Preferences for Verb Interpretation in Children With Specific Language Impairment

Donna J. Kelly
Department of Speech Pathology & Audiology
Marquette University
Milwaukee, WI

Mabel L. Rice
Child Language Program
University of Kansas
Lawrence

This study examined initial preferences for verb interpretation by children with specific language impairment (SLI), MLU-matched children, and age-matched children. Each child watched motion and change-of-state activity scenes on videotape and was then asked to point to the scene that depicted a novel verb, thereby indicating a preferred interpretation. The children were also asked to label the same activity scenes on a second tape. The findings indicated that the 5-year-old age-matched children exhibited a significant verb interpretation preference for the change-of-state scenes, whereas the children with specific language impairment and their 3-year-old MLU-matched peers did not have an interpretation preference for either the motion or change-of-state scenes. The children's labeling of the activity scenes yielded findings that further supported group differences on the two semantic verb categories. The findings suggest that children's initial verb interpretation biases vary relative to age and language proficiency.

KEY WORDS: language disorders, preschoolers, verb learning, semantics

Recently a number of investigations have focused on particular aspects of lexical acquisition by children with specific language impairment (SLI) relative to their age- and language-matched peers (Dollaghan, 1985; Rice, 1990, 1991; Rice & Bode, 1993; Rice, Buhr, & Nemeth, 1990; Rice, Buhr, & Oetting, 1992; Watkins, Rice & Moltz, 1990). Multiple studies have documented that children with specific language impairment are less proficient than normally developing peers at making an initial match between a novel word and the most likely "thing" being referred to, where "thing" can be an object, action, or attribute (e.g., Rice et al., 1990; Rice et al., 1992). This process has been previously referred to in the literature as "fast mapping" (Carey, 1978; Dollaghan, 1985, 1987) and "quick incidental learning" or QUIL (Rice 1990, 1991).

A complementary set of studies has explored lexical acquisition by comparing the verb inventories of children with specific language impairment and normally developing children (e.g., Rice & Bode, 1993; Watkins et al., 1993). Initial studies suggest that children with specific language impairment have limited control over verbs, as characterized by relatively fewer verbs in their lexicons and a greater reliance on a few frequently appearing verbs, when compared to either same-age or language-equivalent peers (Fluck & Peters, 1984; Rice, 1991; Rice & Bode, 1993; Watkins et al., 1993).

Verbs can carry both semantic and grammatical information. Two fundamental meanings represented in verbs are change-of-state (such as break and grow) and motion (such as go and jump). Verbs expressing these two meanings are among the earliest to enter children's lexicons (e.g., Behrend, 1990; Bloom, Lifter, & Haftiz, 1980; Gentner, 1978). Furthermore, these meanings are associated with the argument structures evident in children's earliest utterances (Pinker, 1989b). In the present
study, attention is focused on children's comprehension of novel verbs and the criteria they use to attach initial meanings (i.e., change-of-state or motion) to verb-like scenes. Of particular interest are comparisons between the strategies used by a group of children with specific language impairment as compared to children in control groups.

Early Verb Meanings

Children's initial verb meanings are heavily influenced by perceptual information, such as motion and change, and these distinctions assist children with both the acquisition of meaning and the basis of generalization to new instances of a lexical category (Gentner, 1978). A small number of studies have explored normally developing children's change-of-state and motion verb acquisition (Behrend, 1980; Bloom et al., 1980; Gentner, 1978; Gropen, Pinker, Holland, & Goldberg, 1991; Huttenlocher, Smiley, & Charney, 1983). The findings from these investigations reveal that young children are highly sensitive to the categorical distinctions between these two semantic categories. A replicated finding on both comprehension and production indices is that children ranging from 18 months to 5 years of age exhibit an initial selection bias for motion over change-of-state verbs. Preliminary findings by Gentner (1979) and Behrend (1990) suggest that this preference towards motion shifts to favor change-of-state interpretations between 5 and 7 years of age. A general conclusion is that normally developing children's verb acquisition reflects semantic interpretation biases.

Syntactic Significance of Verbs

Current accounts of syntactic development posit a central role for verb meanings. Linguists have noted a strong correlation between meanings and syntactic frames across languages. It has been useful to categorize verbs by meaning distinctions, such as motion versus change-of-state, that capture regularities in how noun phrases are arranged in sentences (cf. Jackendoff, 1990). Given that these meanings seem to correspond to fundamental conceptual distinctions, and such distinctions are thought to be available to prelinguistic children, it has been argued that children could call upon these semantic/syntactic regularities to construct an initial grammar, a process referred to as Semantic Bootstraping (Pinker, 1984, 1989a, b).

