The Use of Syntactic Cues in Lexical Acquisition by Children With SLI

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This study investigated the syntactic bootstraping abilities of children who differed by language abilities and age. In the first study, the performance of 5-year-old children with Specific Language Impairment (SLI) was compared to that of two groups of typically developing children—one of equivalent language levels, as indexed by mean length of utterance (MLU), and the other of equivalent chronological age. In the second study, two groups of 7-year-old children, one whose language was developing typically and one with SLI, were involved. The count/mass distinction was used as the basis for the experimental tasks. A videotaped story was used to present the novel count and mass words, with syntactic cues in one condition and with neutral syntax in another. Results from the first study revealed that only the 5-year-old nonaffected control children showed evidence of using the syntactic cues. The 5-year-old SLI group and 3-year-old control group achieved comparable scores. However, error analyses suggested that different factors were operative in the two groups. The second study revealed that there was continued growth into the early school years for children with SLI and children whose language was developing typically.

KEY WORDS: specific language impairment, syntactic bootstrapping, lexical acquisition, children’s language impairment

It has been well documented that, in general, preschool children acquire new words at a surprisingly rapid rate (Carey, 1978). One aspect of word learning that has been studied is initial word-referent mapping based on limited exposure. This process is often referred to as fast mapping. Fast mapping studies with normal language learners have shown that preschool children can form initial, partial representations for novel words in didactic teaching situations (Apel, Kamhi, & Dollaghan, 1985; Dickinson, 1984; Dollaghan, 1985, 1987; Heibek & Markman, 1987). Furthermore, work by Rice and her colleagues (Oetting, Rice, & Swank, 1995; Rice, 1990a; Rice, Buhr, & Nemeth, 1990; Rice, Buhr, & Oetting, 1992; Rice & Woodsall, 1988) has demonstrated that children are able to form initial word-referent mappings when the new words are embedded in videotaped stories, a more natural learning situation. Quick incidental learning (QUIL) is the term that has been applied to this form of word learning.

For some time it has been recognized that limited lexical development is one of the hallmarks of specific language impairment (Leonard, 1988, 1998; Rice, 1990b). In a fast mapping study, Dollaghan (1987) found that 4- to 5-year-old children with language impairments were able to comprehend the novel name of an unfamiliar object as readily
as age-matched typically developing children. However, the ability of the children with language impairments to produce the novel words was less than that of their peers. Rice and her colleagues have examined the QUaL abilities of children with SLI and determined that this is an area of vulnerability (Oetting et al., 1995; Rice, 1990b; Rice et al., 1990; Rice et al., 1992). In their studies, 5-year-old children with SLI were able to learn novel words that were presented as part of videotaped stories. However, they mapped fewer words to their referents than normal language learners matched for age and language level as indexed by MLU.

Although it has been shown that children can fast map words, the details of how children do this are unknown. The way in which children align their knowledge of the world, their lexical representation of that knowledge, and the formal grammatical devices associated with lexical representations is a matter of unresolved controversy. There have been a number of studies that suggest that preschoolers learning language normally can use syntactic cues to aid in lexical mapping in structured situations. This has been referred to as syntactic bootstrapping (Bedore & Leonard, 1995; Gleitman, 1999; Gleitman & Gleitman, 1992). With syntactic bootstrapping, the listener uses the syntactic frame and morphological markers associated with a novel word to aid in the determination of its referent. Morphological markers include prenominal forms such as determiners (e.g., articles, any, some) and classifiers (e.g., adjectives; cf. Chierchia, 1994; Klibanoff & Waxman, 1999). Brown (1957) reported that children between the ages of 3 and 5 years of age were able to use the cues a/another, any/some, and -ing to assign novel names to count items, mass items, and actions respectively. Katz, Baker, and McNamara (1974) reported that 2-year-old children could differentiate between novel proper and common nouns based on the presence of the article a if the word referred to a semantically appropriate item (i.e., a doll). This effect was not seen in the boys in this study. In a later study, Gelman and Taylor (1984) reported that both 2-year-old boys and girls were able to use the syntactic cue to differentiate novel common and proper nouns. The effect of syntactic cues on class assignment for novel words has also been demonstrated for nouns versus prepositions (Landa & Stecker, 1990), nouns versus verbs (Dockrell & McShane, 1990), and various classes of verbs (Behrend, Harris, & Cartwright, 1995).

It has been reported by a number of researchers that morphosyntax is particularly difficult for children with SLI (e.g., Cleave & Rice, 1997; Leonard, 1989, 1998; Oetting & Horohov, 1997; Rice & Wexler, 1996; Rice, Wexler, & Cleave, 1995; Rice, Wexler, & Hershberger, 1996; Rice, Wexler, & Redmond, 1999; Watkins & Rice, 1994). Given that children with SLI demonstrate difficulties with both lexical acquisition and morphology, it is reasonable to ask if the lexical limitations of children with SLI are related to their difficulties with morphology. With regard to verb acquisition, Oetting (1999) found that 6-year-old children with SLI could use argument structure cues to interpret novel verbs as readily as their age controls but they did not retain the new verbs as well. This suggests that nonmorphological cues such as argument structure can be useful for children with SLI for their interpretation of novel verbs. Eyer, Leonard, Bedore, Anderson, and Vivescas (1998) reported that young children with SLI benefitted from morphosyntactic cues such as articles and word order (e.g., I found a shong) to deduce that a novel word was a noun and not a verb.

