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Causative Alternations of Children With Specific Language Impairment

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Alternating verbs to indicate or to relinquish cause requires an understanding of semantic and syntactic knowledge. This study evaluated the ability of children with specific language impairment (SLI) to produce the causative alternation in comparison to age peers and to language peers. The children with SLI were proficient in lexically alternating verbs, yet provided fewer passive and periphrastic constructions and more different verbs and adjectival responses. Overgeneralization error data suggest that the semantic systems of some children with SLI were similar to their age comparisons. Individual differences within the SLI group suggested that some children were adept at providing syntactic responses and overgeneralizations, whereas some of the SLI group provided less mature responses of no alternations and no responses. These findings demonstrate a syntactic deficit in the causative alternation for some children with SLI.

KEY WORDS: causative alternation, verb acquisition, verb argument structure, specific language impairment

Verbs play a special role in current theories of language acquisition and a key role in the development of basic sentence patterns (Bowerman, 1996; Pinker, 1989; Tomasello, 1992). Every sentence is built around a verb, and that verb organizes or *projects* the structure of the sentence. Importantly, each verb comes with its own particular expectations about the number of noun phrases (arguments) with which it will associate. In this paper, we present data about one process of the verb system, the causative alternation, and its production by children with and without SLI.

A review of verb argument structures across a number of languages (Pye, 1991) suggests that there is a fair degree of cross-linguistic similarity in the argument structures assigned to particular verbs. Despite this, cross-linguistic similarity within language variations exist that make the mapping of semantics and syntax less clear. For example, in English, verbs such as *shudder* and *shake* are semantically similar, yet have different argument structures. One can shake a jar, adding a causative agent; however, one cannot shudder a jar. As part of the verb acquisition process, children must learn or acquire the syntactic features of verbs (i.e., the verb's argument structure) as well as the semantic features of verbs to produce grammatical sentences. Thus, as children acquire their verb system, semantic meaning and syntactic categorization will likely have a bearing on their acquisition process.

One aspect of verb behavior is the expression of *cause*. Transitive

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verbs have a causal feature attached to them. For instance, in the sentence "I rolled the ball" the verb "roll" has an agent role in the verb's argument structure as well as a direct object. The agent caused the ball to roll. In contrast, the intransitive version of this sentence, "The ball rolled," lacks the agent causer. The process of changing a verb's argument structure to signify cause is called the causative alternation. Different languages achieve this process through lexical, morphological, and/or syntactic methods. English speakers rely on lexical and syntactic methods to achieve the causative alternation. Specifically, the lexical method of showing cause uses the same verb, but in a different transitivity context (e.g., "The vase broke." [Intransitive] → "I broke the vase." [Transitive]).

Not all English verbs alternate lexically in the causative alternation. Verbs such as fixed transitives, fixed intransitives, and antipassive verbs require other syntactic methods of alternation to achieve a causal state. Many verbs, such as "climb" or "throw," require a different type of syntactic construction to relinquish their causative status because they have a fixed transitivity. One must say "The ball was thrown" rather than "The ball threw." The task for the child learning English, and any language, is to discover how the verbs in their given language participate in the causative alternation. Table 1 provides examples of different verb transitivity types.

The Causative Alternation and Typical Language Development

Children with normal language development have been documented to produce the causative alternation at 1;11 (years;months) years of age (Bowerman, 1974). A short time afterwards, they begin to make causative alternation errors also referred to as overgeneralizations. For example, a child tries to lexically alternate a verb with a fixed transitivity resulting in "I swam her" to indicate that she made a doll swim. There are numerous reports of children with typical development who misuse verbs as they acquire English (Bowerman, 1974; Lord, 1979). We add to the literature our own diary study examples of the overgeneralizations of the causative alternation from the first author's daughter, Natelise:

(3;2) "I'm singing her." {making her sing}

(3;4) "Look at me swim her." {make her swim}

(3;5) "I won you." {I beat you}

(3;6) "Stay it there!" {Keep it there}

(3;7) "The snake cutted in half." "It cut it in half."

(3;11) "Let's just dance them naked." {make them dance}

(4;1) "Enter Barbie!" "Are you ready to enter Barbie?" {make Barbie enter}

(4;2) "Watch me disappear this spaghetti."

