Production-Based Theories May Account for Subject Omission in Both Normal Children and Children with SLI: A Case Study

Les théories fondées sur la production expliqueraient l'omission du sujet dans les phrases produites par les enfants présentant un développement normal et ceux présentant un TSDL : étude de cas

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Abstract

One preschool child with specific language impairment (SLI) was compared to a younger, normally developing child for the production of grammatical subjects in sentences with varying levels of linguistic complexity. The children were matched based on mean length of utterance in their spontaneous speech. They were asked to produce sentences within the context of a story completion task that varied in length and number of arguments. The results indicated that both children omitted more subject arguments as complexity increased. However, the child with SLI was more likely to omit subjects in sentences that were less complex. These results are consistent with the theory that grammatical errors in children with SLI and their younger, normal counterparts are due to problems with processing complex linguistic information rather than with limitations in linguistic knowledge.

Abrégé

Les phrases produites par un enfant d'âge préscolaire avec un trouble spécifique de développement du langage (TSDL) ont été comparées à celles d'un enfant plus jeune présentant un développement normal au niveau de sa production grammaticale. Cette comparaison a été effectuée en se basant sur la longueur des phrases spontanées de chacun. On leur a demandé de produire des phrases dans une tâche où il s'agissait de compléter des histoires qui variaient en longueur et en nombre d'arguments. Les résultats obtenus indiquaient une augmentation du nombre d'omissions (du sujet dans les phrases) en fonction de la complexité. Cependant, l'enfant présentant un TSDL omettait plus souvent le sujet dans les phrases moins complexes. Ces résultats corroborent la théorie qui stipule que les erreurs grammaticales retrouvées chez les enfants avec un TSDL et leurs homologues plus jeunes, présentant un développement normal du langage, sont plutôt dues au traitement de l'information linguistique complexe qu'aux limites de la connaissance linguistique.

Key words: SLI, argument structure, linguistic complexity

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Children with specific language impairment (SLI) do not develop language as efficiently as their normal counterparts. Difficulty with language acquisition is seen despite age-appropriate nonverbal abilities, unremarkable neurological development, appropriate social-emotional development and hearing that is within normal limits (Leonard, 1998; Stark & Tallal, 1981). Thus far, research has shown that children with SLI appear to follow a normal developmental pattern and that their language abilities are similar to younger, normally developing children

(Leonard, 1998). However, it is not known whether the mechanisms used to reach language milestones are the same for children with SLI and their normally developing counterparts. Thus, a variety of theories have been used to explain both the developmental sequence and the grammatical errors found in these groups of children. One way of assessing the usefulness of a particular theory is to examine its ability to predict group performance in an experimental study. A problem associated with these types of design is that variability within groups can negate differences between groups. In addition, most empirical studies comparing children with SLI and their normal counterparts are conducted on small numbers of participants reducing the probability of finding differences even if they do exist. An alternative to group studies are case studies, which can be used as exploratory investigations of theoretical constructs. Case study designs are useful for comparing theoretical constructs with an individual's performance on an experimental task. One error pattern observed in both children with SLI and typically developing children is the omission of subjects. The purpose of this study was to examine the pattern of subject omissions that occurred as a result of varying sentence length and the number of arguments required by a verb. A child with SLI was compared to a younger, normally developing child to determine the similarities and differences in their errors.

