

Verb argument structure weakness in specific language impairment in relation to age and utterance length

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Abstract

In spite of the complexity of verb argument structure, argument structure errors are infrequent in the speech of children with specific language impairment (SLI). The study examined the spontaneous argument structure use of school-age children with SLI and with normal language (NL) ($n = 100$). The groups did not differ substantially in frequency of argument structure errors, particularly when pragmatic context was considered. However, children with SLI used significantly fewer argument types, argument structure types and verb alternations than age-matched children with NL. Further, significant differences between children with SLI and mean length of utterance-matched controls were found involving the use of three-place argument structures. The results show that children with SLI demonstrate mostly correct, but less sophisticated, verb argument structure use than NL peers, and that the difference is not merely attributable to production limitations such as utterance length. The possibility of incomplete argument structure representation is suggested.

Keywords: specific language impairment, school-age, verbs, argument structure.

Introduction

There is growing consensus that verbs represent an area of particular difficulty for children with specific language impairment (SLI) (e.g. Rice and Bode, 1993; Watkins, Rice and Moltz, 1993; Conti-Ramsden and Jones, 1997; Jones and Conti-Ramsden, 1997; Hadley, 1998; Loeb, Pye, Richardson and Redmond, 1998). These difficulties have been reported to affect a variety of aspects of verbs, including verb inflection (Conti-Ramsden and Jones, 1997), the use of verb particles (Watkins and Rice,

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1991), verb complementation (Johnston, Kamhi and McDonald, 1981; Stockman, 1992; King and Fletcher, 1993; Fletcher, Ingham, Schelleter and Sinka, 1997; Grela and Leonard, 1997), incidental learning of new verbs (Rice, Buhr and Nemeth, 1988; Oetting, Rice and Swank, 1995), and verb diversity in spontaneous language including reliance on a set of high-frequency verbs (referred to as general all-purpose [GAP] verbs) (Rice and Bode, 1993; Watkins *et al.*, 1993). Nevertheless, the extent to which children with SLI experience verb-related difficulties is not without controversy. Studies of verb diversity and GAP verb use in language samples of preschool children have yielded mixed results (Conti-Ramsden and Jones, 1997; Grela and Leonard, 1997; Loeb, Heid, Rose, Villwock, Pratte, Fey and Pye, 1997). A recent study of the verb diversity of school-age children with SLI found no evidence of verb-specific difficulty in vocabulary diversity and no evidence that GAP verbs were used more by children with SLI than by peers with normal language (NL) (Elin Thordardottir and Ellis Weismer, 2001).

Verbs play a central role in contemporary grammars, where they provide a link between meaning and sentence structure. Several theoretical accounts view verbs as fundamentally different from and more complex than nouns conceptually as well as grammatically (e.g. Gentner, 1982; Maratsos, 1990). The greater conceptual complexity is related to the fact that verbs refer to transient relations between objects (who does what to whom, or who goes where) rather than to individual objects. This relational meaning is captured by the verb's argument structure, which includes the verb's subject and complements. Verb arguments are thematically related to the verb, as, for example, *agent*, *theme*, *beneficiary* or *goal* of the action or motion represented by the verb. The argument structure of a verb, in turn, dictates that certain constituents must be in the sentence: the *agent* argument of an active verb will generally be the syntactic *subject*, the *theme* argument the *direct object*, etc. Verb arguments can be obligatory or optional; the number and types of arguments required or allowed are determined by the verb's meaning. Whereas some verbs allow only one argument structure (in which case all the arguments are obligatory), other verbs allow two or more different argument structures, or argument structure alternations. An example of such a verb is *sing*. It may be used with or without a *theme* argument: 'I sing,' 'I sing a song.' Thus, the *theme* argument is optional. Another way that verbs can have many argument structures is by allowing alternations involving variations in the way that thematic arguments map onto syntactic positions. An example is the verb *ring*. In one of the argument structures, 'I ring the bell,' the syntactic *subject* has the thematic role of *agent* and *bell* has the role of *theme*. In the other argument structure, the syntactic *subject* has the thematic role of *theme*: 'My ears are ringing.' Because of the crucial role of verbs in sentence structure, verb difficulties could indeed be expected to have far-reaching consequences. In light of the role of verbs as links between meaning and syntax, an aspect of verbs that might be particularly problematic for children with language impairments is verb argument structure.

Rice and Bode (1993) examined various aspects of verb use in the spontaneous speech of three preschool boys with SLI. Overall, verb errors affected 3% of the total number of verbs and 2% of the utterances produced by the three children. Of six error categories reported, one category, 'transitivity errors', involved argument structure errors. For these young children, the only error type encountered within this category was the omission of the obligatory object (*theme*) of a transitive verb. This occurred in 15 verbs out of over 5000 utterances. In addition, two instances of

subject omissions were reported. It is important to note that subject omissions were not coded as errors if they occurred in a context that made their omission acceptable. Grela and Leonard (2000) examined argument structure in another way, by noting the effect of argument structure complexity on auxiliary inclusion by children with SLI and NL controls. They demonstrated that children were more likely to omit auxiliaries in sentences with ditransitive verbs than in sentences of equivalent length with either intransitive or transitive verbs. However, the effect was observed for children with SLI and mean length of utterance (MLU)-matched NL children. Together, these studies indicate that children with SLI do not appear to have a strong tendency to omit obligatory verb arguments other than the subject in their spontaneous language. However, they also indicate that argument structure complexity appears to be a source of added processing load for children, although it is not clear that children with SLI are more affected than children with NL.