(4;2) "I disappeared your beer into a can." {make it disappear}

(5;2) "First I have to die it some more." {kill it}

(6;2) "You can jump me later dad." {help me to jump}

These examples illustrate three common errors: (a) fixed intransitive verbs used as transitive verbs (*sing*, *swim*, *dance*, *enter*, *disappear*, *jump*); (b) fixed transitive verbs produced in intransitive contexts (*cut*); and (c) suppletive verb substitutions which have different lexical items to show cause (i.e., *stay*/*keep*, *won*/*beat*, *die*/*kill*). These errors or overgeneralizations of the causative alternation occur over a protracted period of time, from $2\frac{1}{2}$ to 12 years of age (Pinker, 1989). In addition, errors appear to be bidirectional in that they are committed with fixed intransitive verbs as well as fixed transitive verbs (Bowerman, 1974; Lord, 1979). Interestingly, errors do not seem to be the result of limited syntactic knowledge as children have been noted to make these errors during the same period of time that they begin to produce periphrastic clauses (made + verb clauses) (Bowerman, 1974).

Pinker (1989) proposed that children's errors with the causative alternation (i.e., "You swam her") stem from three sources: (a) a lexical rule being applied too broadly, thus not recognizing the narrow semantic restrictions of verbs; (b) a reflection of retrieval errors, where the wrong verb stem is retrieved under discourse pressure; and (c) an immature rule system, where the absence of the adult rule leads to errors in production.

Two levels of rules are used to account for the acquisition of semantic subclasses of verbs: broad range

Table 1. Four types of verb transitivity.

Type	Description
Causative Alternate	Verbs that alternate between transitive and intransitive contexts which indicate cause. "I moved the pen" "It moved"
Fixed Transitive	Verbs that occur only in transitive contexts (Subject + Verb + Direct Object) "Mommy put the baby in the car"
Fixed Intransitive	Verbs that occur only in intransitive contexts (Subject + Verb) "She swam"
Antipassive	Verbs that occur in Subject + Verb + Direct Object contexts, but the Direct Object cannot replace the Subject. "I swept the floor" *"The floor swept"

and narrow range. The broad range lexical rule for the causative alternation is assumed to be innate and specified as "Y changes state → X causes Y to change state." Children have to know verb forms and meaning before they can apply a broad range rule. In contrast, narrow range rules are thought to be learned from the environment. Narrow range rules are generalizations that only occur with verbs similar in meaning to those that children have heard alternating. Children may use a miscellaneous set of semantic features to constrain lexical representations (Pinker, 1989). Verbs that can lexically alternate in English to show cause are in the semantic classes of: extrinsic change of physical state, contained motion taking place in a particular manner, manner of locomotion, and instrument of locomotion. Verbs that do not lexically alternate will belong to the semantic groups of: motion in a lexically specified direction, volitional or internally caused actions, coming in or going out of existence, emotional expression, emission, and motion-contact-effect.

Constraints operate at both the broad and narrow range level of rules. The directness constraint, where the agent needs to have direct contact with the direct object receiving the action, is applicable at the broad range level. Constraints on which verbs alternate based on their semantic properties are learned as narrow range rules. For example, children learn that verbs of volitional action do not alternate (i.e., *eat*, *jump*); whereas verbs of extrinsic change of physical state will alternate (i.e., *open*, *melt*). Overgeneralization errors stem from difficulty constraining the verbs to which the alternation applies on the basis of the semantic features of the verbs.

Braine and his colleagues suggested that errors do not reflect a rule or an overgeneralization of a rule (Braine, Brody, Fisch, & Weisberger, 1990). Instead, these errors reflect the child's use of a canonical sentence schema *agent-verb-patient* argument structure assignment. When the child understands the argument structure of a given verb, the errors will cease to occur. In an experimental task designed to elicit causative overgeneralizations as a result of discourse manipulation, Braine et al. found evidence for the influence of discourse on error. After presenting familiar and nonsense verbs, they asked agent and patient questions that made verb overgeneralization more likely. For example, a child was shown an enactment of a person dancing with a toy figure and the examiner would say, "This is dancing. What is she doing?" (Patient-question, eliciting the intransitive context). The child would respond, "She's dancing." The examiner would next ask, "What did I make her do?" (Agent Question, eliciting the transitive context). The child might say, "You danced her" which would be an overgeneralization error. This error occurred because the agent-question set the stage for the child to try to answer the question with the agent as the subject using agent-verb-patient schema. In contrast, asking a patient question will facilitate the child to attempt an answer with patient as subject. Thus, discourse demands of using agent and patient questions with verbs of fixed transitivity can lead to overgeneralization errors.

