematic role reversal foil by children with SLI in the OVS conditions can be interpreted as resorting to an SVO interpretation, which would be expected if the intervening subject in OVS sentences blocks the dependency formation between the initial object and its gap site.

We also build upon the findings of a number asymmetry in German OVS sentences (Sorokovska, 2017) by differentiating between the position of the singular and plural NP in the structures with number dissimilarity. Children with and without SLI showed an effect of number agreement when the object of the OVS sentence was singular and the subject was plural, but not when the object was plural and the subject was singular. The number asymmetry is, to our knowledge, not predicted by the structural intervention account, which does not specify the exact kind of feature dissimilarity between the subject and the object, but it also does not contradict it. This number asymmetry has also previously been observed in a developmental study on Italian relative clauses (Volpato, 2012) and English relative clause processing (Contemori & Marinis, 2014). We also note that previous German studies that reported number agreement to enhance sentence comprehension accuracy among TD children and adults with aphasia used test sentences with plural subjects (Adani et al., 2017; Hanne et al., 2015) and are, therefore, in line with the asymmetry that was also shown in the current study.

Moreover, adults reveal a reduced ability to detect ungrammatical sentences with subject–verb agreement violations that contain a plural noun inside a modifying prepositional phrase, such as "*the key to the cabinets *are*" (e.g., Pearlmutter et al., 1999), while they tend to continue the sentence with an erroneously marked verb in the same context (e.g., Bock & Miller, 1991). So-called agreement attraction effects are also attested when NPs with mismatching number features occupy argument positions in constructions that involve object movement (Franck et al., 2015, 2010). In a comprehension study with adults, Patson and Husband (2016) showed that the occurrence of such agreement attraction effects in comprehension, that is, the misinterpretation of agreement violations in ungrammatical sentences, is less likely when the subject is plural. The findings for adults' misinterpretation of agreement relations in grammatical sentences parallel the number asymmetry that we found with regard to the OVS: SG–PL and OVS: PL–SG conditions. Thus, it is reasonable to assume that processing effects that make number misinterpretations more likely in sentences with a singular feature on the subject and verb may drive the number asymmetry in our study.

With respect to number agreement, our findings also shed some light on the open question of whether children with SLI who show number facilitation effects in English only relied on the number marking in the nominal domain or whether they actually processed the number agreement on the verb, an issue that was not addressed by Adani et al. (2014). In fact, the English study left open the possibility that the children with SLI might rely on word order to interpret relative clauses (and/or assign the correct thematic roles). In contrast to English, German SVO and OVS sentences both constitute a noun–verb–noun sequence. Hence, the data from the German-speaking children with SLI (and TD) suggest that inflectional morphology that is part of the agreement relation is relevant for the effect of number facilitation. This argument is in line with Belletti et al.'s (2012) structural intervention account that highlights the grammatical features of the verb and capitalizes on features that enter into the agreement relation with the subject. Taken together, the number dissimilarity effect observed by German-speaking children with SLI suggests that these children process number marking not only within the nominal domain but also, at least to some extent, as part of an agreement relation within the verbal domain.

The observed number facilitation in sentences can also be captured by the competition model (Bates & MacWhinney, 1987), which attributes increased comprehension accuracy to the coalition of the case and number cues, since they can be both used to guide the intended assignment of thematic roles. Contrary to the structural intervention account, the competition model does not predict that number agreement should facilitate the comprehension accuracy of children who have difficulty with the interpretation of noncanonical word order that is disambiguated morphologically. Rather, the competition model posits that number agreement should generally follow the case marking during the development of sentence comprehension (cf. Lindner, 2003).