Another population in which verb argument structure has been investigated is individuals with agrammatic aphasia. A series of studies employing on-line tasks and spontaneous language samples to investigate verb argument structure processing and use by adults with NL and agrammatic aphasia have indicated that the major source of increased processing load associated with verbs was the ability of verbs to have more than one argument structure (Shapiro, Zurif and Grimshaw, 1987, 1989; Shapiro and Levine, 1990; Shapiro, McNamara, Zurif, Lanzoni and Cermak, 1992; Thompson, Shapiro, Li and Schendel, 1995). Based on these findings, Shapiro *et al.* proposed that the processing of verbs involves the momentary and obligatory activation of all of the verb's possible argument structures. In other words, verbs that allow multiple argument structures take longer to process than verbs that allow only one, because all the options must be considered.

Studies of argument structure development in children indicate that the acquisition of the full range of argument structure options for complex verbs extends at least into adolescence. Naigles, Fowler and Helm (1992) showed a gradual shift from early school-age (age 5–6 years) into adulthood in the stability of verb interpretation when verbs were presented in inappropriate argument structure constructions. The younger subjects were more likely than the older ones to let the inappropriate argument structures influence their interpretations of the verbs' meanings, or, in other words, to comply with the verb's frame (argument structure) rather than rejecting the inappropriate frame based on the verb's established meaning (verb compliance). Frame-compliance was most persistent for three-place argument structures, continuing to influence the judgement of the oldest subjects, and least persistent for one-place argument structures. In between were two-place structures with a gradual decline in frame-compliance with age. These findings indicated that argument structure learning is still in progress in school-age children; at this age, children were still open to adding to individual verbs' repertoires of argument structures.

Whereas many studies of language impairment have focused on error types and frequency, a more comprehensive approach adopted in several studies is to also examine the variety of forms used. The assumption underlying this approach is that the effects of a language impairment are seen not only as frank errors or omission in obligatory contexts, but also as a limitation in the use of the full complexity of language. It has been noted that mere use of a form in spontaneous language does not imply full mastery of that form. The linguistic limitations in SLI may involve simplifications, or a failure to make use of the range of options available in the

language. As examples involving verb use, Jones and Conti-Ramsden (1997) concluded from a longitudinal study of preschool children with SLI that the development of their cumulative verb lexicons proceeded at a similar rate as that of their younger siblings with NL. However, the children with SLI used fewer verbs per session and differed markedly from their siblings in the variety of verb forms used, suggesting that they had difficulty generalizing verb inflections from one verb to another. Johnston *et al.* (1981) reported differences in the variety of predicate meaning types used by children with SLI ages 4–6 and NL peers matched on age and MLU. Notably, children with SLI used fewer aspectual, modal, location and possession predicates than MLU-matched controls. The purpose of the present study was to further the investigation of argument structure use by school-age children with SLI by examining the actual argument types and argument structure types used by school-age children with SLI, thus evaluating their facility with the complexity of verbs and their flexibility in using the different argument structures of those verbs that permit argument structure alternations. Further, given previous indications that ditransitive verbs are particularly difficult compared with intransitive and transitive verbs (Elin Thordardottir and Ellis Weismer, 1999; Grela and Leonard, 2000), the effects of the number of argument places was also investigated, comparing the groups on their use of two-, three-place and other argument structures. Even in the absence of frank errors, limited use of argument structure options might suggest either partial learning of the verb's options or performance limitations affecting language production, or both.

Methods

Participants

Spontaneous language samples of 100 school-age children collected as part of several previous investigations (Ellis Weismer and Hesketh, 1996, 1998; Ellis Weismer, Evans and Hesketh, 1999) served as the basis for analysis of argument structure. The sample included 50 children with SLI, age 5;5–9;8 (mean 93.62 months, SD 12.52; mean MLU 7.18, SD 2.24, range 3.28–12.76), and 50 children with NL matched on chronological age (6;0–9;5, mean 92.96 months, SD 12.15; mean MLU 9.32, SD 1.94, range 5.15–13.83). Subgroups matched on MLU were formed including 25 children with SLI and 25 children with NL (table 1).