According to Pinker (1989a), semantic structures are mapped onto syntactic argument structures via linking rules. Once an initial grammar is in place, children can use their linking rules to predict individual verbs' syntactic privileges from their meanings. He regards verbs as "choosy" about which argument they will allow, and goes on to argue that the "choosiness" is guided by semantic distinctions. Gropen, Pinker, Hollander, & Goldberg (1981) found that preschoolers are sensitive to the difference between verbs that are choosy about manner of motion versus those that are choosy about a change-of-state. Such choosiness guides the assignment of noun phrases to the object position. For example, pour involves a manner distinction, focusing on how the substance moves. If the following case, the substance doing the moving is in the direct object position: He poured the water into the glass. On the other hand, fill is thought to highlight the change in state of the container, as in He filled the glass with water, assigning the container to the direct object slot. Such errors as pour the glass with water are blocked by the child's appreciation of the manner/change-of-state distinction. Thus, awareness of the distinction between manner of motion and change-of-state would be of fundamental significance for a younger in the process of figuring out verb/argument structures.

It appears that children must use information from both meaning and argument structure to solve their referential mapping problems, particularly with the ambiguity inherent in verb mapping (e.g., Gentner, 1982). As argued by Gleitman and others (Gleitman, 1980; Golinkoff, Hirsh-Pasek, Cauley, & Gordon, 1987; Hirsh-Pasek, Gleitman, Golinkoff, & Nagel, 1988), many verb-like scenes are ambiguous. A situation of giving could also be construed as taking; buying could be selling. They argue that children can draw upon their knowledge of syntactic frames to arrive at the meanings of verbs using a "sentence to word" mapping rather than a "word to word" mapping (Gleitman, 1990). This process has been referred to in the literature as Syntactic Bootstrapping. Gleitman concludes that children must systematically juggle both semantic and syntactic strategies in order to arrive at the appropriate correspondence between novel words and verb concepts.

Verb Acquisition for Children With Specific Language Impairment

Rice (1991) has argued that children with specific language impairment are particularly vulnerable for difficulty with verb acquisition. Their general lexical deficits and prolonged morphological acquisition are well documented (cf. Fey, 1986; Johnston, 1988; Leonard, 1989; Rice, 1991). Given that both meanings and syntactic information may be implicated in the initial mapping task, two potential problem sources are posited. First, it may be that children with specific language impairment are unable to identify the relevant semantic information contained in the scene. On the other hand, their morphosyntactic deficits may deny them grammatical distinctions relevant for inferring a novel verb's meaning. Finally, if both major linguistic dimensions are limited, children with specific language impairment would have difficulty using one aspect of language to build upon another, and would thus be vulnerable for either semantic or syntactic bootstrapping operations. It is the first possibility that will be investigated in this study.
Recent investigations (Fletcher & Peters, 1984; Rice & Bode, 1993; Watkins et al., 1993) provide support that children with language impairment have difficulties with verb acquisition. These studies analyzed the spontaneous utterances of children with specific language impairment and normally developing children for general patterns of verb use (total number of different verbs in the samples), the frequency of use per verb, and, in the case of Rice and Bode (1993), error patterns. Fletcher and Peters (1984) document differences between children with specific language impairment and children of the same chronological age. Watkins et al. (1993) included two comparison groups of children, one matched for age and the other matched for MLU. They report significant differences between the group of children with specific language impairment and each of the other two groups on measures of verb frequency and diversity. Across the three studies, a relatively small set of verbs accounted for much of the verb inventory for the youngsters with specific language impairment.

Very little information is available to inform interpretations of the locus of those children's apparent difficulties with verb acquisition. One possibility is that these youngsters encounter difficulty in the initial phase of novel verb interpretation, when they must align plausible semantic categories with new verbs. An interesting way to explore this possibility is within the conventional two-control-group design, in which children with specific language impairment are matched to children of the same age and to younger children (matched for general linguistic level) who are normally developing. In such a comparison, the children with specific language impairment would be expected to have similar lexically relevant world experiences as their chronological age-matched controls. In their 5 years of life experiences, they would have encountered objects in their world that moved about (action) or changed state. They would also have had considerable experience in forming categorized representations of the sort measured by nonlinguistic cognitive tasks. It is expected then that their basic nonlinguistic conceptual abilities (e.g., as indexed by a nonverbal cognitive measure) by age 5 years would be sufficient for detecting and classifying basic motions and change-of-state. Thus the comparison between the children with specific language impairment and the chronological age-matched children can be viewed as a general experiential knowledge match. This kind of knowledge serves as a necessary but not sufficient accomplishment for linguistic and semantic acquisition. On the other hand, the younger, language-equivalent controls serve as a comparison group for general language level. If the Semantic Bootstrapping hypothesis holds, then elaboration of clause structures and other syntactic advances may serve a role in verb comprehension. This study was designed to explore the role of initial semantic/conceptual biases (motion vs. change-of-state) in verb acquisition for these three groups of children.

Methods

Subjects

Forty-five children participated in this investigation, that is, 15 children with specific language impairment (ages 4.6 to 5.8, M = 5.0), 15 chronologically age-matched normally developing children (ages 4.6 to 5.8, M = 5.0), and 15 MLU-matched normally developing children (ages 2.7 to 3.11, M = 3.1). The children were enrolled in preschool programs at the time of data collection and were generally from white, middle-class socioeconomic backgrounds. All of the children were native English speakers, with no known history of physical, socioemotional, or psychological impairments.