How can we then reconcile these findings with the poor performance of children with SLI on agreement judgment tasks (cf. Lalioti et al., 2016; Moscati et al., 2020; Rispens & Been, 2007)? It has been discussed that the metalinguistic aspect of grammaticality judgment tasks introduces additional difficulty to the task that may deteriorate the performance of children with SLI (Lalioti et al., 2016). This means, even when children with SLI may have difficulty explicitly rejecting an incorrectly marked agreement as ungrammatical, they may nevertheless be sensitive to subject–verb agreement in other tasks. Additionally, Rispens and Been (2007) report the detection rate of number agreement errors as 56%, indicating that children with SLI do not systematically accept agreement errors as grammatical.

The presence of the number facilitation does not support the agreement deficit account that posits that number features of the verb are specifically impaired in SLI (Clahsen et al., 1997). When adapted to the comprehension of number agreement between verbs and subjects, this account would rule out that number features of the finite verb could be evaluated during the comprehension process. Moreover, the observation of number facilitation does not rule out the possibility that the computation of agreement relations follows the same feature checking mechanisms as in typical development. It may be inherently weak in children with SLI, thus leading to higher error rates in comparison to TD children (Moscati et al., 2020), but leaving the computation of agreement still sufficiently effective to enhance comprehension accuracy.

Currently, our data on the comprehension of number agreement can be captured by the structural intervention account. According to this account, children will struggle to correctly comprehend those sentences in which the intervening subject carries morphosyntactic features that are too similar (e.g., by constituting a subset) to those of the object, but comprehension will be alleviated when features are disjoint, as in OVS sentences with plural- and singular-marked NPs (cf. Belletti et al., 2012). This account is appealing for characterizing the nature of the morphosyntactic symptoms in comprehension in SLI, because it emphasizes the difficulty that children with SLI have with noncanonical word order but offers the possibility to evaluate morphological markings according to their effects on sentence comprehension. It also offers the possibility to rank complex sentences according to their level of difficulty across language disorders (Adelt et al., 2017; Durrleman et al., 2016; Hanne et al., 2015) and can inform standardized tests as well as language intervention practice (Levy & Friedmann, 2009; Stegenwallner-Schütz & Adani, 2017).

In conclusion, this study demonstrated that children with SLI who have a syntactic impairment according to standardized assessment can make use of number agreement between the verb and the subject to improve thematic role assignment during the comprehension of OVS sentences. In addition, whether the subject was plural affected the observation of number facilitation in children with SLI and TD controls. These results emphasize the important role that number agreement plays in the comprehension of German transitive sentences and can serve to identify language abilities among children with SLI.

There are a number of intriguing open issues that go beyond the scope of this article but, in our opinion, require further scrutiny. For example, we leave it to future research to systematically vary unambiguous case marking and number features on the first and second NPs in OVS sentences to disentangle how case and number markings may modulate the comprehension of OVS sentences in German. Toward this end, we suggest that this research question should be preferably addressed using an online method, which might be more sensitive than picture-matching tasks to differentiate between local and global ambiguity effects.

Moreover, the sentence material that was used also differed from many other studies on the German language by containing accusative and dative marked objects, while the majority of studies only used accusative objects (e.g., Dittmar et al., 2008; Schipke et al., 2012). In the proposed analysis, we have not systematically differentiated between dative and accusative cases because the distinction between dative and accusative cases appears to play an inferior role in the development of typical sentence comprehension (cf. Schaner-Wolles, 1989). Moreover, unlike accusatives, plural dative markings on determiners bear the advantage that they are not ambiguous between the nominative and dative forms and consequently do not introduce temporary ambiguity in OVS sentences with sentence-initial dative plural objects. The systematic variation of dative- and accusative-marked sentence-initial objects could be implemented in larger item sets, to potentially distinguish between subtle effects that were not assessed in the current study.