This study focused on noun learning and the possible role of determiners within the noun phrase to guide children's initial understanding of the meanings of novel nouns. Of particular relevance here is the finding that 5-year-old children with SLI are more likely to omit the articles a/the than are age-matched or 3-year-old language-matched control children (Rice & Wexler, 1996). This suggests that if SLI children do not have a robust representation of articles, they would have fewer grammatical cues to use for learning the meanings of novel nouns.

Preschool children without language impairments are known to draw upon the grammatical context provided by determiners to learn novel words for things that can be counted as individual items (count nouns, such as car) versus things that are treated lexically as nonindividuated substances (mass nouns, such as water) (Bloom, 1994; Chierchia, 1994; Dickinson, 1988; Gathercole, 1986; Gordon, 1985, 1988; Soja, 1992; Soja, Carey, & Spelke, 1991). In this study, we used the count/mass distinction to explore children's use of grammatical cues in the assignment of novel names to novel objects and to determine if children with SLI have a selective disadvantage for lexical learning that is associated with fewer grammatical cues.

**Design**

The study involved groups of children who were randomly assigned to one of two viewing conditions. The children viewed a videotaped story in which novel count and mass items were presented. For the children in the Cued Syntax condition, the narration provided syntactic cues as to the assignment of novel word to novel object. For the children in the Neutral Syntax condition, there were no syntactic cues provided.

This study was designed to investigate factors that can affect the use of grammatical cues in the assignment of names to things. One such factor is whether or
not children control the grammatical contrast that serves as a cue. Children in the process of learning a language structure, such as the determiner system, may have only partial knowledge of its features, and, thus, they may not be able to benefit from the cues provided by the structure as an adult would. In the first study, the performance of a group of 5-year-old children with SLI was compared to that of two groups of typically developing children—one matched for age and the other for language level as indexed by MLU. The second study extended the findings by including two groups of 7-year-old children—one consisting of children with SLI, the other of typically developing children. This design allowed for an examination of the effect of both language learning abilities and age variables. The influence of language abilities was examined by comparing the performance of the SLI groups with that of the typically developing groups. The influence of age was examined by comparing within the three typically developing groups and then between the two SLI groups.

A second factor involves performance demands, such as the recall of novel things and novel names. In this study, error responses were analyzed for evidence of limited recall of words and things in the introducing condition.

A third factor involves the conditions under which the novel names are introduced. If young children are to receive maximal benefit from the use of grammatical cues to guide word learning, they must be able to do so in the press of naturalistic on-line processing. For this study, the new words were introduced in simple story scenes presented on videotape, which had the further advantages of standardizing the introducing conditions across subjects, eliminating inadvertent examiner bias, and generating carefully matched experimental and control conditions.

The specific questions under evaluation were as follows:

1. Do young children in syntax-informative input conditions use grammatical information in the assignment of novel words to novel things?

2. Are there differences attributable to the completeness of the child's representation of the linguistic structures such that children with limited grammatical competencies (e.g., SLI children) are less likely to benefit from informative syntax than are children with greater grammatical competencies?

3. Are there developmental differences, both within typically developing groups and SLI groups, such that older children have higher levels of syntax-consistent lexical assignment than younger children?

4. Are there differences in the types of errors made by the three groups which suggest different sources of difficulty?

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**Study One**

**Methods**

**Participants**

Sixty-two children participated in this study. Twenty of the participants were identified as SLI, 20 were typically developing children of equal language levels, and 22 were typically developing children of equivalent chronological age. All of the participants were drawn from monolingual English-speaking homes and were enrolled in one of several area preschool or day care programs in eastern and central Kansas. Because we did not contact parents for ethnicity or SES data, we did not record it for these participants (cf. Entwistle & Astone, 1994, who strongly recommend that parents be the source of ethnicity and SES data). In other studies whose samples were drawn from the same attendance centers, we recruit approximately 10% minority participants, distributed evenly across the three groups (e.g., Rice, Wexler, & Hershberger, 1998).

The children with SLI were approximately 5 years of age (5-SLI group). Their ages ranged from 54 to 68 months (M = 59.85, SD = 4.40). There were 10 girls and 10 boys in the group. They had been diagnosed as having a language impairment by a certified speech-language pathologist and were enrolled in a preschool program for children with language impairment. Their intellectual functioning was within normal limits, as evidenced by an age deviation score of 85 or above on the Columbia Mental Maturity Scale (CMMS; Burgemeister, Blum, & Lorge, 1972). They displayed normal hearing, according to a hearing screening or audiological examination conducted within 6 months of the study. Their receptive and expressive language performance was below age expectations. Each subject scored one or more standard deviations below the mean on the Peabody Picture Vocabulary Test—Revised (PPVT-R; Dunn & Dunn, 1981) and produced an MLU one or more standard deviations below the mean. The MLU measure was based on analysis of a language sample of at least 100 utterances and the normative information provided by Leadholm and Miller (1992). The children in the 5-SLI group were randomly assigned to one of the two viewing conditions: Cued Syntax (N = 11) and Neutral Syntax (N = 9).

Two groups of typically developing nonaffected children also participated in the study: one at equivalent levels of language development as indexed by MLU, who were approximately 3 years old (3N group), and the other at equivalent chronological age (5N group). The ages of the 20 children in the 3N group ranged from 30 to 40 months (M = 35.50, SD = 3.24). Eleven were girls and 9 were boys. These children displayed normal intelligence,
hearing, and social development, according to teacher report, and their performance on the PPVT-R was within or above one standard deviation above the mean. MLU was used as the grouping variable because of its conventional status as a general index of language development for preschool children. The 5N group demonstrated an MLU within or above one standard deviation of the mean expected for age (Leedholm & Miller, 1992). In addition, the MLU of each child in this group was within 10 morphemes of the MLU of one of the children in the 5-SLI group. Assignment to the viewing conditions was carried out such that for each child in the 5-SLI group there was a child in the 3N group whose MLU was within 10 morphemes assigned to the same viewing condition. Eleven children were assigned to the Cued Syntax condition, and 8 were assigned to the Neutral Syntax condition.