The children with specific language impairments met the following criteria for inclusion as participants in this study: (a) cognitive functioning documented to be within normal limits for age—standard scores ranged from 86 to 116 (M = 101) on a formal psychometric measure (i.e., the Columbia Mental Maturity Scale [Burgemeister, Blum, & Lorge, 1972], Leiter International Performance Scale [Arthur, 1952], Stanford-Binet Intelligence Scale (3rd edition) [Terman & Merrill, 1973], or the performance scale of the Wechsler Preschool and Primary Scale of Intelligence [Wechsler, 1967]); (b) no report or evidence of hearing impairment (all these children were enrolled in language intervention programs and had their hearing status monitored on a regular basis); and (c) documented receptive and expressive language deficits as evidenced by significant delays on the Peabody Picture Vocabulary Test-Revised (PPVT-R) (Dunn & Dunn, 1981) (standard score equilvalue ranged from 63 to 86, M = 78), an MLU for morphemes at least one standard deviation below the mean for age (M = 3.53), and lack of mastery of at least three of Brown's 14 grammatical morphemes (Miller, 1981).

The normally developing children exhibited age-appropriate speech, language, social, and cognitive functioning according to preschool teacher and parent report. These observations were confirmed through interactions with the first author. All of these children obtained a standard score equivalent on the Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981) of at least 90 (PPVT-R scores: MLU matches M = 105; age-matches M = 110). The chronological age-matched children were matched such that for each child in the specifically language impaired group there was a child in the chronological age group within 1 month of age. The MLU-matched children were matched such that for each child in the specifically language impaired group there was a child in the MLU group typically within .15 morphemes (MLU M = 3.63).

Procedures

Following the pretesting to determine subject eligibility, each child participated in two videotape procedures that were completed in one session lasting 20–25 min.

Materials

The two video programs depicting motion and change-of-state activity scenes were produced by the first author. The first paradigm was designed to elicit information about preferred interpretations (comprehension), whereas the second was designed to elicit naming of the activity scenes. Both videos were shown on a Sony 10-in. color television monitor.

Video 1. The comprehension video had been edited into a four-way split screen format that displayed simultaneous
dynamic representations of motions and change-of-state transitions. This split-screen format looks much like what is used occasionally in broadcast television, when four scenes are on screen at once in four equal-sized quadrants. Within each cell were one or two "entities" engaging in one of the two types of "verbing." The entities consisted of novel, two-dimensional, multicolored construction paper figures that appear three-dimensional in the video program.\(^2\) See Figure 1.

Each activity scene lasted 8 sec (i.e., the motion entities were in motion for 8 sec, and the change-of-state transition occurred after approximately 4 sec). Thus, for each four-way scene, the entire duration was 8 sec, during which action was continuous and change-of-state was punctuated at the midpoint. Examples of motions include figure moving across the screen from left to right, figure moving in a stair-step fashion bottom left to top right, and figure moving up and down in the center of the screen. Examples of change-of-state transitions include figure changing color from yellow to green, figure splitting into three pieces, figure losing a portion of its original form. (Refer to Appendix A for a complete list of the events in the activity scenes.)

The scenes were configured into 3 practice items and 16 experimental items that constituted a video program of 4-min duration. Each of the 19 different entities participated in 19 different motion and change-of-state activity scenes. Although each split-screen format displayed two cells of motion scenes and two cells of change-of-state transitions, the occurrence of motion versus change-of-state (and plural vs. singular figures) was randomly assigned to the four cells.

The original design of the study included both singular and plural figures in an attempt to see if the children's selections would be guided by morphosyntactic information affixed to the nonce items. This experimental manipulation did not yield any group differences. Therefore the results are collapsed across singular and plural items, and the manipulation will not be discussed further.

Video 2. The content of the second video program was drawn from the individual scenes used to prepare the first program. This program, however, was not in a split-screen format so that a child viewed one activity scene at a time.
Each of the 19 novel figures engaged in two activity scenes, one motion and one change-of-state. For example, a child saw a novel figure engage in a motion activity for 8 sec and then saw the same novel figure engage in a change-of-state transition. This was followed by a different novel figure engaging in a motion or a change-of-state transition. There was a 3 sec pause between each item. The total of 38 scenes lasted 8 min.

**Procedures for Video Task 1**

Each child was asked to watch the television screen and to point to a picture when directed. The first practice item required the child to point to “Clocks break” while the child viewed four simultaneous activity scenes: (a) 2 clocks break, (b) 2 clocks bounce/jump, (c) 1 clock breaks, (d) 1 clock bounces/jumps. The second practice item required the child to point to “Plant flies” while viewing (a) 2 plants fly, (b) 1 plant flies, (c) 2 plants bloom, (d) 1 plant blooms. The last practice item required the child to point to /puz/ /bak/ while viewing the figures engaging in motion and change-of-state activities. All of the experimental items used a nonce format. (Refer to Appendix B for a complete list of the nonce forms.)