It is well known that in the early stages of language acquisition normally developing English-speaking children omit subjects in tensed clauses (e.g., Bloom, 1989; Gerken, 1991; Ingham, 1992; O'Grady, Peters, & Masterson, 1989; Rizzi, 1998; Valian, Aubrey, & Hoeffner, 1996; Wang, Lillo-Martin, Best, & Levitt, 1992). For example, between two and three years of age, normally developing children will produce sentences such as *kiss mommy* or *play toys* even though they are not responding to questions (e.g., *What would you like to do?*) or commanding another person to perform an action (e.g., imperatives). A similar pattern has been found in preschool children with SLI (Grela & Leonard, 1997; McGregor & Leonard, 1994). Unlike languages such as Spanish or Italian, English requires a subject because the referent cannot be determined from the morphology of the language. However, null subjects are allowed in instances where the subject is implied, such as imperatives (e.g., *Buy me some chips*). In comparison, it is not permissible to omit subjects in tensed clauses (e.g.,**bought me some chips*). In the first example, one can conclude that the speaker is addressing another person who is present when the utterance is produced. However, in the second example, we have no idea to whom the speaker is referring. Children are exposed to both tensed and non-tensed clauses as they acquire English, but quickly discover when it is appropriate to omit a subject and when a subject is required.

Theories that explain subject omission errors in normal children can be placed into three general schools of thought. The first theory assumes that language is innate and children have the potential to learn any of the world's languages (Hyams & Wexler, 1993). According to this account, all children are born with a parameter set for null subjects. As a result, English-speaking children will believe that subjects are optional. It is only as they begin to discover the grammatical properties of English that they realize that subjects are required in tensed clauses. Shortly thereafter, they reset the null subject parameter to an obligatory setting for tensed clauses.

A second theory presumes a relationship between finiteness and use of subjects (Ingham, 1992; O'Grady et al., 1989). Ingham (1992) and O'Grady et al. (1989) argued that the use of grammatical subjects is closely tied to children's knowledge of tense. They noted a positive correlation between children's use of subjects and grammatical morphemes marking tense (e.g., regular past, third person singular, auxiliary verbs). Productions that lacked a grammatical subject also were devoid of tense markers. Ingham (1992) noted that as children acquire morphemes that mark tense, their use of grammatical subjects increases.

Finally, an alternative to the linguistic interpretations of subject omission is the theory that children omit subjects because of limitations in processing ability (e.g., Bloom, 1989, 1993; Valian et al., 1996). According to this account, children understand that subjects are obligatory in English sentences, but they are omitted because their production system limits the length of their utterances. Bloom (1989) suggested that subjects are vulnerable to omission because of a processing asymmetry between the subject and the other components of the sentence. As children's processing systems mature and they become more familiar with language, they are able to tolerate and process more complex language (Adams & Gathercole, 1995; Bock, 1982).

Research suggests that children with SLI do not process linguistic information as well as their normally developing peers (e.g., Ellis Weismer, Evans, & Hesketh, 1999; Gillam, Cowan, & Marler, 1998; Johnston, 1994; Miller, Kail, Leonard, & Tomblin, 2001). In other words, it takes children with SLI longer to learn language because they are inefficient at processing language. Montgomery and Leonard (1998) tested this hypothesis in a group of school-aged children with SLI. In this experiment, the children were asked to monitor the grammaticality of sentences where inflectional markers were either present or absent. They found that this group was less likely to identify the presence of morphemes of brief duration (e.g., regular past tense markers) than a group of normally developing children. They concluded the children with SLI were unable to complete an analysis of the brief morphemes because of the resource demands placed on the processing system by subsequent linguistic information. Miller and colleagues (2001) provided further support for this finding. They found that children with SLI were slower to respond during grammaticality judgment tasks than their normal peers. Results such as these demonstrate that children with SLI are poor at processing linguistic information, and as a result, may be delayed in the acquisition of language.

The majority of processing theories have focused on children with SLI and their difficulty with language comprehension. Processing theories also are able to account for the production of grammatical errors in these children. Production-based theories emphasize that children with SLI

have an intact linguistic system but that errors are due to a breakdown in sentence formulation. It is suggested that performance errors increase as the linguistic complexity of an utterance increases (Bock, 1982; Grela & Leonard, 1997, 2000; Leonard, 1998). The idea is that increased linguistic complexity places excessive processing demands on children with SLI resulting in grammatical errors.