There were 22 children in the 5N group. They ranged in age from 55 to 67 months (M = 60.91, SD = 3.89). There were 14 girls and 8 boys. These children displayed normal intellectual functioning as evidenced by an age deviation score of 85 or above on the CMMS. Their performance on the PPVT-R was within or above one standard deviation above the mean. Their hearing and social development was also normal according to teacher report. As with the 5-SLI group, children in the 5N group were randomly assigned to one of the two viewing conditions, with 11 children being assigned to each condition. In addition to the tests listed above, the Goldman-Fristoe Test of Articulation (GFTA; Goldman & Fristoe, 1986) was administered to all children to assess their sound production. Table 1 summarizes the results of the identification testing for the three groups.

### Reliability

The language samples were transcribed and coded by four graduate assistants. Quality control checking was carried out by a full-time lab staff member who was expert with the transcription/coding system. Transcription and coding followed the conventions for the SALT software (Miller & Chapman, 1991), which were described in detail in an internal lab manual. All were trained to a standard of 95% agreement with three practice child samples of more than 500 child utterances before the experimental data collection. Two graduate assistants collected the samples and transcribed and coded the child utterances. Each examiner completed the samples for the children whose data she collected. Two other graduate assistants made a second pass through the audio recordings to insert the adult utterances, and while they were listening to the tapes they also checked on the transcription and coding. Any disagreements with transcription or coding were noted and resolved via consultation with the initial coder. Finally, 10% of the data were checked by a lab staff member expert with the coding system; it was found to be 95–99% consistent with the expert coding.

### Materials

#### Naming Task

A naming task was administered as a way of evaluating the children’s ability to differentiate the two classes of objects (count vs. mass things) for the purpose of semantic classification. Specifically, the task tested whether the children, when asked to label an unfamiliar object, were able to use a familiar count name to refer to a novel count thing and a familiar mass name to refer to a novel substance. Four novel count items (i.e., a white plastic drawer glide, one half of a gold window lock, a gray plastic light socket, and a beige plastic loop) and four novel masses (i.e., loose tea, purple decorator sand, instant potato flakes, and sawdust) were presented to the child one at a time. The children were encouraged to look at and explore each item. Then they were asked to provide a name for the item. The label the children

### Table 1. Participant identification testing by group: Study One.

<table>
<thead>
<tr>
<th></th>
<th>3N (N = 20)</th>
<th></th>
<th>5 SLI (N = 20)</th>
<th></th>
<th>5N (N = 22)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Range</td>
<td>M</td>
<td>SD</td>
<td>Range</td>
</tr>
<tr>
<td>Age*</td>
<td>35.50</td>
<td>3.24</td>
<td>30–40</td>
<td>59.85</td>
<td>4.40</td>
<td>54–68</td>
</tr>
<tr>
<td>MLU</td>
<td>3.49</td>
<td>3.6</td>
<td>2.89–4.35</td>
<td>3.47</td>
<td>0.44</td>
<td>2.79–4.44</td>
</tr>
<tr>
<td>PPVT-R</td>
<td>105.60</td>
<td>9.67</td>
<td>93–125</td>
<td>75.65</td>
<td>6.55</td>
<td>61–85</td>
</tr>
<tr>
<td>CMMS*</td>
<td>NA*</td>
<td>NA</td>
<td>NA</td>
<td>99.20</td>
<td>9.02</td>
<td>85–115</td>
</tr>
<tr>
<td>GFTA*</td>
<td>89.10</td>
<td>15.55</td>
<td>37–99</td>
<td>20.30</td>
<td>19.63</td>
<td>4–66</td>
</tr>
</tbody>
</table>

*in months

*Mean length of Utterance in morphemes

*Peabody Picture Vocabulary Test–Revised, Standard score reported.

*Columbia Mental Maturity Scale, Age deviation score reported.

*not available

*Goldman-Fristoe Test of Articulation, percentile rank reported.
gave and any use of a determiner was recorded.

A secondary purpose of the naming task was to familiarize the children with the properties of the objects that they would be viewing in the experimental task. The novel substances were clearly poured out of a container, to demonstrate that they were nonsolids.

**Video Stimuli**

The experimental task involved viewing a videotaped story in which novel count and mass items were introduced. Sixteen nonce forms were presented in pairs, one count and one mass, within eight videotaped segments. Each nonce form corresponded to 1 of 16 unfamiliar referents; half of these referents were count items and the other half mass items. Unfamiliar objects from a hardware or craft store (e.g., plumber’s T) were used for the count referents. The mass referents included a variety of granulated or small individualized substances that varied in color and texture (e.g., crushed seaweed). Pilot testing confirmed that children under 5 years of age could not name any of the count or mass items. The nonce forms followed English orthographic rules and involved early emerging phonemes. Half of the count terms were monosyllabic and half were bisyllabic. The same was true of the mass terms. A description of the experimental items and the nonce forms assigned to each item is provided in Table 2.