The children responded to the nonce format by selecting one of the activity scenes, just as they had previously with the non-nonsense practice items. Several children commented that they thought the new words sounded silly; they also commented that the figures in the activity scenes looked silly. The experimenter gave directions for each item only when a child was looking at the screen. This step was necessary for the youngest participants in this study, who were just over 2½-years-of-age. The responses were recorded on-line; that is, the quadrant of the monitor selected by the child was recorded as a, b, c, or d.

**Procedures for Video Task 2**

The experimenter demonstrated the task for the child by presenting the first two practice scenes and labeling them as follows: “the clock breaks”; “the clock bounces”; “the plant flowers”; “the plant flies.” Then the tape was rewound and the child was asked to tell the adult what happened. Thirty-four of the 38 items contained the novel figures that the children had seen previously on the first videotape program; the other 4 items consisted of the two activity scenes with the clock and the plant seen in the demonstration. What is of primary interest in this labeling task is the verb chosen to represent the activity. At the same time, however, because the children did not have an existing label for the novel figures, they had to come up with a way to refer to the figures as well. They managed this in one of four ways: (a) by dropping the subject; (b) using a pronoun—that is, it, he, she, they; (c) giving it a label—for example, glasses, vase; or (d) describing the figure—for example, “the green thing.”

One of the 2-year-old children was unable to complete this task. She consistently responded to the “What happens?” prompt by excitedly imitating the experimenter’s prompt—for example, “Yes, what happens?” The 44 remaining children’s responses consistently encoded a motion or a change-of-state event. Only 7 of the 1,576 responses failed to apply a motion or a change-of-state label.

**Transcription reliability.** The children’s responses were recorded by hand during the session, as well as audio recorded. The accuracy of the response transcription was verified for all 44 of the children on three separate listening checks by the first author. Reliability was independently calculated on all 44 of the response transcripts for this task by a graduate student research assistant. The total number of point-to-point transcription agreements for the action/change-of-state descriptions (1,568) was divided by the total number of opportunities for agreement (1,576). These calculations yielded a 99% level of agreement for the transcription responses on this task.

**Procedures for video-only condition.** A video-only condition was included in this study. This condition served to rule out the possibility that the children in the experimental condition were either (a) responding randomly to the visual + auditory information provided, or (b) responding exclusively to the visual portion of the information (i.e., not interpreting it as a lexical assignment task). Two groups of normally developing preschoolers (i.e., 20 3-year-olds, and 16 5-year-olds) viewed the split-screen video program. In this condition, they completed the task without the experimenter’s verbal labeling (e.g., Show me /nup/ /ku/). They were asked to view the videotape. After viewing each item they were asked to point to a picture, and their pointing response was recorded.

**Validity of the Verb Subcategories**

In order to ensure that the children’s construal of the two targeted verb classes was consistent with the intended classification, the videos were pilot tested. Five children ranging in age from 3 to 6 years and three adults individually viewed the video program. The children were asked to tell the adult what happens after viewing each scene. Only 1 of the 38 activity scenes failed to elicit the targeted verb category. That item was removed and replaced with an alternative scene that consistently elicited the intended response. Thus, after pilot testing, all of the experimental stimuli elicited the intended response.

A more rigorous test of the validity of the motion and change-of-state activity scenes was derived post hoc from the transcripts of the children in the study. Of the 1,576 responses analyzed only 76 of the responses did not match the intended category. There was no one item (or set of items) that accounted for the mismatched categories. The mean error rates for the three groups of children were as follows: children with SLI = 3.2%, MLU-matches = 1.2%, age-matches = 7%.

**Reliability of MLU.** Reliability was calculated on four randomly selected language transcripts (i.e., two from children with specific language impairment and two from the MLU-match group). The mean length of utterance for morphemes (MLU) was independently calculated by the first author and a clinically certified doctoral candidate. The total number of point-to-point morpheme agreements for the four transcripts (i.e., 1,238) was divided by the total number of opportunities for morpheme agreement (i.e., 1,245). These
TABLE 1. Means and standard deviations (in parentheses) of preference for verb type meaning by group.

<table>
<thead>
<tr>
<th></th>
<th>Language-Impaired</th>
<th>MLU-Matches</th>
<th>Age-Matches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motion</td>
<td>8.4 (3.77)</td>
<td>8.9 (1.93)</td>
<td>4.9 (5.29)</td>
</tr>
<tr>
<td>Change-of-state</td>
<td>7.6 (3.77)</td>
<td>7.1 (1.98)</td>
<td>11.1 (5.29)</td>
</tr>
</tbody>
</table>

Note. 16 items possible. $F(2,36) = 4.76, p < .01$.

Calculations yielded a 99% level of agreement for the MLUs derived from the transcripts.