Linguistic complexity can been defined in different ways. Bloom (1993) described sentence complexity in terms of the number of words following the main verb of a sentence. Therefore, the more words children produced postverbally, the more likely it is that they omit information preceding the verb in a sentence. However, one of the problems with Bloom's experimental design is that the children were asked to imitate sentences of varying length. It is possible that by the time the children heard the information at the end of the sentence the beginning had already been forgotten. So the task may have been measuring auditory working memory rather than a production-based processing problem.

Grela and Leonard (1997, 2000) suggested another measure of linguistic complexity for children. They stated that it might not be the length of the sentence that exceeds children's processing abilities but rather the number of linguistic units included in an utterance. More specifically, the main verb, or predicate, is considered to be the central component of a sentence and the number of units, or arguments, required by the verb to be an index of complexity. Using this rationale, the complexity of sentences can vary depending upon the number of arguments required for a particular verb. For example, intransitive verbs that require only one argument (e.g., *Tommy is playing*) are less complex than ditransitive verbs that require three arguments (e.g., *Tommy is giving some money to his teacher*). In the first example, only a subject (*Tommy)* is required by the verb. In the second example, a subject (*Tommy)* is transferring an object (*some money)* to another person (*his teacher*). Transitive verbs fall in the middle of this complexity continuum because only two units of information are required, a subject and a direct object (e.g., *Tommy is picking the berries*). Grela and Leonard (1997, 2000) found that children with SLI made more grammatical errors as the number of arguments required by the verb increased.

Using linguistic complexity as an independent variable, it may be possible to investigate its impact on the processing abilities of both normally developing children and children with SLI. If subject omission is contingent upon processing ability and linguistic complexity, then we would expect to see more omissions as grammatical complexity increases. It is possible to test this by manipulating both the length and the number of arguments within an utterance. A potential problem with this is that increasing the number of arguments also increases the length of an utterance. However, it is possible to increase length postverbally without increasing the number of arguments required by a verb. This can be accomplished by adding an adjunct that follows the final argument specified by a verb. Adjuncts function to provide additional information but are not required by a verb for a sentence to be grammatical (e.g., *Tommy is giving money to his teacher, Tommy is giving money to his teacher at school*). In this example, the prepositional phrase *at school* provides information about the location of the transaction, but it is not necessary for the sentence to be grammatically correct. By adding an adjunct to the end of sentences it may be possible to isolate an effect due to length from an effect due to the number of arguments. Therefore, if subject omissions increase by adding an adjunct, it can be argued that the number of words following the verb caused this increase. However, if there is no change in the number of subject omissions by adding an adjunct, it can be argued that the number of words postverbally did not have an effect on omissions.

A number of studies have examined subject omission in normally developing children and children with SLI. These studies have tested particular theoretical constructs on groups of children. A major problem with group studies is that individual differences are lost when data are pooled. The present study examines the predictions of linguistic and processing accounts of subject omissions by comparing the individual data of two children whose sentences in spontaneous speech were approximately the same length. If length is a factor, then more errors would be made as sentence length increases postverbally (e.g., *The cat is biting the mouse* vs. *The cat is biting the mouse at home*). If the number of arguments required by a verb is a factor then differences would be found between verb types even when the sentences are the same length (e.g., *The cat is jumping at home, The cat is pushing the box*). However, if the errors are linguistically based, the subjects would be omitted equally across all sentence types. Differing patterns of subject omission would indicate different underlying causes of errors. This information would provide additional support that intervention programs need to be customized to address the cause of the underlying problem in children with SLI.