The video consisted of eight segments involving an Oscar the Grouch puppet and two female actors. In each segment, one novel mass item and one novel count item were introduced. A narrated story about how Oscar’s can became filled with trash tied the video segments together. The first four segments involved Oscar and a woman who cleans out her purse by throwing items into Oscar’s trash can. The final four segments involved a second woman on the way to the dump whom Oscar stops and convinces to put items in his trash can. In each scene, the woman presented the novel count and mass items simultaneously and labeled them five times, always in the same sentence (e.g., “I found a keelwug and some blick”).

Two versions of the narrated story were used for the creation of two viewing conditions—one in which the syntax provided cues for the assignment of novel word to novel object (Cued Syntax) and the other in which neutral syntax was used (Neutral Syntax). In the Cued Syntax condition, the novel count terms were preceded by the determiner a; the novel mass terms were preceded by the determiner some (e.g., Look, I found a keelwug and some blick). In the Neutral Syntax condition, both count and mass terms were preceded by the determiners the or my (e.g., “Look I found the keelwug and the blick”). The order in which the count and mass terms were mentioned in each pair was counterbalanced. Pilot testing of the video stimuli using adults confirmed that the two forms of the narration provided the expected cues. A total of 10 adults viewed the videotapes. The 5 adults who viewed the Cued Syntax condition were almost perfect in their mapping of novel word to novel object (M = 15.6 out of a possible 16). The 5 adults who viewed the Neutral Syntax condition performed essentially at chance, as was predicted (M = 7.6). The script of the videotape appears in the Appendix.

**Table 2. Stimuli: label and description.**

<table>
<thead>
<tr>
<th>Nonce label</th>
<th>Description of item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count items</td>
<td></td>
</tr>
<tr>
<td>keelwug</td>
<td>large oddly shaped silver button</td>
</tr>
<tr>
<td>pel</td>
<td>gold and blue metal hose connector</td>
</tr>
<tr>
<td>didum</td>
<td>white plastic plumber’s T</td>
</tr>
<tr>
<td>troke</td>
<td>yellow and black plastic nozzle</td>
</tr>
<tr>
<td>naket</td>
<td>orange two-prong hook</td>
</tr>
<tr>
<td>dute</td>
<td>red s-shaped hook with silver attachment</td>
</tr>
<tr>
<td>mopat</td>
<td>grey metal fence post top</td>
</tr>
<tr>
<td>weem</td>
<td>silver tooth</td>
</tr>
<tr>
<td>Mass items</td>
<td></td>
</tr>
<tr>
<td>blick</td>
<td>dried mustard powder</td>
</tr>
<tr>
<td>geeder</td>
<td>ground red pepper</td>
</tr>
<tr>
<td>pleen</td>
<td>crushed black seaweed</td>
</tr>
<tr>
<td>payleen</td>
<td>raw bran</td>
</tr>
<tr>
<td>spet</td>
<td>crushed green seaweed</td>
</tr>
<tr>
<td>pomen</td>
<td>dried herbs</td>
</tr>
<tr>
<td>sim</td>
<td>chestnut powder</td>
</tr>
<tr>
<td>kamet</td>
<td>instant coffee granules</td>
</tr>
</tbody>
</table>

**Picture Comprehension Test**

Comprehension of the novel count and mass terms was tested using a picture-pointing task that paralleled the format of the PPVT-R. There were 16 four-picture arrays, one for each target item. Each four-picture array consisted of the target item, the other item in the pair, a second count item, and a second mass item. The nontarget mass and count items were present in the video segments as background objects when the experimental items were introduced. Following the PPVT-R format, the children were asked to point to the target items (e.g., Show me blick). No determiner was used in the comprehension testing.

**Procedures**

The testing and experimental tasks were administered over a 3-day period to each participant in a quiet
room near the preschool or day care class. Each session was 15 to 30 min in length. On the first two days standardized testing was completed, the mass/count probe was administered, and the language sample was collected. Language samples were elicited via play with a standard set of toys. Transcription and coding followed the procedures outlined in a detailed lab manual. On Day 3 the mass/count videotape was viewed. The procedures for Day 3 were as follows. The children were told that they were going to watch a TV show about how Oscar the Grouch got lots of trash in his trash can. They were told to watch carefully because they would be asked questions about the show. Then each child viewed the first video segment. After viewing, the picture comprehension test was presented and the child was asked to point to the pictures of the stimuli that were introduced in the preceding scene. A different four-picture array was used to test each count and mass item. Following testing, the videotape was turned back on and the child and examiner watched the second video segment. This format of viewing and testing continued until all eight video segments were completed.

Results
Preliminary Analyses
Identification Testing

Univariate one-way ANOVAs revealed the expected group differences on the PPVT-R and MLU measures. For the PPVT-R standard scores, the overall ANOVA indicated significant group differences \( F(2, 59) = 78.67, p < .000 \). Follow-up \( t \) tests revealed that there were significant differences between the 5-SLI group and both the 3N group \( t(59) = 9.94, p < .000 \) and the 5N group \( t(59) = 11.56, p < .000 \). There was no significant difference between the 3N and 5N groups \( t(59) = 1.48, p > .10 \). For the MLU measures, the overall ANOVA again indicated significant group differences \( F(2, 59) = 32.70, p < .000 \). Because the group variances were significantly different, follow-up pairwise comparisons used separate variance estimates. As expected, \( t \) tests revealed that there were significant differences between the 5N group and both the 3-SLI group \( t(59) = 6.27, p < .000 \) and the 5N group \( t(59) = 6.39, p < .000 \). There was no significant difference between the 3N and 5-SLI groups \( t(36.4) = .177, p > .860 \).