All 100 children were monolingual English-speakers who demonstrated normal development physically, emotionally and motorically. Hearing sensitivity was verified for all the children by pure tone hearing screening (20 dB HL at 500, 1000, 2000 and 4000 Hz) and middle ear function by screening tympanometry. All children had normal results on a visual acuity test. The structure and function of the oral mechanism was assessed using a screening measure adapted from that of Robbins and Klee (1987) and was normal for all the children. An informal protocol assessed the children's phonological skills (cf. Smit, 1994). The assessment, which involved examination of the children's phonetic repertoire, word shapes and phonological processes from spontaneous language samples, ruled out the presence of phonological simplification processes such as final consonant deletion or other simplification processes sufficiently severe to interfere with overall speech intelligibility or coding of morphological markers. The NL children had no history of problems with language development or school-related difficulties. The children with SLI had been

Table 1. *Standardized language test scores of participants, and maternal education (means and SD)*

	CA-matched groups (<i>n</i> = 100)		MLU-matched groups (<i>n</i> = 50)	
	SLI	NL	SLI	NL
Age (months)	93.62 (12.51)	92.96 (12.15)	100.28 (9.18)	84.04 (8.52)
MLU in morphemes	7.18 (2.24)	9.32 (1.94)	8.62 (1.86)	8.61 (1.80)
PPVT-R*	94.56 (10.94)	117.85 (17.07)	89.20 (8.40)	99.08 (15.10)
TACL-R*	41.00 (7.93)	52.85 (8.17)	32.93 (5.30)	37.80 (15.74)
Token Test for children*	494.32 (6.33)	501.46 (3.80)	14.12 (3.86)	17.20 (2.18)
CMMS, ADS	103.50 (9.81)	113.38 (11.16)	102.88 (10.51)	114.20 (12.39)
Maternal education (years)	13.84 (2.45)	16.14 (2.43)	14.24 (2.22)	16.00 (2.18)

*Standard score for CA-matched groups; raw score for MLU-matched groups.

previously diagnosed by a certified speech–language pathologist and were enrolled in language intervention in their schools within the Madison Metropolitan School District (WI, USA), or had recently undergone a multidisciplinary team evaluation indicating that they required intervention. For 21 of the children with SLI, the profile also included a diagnosis of learning disability or special programming for reading difficulty. Table 1 summarizes the background characteristics of the children, including performance on language and cognitive measures that were administered as part of the original studies in which the children participated. All children in both groups exhibited normal range non-verbal cognitive abilities, as assessed by the Columbia Mental Maturity Scale (CMMS; Burgemeister, Blum and Lorge, 1972). Children in the NL group met the criteria of normal range performance (better than -1 SD) on each of the language measures, whereas children with SLI scored below -1 SD on one or more of these measures. Receptive language measures included Subtest V of the Token Test for Children (DiSimoni, 1978) and either the Peabody Picture Vocabulary Test—Revised (PPVT-R, Dunn and Dunn, 1985) or the Grammatical Morphemes subtest of the Test of Auditory Comprehension of Language—Revised (TACL-R; Carrow-Woolfolk, 1985) (60 children were administered the PPVT-R and the remaining 40 the TACL-R). Expressive language abilities were evaluated from narrative language samples that were transcribed and analysed using Systematic Analysis of Language Transcripts (SALT) and the SALT Profiler Reference Database (Miller and Chapman, 1993). Indices included MLU as well as additional productive language features (omitted bound morphemes, omitted words, word errors, utterances with mazes and a number of different word roots). The children with SLI included 36 white children, nine African-American, three Asian, one Hispanic and one Native American; the children with NL included 48 white and two African-American children.

Procedure

Narrative language samples were used, which had been collected by a single examiner. During a 15-min interaction, the children were asked to describe a book, movie, school activity, vacation or another topic of special interest to them. Similar questions and prompts were used across children, such as asking them to describe how to play their favourite sport. The language samples were transcribed orthographically

and coded for bound morpheme use according to SALT conventions (Miller and Chapman, 1993). The MLU thus obtained was used for matching purposes.

Analysis of argument structure complexity and correctness

The argument structure analysis was an adaptation of Thompson *et al.*'s (1995) procedure, which was used for the investigation of argument structure use by individuals with aphasia. Although Thompson *et al.* examined the middle 25 utterances per sample for the labour-intensive coding of argument structure use, we elected to analyse the middle 50 utterances from each sample to increase the number of verbs in the sample. This resulted in a sample of 5000 utterances, 6746 verbs and 511 different verbs. The mean number of verbs used by each child was 73.14 (15.92) and 61.78 (20.53) for NL and SLI children respectively (Elin Thordardottir and Ellis Weismer, 2001). Abandoned and partially unintelligible utterances and utterances containing mazes were included. However, verbs within mazes were not analysed.

Each lexical verb appearing in the samples was coded in terms of the number and types of argument structures it allowed. This catalogue of the verbs' maximum range of options established which structures were counted as verb arguments versus adjuncts for particular verbs and whether verbs permitted alternations (more than one argument structure). Each verb used was then coded for the arguments and argument structures actually used. Thus, dependent measures reported in the study involve argument structure types actually used, not the maximally complex argument structures allowed by verbs. The analysis included all lexical verbs, phrasal verbs and copula verbs. Auxiliaries and modal verbs were excluded because they do not have argument structures. Also excluded were semi-auxiliaries such as *have to*, *going to* and *use to*. The verbs *have*, *do*, and *be* were included in the analysis when they were used as main verbs. Several verbs had two or more usages considered sufficiently different in terms of meaning and argument structure to warrant viewing them as separate verbs. The most notable example was the verb *get*, which has three different meanings/argument structures: (1) *get* meaning to obtain or being allowed, as in 'get something' or 'get to do something'; (2) copula *get*, as in 'get tired'; and (3) *get* denoting movement, as in 'get home'. The past participle of verbs used in sentences with a passive voice construction was considered to be a verb only if it referred to the actual action depicted by the verb rather than the resulting effect of that action. Arguments were coded before any movement of constituents. For example, verbs in the passive voice were coded for arguments as if they were used in the active voice (in the passive voice, the theme argument becomes the syntactic subject). Syntactically legal omissions of arguments were coded as though the obligatory argument was present. These included, for example, subject omission with verbs in the imperative mood, and subject omissions in subordinate to-infinitive clauses. It should be noted that these syntactically legal omissions of an overt subject differ from subject omissions that may be seen as acceptable for pragmatic reasons (see below). Syntactically legal omissions are such that the subject should not be expressed overtly, whereas in pragmatically acceptable omissions, the expression of the subject would be correct, but its omission may be seen as being an acceptable stylistic option. The following measures were obtained for each participant: (1) the number of different types of arguments used (e.g. *theme*, *goal*, *beneficiary*); (2) the number of types of argument structures used (e.g. *intransitive* [subject only], *transitive*