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Appendix A

Overview of the German Case Marking of Definite Determiners

Case	Nominative		Accusative		Dative	
Gender/Number	**Singular**	**Plural**	**Singular**	**Plural**	**Singular**	**Plural**
Masculine	der	die	den	die	dem	den
Feminine	die	die	die	die	der	den
Neuter	das	die	das	die	dem	den

Appendix B

Standard Scores of the SLI Group

ID	Age		CPM	TSVK 4	TSVK 5	TSVK 6	SET 9	Expressive vocabulary	Receptive vocabulary	Lise-KAS
	Years	Months	IQ	*T*	*T*	*T*	*T*	*T*	P	*T*
SLI1	5	0	92	NA	51	**38**	**37**	**17**[c]	21[d]	70[a]
SLI2	5	1	108	61	51	**30**	50	**3**[c]	42[d]	NA
SLI3	5	2	99	46	**39**	45	**39**	32[b]	**9**	**37**[a]
SLI4	5	2	105	NA	51	**38**	**37**	**36**[c]	84[d]	NA
SLI5	5	3	82	NA	**19**	**38**	50	**8**[c]	**0**[d]	NA
SLI6	5	4	103	NA	43	**22**	42	**22**[c]	**8**[d]	NA
SLI7	5	6	131	61	59	**38**	80	36[b]	65	**37**[a]
SLI8	5	7	108	50	59	**30**	80	**32**[c]	84[d]	60[a]
SLI9	5	7	104	69	51	69	**38**	42	59	**<30**
SLI10	5	8	109	NA	55	**38**	46	**36**[c]	84[d]	NA
SLI11	6	1	99	NA	54	**27**	**28**	**32**[c]	84[d]	NA
SLI12	6	2	85	**38**	59	**27**	42	**10**[c]	84[d]	48[a]
SLI13	6	2	94	NA	54	**33**	51	**25**[c]	84[d]	NA
SLI14	6	2	131	57	54	**39**	**35**	53	78	48[a]
SLI15	6	4	102	**38**	50	**39**	47	**25**[c]	95[d]	NA
SLI16	6	7	95	**26**	50	**33**	47	46	87	NA
SLI17	6	8	97	57	54	**20**	51	**35**	**10**	NA
SLI18	6	8	97	**38**	50	**39**	51	50	87	**33**
SLI19	7	0	135	**39**	54	**22**	**35**	41	17	**33**[a]
SLI20	7	3	116	**39**	54	**29**	55	47	55	**37**[a]
SLI21	7	3	92	**27**	60	**29**	50	46	74	48[a]
SLI22	8	3	94	**<13**	**20**	**38**	40	**37**	32	43[a]
SLI23	8	7	110	48	54	42	**36**	48	41	**37**[a]
SLI24	8	11	97	**13**[a]	**37**	**34**	**32**	**30**	23	NA
SLI25[e]	10	3	65	48[a]	54[a]	42[a]	**30**	**0**	48	NA
SLI26	10	5	150	41[a]	54[a]	**26**[a]	49	**0**	48	NA
SLI27	10	11	83	NA	**37**[a]	**38**[a]	**29**	**0**	17	NA

Note. Bold font indicates a score of at least −1 *SD* below the age-appropriate mean. SLI = specific language impairment; CPM = intelligence quotient from the colored version of the German adaptation of *Raven's Progressive Matrices* (Raven et al., 2000); IQ = intelligence quotient; TSVK 4 = passives subtest of the *Test zum Satzverstehen von Kindern* (TSVK; Siegmüller et al., 2011); *T* = *T* score; TSVK 5 = Binding subtest of the TSVK; TSVK6 = Relative Clause subtest of the TSVK; SET9 = correction of incorrect sentences of the *Sprachstandserhebungstest für Kinder im Alter zwischen 5 und 10 Jahren* (SET 5-10; Petermann et al., 2010); Expressive vocabulary = subtest of the WWT (*Wortschatz- und Wortfindungstest für 6- bis 10-Jährige;* Glück, 2007); P = percentile; Lise-KAS = Case Marking subtest of the Lise-DaZ (Schulz & Tracy, 2011); NA = not available.