There was an unexpected group difference on CMMS scores between the 5-SLI (\( M = 99.20 \)) and 5N (\( M = 105.55 \)) groups \( t(40) = 2.42, p < .02 \). However, all the children in the 5-SLI group achieved scores within normal limits for their age. Therefore, cognitive levels of the children in the 5-SLI group were sufficient to assume that they knew the difference between count things and mass substances. This assumption was supported by the 5-SLI group’s performance on the naming task.

Group comparisons were also conducted on the results from the GFTA. A one-way ANOVA on percentile rank scores revealed significant group differences \( F(2, 59) = 125.82, p < .000 \). Follow-up \( t \) tests revealed that the 5-SLI group differed from both the 3N \( t(59) = 13.47, p < .000 \) and the 5N group \( t(59) = 14.08, p < .000 \). There was no significant difference between the 3N and 5N groups \( t(59) = 0.30, p > .77 \). The difference in percentile rank for the children with SLI was largely attributable to their mispronunciation of /l/, /ʃ/, /f/, /θ/, and /ð/. Although the 5-SLI group displayed difficulty with phonology, the overall intelligibility of the children’s spontaneous samples was good. Furthermore, the overall intelligibility of the 5-SLI group was equivalent to that of the 3N group in the spontaneous samples. The percentage of intelligible utterances for the 5-SLI and 3N groups were 92% and 91% respectively.

For each of the three groups, \( t \) tests were completed comparing initial testing results for the children in the two experimental conditions. On each measure, there was no significant difference.

Naming Task

The performance of all the children on the Naming Task indicated that they had the appropriate categorization for count and mass items to allow them to classify the novel objects. The children in all three groups consistently differentiated count from mass things for the purpose of labeling. In order to be regarded as “differentiated,” the participants had to use count names for count things and mass names for mass things. Labels such as plastic or red were regarded as ambiguous. In the 5-SLI group, 16/20 children were classified as differentiated names; in the 3N group, 15/20; and in the 5N group, 22/22 children. The unclassified children relied heavily on ambiguous responses or no responses.

Spontaneous Speech Sample

The spontaneous speech samples were examined to determine the children’s use of the determiner a. The three groups of children differed in their use of the determiner in spontaneous speech \( F(2, 59) = 9.05, p < .0004 \). The sample means for percent use in obligatory context were as follows: 5N, 87%; 3N, 76%; and 5-SLI, 58%. Pairwise comparisons yielded significant differences for all comparisons: \( ts > 2.02, ps < .05 \).

Experimental Task

The results from the experimental task are reported in Table 3. The data were analyzed using a mixed model of ANOVA (group by condition). There was a significant main effect for group \( F(2, 56) = 11.18, p < .000 \). Follow-up pair-wise comparisons revealed significant differences
Table 3. Mean (standard deviation) scores on word learning task by group: Study One.

<table>
<thead>
<tr>
<th></th>
<th>Cued condition</th>
<th>Neutral condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>5N</td>
<td>9.27 (2.94)*</td>
<td>7.45 (2.11)*</td>
</tr>
<tr>
<td>3N</td>
<td>5.00 (1.61)</td>
<td>5.44 (1.33)</td>
</tr>
<tr>
<td>5-SLI</td>
<td>6.72 (2.72)</td>
<td>6.89 (1.62)</td>
</tr>
</tbody>
</table>

*The maximum number possible is 16.
*Difference between the two conditions is significant (p = .05), one-tailed test.

for all comparisons: ts > 2.3, ps < .02. The main effect for condition was not significant [F(1, 56) = .659, p > .417]. Because of the a priori interest in the within-group differences in conditions, t tests were carried out. Results revealed a significant difference between the Cued Syntax and Neutral Syntax conditions for the 5N group only [t(20) = 1.67, p = .05 (1-tail)]. The values for the 5-SLI and 3N were t(18) = .16, p = .43 and t(20) = .66, p = .25, respectively.

Error Analyses

Because it was possible for the children to err in different ways, the errors of the groups were evaluated and found to demonstrate different strategies. Recall that on the comprehension test, the children were presented with a four-picture array and asked to point to the correct picture. The test was designed to reveal the children’s error strategies as well as correct performance. The four items consisted of (1) a picture of the target item, (2) the other item in the pair, (3) a second count item, and (4) a second mass item. The children’s errors were interpretable as one of the following: (a) An error of pointing to option (2) was regarded as a Lexical Mapping strategy. In this case the child attached a novel word to a novel object from the pair of objects presented, but did so irrespective of the informative syntactic cues. Another possibility (b) was an Object Kind strategy, in which the error was the alternate object in the same object class. A third possibility (c) was a Random strategy, in which selection of the (3) and (4) options fluctuated according to no discernible pattern.

The errors of the groups were examined to determine if the groups differed on the proportion of errors that were lexical mapping errors. Because only the children in the Cued Syntax condition were provided with the necessary information to make the “correct” choice, only children in that condition were included in this error analysis. The mean proportions for the groups were 5-SLI: .60 (SD = .13, N = 11), 3N: .46 (SD = .21, N = 11), 5N: .69 (SD = .17, N = 11). A one-way ANOVA revealed significant group differences [F(2, 29) = 5.05, p < .02].

Follow-up t tests revealed significant differences between the 5-SLI and 3N groups [(t(29) = –1.98, p < .05) and the 3N and 5N groups t(29) < .004]. The difference between the 5-SLI and 5N groups was not significant t(29) = 1.20, p > .24.