Results

Video Task 1

The children were given 16 opportunities to demonstrate their preference for verb meaning. The dependent variable was the number of times a child selected change-of-state scenes. A one-way ANOVA to test possible group effects revealed a significant effect ($F(2,36) = 4.76, p < .01$). Post hoc comparisons, using the Tukey procedure, were conducted to determine the source of the differences between the groups' performances. The responses of the age-matched control group were significantly different from those of the children with specific language impairment and their MLU-matched control group ($p = .05$). The age-matched children were more likely to select a change-of-state scene. The performances of the children with specific language impairment and the MLU-matches were not significantly different from one another. The group means and standard deviations are reported in Table 1.

Next, the children's individual verb preferences were examined using binomial probabilities. On the assumption that a child could select change-of-state (or motion) solely by chance, the binomial distribution indicated that the probability of a child selecting change-of-state (or motion) 12 or more times out of the 16 opportunities was approximately $p = .04$. This .04 probability level was used to distinguish between those children who exhibited a specific verb interpretation preference from those who did not. The results of this analysis revealed that one of the children with specific language impairment, none of the MLU-matched children, and none of the chronological age-matched children exhibited a preference for selecting the change-of-state activity scenes as the referent. On the other hand, four of the children with specific language impairment, two of the MLU-matches, and one of the age-matches exhibited a preference for selecting the motion scenes as the referent.

Thus, a majority of the children with specific language impairment and the MLU-matched children did not exhibit a preference for either of the targeted verb classes. Nine out of 10 of the age-matched controls who exhibited a verb interpretation preference on this task, however, preferred the change-of-state interpretation. A chi-square analysis indicated that these distributions differed from chance: $\chi^2 (4, N = 45) = 20.12, p < .001$. Table 2 provides a breakdown of the individual response patterns by group.

In summary, statistical analyses of the group and individual verb preferences of the children revealed that the 5-year-old normally developing age-matched children demonstrated a significant change-of-state verb interpretation preference at both the group and individual levels. The children with specific language impairment and their MLU-matched controls did not exhibit an interpretation preference for either of the two verb classes.

Visual-only condition. Another way to evaluate possible random response strategies is to determine how children respond to the video program in the absence of verbal information. Two groups of normally developing preschoolers participated in this condition. Their responses were then analyzed using binomial probabilities. For 3-year-olds the following responses were evident: 7 (35%) exhibited a perseverative position bias (which was defined as 12 to 16 responses to the same quadrant—for example, always pointing to the upper left quadrant of the TV screen); 4 (20%) exhibited a preference for motion; 1 (5%) exhibited a preference for change-of-state; and 8 (40%) did not exhibit a preference for either the motion or change-of-state activity scenes.

The 5-year-olds demonstrated the following response pattern: 2 (13%) exhibited a perseverative position bias; 1 (7%) exhibited a motion preference; 5 (31%) exhibited a change-of-state preference; and 9 (60%) did not exhibit a preference for either the motion or the change-of-state activity scenes.

In contrasting the responses of the children in the experimental group with those in the visual-only group, two primary differences are apparent. First, none of the 45 children in the experimental group exhibited a perseverative position bias. Instead, no perseverative patterns were noted in their responses. In contrast, 7 (35%) of the 3-year-olds and 2 (13%) of the 5-year-olds in the visual-only condition dropped to a perseverative level. Next, although the majority of the 5-year-olds in the experimental study exhibited a clear preference for the change-of-state scenes, the majority of the 5-year-olds in the visual-only condition did not exhibit a preference for either of the activity scenes. Two conclusions can be drawn from the performance of the children in the visual-only condition relative to the children in the experimental conditions. One is that random responses tend to drop into the perseverative, nonmeaningful level, which is not true of the experimental groups' performances. Second, the findings suggest that the experimental task indeed involves semantic interpretation. The children in the experimental tasks are more likely to respond in a manner consistent with a semantic reading of the pointing task.
TABLE 3. Verb frequency and diversity by group. Response frequency summary by group.

<table>
<thead>
<tr>
<th></th>
<th>Language-Impaired</th>
<th>MLU-Matches</th>
<th>Age-Matches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total verbs</td>
<td>549</td>
<td>486</td>
<td>590</td>
</tr>
<tr>
<td>Number of different verbs</td>
<td>25</td>
<td>21</td>
<td>40</td>
</tr>
<tr>
<td>Motion verbs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>13</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>Percent</td>
<td>52%</td>
<td>52%</td>
<td>40%</td>
</tr>
<tr>
<td>Change-of-state verbs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>12</td>
<td>10</td>
<td>24</td>
</tr>
<tr>
<td>Percent</td>
<td>48%</td>
<td>48%</td>
<td>50%</td>
</tr>
</tbody>
</table>


Video Task 2

To assist in the interpretation of the first video program, the children were asked to label the activity scenes. Insofar as the children's interpretation biases are not directly observable and therefore not without some ambiguity, supporting evidence was gathered. The children's responses on the event-labeling task were examined relative to the frequency, diversity, and specificity of the verbs they produced.