[a]This child was actually older than the oldest norm group. [b]This child was actually younger than the youngest norm group. [c]As a vocabulary test, the Verb Production subtest *of the Patholinguistische Diagnostik für Sprachentwicklungsstörungen* (PDSS; Kauschke & Siegmüller, 2002) was used. [d]The Verb Comprehension subtest of the PDSS was used, and *T* scores were converted to percentiles. [e]This child scored a full-range IQ of 91 on the Intelligence & Developmental Scales (Grob et al., 2009).

Appendix C (p. 1 of 3)

Stimulus Materials

Table C1. Sentence materials.

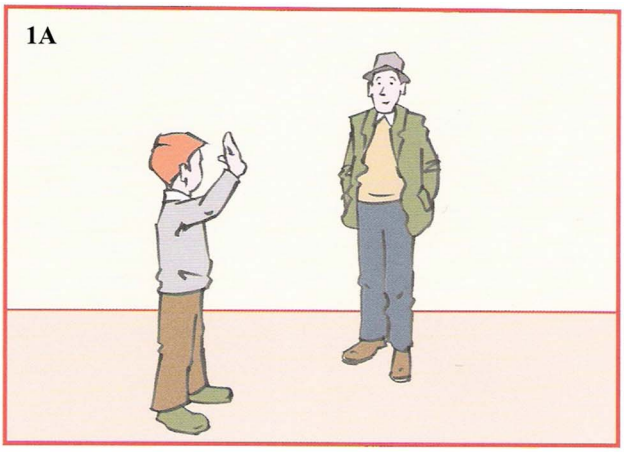
Item no.	Position	Word order	Number features	Test sentences (English translation)
1	2	SVO	SG–SG	Der Junge trägt den Mann. the.SG.NOM boy carries the.SG.ACC man "The boy carries the man."
11	12	SVO	SG–SG	Die Oma hilft der Frau. the grandmother helps the.SG.DAT woman "The grandmother helps the woman."
4	5	SVO	SG–PL	Der Junge tritt die Pferde. the.SG.NOM boy kicks the horses "The boy kicks the horses."
10	11	SVO	SG–PL	Die Oma gratuliert den Kindern. The grandmother congratulates the.PL.DAT children "The grandmother congratulates the children."
2	3	SVO	PL–SG	Die Kinder winken dem Mann. the children wave the.SG.DAT man "The children wave to the man."
8	9	SVO	PL–SG	Die Elefanten schieben den Clown. the elephants push the.SG.ACC clown "The elephants push the clown."
0	1	OVS	SG–SG	Dem Kind winkt der Mann. the.SG.DAT child waves the.SG.NOM man "The man waves to the child."
5	6	OVS	SG–SG	Das Kind zieht der Esel. the child pulls the.SG.NOM donkey "The donkey pulls the child."
3	4	OVS	SG–PL	Dem Einbrecher folgen die Polizisten. the.SG.DAT burglar follow the policemen "The policemen follow the burglar."
6	7	OVS	SG–PL	Den Opa füttern die Kinder. the.SG.ACC grandfather feed the children "The children feed the grandfather."
7	8	OVS	SG–PL	Der Oma winken die Polizisten. the.SG.DAT grandmother wave the policemen "The policemen wave to the grandmother."
9	10	OVS	PL–SG	Die Kinder zeichnet der Mann. the children draws the.SG.NOM man "The man draws the children."
12	13	OVS	PL–SG	Den Mädchen gratuliert die Mutter. the.PL.DAT girls congratulates the mother "The mother congratulates the girls."