Method

Participants

One child with SLI was compared to a younger, normally developing child with a similar mean length of utterance (MLU). Both children were female. The child with SLI was four years, nine months old and the typically developing child was three years, three months old at the time of the experiment. The MLU for the child with SLI was 3.89 and 4.05 for the typically developing child. The children were compared because their average sentence length, based on MLU, was approximately the same. This measure of language ability was selected because it meant that both participants were capable of producing sentences of approximately the same length. Standardized and informal assessment procedures were completed to confirm that one child met the diagnostic criteria for SLI (Stark & Tallal, 1981) and that the other child was developing language in a typical manner. The Reynell Developmental Language Scales (RDLS; Reynell & Gruber, 1990) was used to obtain a standard score for verbal comprehension and language production for both children. The Columbia Mental Maturity Scale (CMMS; Burgemeister, Blum, & Lorge, 1972) was used to assess the

nonverbal abilities of the child with SLI and because the typically developing child was less than three years, six months, the Leiter International Performance Scale (LIPS; Levine, 1982) was used. The scores for the standardized procedures can be found in Table 1. In addition, both children passed a hearing screening at 25 dB (HL) for each ear at 500, 1000, 2000, and 4000 Hz, and demonstrated adequate oral structure and function as determined by the Oral Speech Mechanism Screening Evaluation-R (St. Louis & Ruscello, 1981). According to a parental report, the child with SLI had a negative history of neurological dysfunction. She was receiving speech and language services at the time of participation in the study.

Procedure

A story completion task was used to assess the children's production of subject arguments in the target sentences (Grela & Leonard, 2000). For each sentence, the experimenter introduced a short story while manipulating gender-neutral, animate characters (e.g., horse, duck, clown) and inanimate objects (e.g., spoon, knife, ball). All of the characters and objects used in the stories were familiar to both children. The experimenter told the first part of the story and then requested the children to complete the story by describing the final action performed by the characters to a puppet named Woody. The experimenter prompted the children to finish the story by saying, "It's your turn. Tell Woody what's happening now." To ensure that a noun phrase (e.g., *the dog*) rather than a pronoun (e.g., *he, she, they, it*) was used in the response, the children were encouraged to describe the final action to Woody, who was hidden behind the experimenter. The children were told that Woody was unable to see the action being performed, but that he was able to hear them tell what the characters were doing. In addition, at least two potential subjects and objects were used in each story so that the child was obligated to specify which character was performing the action. The target verb was never used in a sentence during the story presentation; however, the experimenter would perform the final action repeatedly while saying the target verb. For example, in a story where *a duck was giving a spoon to a horse*, the experimenter would say, "Give." This was repeated until the child attempted the target sentence. This served to prime the child for the preselected verb in the target sentence without the experimenter providing information about the arguments required by the verb.

Table 1
Language Profiles for Both Children*

	Verbal Comprehension (RDLS)	Language Production (RDLS)	Nonverbal (CMMS, LIPS)
Child with SLI	< 63	< 63	111
Typically developing child	112	118	120

Note. *All test results are reported as standard scores. The CMMS was administered to the child with SLI and the LIPS to the typically developing child.

During the presentation of all the stimuli, the experimenter avoided the use of questions to elicit the target responses. This was done to ensure that if subject arguments were not produced, they were not omitted for pragmatic reasons (e.g., ellipses). Therefore, if the children did not respond, the action and prompt were repeated. If they still did not respond, the experimenter moved on to the next item.

The target sentences were constructed to measure the children's production of subject arguments when the complexity of the sentences were varied by increasing the number of arguments and/or the length of the sentence postverbally. To examine the children's use of subject arguments, they were asked to produce sentences containing verbs requiring a different number of arguments. Two verbs from each category were used to construct the sentences (intransitive: *jump, run;* transitive: *bite, push;* ditransitive: *put, give*). Each verb was used in six sentences that contained an adjunct, and in six sentences that did not contain an adjunct. The children were asked to produce a total of 72 sentences.