[*subject* and *theme*], *ditransitive* [*subject*, *theme* and *beneficiary*], directed motion [*subject*, *goal*]); (3) the number of verbs used with more than one argument structure type in the same sample; and (4) the number and type of argument structure errors, including the number of omission of obligatory arguments and the type of argument omitted.

Argument structure options for individual verbs were based on Longman's *Dictionary* (1995) and on the main verb categories of English specified by Leech and Svartvik (1975), considering the basic meaning of the verb as used in the samples, and excluding argument structures that entailed a different meaning of the verb. Studies have differed somewhat in how verb arguments are distinguished from adjuncts. In this investigation, verb arguments were defined as any constituent that is theta-marked by the verb, whether obligatory or optional, whereas adjuncts were viewed as adverbials not theta-marked by the verb. The distinction based on theta-marking is not always an easy one to make, however, as several researchers have pointed out (Haegeman, 1991; Thompson *et al.*, 1995). Briefly, arguments are theta-marked by a verb if they are inherent in the verb's meaning. Thompson *et al.* (1995) give the following example:

Dean sent the car *to the garage*. (argument)
Dean fixed the car *in the garage*. (adjunct)

The verb *send* implies that something is sent somewhere. In contrast, the location 'in the garage' is not inherent in the verb *fix*, even though it may be argued that all things must happen in some location. Several criteria can be used to help distinguish arguments from adjuncts: (1) adjuncts are always optional, whereas arguments can be obligatory or optional; and (2) adjuncts can be ambiguous whereas arguments cannot (in the second sentence above, 'in the garage' can be interpreted as modifying either 'fixed the car' or simply 'car') (Thompson *et al.*, 1995). In deciding on the relevant argument possibilities for individual verbs, we considered systematically whether the verb could have different argument types and whether these were inherent in the verb's meaning.

It is worth mentioning that our resulting classification differs from some other previous classifications. For example, Grella and Leonard (1997) give the verb *play* as an example of an intransitive, unergative verb. In our classification, however, this verb was viewed as optionally transitive, or a verb that allows alternation between intransitive and transitive argument structures. Thus, 'the children play' was coded as intransitive, but 'the children play a game' was coded as transitive. If both of these appeared within the same sample, this was viewed as evidence that the child was able to use the same verb with different argument structures. Differences in coding decisions between studies reflect differences in the purpose of the coding. In the present study, the focus was on children's ability to use the different options offered by individual verbs. It was important that each verb be consistently coded in terms of the number and types of arguments used and that arguments be consistently differentiated from adjuncts. Examples of the verb argument types and argument structure types encountered in the language samples are provided in appendix 1.

Reliability

The orthographic transcription and bound morpheme coding of the language samples was verified as part of the studies for which they were originally collected.

Rescoring randomly selected samples constituting 15% of the total number of samples revealed 97.5% interrater morpheme-to-morpheme agreement. This was important because MLU measures were used to match participants. Argument structure coding was originally done by E. T. T. For reliability purposes, 10 randomly selected samples (10% of total number of samples, five from the NL group, five from the SLI group) were recoded by an independent scorer who received training in the scoring procedure. The interrater agreement in argument structure coding was 93.1%. The accuracy of coding included the number of arguments present and their thematic role.