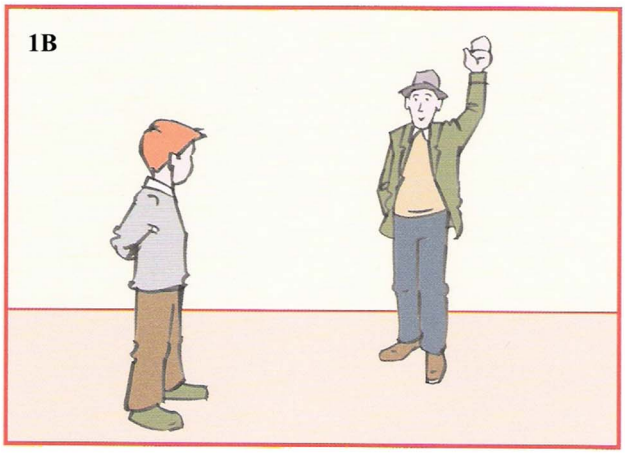
Note. SVO = subject–verb–object; OVS = object–verb–subject ; SG–SG = singular–singular; SG–PL = singular–plural; PL–SG = plural–singular.

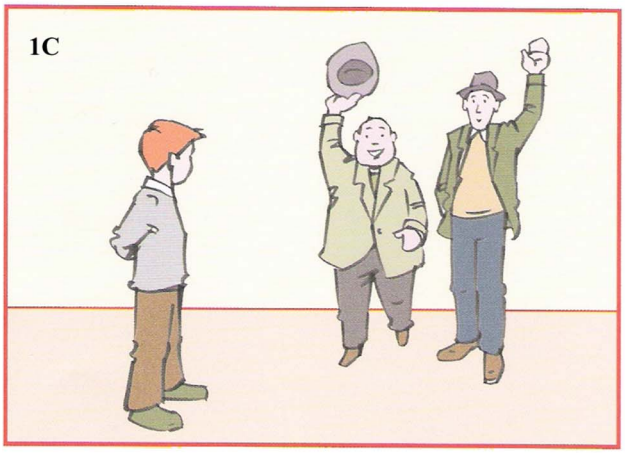
Appendix C (p. 2 of 3)

Stimulus Materials

Figure C1. Examples of the picture materials used in the experimental task. Target pictures displaying the correct interpretation of the test sentence (1B and 2B), foils displaying an interpretation of the target sentence with reversed thematic role assignment (1A and 2C), and number foils displaying characters with different number properties (1C and 2A). Copyright: Siegmüller, Test zum Satzverstehen von Kindern (TSVK), 1. Auflage 2011 © Elsevier GmbH, Urban & Fischer, München. This content is not included in the Creative Commons license.