In the adjunct condition, the children were encouraged to specify where the action had taken place by adding the prepositional phrase *at home* to the end of the sentences (e.g., *The cat is jumping at home*). This was accomplished by performing the action next to a cardboard model of the inside of a dollhouse while the experimenter reminded the child to specify where the action was taking place. For the sentences in the nonadjunct condition, the action was performed with the dollhouse removed from the child's view (e.g., *The dog is running*). The child was reminded that she did not have to specify a location in this condition (e.g., *You don't have to say at home this time*). The purpose of selecting an adjunct condition was to manipulate the number of words produced postverbally. Therefore, it was possible to determine whether the total number of words in a sentence (length) rather than the number of arguments would increase the processing load.

The format of each sentence was controlled so that the subject of each sentence consisted of a noun phrase (*article + noun*) and the main verb of the sentence. The transitive verb constructions required a direct object and the ditransitive verbs required a direct object and a location (oblique argument). To control for complexity postverbally, all obligatory arguments consisted of noun phrases (*article + noun*) or preposition phrases (*preposition + article + noun*). All nouns and prepositions in the target sentences were monosyllabic (e.g., *cow, pig, duck, on, in*). Additional information in the form of an adjunct was required for half of the sentences. The adjunct for all sentences consisted of a prepositional phrase (*at home*). An example of these sentences can be found in Table 2.

Each child participated in a total of three experimental sessions. Each session took approximately one hour. The purpose of the first session was to collect a representative sample of the children's production of spontaneous speech and to complete all the standardized testing. The language sample consisted of pretend play scenarios using a cooking set

and a Fisher Price farm set. During the subsequent sessions, the experimental stories were presented to the children in random order.

The children were given six practice trials at the beginning of the experiment to introduce the task and familiarize them with the adjunct condition. A different set of verbs (e.g., *kiss*) was used in the practice trials. To ensure that the children understood the task required, they were given corrective feedback about their performance on the practice items. No corrective feedback was given during the experimental trials. However, the children were given verbal encouragement for attempting a target sentence.

Experimental sessions took place in a quiet testing room. All the sessions were recorded using a Marantz PMD 430 recorder and a Crown PZM 180 microphone. All of the children's responses were scored and coded from the audio recordings of the experimental sessions by the experimenter. All target sentence productions were scored for the presence or absence of the subject arguments. Only those sentences that contained all postverbal (nonsubject) arguments were considered. If a prepositional phrase was omitted in the adjunct condition, that utterance was excluded from the analysis. For each child, the percentage of omissions of subjects was then calculated. Two undergraduate students were recruited to measure inter-rater agreement. The students reviewed the children's responses and calculated the percentage of subject omissions for each verb by length condition. There was one hundred percent agreement between the investigator and the students.

Results

Both children omitted subjects across all sentence types. However, different patterns of omission emerged for the children. The profiles of the children's omission patterns can be seen in Figure 1. The child with SLI omitted subjects thirty-three percent of the time in the intransitive only condition (zero words postverbally), but the number of omissions dramatically increased in the intransitive with adjunct condition (two words postverbally). She omitted subjects ninety-two percent of the time. Her omissions remained at ninety-two percent in the transitive condition (two words postverbally), but increased to one hundred percent in the transitive with adjunct condition (four words postverbally). The subject omission rate for the child with SLI remained at one hundred percent for the ditransitive (five words postverbally) and ditransitive with adjunct condition (seven words postverbally). This pattern reflects a length effect because the omission rate increased as the number of words following the verb increased.

In comparison, omissions for the typically developing child remained relatively low for both intransitive conditions (zero and two words postverbally). In these sentences, she omitted the subject eight percent of the time. There was a slight increase in the percent of omissions for both transitive conditions (two and four words postverbally) where she omitted subjects eighteen and seventeen percent of the time. However, there was a dramatic increase in the number of omissions in the ditransitive conditions (five and seven words postverbally) where she omitted subjects ninety and eighty percent of the time. There appeared to be no difference for subject omission between the adjunct and no adjunct conditions, suggesting that the number of arguments, and not length, contributed to omissions of the typically developing child.