The children served as age-matches exhibited the largest frequency of verb production. As a group they produced 590 verbs, compared to 549 produced by the children with specific language impairment and 486 produced by the children serving as MLU-matches. The age-matches also produced the greatest diversity of verb production, that is, 40 different verbs on the 38-item task. As a group, these children produced 16 (40%) different motion verbs and 24 (60%) different change-of-state verbs. An examination of their verb productions revealed that although they produced several verbs that do not specify manner of motion (for example, go, move, turn, change), they produced a relatively high frequency of manner-specified verbs in their response repertoires (for example, appear, bloom, split, rock).

The children with specific language impairment and their MLU-matched controls exhibited a profile of verb production on this task that was markedly different from the age-matched children. The group of children with specific language impairment produced a total of 25 different verbs while labeling the scenes: 12 (48%) change-of-state and 13 (52%) motion verbs. They exhibited a tendency to rely on several nonspecific verbs, such as go, move, and change, during their on-line labeling of the scenes. The MLU-matched children were similar to the children with specific language impairment. They produced 21 different verbs: 10 (48%) change-of-state and 11 (52%) motion verbs. They also exhibited a tendency to rely on a few nonspecific verbs, such as go, move, change, and turn. Group comparisons for the descriptive verb information elicited in the second video are provided in Table 3.

When comparing the results from the naming task and from the interpretation task, consistency in the children's performance is evident. The age-matches demonstrated a change-of-state interpretation preference, and when labeling they produced a greater number and diversity of change-of-state verbs relative to motion verbs. On the other hand, for the other two groups of children, for both the interpretation and naming tasks, no advantages for semantic content were evident. The consistency evident in the children's labeling and verb interpretation responses provides evidence that the same type of underlying semantic representation has been accessed.

Discussion

This study examined the initial verb interpretation preferences of children with specific language impairment and their MLU- and age-matched controls. The children were simultaneously presented with two possible meanings for a novel verb-like scene, one involving motion and one involving change-of-state transitions. Two findings are of particular interest. First, of the normally developing children, the 3-year-old MLU-matched children did not exhibit a preference for one of the two possible meanings. On the other hand, the 5-year-olds did exhibit a preference for change-of-state interpretation. The second finding is that the children with specific language impairment differ from their age-matched controls in that they do not demonstrate a semantic preference in interpreting novel verbs. In this they are like their younger MLU-matched controls. These two key findings bear on existing explanations of verb acquisition by normally developing children and on interpretations of the limited verb lexicons of children with specific language impairment.

Normally Developing Children's Preference for Verb Interpretation

Several previous investigations have consistently reported that young children (2 to 3 years old) exhibit a bias toward motion over change-of-state verbs (e.g., Behrend, 1990; Bloom et al., 1980; Huttenlocher et al., 1983). This preference is evident in the words that children choose to label events and in the children's choice of referent scenes when they hear verbs. Thus the lack of a verb interpretation preference in the MLU-matched children runs counter to the conclusions reached in previous studies that a predisposition toward motion events guides youngsters in their initial mapping of verb forms to meaning. Methodological and interpretive issues may account for the unpredicted findings.

The major difference between this study and the previous ones is the methodology and data analysis. In this experimental task of simultaneous split-screen video presentation, the meanings were placed in contrast with each other so that the children had to choose directly between the two alternative verb meanings. Another point of difference is that the other available studies did not formally evaluate the random-response possibility in the explicit way done here—for example, by examining individual response data in terms of binomial probabilities. So it is possible that, when confronted with a direct choice, young children's preference for motion is not as dominant as indicated by previous comprehension measures and analyses.

Another possible explanation has to do with the interpretation of motion in the scenes. In this study, the figures that were in motion or changing state were inanimate, abstract
forms, which appeared as solitary entities in the scenes. In naturalistic settings motion co-occurs with interesting events, people, and objects, or is part of an interrelated series of activities of particular interest to children. These possible associated cues were not available in this experimental referential context. It is possible that young children's apparent preference for motion meanings, as found in previous studies, may not be so much a matter of preference for motion, per se, as a reflection of the influence of other associated cues in the environment.

One such associated cue for consideration would be animacy. Weist (1982) differentiated between actions that occur with an animate initiator of action (e.g., *The girl is running*) and those that can be initiated by an inanimate instigator or force (e.g., *The motor is running*). He found that 3-year-olds are sensitive to this distinction between verbs. The inanimate figures in this study did not have an animate instigator; instead they appeared to reflect the influence of unseen forces. In the earlier studies, cited above, motion and animacy were typically illustrated as combined features of a scene. According to Weist (1982), the natural context for verb meaning is animate instigator of action with few clear cases of verbs that take the force instigator.

The children's labeling of the figures in this study lends support to this notion. As noted earlier, the children were faced with a labeling challenge as they explained "what happened" to the adult. One of their strategies was to label the figure. The children's labels were almost exclusively of inanimate objects—for example glasses, vases, clouds, hot dogs, bananas, mountains, balls. It may be that this natural packaging of motion + animacy is separated, motion by itself may not carry the same semantic significance for young language learners. This possibility requires additional investigation.