To further examine error patterns, each child was designated as a Cue-User (defined as having above 50% correct), Lexical Mapper (defined as having more than 50% of the errors within pair [i.e., selection of Option 2]), or Random Responder (having 50% or more errors out of pair [i.e., selection of Option 3 or 4]). For the 5N children, 6/11 children in the Cued Syntax condition were designated as Cue-Users. Of the remaining 16 children (11 of whom were in the Neutral Syntax condition), 12/22 were Lexical Mappers and 3/22 followed a Random strategy. There was no evidence of an Object Kind strategy.

For the 3N children, none were Cue-Users; 9/20 children were designated as Lexical Mappers. The remaining 11 children followed a Random pattern. The majority of the youngest children, then, were unable to map a new word to one of the two designated objects in the introducing scene. An Object Kind strategy was not evident in any child’s error pattern.

For the 5-SLI children, 2/11 children in the Cued Syntax condition were Cue-Users. Of the remaining 18 children, 16/20 followed a Lexical Mapping strategy, whereby they chose the picture of one of the objects that were presented in the narrative. The final 2 children followed a Random strategy. In contrast to the majority of the 3N children, the majority of the 5-SLI children did recall the targeted objects in the introducing scene, but were apparently unable to use the syntactic information for differential assignment of names to things. For none of the children was there evidence of a bias toward count or mass things. Table 4 summarizes the results of the error analyses.

Study Two

Methods

Participants

Nineteen 7-year-old children participated in this second study. Because the purpose of this second study was to examine the growth in ability to use syntactic cues, all the children were in the Cued Syntax condition. Eight were children who had been identified as language impaired by a certified speech-language pathologist and were currently receiving language services in their school (7-SLI group). Eleven were children who were nonaffected and developing language typically (7N group). All the children were from monolingual English-speaking homes.
Table 4. Number of children classified as cue-user, lexical mapper, and random responder in each group: Study One.

<table>
<thead>
<tr>
<th>Group</th>
<th>Cue-User</th>
<th>Lexical Mapper</th>
<th>Random Responder</th>
</tr>
</thead>
<tbody>
<tr>
<td>5N</td>
<td>6/11</td>
<td>13/22</td>
<td>3/22</td>
</tr>
<tr>
<td>3N</td>
<td>0/11</td>
<td>9/20</td>
<td>11/20</td>
</tr>
<tr>
<td>5-SLI</td>
<td>2/11</td>
<td>16/20</td>
<td>2/20</td>
</tr>
</tbody>
</table>

*Only children in the Cued Syntax Condition were provided with the syntactic cues, so only those children could possibly be Cue-Users (N = 11 for each group).

The children in the 7-SLI group ranged in age from 80 to 94 months (M = 85.5, SD = 5.63). The children in the 7N group ranged in age from 82 to 96 (M = 90.19, SD = 4.69). The children in both groups displayed intellectual functioning within normal limits as indexed by a score of 85 or above on the CMMS. The two groups of children differed in the area of language performance. On the PPVT-R, the children in the 7-SLI group received scores below 87, whereas the children in the 7N group received scores above 98. Table 5 contains a summary of the identification testing.

**Procedures**

The children were seen individually in a quiet room in their school on two occasions. On the first day, the standardized tests were administered, and on the second day the videotaped story task was completed. The materials and procedures for the story task were the same as in Study One.

**Results**

**Preliminary Analyses**

T-tests were conducted on the identification testing measures. There was no significant difference in age between the 7-SLI and 7N groups (t(17) = 1.92, p > .07). As expected, there was a significant group difference on PPVT-R standard scores (t(17) = 11.69, p < .000). A group difference also existed on the CMMS (t(17) = 3.87, p < .001). However, as in the 5-SLI group, the children in the 7-SLI group displayed intelligence within normal limits, and thus it was assumed that they knew the difference between count things and mass substances.

**Experimental Task**

The results from the experimental task for the Cued Syntax condition are reported in Table 6. An ANOVA was conducted for the children in the 5-SLI (N = 11), 5N (N = 11), 7-SLI (N = 8), and 7N (N = 11) groups to look at the impact of age and language status. The mean scores for the various groups were 5-SLI: 6.73 (SD = 2.72), 5N: 9.27 (SD = 2.94), 7-SLI: 8.25 (SD = 1.48), 7N: 10.73 (SD = 1.35). Main effects were seen for age [F(1, 37) = 4.26, p = .046] and language status [F(1, 37) = 12.21, p = .001]. There was not a significant interaction between the two factors [F(3, 37) = .002, p = .963].

In addition, the assignment of the 7-year-old children as Cue-User, Lexical Mapper, or Random Responder was determined, and the results compared to that for the 5-year old groups. In the 7-SLI group, 4/8 (50%) were Cue-Users, and the remaining 4/8, 50% were lexical mappers. Recall that for the 5-SLI group, only 2/11 (18%) were Cue-Users. In the 7N group 11/11 (100%) were Cue-Users, whereas only 6/11 (55%) of the 5N group were Cue-Users. Thus, there was evidence of growth in the ability to use syntactic cues in both groups of children.

**Discussion**

The purpose of these studies was to investigate the syntactic bootstrapping abilities of children who differed by language abilities and age. Syntactic bootstrapping, the use of syntactic cues to aid in word-referent matching, is one mechanism thought to assist in learning new vocabulary. We were interested in how the morphosyntactic difficulties evident in children with SLI might...
be a factor in their weak word learning. In this investigation, we specifically examined the children's ability to use the morphosyntactic cues associated with the count/mass distinction to assign novel words to novel count and mass items. In order to be successful in the experimental task (i.e., to map each label to its appropriate referent), the child in the syntax-informative condition had to recall both the novel words and novel items and to then use the syntactic cues (i.e., a vs. some) to establish which word goes with the count item and which word with the mass item. Children in the syntax-neutral condition were not given the necessary syntactic cues to differentiate between the count and mass items.