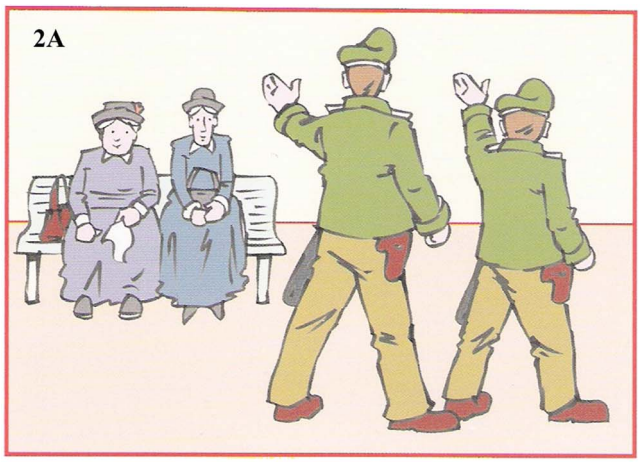


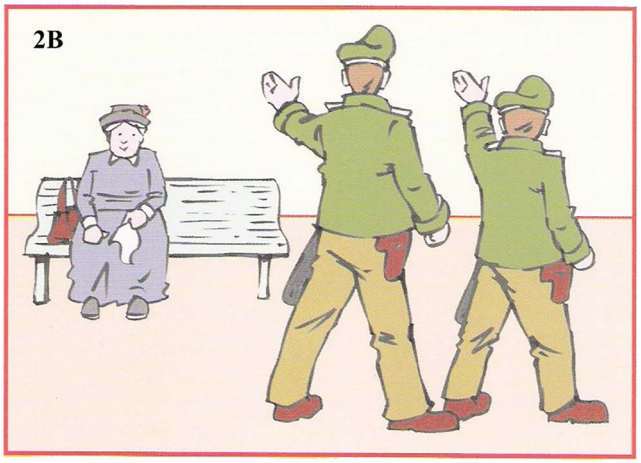


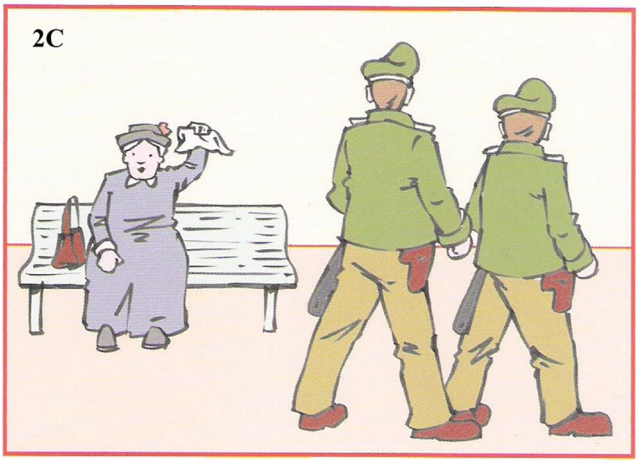
Appendix C (p. 3 of 3)

Stimulus Materials

Figure C2. Examples of the picture materials used in the experimental task. Target pictures displaying the correct interpretation of the test sentence (1B and 2B), foils displaying an interpretation of the target sentence with reversed thematic role assignment (1A and 2C), and number foils displaying characters with different number properties (1C and 2A). Copyright: Siegmüller, Test zum Satzverstehen von Kindern (TSVK), 1. Auflage 2011 © Elsevier GmbH, Urban & Fischer, München. This content is not included in the Creative Commons license.







Appendix D (p. 1 of 3)

Model Outputs and Graphical Displays of the Data Analyses

Figure D1. Individual item accuracies. SVO = subject–verb–object; OVS = object–verb–subject; SG–SG = singular–singular; SG–PL = singular–plural; PL–SG = plural–singular.

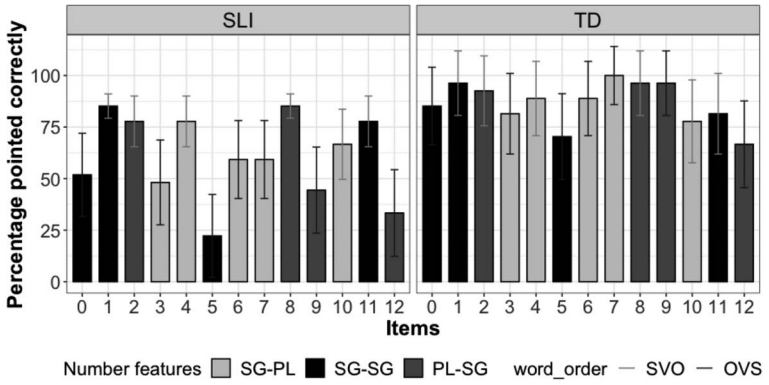


Table D1. Model output of the accuracy analysis for the SLI and TD groups.

Fixed effects	Estimate	*SE*	*z* value	*p* value
(Intercept)	1.630	0.231	7.042	.000
Age	**0.874**	**0.197**	**4.446**	**< .001**
Group	**–1.919**	**0.387**	**–4.955**	**< .001**
Word order	**–1.305**	**0.329**	**–3.973**	**< .001**
Number features (SG–SG – SG–PL)	–0.234	0.382	–0.613	.540
Number features (PL–SG – SG–SG)	0.313	0.413	0.759	.448
Group × Word Order	**–1.357**	**0.472**	**–2.876**	**.004**
Group × Number Features (SG–SG – SG–PL)	0.127	0.533	0.238	.812
Group × Number Features (PL–SG – SG–SG)	–0.531	0.598	–0.888	.375
Word Order × Number Features (SG–SG – SG–PL)	**–1.703**	**0.766**	**–2.223**	**.026**
Word Order × Number Features (PL–SG – SG–SG)	–0.224	0.825	–0.271	.787
Group × Word Order × Number Features (SG–SG – SG–PL)	0.134	1.070	0.125	.900
Group × Word Order × Number Features (PL–SG – SG–SG)	0.674	1.194	0.564	.572