The other key normative finding is the strong preference by the 5-year-olds for the change-of-state verb interpretation. This study places this shift in a child's interpretation bias at an earlier age than reported in the preliminary studies by Behrend (1990) and Gentner (1978). Gentner's investigation found that 5- to 7-year-old children were more likely to accurately follow the motion directives to stir and shake a substance, but few accurately followed the end-state directive to mix the substance. Behrend found that the 5-year-olds in his study exhibited a preference for motion, whereas by 7 years of age they had clearly shifted toward change-of-state preferences. Methodological differences may again contribute to the differences in the findings.

In this study, the distinctions between the motion and change-of-state scenes were fairly obvious. Objects either moved along a path, or changed color, or changed their configuration. As noted previously, the error rate on the children's match between the category of verb meaning to the intended category was quite low, with a total error rate across the three groups of only 4.5%. Among the normally developing children, there was no greater tendency to label motions as change-of-state or vice versa, although this pattern was noted in the errors of some of the children with specific language impairment (reported in Kelly & Rice, 1991). In summary, clear unambiguous categorical distinctions between the two targeted verb classes may have been responsible for the earlier change-of-state verb preference documented in this study.

**Interpretation of Novel Verbs by Children With Specific Language Impairment**

The children with specific language impairment did not share the change-of-state interpretation of their age-matched controls. Instead, like their younger, normally developing MLU-matched peers, the children with specific language impairment did not seem to be guided by a particular bias toward motion or change-of-state interpretations. What would account for this finding?

It appears that children with specific language impairment do not have access to the same preferences in interpretation of scenes involving object motion or change that inform their age-matched controls' assignment of novel words to verb-like referents. Bowerman (1969) speculates that children with specific language impairment may have an inordinate difficulty discovering or integrating the "salient grouping principles" that would allow them to effectively make use of their language input and derive the necessary semantic distinctions. These findings suggest that one of these grouping principles may be to look for distinctions between motion and change-of-state and to favor one or the other for assignment of new words to putative verb categories.

The comparison of the children with specific language impairment with their MLU-matched controls does not bring a ready clarification of how these grouping principles or semantic biases may be vulnerable for the children with specific language impairment. Because neither group of children indicated a preference, two different situations may be operative. One possibility is that the MLU-matched controls may have already moved beyond a preference for motion interpretations characteristic of younger children and are on their way to the change-of-state preference of the older children. On the other hand, they might not yet have developed a preference. Or, as noted above, the normative preference for action may actually involve the action of animate actors, a preference that only later extends to the actions of inanimate things as well. Conceivably, then, the children with specific language impairment may not have a preference because they have yet to work out a possible bias that could guide further verb acquisition, or they could be in the same transition between biases that the younger normally developing children are. Another line of argument might be that the lack of preference findings for the specifically language impaired and MLU groups is attributable to an inability of the children to detect the relevant differences in the scenes. In this interpretation, children would be "blind" to the ways in which the actions differed from the change-of-state of the objects. It would be not so much a matter of inattention to relevant cues (as suggested above) as a matter of inability to perceive them. This account would conform to reports of subtle cognitive deficits in children with specific language impairment (cf. Johnston, in press).

There is reason, however, to question such an interpretation. Both groups of children used different verbs to label the change-of-state versus action scenes. Such differential label-
ing is presumptive evidence for the ability to detect differences in what they viewed. The problems instead seem to be more semantic in nature, at the level of trying to find a way to construe a scene for the purpose of forming a link between the scene and an unfamiliar label. What this study has attempted to do is to illuminate some of that mental territory between detection or perception and semantic interpretation.

Conclusions

The findings suggest that when children with specific language impairment are asked to interpret novel verb-like scenes they do not share the same semantic biases as their same-age controls. A potential consequence of this difference would be the disruption of both posited language acquisition processes, that is, Semantic Bootstrapping and Syntactic Bootstrapping. As stated by Gleitman (1990), the language acquisition problem requires the language learner to juggle both semantic and syntactic strategies to arrive at the correct solutions (e.g., the correspondence between novel lexical terms and verb concepts). If, as suggested by this study, the semantic assignment strategies of the children with specific language impairment are different from their age-matched peers the language learning process would predictably be altered.

In summary, this study provides further documentation of the differentiation between two groups of verbs in young children’s lexicons, those that encode motion scenes and those that encode change-of-state, and a shift in biases in interpretative strategies for the normally developing children in the 3- to 5-year-old age range. At the same time, the findings reveal that the 5-year-old children with specific language impairment differ from their age-matched peers in the manner in which they are inclined to interpret the semantic content of novel verbs. Such a difference in interpretative strategy could certainly limit the verb acquisition of children with specific language impairment relative to children without language deficits, and may at least partially contribute to the observed deficits in the verb lexicons of children with specific language impairment (Fletcher & Peters, 1984; Rice & Bode, 1993; Watkins et al., 1983). At the same time, the results do not yield a ready interpretation of how children with specific language impairment differ from their normative controls in their strategies for verb interpretation—for example, whether their apparent lack of an interpretive bias is indicative of a qualitative difference in available semantic strategies, or whether they are simply at an expected semantically driven transition for such strategies. It remains for future studies to evaluate these possibilities.