A comparison of both children's errors suggests that the ability of the child with SLI to process linguistic information is not as well developed as that of the typically developing child. The child with SLI could cope with intransitive sentences without the adjunct, but had more difficulty with sentences that had two or more words following the verb. The typically developing child, on the other hand, made relatively few errors while producing intransitive and transitive sentences but the number of subject omissions increased dramatically during the production of ditransitive sentences. Therefore, the point at which the processing capabilities of the child with SLI was overwhelmed occurred at lower levels of sentence complexity than that of the typically developing child.

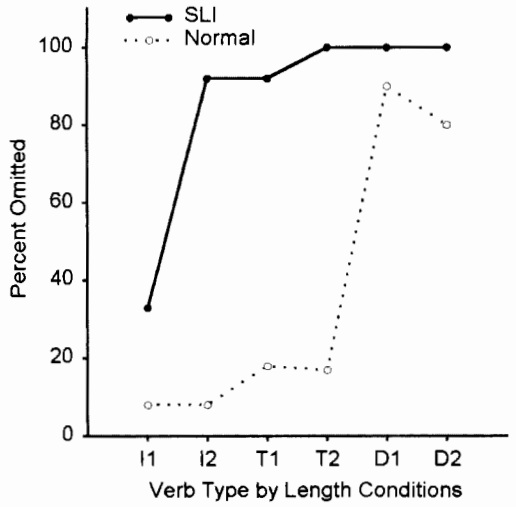
Table 2
Sample Sentences by Verb Category

Sentence Type	Number of words postverbally	Sample Sentences
Intransitive only	0	The bear is running.
Intransitive + adjunct	2	The birds are jumping at home.
Transitive only	2	The cow is biting the boy.
Transitive + adjunct	4	The cats are pushing the car at home.
Ditransitive only	5	The pig is giving the cup to the mouse.
Ditransitive + adjunct	7	The snakes are putting the block in the truck at home.

Discussion

The results of this study showed that the two preschool children were similar in that they omitted subject arguments when subjects are required. Furthermore, their error patterns are consistent with the processing limitation accounts. Both children omitted subjects as grammatical complexity increased. However, the patterns of omission were different for both children. For the child with SLI, a pattern consistent with a length effect is evident, while an effect due to the number of linguistic units is apparent for the typically developing child. Even though the two children produced sentences that are approximately the same length in spontaneous speech, as measured by MLU, the child with SLI omitted subjects at lower levels of linguistic complexity than the typically developing child. A comparison of the two children provided evidence that some children who meet the diagnostic criteria of SLI are less efficient at processing linguistic information in comparison to normal peers. These findings are discussed in the following section.

Figure 1.
Percent of subject argument omissions by linguistic complexity for the child with SLI and the typically developing child. I1 = intransitive no adjunct, I2 = intransitive with adjunct, T1 = transitive no adjunct, T2 = transitive with adjunct, D1 = ditransitive no adjunct, and D2 = ditransitive with adjunct.



Bloom (1993) proposed that children's grammatical errors are influenced by the length of an utterance. He noted that children are less likely to repeat the subject of a sentence on imitation as the number of words following the verb increases. He suggested that this is due to a processing asymmetry between the subject and the other components of sentence. In other words, children are limited in the number of words they are able to produce in an utterance. Once their linguistic processing system is saturated, some component of the sentence is sacrificed. In most of the cases, the subject is omitted. By varying the number of words following the main verb of a sentence, it may be possible to identify the point at which a child's processing system reaches its limit. For the child with SLI, the percentage of subject omissions increased as she attempted to produce sentences with two or more words following the verb. This is the case for intransitive sentences with adjuncts and transitive sentences. No differences were found between these two sentence types, which both have two words postverbally. Then the child with SLI omitted subjects one hundred percent of the time as she produced transitive with adjunct, ditransitive, and ditransitive with adjunct sentences. These sentence types have four or more words postverbally.