The Causative Alternation in Children With SLI

Children with specific language impairment (SLI) display difficulty learning semantic and syntactic aspects of language (Bishop, 1992). By evaluating their use of the causative alternation, we may gain insight to the interface between semantics and syntax with their verb representations. Children with SLI are delayed in their acquisition of referential and relational semantics (Leonard, Bolders, & Miller, 1976; Leonard, 1988; Paul & Smith, 1993) as well as in their semantic memory (Kail & Leonard, 1986). There is limited evidence that verbs may pose a problem for children with SLI. At the one-word stage in novel verb learning studies, these children tend to learn more novel action words than object words (Leonard, Schwartz, Chapman, Rowan, Prelock, Terrell, Weiss, & Messick, 1982). However, during preschool and early elementary age, they possess less diverse verb repertoires (Watkins, Rice, & Moltz, 1993) and rely on general all purpose or GAP verbs such as "get" "make" and "go" (Rice & Bode, 1993). These children also do not interpret change-of-state verbs similarly to age-comparison peers (Kelly & Rice, 1994). Our research on verb labeling found that children with SLI had more difficulty labeling verbs compared to their chronological and language matches when presented with action scenarios (Loeb, Pye, Redmond, & Richardson, 1996).

The morphological and syntactic skills of children with SLI also are markedly impaired. These children produce fewer lexical categories per sentence, more grammatical errors, more pronoun case errors, and more errors in grammatical morphology (See Fletcher, 1995 for a review). Despite documentation of these syntactic and morphological difficulties, relatively little is known concerning how these children coordinate semantic knowledge in lexical entries with their syntactic development (Bishop, 1992). We do know that children with SLI produce fewer causal actions on objects (Johnston, Kamhi, & McDonald, 1981). This suggests a deficit in the causative alternation. However, a significant difference was not found between language matches and children with SLI in their ability to produce causative alternations (King, Schelleter, Sinka, Fletcher, & Ingham, 1995). In the latter study, the set of verbs tested was quite limited. Children with SLI who displayed morphosyntax problems exhibited the most difficulty with the causative alternation.

The causative alternation provides an ideal probe of these children's knowledge of the basic syntactic and semantic requirements for verbs. To use this alternation successfully, in English, verbs must be sorted into three syntactic groups: the fixed intransitives, the fixed transitives, and the causatives. This requires an extraordinary coordination between the child's syntactic and semantic resources that is the essence of language acquisition. In the present study, we examined the causative alternations of children with and without SLI using a task based on the work of Braine et al. (1990). This task manipulates discourse pressure that should result in overgeneralizations, and it allows us to detail the types of syntactic methods available for expressing and relinquishing cause.

Manipulating the causative alternation may reveal the learning strategies that are characteristic of these children. Children with SLI may have intact semantic representations, but they have difficulty with the syntactic requirements of the causative alternation (hereafter referred to as the syntactic deficit hypothesis). In contrast, these children may not be able to extract the semantic information needed to build an adequate semantic representation to constrain the causative alternation. We will refer to this as the semantic deficit hypothesis. Our research questions were: (a) Do children with SLI produce similar syntactic responses compared to their age-comparison (AC) and language-comparison (LC) peers in a causative alternation task? and (b) Do children with SLI produce more overgeneralization errors compared to their AC and LC peers?

These questions allow us to begin a preliminary examination of the causative alternation as well as test the syntactic deficit and semantic deficit hypotheses in children with SLI. Confirmation of the syntactic deficit hypothesis would be findings of limited syntactic devices in the causative alternation task and overgeneralizations at a rate similar to their AC or LC peers. In contrast, if children with SLI conform to a semantic deficit hypothesis, few differences would be seen in their response types and a large number of overgeneralizations would occur compared to their AC and LC peers because they are unable to form the semantic subclasses that would constrain verbs.

Method

Participants

We studied 21 children: 7 children with SLI (5;2–6;7) matched with 7 normally developing children by age (5;1–6;6) (AC) and matched with 7 normally developing children (2;6–4;0) by language abilities (LC). The SLI and LC groups were within .2 on their Developmental Sentence Scores (DSS) (Lee, 1974). Developmental Sentence Score was used as a matching index rather than Mean Length of Utterance (MLU) because of concerns regarding the MLU levels (i.e., MLU > 3.5 morphemes) and ages (i.e., 5 years or older) of the children with SLI (Klee, Schaffer, May, Membrino, & Mougey, 1989; Scarborough, Wyckoff, & Davidson, 1986). The typically developing children in the AC group were matched with the children with SLI within ±2 months.