Results from the first study revealed that only the 5-year-old nonaffected, typically developing children showed evidence of using the syntactic cues. The 5-year-old SLI group and 3-year-old control group achieved comparable scores. However, error analyses suggested that different factors were operative in the two groups. The second study revealed that there was continued growth into the early school years for children with SLI and children whose language is developing typically.

Participants' failure to use syntactic cues in this study could have a number of explanations. One possibility is that the children did not differentiate between count and mass items. This is unlikely given results of previous studies documenting the count/mass distinction in children younger than those in the present investigation (Bloom, 1994; Gathercole, 1986; Gordon, 1985; Soja, 1992; Soja et al., 1991). Furthermore, in the Naming Task in Study One, the majority of children in all three groups appropriately classified novel count and mass items as revealed by their use of count terms for novel count items and mass terms for novel mass items. This demonstrated that they did have the relevant conceptual distinction. Recall that the few children who were not classified as differentiated namers produced ambiguous responses or no responses to the naming task. They did not produce mass terms for count items and vice versa. Thus, their responses in this task were not a clear indication that they did not differentiate between count and mass items.

Given this evidence that the children could distinguish between count and mass items, their performance on the experimental task must be explained by other factors. One of these is memory limitations. There is evidence that these limitations were particularly operative for the 3-year-old control children. Error analyses revealed that over half of the children in the 3N group responded randomly in the Experimental Task, choosing an item outside the focused pair as often as one within the pair. This suggested that they were less able to recall the critical parts of the introducing scene. The problem could have been with the memory of the potential referents or the word stem, or both.

Although the 5-year-old children with SLI did not differ from the 3-year-old children in terms of number correct on the video task, they did display a distinct error pattern. Ninety percent of the children in this group chose within the target pair on most trials, suggesting that they were able to remember the referents and the word stems. However, there was no difference between the children in the syntax-informative condition and those in the syntax-neutral condition. Thus, they were not able to use the syntactic cues to determine which label went with the novel count item and which with the novel mass item. Therefore, factors that could block utilization of syntactic cues in assignment of novel names to novel individuated things or substance appear more important for this group. One of these factors is the ability of the child to use the cues provided by the linguistic structures. If the associated syntactic cues are not fully represented in the child's knowledge of the structure, such cues would not be expected to guide name/thing pairings (cf. Soja, 1992). This limitation, as predicted, may have been especially operative for children in the SLI group, whose use of a in obligatory contexts was well below mastery (i.e., a mean of 58%). It is important to note that the spontaneous errors of the SLI children, as well as the 3N group, were almost all omissions. Errors such as *a dirt were rare. Thus, although there was optionality in the use of articles, there also was evidence of distributional use according to noun subcategorizations. However, the children with SLI were not able to use the available grammatical cues to make the appropriate word-referent mapping in the experimental task.

A second factor that may have blocked the use of syntactic cues is nonintegration of semantic and syntactic information. It is widely recognized that the syntactic correlates of the count/mass distinction denote semantic as well as syntactic information (cf. Bloom, 1964; Chierchia, 1994; Gathercole, 1986; Gordon, 1985). In this experiment, the children who did not benefit from syntactic cues (i.e., the SLI and 3N groups) at the same time did demonstrate differentiated naming of the class of count things and the class of substances on the Naming Task, although neither group performed at conventional levels of mastery for a use. Thus, they had available semantic distinctions that were not fully marked in their grammar. The frequent omission of a suggests
that the obligatory status of articles before count nouns was not fully recognized. Children who regard the article as having some degree of optionality may not fully appreciate its significance in differentiating individuated things from substances. They may instead rely on other possible grammatical cues for quantification and individuation, such as plural marking. Plural morphology appears on count names (e.g., cars), but not mass nouns (e.g., waters). Other studies have shown that SLI children of this age and 3N children have acquired the plural marker (Oetting & Rice, 1993; Rice & Oetting, 1993), so this cue could be available.

Although the group of typically developing 5-year-old children did demonstrate an ability to use syntactic cues to assist in word-referent mapping, they were well below ceiling on the task. The results from Study Two showed that the ability to use syntactic cues continues to develop in early school years for children learning language typically as well as those with specific language impairment. However, even 7-year-old children were well below adult-level performance. Thus, there is reason to exercise caution with the assumption that young children have a robust ability to use grammatical cues as a guide to word learning and that this ability plays a powerful role in youngsters’ early vocabulary acquisition. In naturalistic learning conditions, this ability may be hampered by performance constraints, such as memory limitations, and by incomplete mastery of the informative grammatical contrasts. Thus, in circumstances in which the performance demands are scaffolded in such a way as to buffer children from performance limitations, they may be able to attend to and use informative syntax. In the press of on-line processing of novel words, however, the informativeness of the grammatical forms may be lost. Nevertheless, the lexical limitations of the children with SLI appear to be related to some extent to their morphological limitations.

Language is a complex system of interrelated dimensions. It is well known that children with SLI often have difficulties with more than one area of language, but how these difficulties interact is poorly understood. This study provides a glimpse of the ways in which morphosyntactic limitations can interact with lexical limitations to hinder the ability of children with SLI to learn new words. An immediate clinical implication is to recognize that efforts to teach the lexicon could benefit from concurrent attention to the role of determiners in establishing a novel noun’s membership in noun categories such as count versus mass and the related grammatical properties that ensue from that categorical status.