Results

Omission of obligatory arguments

Children with NL and SLI were compared on inclusion of obligatory arguments by one-way ANOVA analyses. Groups matched on chronological age (CA) and MLU were compared in separate analyses given that the latter was a subgroup of the former. The CA-matched groups of children differed significantly in the extent to which they included all obligatory verb arguments ($F(1,98)=7.14$, $p=0.009$, $\eta^2=0.07$). The children with SLI used 93.5% of their verbs with all obligatory arguments included, the NL group 96.6%. For the MLU-matched subgroups, the corresponding numbers were 95.4% for the SLI group and 96.3% for the NL group, which was not significantly different ($p>0.4$). The types of argument omissions made by the children with SLI ($n=50$) were as follows: 82% involved the *subject* argument, 8% the *theme*, 4% the *copula complement* and 3% the *goal*. Inappropriately used arguments were also encountered (2%, e.g. have to change *them* water every day, mono-transitive verb used as ditransitive). The omission types of the NL children ($n=50$) were: *subject* (68%), *theme* (14%), *copula complement* (10%) and *goal* (7%). It should be noted that the *source* and *goal* arguments which were among the arguments included in the maximum complexity of verbs are seldom obligatory. Subject omissions were of two kinds that require further description. They were in some cases frank errors, rendering sentences ungrammatical or awkward. However, a large proportion of subject omissions occurred in response to examiner prompts or questions and were considered pragmatically acceptable. For example, the examiner might ask 'What do you usually do in school?', and the child might answer 'Read books, do math, play games.' Pragmatically valid subject omissions constituted 69% of all argument omissions for the SLI group (84% of all subject omissions) and 50% of all argument omissions for the NL group (64% of all subject omissions). If these acceptable subject omissions are not counted as errors, both groups of children achieved >98% accuracy in their use of obligatory arguments.

Repertoire of arguments and argument structures

The children's repertoire of argument types and argument structure types was compiled from the variety used in their samples. The arguments were classified as these eight types: *agent*, *theme*, *goal*, *source*, *beneficiary*, *copula complement*, *object+verb* and *unspecified*. The argument structure types included one-, two-, three- and four-place argument structures (see examples of each type in appendix 1). Results are shown in figures 1 and 2 for groups matched on CA and MLU. The

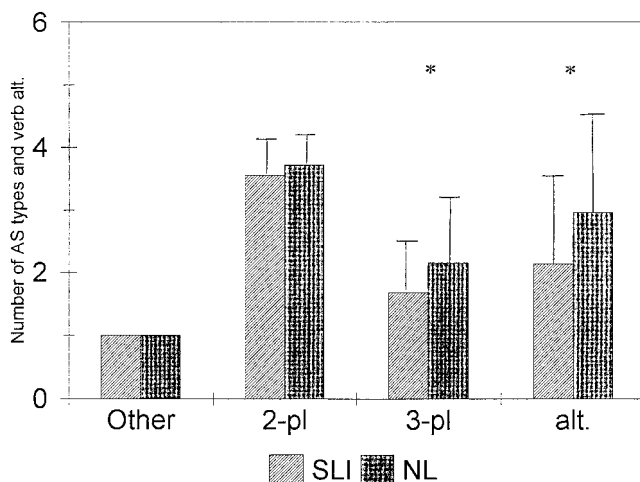


Figure 1. *Argument structure diversity and use of verb alternations by CA-matched groups of children. The first three sets of bars show the number of different argument structures (AS types) used by each group (mean and SD) within each of three argument structure categories based on the number of argument structure places: other (one- and four-place), two- and three-place. The fourth set of bars represents the number of verbs used with two or more different argument structures within a given sample (verb alt.). *Significant group differences (<0.05).*

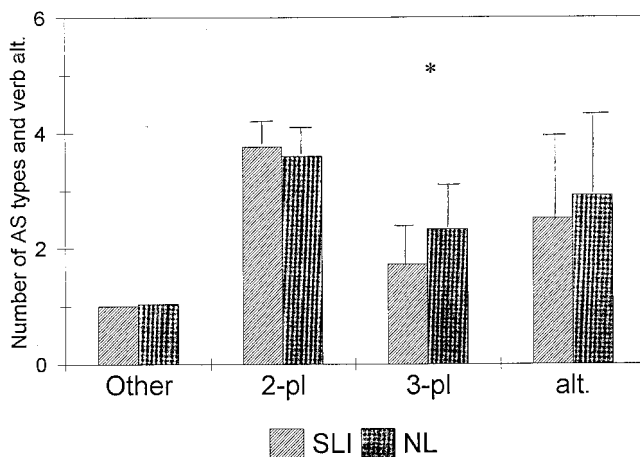


Figure 2. *Argument structure diversity and use of verb alternations by MLU-matched groups of children. The first three sets of bars show the number of different argument structures (AS types) used by each group (mean and SD) within each of three argument structure categories based on the number of argument structure places: other (one- and four-place), two- and three-place. The fourth set of bars represents the number of verbs used with two or more different argument structures within a given sample (verb alt.). *Significant group differences (<0.05).*

groups were compared on the following aspects of argument structure use: (1) number of different argument types used, compared by one-way ANOVAs; (2) number of argument structure types used, compared by mixed model ANOVAs with Group (SLI and NL) as the between subject factor and Structure Type (two-, three-place structures and other structures) as repeated measures, and (3) number

of verbs used with two or more different argument structures (flexibility in making use of alternation possibility). In each case, separate ANOVA analyses were conducted for groups matched on CA and MLU given that the latter is a subgroup of the first. 'Other' structures under Structure Type (see point 2 above) included one- and four-place structures. Four-place structures were very rarely used and thus did not warrant a separate category. Their contribution to the category of Other Structures is negligible. The main interest here was in the possibility that three-place verbs presented more difficulty than two- or one-place verbs.