Acknowledgments

The investigation was partially supported by University of Kansas General Research Allocation No. R29-DC00485 awarded to Mabel L. Rice. Appreciation is extended to the children, parents, and staff of the preschool programs who participated in this study: Early Education Center, Hutchinson; Language Acquisition Preschool, Lawrence; Language Project Preschool, Lawrence; Franklin County Day Care, Ottawa, Missouri; Children’s House, Lawrence; Stepping Stones Day Care, Lawrence; St. Luke’s Developmental Preschool, Kansas City; Shawnee Mission Public Schools, Mission; Jaycare, Kansas City; Raintree, Lawrence; Marquette University Child Care Center, Milwaukee, Wisconsin. This manuscript reflects a portion of the findings contained in a doctoral dissertation conducted by the first author while at the University of Kansas. A shorter version of this work was presented at the November Convention of the American Speech-Language-Hearing Association, Seattle, Washington, in 1990.

References

Symposium for Research on Child Language Disorders, Madison, Wisconsin.


Received January 19, 1993
Accepted September 20, 1993

Contact author: Donna J. Kelly, PhD, Department of Speech Pathology & Audiology, Marquette University, Milwaukee, WI 53233. E-mail: 9322 kellyd@vms.csd.mu.edu

---

**Appendix A**

**List of Motions**

**Pre-experimental**

- a. Clock moves to the top of the screen and back down again, that is, jumps, bounces, goes up and down.
- b. Plants move forward vertically then cross the screen from right to left: fly, swing, go up and over.
- c. Figure 1: Moves horizontally across the screen from left to right: goes, moves, walks, slides.

**Experimental**

1. Figure 2: Moves up and down.
2. Figure 3: Rises and swings across the screen.
3. Figure 4: Moves up from left to right in a stair-step manner.
4. Figure 5: Moves up and down from left to right in an inverted W pattern.
5. Figure 6: Moves along the bottom of the screen right to left.
6. Figure 7: Moves down diagonally from left to right.
7. Figure 8: Moves up and down.
8. Figure 9: Moves upward along the left side of the screen with a climbing or hopping motion.
9. Figure 10: Moves from left to right across the top of the screen with a dipping motion.
10. Figure 11: Moves in a rectangular shape.
11. Figure 12: Moves down from left to right then comes up like a V.
12. Figure 13: Moves up diagonally from left to right.
13. Figure 14: Moves down from left to right in a star-step fashion.
14. Figure 15: Moves down diagonally from left to right.
15. Figure 16: Rocks in center of screen.
16. Figure 17: Moves up diagonally from left to right.

**List of Change-of-State Transitions**

**Pre-experimental**

- a. Clock breaks/cracks in two.
- b. Plants bloom.
- c. Figure 1: Predominantly blue, it loses the red X shape from the center.

**Experimental**

1. Figure 2: Originally green, it changes to yellow.
2. Figure 3: It gains a projection.
3. Figure 4: Originally yellow, it changes to blue.
4. Figure 5: Inner yellow pieces disappear from figure.
5. Figure 6: Loses orange and green spots and becomes all brown.
6. Figure 7: Changes from a half moon shape to a larger shape (it gains a section).
7. Figure 8: Originally orange, it changes to green.
8. Figure 9: It loses its top portion.
9. Figure 10: Originally red, it changes to green and yellow.
10. Figure 11: Originally 3 colors, it changes to yellow.
11. Figure 12: Yellow is added to the figure.
12. Figure 13: Originally 3 colors, it becomes all brown.
13. Figure 14: Tear/teardrop shapes are added to the figure.
14. Figure 15: Green and yellow figure changes to red.
15. Figure 16: It splits into 3 pieces.
16. Figure 17: Top of figure pops off.
Appendix B

List of Nonce Forms

<table>
<thead>
<tr>
<th>Trial Items</th>
<th>Experimental Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Clocks break</td>
<td>5. /kug dok/</td>
</tr>
<tr>
<td>b. Plant flies</td>
<td>6. /cap gon/</td>
</tr>
<tr>
<td>c. /punz bak/</td>
<td>7. /gen teps/</td>
</tr>
<tr>
<td></td>
<td>8. /tilz bop/</td>
</tr>
<tr>
<td></td>
<td>9. /mekz wonz/</td>
</tr>
<tr>
<td></td>
<td>10. /rub gek/</td>
</tr>
<tr>
<td></td>
<td>11. /toks pibz/</td>
</tr>
<tr>
<td></td>
<td>12. /miez weps/</td>
</tr>
<tr>
<td></td>
<td>13. /banz puk/</td>
</tr>
<tr>
<td></td>
<td>14. /kick dugz/</td>
</tr>
<tr>
<td></td>
<td>15. /poa dik/</td>
</tr>
<tr>
<td></td>
<td>16. /wormz kets/</td>
</tr>
</tbody>
</table>