The typically developing child also showed an omission pattern that is consistent with a processing capacity limitation account. However, her processing system tolerated a higher level of complexity than did the child with SLI. The percentage of subject omissions increased substantially as the typically developing child produced utterances with five or more words postverbally. Furthermore, omissions of the subject by the typically developing child were sensitive to the number of arguments rather than to the number of words following the main verb. There did not appear to be differences in the percent of omissions between the verbs with and without adjuncts. However, the typically developing child produced more errors when the verb required more arguments postverbally. It is possible that length was a factor for the typical child, but did not affect her until she attempted the ditransitive sentences. It may have been more difficult for her to produce sentences that contained five rather than four words postverbally. However, if this were the case, we would expect to see even more errors as she produced the ditransitive with adjunct sentences (seven words postverbally). The profile shown by the typically developing child is consistent with the proposal of Grela and Leonard (1997) who found that children omit more subjects when producing verbs requiring a greater number of arguments.

Individual variation in processing capacity occurs in the general population (e.g., Just & Carpenter, 1992). Even though variation exists within the normal population, normal individuals are significantly better at processing linguistic information than children with SLI (e.g., Ellis Weismer et al., 1999; Leonard, Miller, Grela, Holland, Gerber, & Petucci., 2000; Miller et al., 2001). These results hold true for both comprehension and production data (e.g., Bishop, 1994; Chiat & Hirson, 1987; Leonard et al., 2000). According to Bishop, children with SLI show considerable variability in their production of grammatical structures. She argued that these children have a general competence with the grammatical properties of language but can fail to demonstrate this competency because of performance limitations. Bishop emphasized that processing complex linguistic information may place a severe strain on a limited capacity system. If this is true, then we would expect to find some type of breakdown of the outgoing message. Bishop argued that omission errors would be the result of a processing overload. This is the case in the present study. As the syntactic and semantic complexity of the sentences increased, both children were more likely to omit the subject of the sentence. Since children with SLI are less proficient with language, the processing ability of the child with SLI was affected at a lower level of sentence complexity than that of the typically developing child. Thus, the addition of the adjunct affected the child with SLI, while the adjunct did not have the same impact on the performance of the typically developing child. It is possible that the typically developing child was able to produce adjuncts at the end of the utterances without them affecting processing. This is likely because the task was repetitive and the children were reminded to produce the adjunct if needed. The point of saturation occurred for her when she produced ditransitive sentences that required a direct object and oblique argument. The child with SLI, on the other hand, may not have been able to automatically add the adjunct. The effort of adding the adjunct may have consumed the resources she had available for the production of the subjects.

There are several reasons for suspecting that grammatical errors may be influenced by linguistic complexity. Adams and Gathercole (1995) suggested that a processing system

may be limited in the amount of space it has available to devote to linguistic analysis. If a linguistic unit is too large (i.e., two or three place predicates), then it is likely that some components of the sentence will be sacrificed so that the system is able to generate some sort of output. In this case, the subject may be susceptible to omission. A similar idea includes the notion of a buffering system where the components of the sentence must be held in working memory where they can be assembled before the completed sentence is sent for phonological encoding and production (Bock, 1982; Bock & Levelt, 1994). If the buffer is too small, it is possible that the subject argument is overwritten, or purged from memory, in order to make room for the verb and its subsequent information.

Bishop (1994) argued in favour of slow grammatical coding, rather than insufficient space for processing. She stated that a slow grammatical coding system would be unable to deal with incoming information and as a result certain information would be lost during production. It is a possibility that the subject is one of the first units to be retrieved, as in a sentence repetition task (Bloom, 1989). Consequently, it takes time to retrieve the other components of the sentence. As a result, the subject fades from memory before the information is sent for phonological encoding. This would be consistent with a system that is slow in processing linguistic information.