First, comparing the groups matched on CA, children with SLI differed significantly from children with NL on all three measures. Children with SLI had a lower mean number of different argument types used ($F(1,98)=5.76$; $p=0.018$, $\eta^2=0.06$). For mean number of different argument structure types used, a significant main effect of Group ($F(1,98)=8.28$, $p=0.005$, $\eta^2=0.08$) indicated that children with NL used a greater variety of argument structure types than children with SLI. The Structure Type \times Group interaction was marginally significant ($F(2,196)=2.87$, $p=0.059$). The Post Hoc Fischer LSD tests indicated that children with SLI used significantly fewer types of three-place argument structures than did NL children, but the groups did not differ significantly in the number of different types of two-place argument structures or other structures. Finally, children with SLI differed significantly from the NL children in that they demonstrated fewer instances of alternations in their samples, using fewer verbs with two or more different argument structures ($F(1,98)=5.60$, $p=0.020$, $\eta^2=0.05$).

For the groups matched on MLU, significant differences were found in terms of number of different argument structure types used. The Structure Type \times Group interaction was significant ($F(2,96)=4.22$, $p=0.018$, $\eta^2=0.08$). Fischer LSD tests revealed that the SLI and NL groups differed significantly in the number of three-place argument structure types used, but not in the number of types of two-place argument structures or other argument structures. No other effects were significant for the MLU-matched groups. In terms of number of argument types used and number of verbs used with evidence of alternation, MLU-matched groups with SLI and NL were equivalent ($p>0.4$).

Figures 3 and 4 further depict the differences observed between the CA-matched groups of children, showing the number of SLI and NL children in subgroups according to the number of different arguments and number of different argument structures appearing in their samples. For the number of different argument types used, the distribution of NL children peaks at a higher value than the SLI distribution. The NL group counts considerably more children in the categories of children using six, seven and eight arguments, whereas the SLI group has more children in the category using only five different argument types in their samples. The children with NL have equal numbers of children in the four and five argument-type categories, whereas the group with SLI has a large difference between these categories. For number of argument structure types (figure 4), a similar pattern is observed, with categories of more argument structure types in general having a greater number of NL children and categories with few argument structure types having more SLI children.

Figure 5 offers further descriptive analysis of the proportion of children (age-matched) in each group who used the different argument structure types. For both children with NL and SLI, the most commonly used argument structures were intransitive structures (subject argument only) and two-place structures. Intransitive

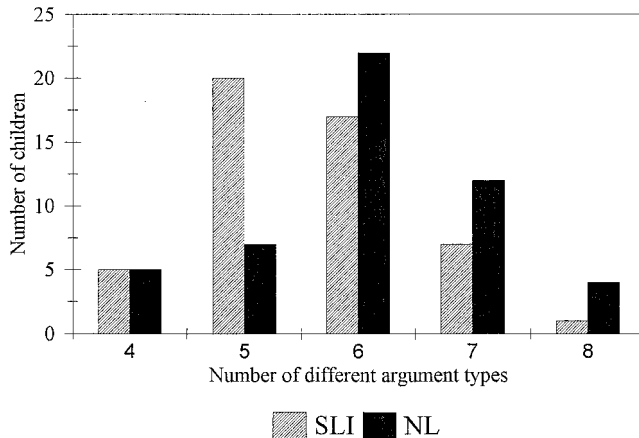


Figure 3. Number of children with SLI and NL in categories based on the number of different argument types used (CA-matched groups).

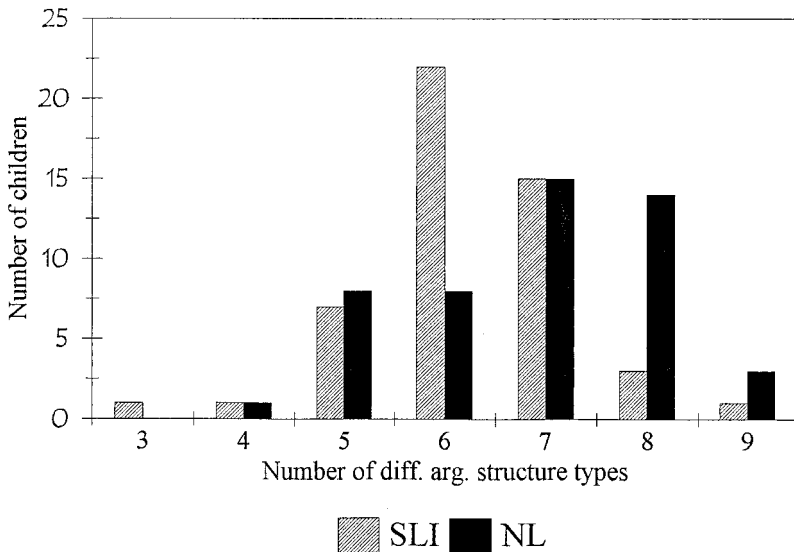


Figure 4. Number of children with SLI and NL in categories based on the number of different argument structure types used (CA-matched groups).

structures as well as three types of two-place structures were used by almost all the children. Three other types of two-place structures were used by much fewer children. These argument structures, 2S, 2D and 2V (see appendix 1 for examples), are simplified versions of more complex argument structures. The children with NL and SLI differed mainly in their use of ditransitive argument structures, where SLI children tended not to include the *beneficiary* argument, thus reducing a potential three-place argument structure to a two-place one (3DT to 2T). Further, children with SLI tended to make less use of verb+ object+ verb constructions than did the NL children. Finally, any four-place argument structure and two types of three-place argument structure types (3TS and 3DU, see appendix 1) were used exclusively by NL children. Virtually all the children made use of the *agent* argument. For those