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Appendix. Experimental Script Cued Version (Neutral Version)

This is a story of how Oscar got lots of stuff in his trash can.

One day Oscar was just sitting beside his trash can when a stranger came by. She was cleaning up the purse. (A person is going through her purse. She takes two items out and puts them on the tray sitting on the table.) "I found a (my) keelwug and some (my) blick," said the woman. "I don’t need a (my) keelwug and some (my) blick. I’m going to throw a (the) keelwug and some (the) blick away."

"Where is she gonna throw a (the) keelwug and some (the) blick?" wondered Oscar.

Just then, the woman dumped a (the) keelwug and some (the) blick into Oscar’s trash can. (woman dumps items in the can) "I can’t believe it," said Oscar. "That woman threw a (the) keelwug and some (the) blick in my trash can."

"I have too much stuff in my purse," said the woman. "It is so heavy. (bring out second pair) Some (my) geeder and a (my) pel. Maybe I should get rid of some [the] geeder and a [the] pel too. I know, I’ll just throw some (the) geeder and a (the) pel into this trash can."

"Is she really gonna put some (the) geeder and a (the) pel into my can," cried Oscar.

The woman threw some (the) geeder and a (the) pel into Oscar’s can.

"Not again," cried Oscar. "That woman threw some (the) geeder and a (the) pel in my trash can."

"Let’s see if I have any more trash in here," said the woman. Maybe I can throw some other things out. (take out third pair) "Here’s a (my) didum and some (my) pleen. I don’t really need a (the) didum and some (the) pleen any more. If I throw a (the) didum and some (the) pleen out my purse will be much lighter."

"Not a (the) didum and some (the) pleen in my can," whined Oscar.

The woman dumped a (the) didum and some (the) pleen into Oscar’s trash can.
(woman walks away)

"Why did she dump a (the) didum and some (the) pleen into my trash can."

Then the woman came back.

"Someone left some (the) payleen and a (the) troke on the street," said the woman. "some (the) payleen and a (the) troke. I don’t need some (the) payleen and a (the) troke. I’ll put them in this trash can, too."

"Here we go again," cried Oscar. "That woman is going to dump some (the) payleen and a (the) troke in my can."

The woman threw some (the) payleen and a (the) troke into Oscar’s trash can.
(woman walks away)

Oscar wasn’t very happy. But then he looked inside his trash can. "Hey, my can looks pretty good," thought Oscar. "That woman made a great mess with some (the) payleen and a (the) troke."

"I sure hope somebody else comes by," thought Oscar. "My trash can would look really great if I just saw a little more junk."

(second person enters)

Just then, Oscar’s friend, Pam, came by with the lovely box of junk. Oscar really wanted some of the junk for his trash can.

"Hi Pam," said Oscar. "Where are you going?"

"I’m just going to throw this junk out," replied Pam. "I don’t need it any more."

"What have you got in there?" wondered Oscar. (takes out items and puts them on the tray)

"A (my) naket and some (my) spat," answered Pam. "I have a (the) naket and some (the) spat. I don’t need a (the) naket and some (the) spat any more. I’m gonna take them to the dump."

"To the dump!" cried Oscar. "I want a (the) naket and some (the) spat. Can I have them?"

"I guess so," said Pam, and she dumped a (the) naket and some (the) spat into Oscar’s trash can.

"Hey," said Oscar. "A (the) naket and some (the) spat

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make my can look much better.”

“What else have you got?” asked Oscar.

(pulls out second pair and puts them on the tray)

“Some (my) pomen and a (my) dute. I’m throwing some (the) pomen and a (the) dute away” explained Pam. “I don’t want some (the) pomen and a (the) dute.”

“I could use some (the) pomen and a (the) dute,” said Oscar.

“Here you go,” said Pam as she dumped some (the) pomen and a (the) dute into Oscar’s can.

(dumps items into the can)

“Gee thanks,” said Oscar, “I really like the way some (the) pomen and a (the) dute look in my can.”

“Is that all the stuff you have?” asked Oscar. “I still have some more room in my can.”

“Well,” said Pam. (take out seventh pair) “I also have a (my) mopat and some (my) sim. I can give you a (the) mopat and some (the) sim. Do you really want a (the) mopat and some (the) sim?”

“I sure do,” replied Oscar. “I would love a (the) mopat and some (the) sim.”

“Alright,” said Pam as she put a (the) mopat and some (the) sim in the can.

Oscar looked in his can. “Thanks a lot. My can looks much trashier now with a (the) mopat and some (the) sim.”

“Do you want these other things too?” asked Pam.

“What things?” wondered Oscar.

(take out 8th pair)

“Some (my) kamet and a (my) weem,” replied Pam. I have some (the) kamet and a (the) weem in here too. I was going to throw them out but if you want some (the) kamet and a (the) weem you can have them.”

“I’ll take some (the) kamet and a (the) weem if you don’t want them,” offered Oscar.

“They’re all yours,” said Pam and she threw some (the) kamet and a (the) weem in Oscar’s trash can. (dumps stuff in)

“Look at that,” said Oscar. “Some (the) kamet and a (the) weem look great in my can.”

Then the first woman came back.

“Hi Mary,” said Pam. “Oscar, this is my friend Mary.”

“You’re the woman who put all that junk in my trash can,” said Oscar.

“This is your trash can?” said Mary.

“Yeah,” said Oscar, “Look at how great my can looks with all that trash.”