If children with SLI are slow processors of information, or have insufficient space to process linguistic information, it is still unclear why subjects are affected more than other components of the sentence. There are several factors to consider when comparing subjects with other arguments. First of all, subjects are assigned nominative case (e.g., I, he, she), while the other arguments are typically assigned accusative case (e.g., me, him, her). From the examination of case errors in young children and children with SLI, it is been suggested that accusative case is a default case and that a separate grammatical function must be performed to assign nominative case (e.g., Loeb & Leonard, 1991; Radford, 1990). According to the minimalist principle, nominative case is assigned through a process of feature checking (Radford, 1997). If feature checking requires additional resources, it is possible that the nominative case assignment is not completed and as a result the subject is omitted. Another notion from the minimalist perspective is the idea that subjects are projected within the verb phrase. The subject must move to an external position to receive case marking, or for the features to be checked for case (Radford, 1997). Again, it is possible that this movement consumes processing resources resulting in an omission of subjects.

As children mature and language production becomes more automatic, their processing system is able to tolerate more complex linguistic information, such as more arguments. For children with SLI, this maturational process takes longer than it does for normally developing children (e.g., Leonard, 1998; Leonard, Eyer, Bedore, & Grela, 1997; Rice, Wexler, & Cleave, 1995). Therefore, we would expect to see grammatical errors occurring for a longer period of time, as well as differences in processing abilities when comparisons are made to younger, normally developing children.

The results of this study are not dissimilar with the linguistic accounts of subject omission in children who are in the process of acquiring English (e.g., Hyams & Wexler, 1993; Ingham, 1992; O'Grady et al., 1989). In fact, an initial examination of the children's productions might lead one to believe that they used subjects optionally. However, it is the pattern of error that weakens the linguistic accounts of subject omission. According to these accounts, we should expect to see subject omission occurring randomly. The results of this study do not exhibit a random pattern, but a systematic pattern of omission as sentence complexity increases. For the child with SLI, it appeared that subject omission was due to the length of the sentence, whereas, with the typical child, it was the number of linguistic units required by the verb.

One final factor that must be considered in explaining the children's performance on the story completion task is their level of cognitive maturation. The task required the children to pretend that nonhuman figures could perform uncharacteristic actions (e.g., a cat pushing a car) and that the puppet, Woody, was capable of hearing, but not seeing. While this may have influenced their language performance, it is unlikely because both children possessed nonverbal abilities within the normal range and they were capable of pretend play as was observed in the collection of their language sample. In addition, it has been shown that the performance on "theory of mind" tasks is enhanced when the linguistic demands for a response are simplified for both preschool children with SLI and their younger typically developing peers (Miller, 2001). Since the probe presented (e.g., *Tell Woody what's happening now*) did not vary in complexity, it is unlikely that the linguistic demands on comprehension can account for more production errors associated with increased length or number of arguments. Also, the items were presented in random order. Therefore, if there were any practice effects associated with the items, it should have been equally distributed across all sentence types.

Since the present study was completed on two children, it is not possible to generalize the results to a larger group of children with SLI. If the assumptions made in this study are correct, they have significant implications for language intervention. It is possible that some children may have a general understanding of the grammatical properties of their language, but that production based errors occur because of the complexity of the responses that the children are asked to produce. It may be better to teach variable linguistic forms in the least complex contexts until the child demonstrates competency with that form. Then it would be appropriate that the complexity of the context be increased to accommodate the child's proficiency with a particular linguistic item. This procedure differs from an intervention program focused on teaching a child who does not understand the linguistic rules of subject use. If the child with SLI used subjects inconsistently, then an intervention program should focus on teaching her that subjects are required in tenses clauses but not in clauses where tense is not required.

In conclusion, this case study was completed to examine possible reasons for the variability of subject use in both young, normally developing children and children with SLI. While this study provides some preliminary evidence that linguistic complexity may account for omission errors in children's production of sentences, this study needs to be completed on a larger group of children from a homogeneous population. This would help to determine whether these patterns of error hold true for other children, or whether they are specific to the two children who participated in this study.

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