Note. Statistical model: m <- glmer(accuracy ~ age + group*(word order + number features (sgsg-sgpl) + number features (plsg-sgsg) + word order:number features (sgsg-sgpl) + word order:number features (plsg-sgsg) + (1 | ID) + (1 | item), family=binomial, control=glmerControl (optimizer="bobyqa"), data). Boldfaced items mark significant results. SLI = specific language impairment; TD = typically developing; SG–SG = singular–singular; SG–PL = singular–plural; PL–SG = plural–singular.

Table D2. Model output of the accuracy analysis for the SLI and TD groups, modeling the interaction of Group × Word Order by nesting the word order comparison in each group.

Fixed effects	Estimate	*SE*	*z* value	*p* value
(Intercept)	1.630	0.231	7.042	.000
Age	**0.874**	**0.197**	**4.446**	**< .001**
Group	**–1.919**	**0.387**	**–4.955**	**< .001**
Word order (only SLI group)	**–1.984**	**0.368**	**–5.397**	**< .001**
Word order (only TD group)	–0.627	0.438	–1.429	.153
Number features (SG–SG – SG–PL)	–0.234	0.382	–0.613	.540
Number features (PL–SG – SG–SG)	0.313	0.413	0.759	.448
Word Order × Number Features (SG–SG **– SG–PL)**	**–1.703**	**0.766**	**–2.223**	**.026**
Word Order × Number Features (PL–SG – SG–SG)	–0.224	0.825	–0.271	.787
Group × Number Features (SG–SG – SG–PL)	0.127	0.533	0.238	.812
Group × Number Features (PL–SG – SG–SG)	–0.531	0.598	–0.888	.375
Group × Word Order × Number Features (SG–SG – SG–PL)	0.134	1.070	0.126	.900
Group × Word Order × Number Features (PL–SG – SG–SG)	0.674	1.194	0.564	.572

Note. Boldfaced items mark significant results. SLI = specific language impairment; TD = typically developing; SG–SG = singular–singular; SG–PL = singular–plural; PL–SG = plural–singular.

Table D3. Model output of the accuracy analysis for the SLI and TD groups, modeling the interaction of Word Order × SG–SG – SG–PL by nesting the number comparison in each word order.

Fixed effects	Estimate	*SE*	*z* value	*p* value
(Intercept)	1.630	0.231	7.042	.000
Age	**0.874**	**0.197**	**4.446**	**< .001**
Group	**–1.919**	**0.387**	**–4.955**	**< .001**
Word order	**–1.305**	**0.329**	**–3.973**	**< .001**
Number features (PL–SG – SG–SG)	0.313	0.413	0.759	.448
Word Order × Number Features (PL–SG – SG–SG)	–0.223	0.825	–0.271	.787
Number features (SG–SG – SG–PL; only SVO)	0.618	0.573	1.078	.281
Number features (SG–SG – SG–PL; only OVS)	**–1.086**	**0.507**	**–2.143**	**.032**
Group × Word Order	**–1.357**	**0.472**	**–2.876**	**.004**
Group × Number Features (SG–SG – SG–PL)	–0.531	0.598	–0.888	.375
Group × Number Features (PL–SG – SG–SG)	0.674	1.194	0.564	.572
Group × Word Order × Number Features (SG–SG – SG–PL)	0.060	0.811	0.074	.941
Group × Word Order × Number Features (PL–SG – SG–SG)	0.194	0.695	0.279	.780

Note. Boldfaced items mark significant results. SLI = specific language impairment; TD = typically developing; SVO = subject–verb–object; OVS = object–verb–subject; SG–SG = singular–singular; SG–PL = singular–plural; PL–SG = plural–singular.