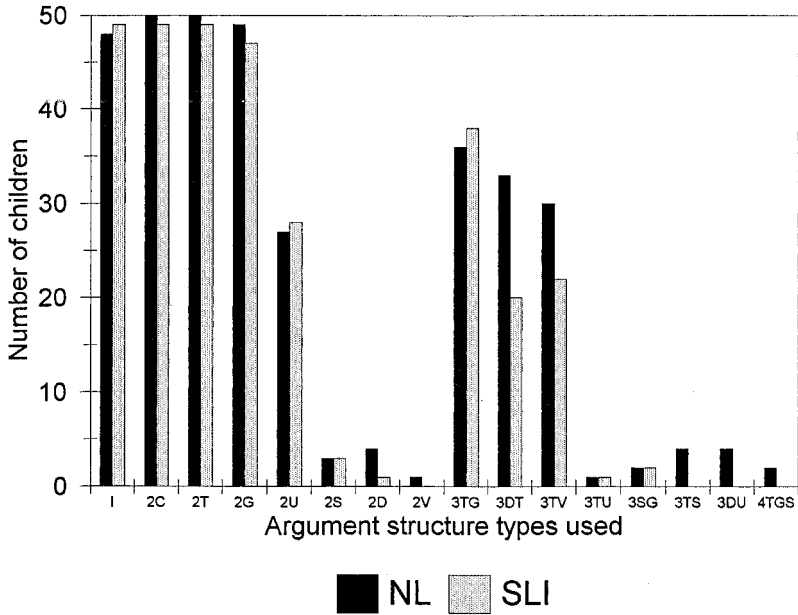


Figure 5. Number of children with SLI and NL using each of the argument structure types encountered in the samples (CA-matched groups).

children who used four different argument types, these always included, in addition to *agent*, the *copula complement*, *theme* and *goal*. The other argument types were used only by children with larger repertoires.

Discussion

Argument structure use by school-age children with SLI was examined in two ways: as frank errors or omissions of obligatory arguments and as the repertoire of arguments and argument structures used. In terms of frank errors, the results confirmed previous findings indicating that such errors are quite infrequent. However, when all argument omissions were counted, the difference between age-matched groups was statistically significant, although the practical significance may be questioned in light of the small effect size. Error analysis revealed that for both groups of children, the most common argument omission involved the subject argument. Further, for both groups, most of these subject omissions were acceptable pragmatically given the context, or even dictated by pragmatic rules of conversation. When pragmatically acceptable subject omissions were not counted as errors, both groups performed highly accurately, indicating that omission of obligatory arguments is not a major source of difficulty.

The finding that argument omissions involve mainly the subject argument is in agreement with previous studies. Those studies that have examined only complement omissions have found them to be infrequent (King and Fletcher, 1993; Rice and Bode, 1993). Grela and Leonard (1997) found no significant differences between children with SLI and NL on any argument position other than the subject. In their study, the tendency of children to omit subject arguments was attributed to movement. The present study suggests a different possible reason, namely that most

subject omissions were justified by the context and could thus be done without loss of critical information and without resulting in a grammatically awkward or incorrect utterance. However, it should be kept in mind that previous studies, including Grela and Leonard (1997) and Rice and Bode (1993), focused on preschool children who were thus significantly younger and at lower levels of language development than the participants in this study. The possibility must, therefore, be considered that these groups of children may tend to omit subject arguments for different reasons.

Nevertheless, previous studies have mentioned acceptable argument omissions such as those discussed above. Rice and Bode (1993) did not code as errors occurrences where the context allowed the subject to be elided. Similarly, King and Fletcher (1993) discussed coding issues relevant to the definition of obligatory contexts, some of which are sensitive to the discourse context. In the present study, pragmatically valid subject omissions were more common among children with SLI than children with NL. Because these subject omissions were made primarily in response to questions, the frequency of examiner questions was examined in both groups. No significant group difference was found in this respect. Therefore, the difference between the groups appeared to lie in the communication styles of the children themselves. A re-examination of the samples indicated that many children in both groups did not omit subject arguments where they could have done so. It may be that children who omitted subjects frequently may have identified these omissions as an acceptable way of simplifying their utterances.

In terms of variety of arguments and argument structures used, children with SLI clearly differed from age-matched controls, demonstrating significantly fewer argument types and argument structure types. They were also significantly less likely to demonstrate a flexible use of verb alternations within their samples, that is, to use the same verb with two or more different argument structures. These results suggest that school-age children with SLI evidence significant delays in argument structure development compared with age peers. This is consistent with reports indicating that the acquisition of argument structure extends well into the school-years (Naigles *et al.*, 1992). To the extent that a developmental sequence can be inferred from this cross-sectional study, it appeared similar for both groups of children. In general, all children used the *subject* argument, and most used the *theme* and *goal*. Other arguments such as the *source* and *beneficiary* were used only by those children who also used the theme and goal, and were thus more advanced.