Figure D2. Response types of the SLI and TD groups, including the chosen foil type, when the pointing reaction was incorrect. SLI = specific language impairment; TD = typically developing; SVO = subject–verb–object; OVS = object–verb–subject; SG–SG = singular–singular; SG–PL = singular–plural; PL–SG = plural–singular.

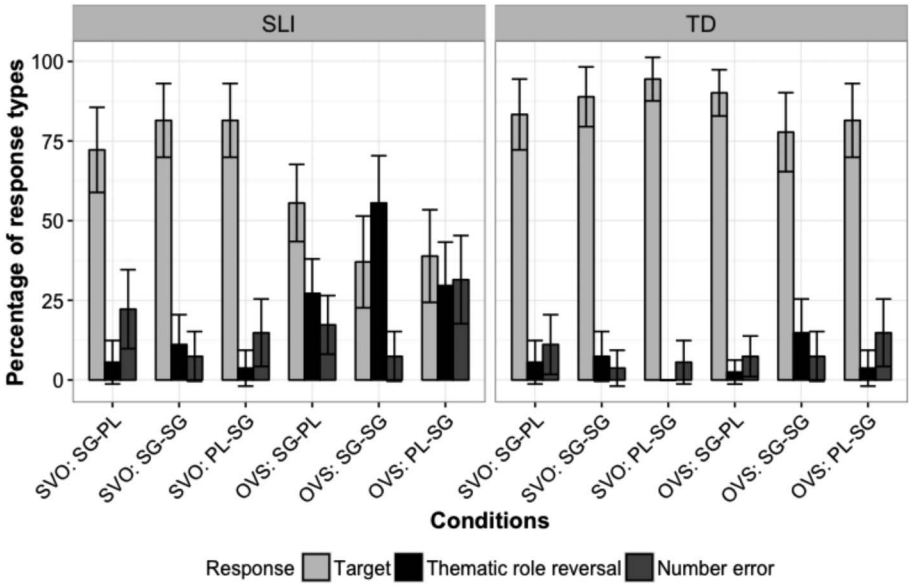


Table D4. Output of the analysis of the thematic role reversals for OVS sentences.

Fixed effects	Estimate	*SE*	*z* value	*p* value
(Intercept)	–2.381	0.448	–5.313	< .001
Group	**3.259**	**0.739**	**4.412**	**< .001**
Number features (SG–SG – SG–PL)	**1.995**	**0.683**	**2.919**	**.004**
Number features (PL–SG – SG–SG)	**–1.734**	**0.724**	**–2.394**	**.017**
Group × Number Features (SG–SG – SG–PL)	–0.783	1.010	–0.775	.438
Group × Number Features (PL–SG – SG–SG)	0.507	1.039	0.488	.626

Note. Boldfaced items mark significant results. OVS = object–verb–subject; SG–SG = singular–singular; SG–PL = singular–plural; PL–SG = plural–singular.

Table D5. Output of the analysis of the number errors for OVS sentences.

Fixed effects	Estimate	*SE*	*z* value	*p* value
(Intercept)	–2.534	0.507	–4.997	< .001
Group	0.884	0.473	1.871	.061
Number features (SG–SG – SG–PL)	–0.471	1.065	–0.443	.658
Number features (PL–SG – SG–SG)	1.118	1.158	0.965	.334
Group × Number Features (SG–SG – SG–PL)	–1.122	0.956	–1.174	.241
Group × Number Features (PL–SG – SG–SG)	1.342	0.971	1.382	.167

Note. Boldfaced items mark significant results. OVS = object–verb–subject; SG–SG = singular–singular; SG–PL = singular–plural; PL–SG = plural–singular.