Groups matched on MLU demonstrated similar performance in terms of argument variety and the ability to use verb alternations in their samples. However, similar to the CA-matched children, the MLU-matched group of children with SLI evidenced significantly fewer types of three-place argument structures in their samples compared with the NL children. In addition, descriptive analysis indicated that four-place structures were used only by children with NL. Thus, complex argument structures represented a significant area of difficulty for children with SLI even when groups were matched on length of utterance. These findings are partly consistent with previous reports of difficulty in the use of ditransitive verb structures by preschool children. Grela and Leonard (2000) found that ditransitive verbs had a significant detrimental effect on the use of auxiliaries by children with SLI and NL, indicating that the use of this verb type is more taxing than that of verbs with fewer argument positions. The findings of the present study indicate that inordinate difficulty with complex argument structures persists in school-age children, and they also indicate that children with SLI and NL differ significantly in this respect even

when utterance length is controlled. This differs from the finding of Grela and Leonard's study, which found that the effect of ditransitive verbs was equivalent across children with SLI and NL. It should be noted that the studies differed both in the age range of the participants and in focus, with Grela and Leonard using an elicitation task to investigate the effects of argument structure on verb inflection. In contrast, the present study was focused on the spontaneous production of argument structure itself.

Naturalistic language samples are routinely used in child language research to establish the extent of children's linguistic knowledge. This was the case in the present study, which attempted to establish children's argument structure repertoire based on spontaneous language samples. However, it must also be kept in mind that spontaneous production is subject to various factors and that speakers will not always attempt or choose to use the most complex language they are capable of using under optimal conditions. This is particularly true of verb argument structure, which includes both obligatory and optional elements. Whether all possible arguments are included or whether different argument structure alternations are used in a given sample depends on a number of factors such as the intended message and pragmatic factors related to the need to be informative yet succinct (see Grice's maxims, cf. Levinson, 1983). In addition, speakers may vary in how willing they are to attempt complex language. Therefore, what is still unclear is the extent to which the less sophisticated use of argument structure by the children with SLI was due to less complete representation of the verb's complexity (partial learning) versus greater susceptibility to production factors or less tendency to attempt complex forms. In another analysis of the language samples in the present study (Elin Thordardottir and Ellis Weismer, 1999), children with SLI and NL were equivalent in terms of the proportion of allowable arguments that they actually used. Thus, an analysis focusing merely on **number** of arguments (and thus length) was insensitive to the fact that the children with SLI used fewer **types** of arguments and fewer types of argument structure, as demonstrated in the present analysis. Together, these findings suggest that the impoverished argument structure use of school-age children with SLI is not merely attributable to production limitations such as utterance length, and that these children may have only partial representations of complex verbs, resulting in overall correct but less sophisticated use of verbs. Further investigation of the contribution of incomplete verb representations versus susceptibility to production limitations will benefit from the use of more varied experimental tasks that allow more control over the speaker's productions than does spontaneous production. However, it should be emphasized that spontaneous production which preserves true communicative intent is also a crucial context in which to study children's sophistication of language use.

In conclusion, the present study demonstrates that there are significant differences between school-age children with SLI and NL peers in the use of verb-argument structure. Although argument structure errors were infrequent in both children with SLI and NL, consistent with previous studies, less sophisticated argument structure use by children with SLI was noted compared with age-matched children with NL and compared with NL children matched on MLU, although to a lesser extent. Clinically, the findings indicate that the absence of argument structure errors should not be taken as evidence of age-appropriate mastery of argument structure. Further, they suggest that intervention efforts targeting verb-argument structure should focus on increasing verb diversity by presenting verbs in a variety of meaningful contexts that allow exposure to the different argument structure options of the target verbs.

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Appendix 1: Argument types and argument structure types

The following is a comprehensive list of the argument structure types encountered in the 100 language samples employed in the study, each illustrated by an example utterance taken from the language samples. Note that these are actual argument structures used and not necessarily the most complex argument structures allowed

by the verbs in the examples. In each of the argument structure examples, the number indicates the number of arguments involved including the subject, the letters specify which arguments other than the subject are used.

Key to argument types

I	intransitive, subject argument only.
C	copula complement.
T	theme.
G	goal.
U	argument of an unspecified thematic role.
S	source.
D	beneficiary (ditransitive verb).
V	verb+ object+ <i>verb</i> construction.

Argument structures

TYPE	EXAMPLE
I	We get to go outside and play .
	C
2C	It's <i>a never-ending game</i> , scattercat.
	T
2T	Kevin finds <i>a BB gun</i> .
	G
2G	If you tag somebody then that person has to go down .
	U
2U	They live <i>in the highest trees</i> .
	S
2S	Well, my teacher is Mr T. and everyone who comes <i>out of his classroom</i> says he's one of the nicest teachers.
	D D
2D	We can either read <i>to ourselves</i> or read <i>to a friend</i> .
	V
2V	I helped <i>make a cake</i> .
	T G
3TG	Then I have to put <i>it back in the racetrack</i> .
	D T
3DT	Well, my parents are gonna give <i>me a limo-drive</i> .
	T V
3TV	Well, I was helping <i>people make a snowfort</i> .

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