Table 2 displays the characteristics of the children with SLI. Most of the children with SLI were male and had significant impairments of syntax and morphology as measured by the Structured Photographic Elicited Language Test–II (SPELT-II) (Werner & Kresheck, 1983) and Developmental Sentence Scoring (Lee, 1974). Half-hour language samples were collected using a standard set of play toys. DSS computation was conducted on the first 50 intelligible, complete, and unique utterances derived from the language sample. All of the children except for Subject 4 displayed age appropriate expressive vocabulary skills as measured by the Expressive One Word Picture Vocabulary Test (EOWPVT) (Gardner,

Table 2. Characteristics of the children with SLI.

Subject	Gender	Age	NV ADS	SPELT-II	DSS %	EOWPVT	TACL
1	M	6;7	98	–2.33	6.08	108	WNL
2	F	6;2	101	–1.00	8.24	95	WNL
3	M	5;7	104	–2.33	5.27	102	–1.00
4	M	5;2	90	–2.33	3.10	78	–1.64
5	M	5;3	87	–2.33	4.44	91	–1.88
6	M	5;7	99	–2.33	4.24	95	–1.04
7	M	5;2	107	–2.33	6.26	87	WNL

Note. Gender = *M*ale or *F*emale; Age = years;months; NV ADS (Nonverbal Age Deviation Score) = Mean is 100, standard deviation is 16; SPELT-II (Structured Photographic Expressive Language Test) = ±standard deviation; DSS (Developmental Sentence Score) = All scores reported are clinically significant; TACL (Test of Auditory Comprehension of Language) = WNL is within normal limits, others are –standard deviation; EOWPVT (Expressive One Word Picture Vocabulary Test) = Mean is 100, standard deviation is 15.

1990). Four of the children (Subjects 3, 4, 5, & 6) had a receptive component to their language problem as measured by the Test for Auditory Comprehension of Language–Revised (TACL-R) (Carrow-Woolfolk, 1985). All of the children with SLI displayed nonverbal abilities within normal limits as measured by the Columbia Mental Maturity Scale (Burgemeister, Hollander Blum, & Lorge, 1972). The Oral Speech Mechanism Screening Examination (OSME-R) (St. Louis & Ruscello, 1987) indicated no structural anomalies or nonverbal sequencing difficulties. Hearing screening at 20 dB indicated normal hearing. Questionnaires completed by the parents indicated no evidence of gross neurological or behavioral-emotional problems.

The children with typical language skills in both the AC and the LC groups passed an oral-peripheral mechanism screening, hearing screening, and parental questionnaires indicated no neurological and/or emotional-behavioral disturbances. In addition, these children all passed a screening test of speech and language abilities (Fluharty, 1978). The children in the LC group also participated in language sampling that followed the same procedure as the SLI group. Developmental sentence scores were then computed from the sample to determine if these children would serve as language comparisons.

Procedure

The alternation of a total of 43 verbs was evaluated (Table 3). Two tasks were administered, a verb elicitation task and a causative alternation task. The purpose of the verb elicitation task was to determine if the children could produce the verbs spontaneously. The examiner enacted actions with objects using a standard protocol to elicit the verbs and asked the child to label the action.

The 43 were selected because of their depictability, frequency of use (as determined by Hall, Nagy, & Linn, 1984), semantic category, and syntactic category. Semantic categories included: change of state, contained motion, volitional action, expressive, and directed motion verbs (Levin, 1993; Pinker, 1989). Syntactic categories were: causative alternates, fixed transitives, fixed intransitives, and antipassives. Rationale for verb selection and a reproduction of the verb elicitation task in its entirety is reported in Loeb et al. (1996).

The causative alternation task was similar to that devised by Braine et al. (1990). It involved the examiner eliciting the same 43 verbs from the verb elicitation task in either a transitive or intransitive context and then having the child respond to agent or patient questions that would elicit a causative alternation.

The verbs were assigned to either one of two conditions, an intransitive to transitive condition (I→T) or a transitive to intransitive condition (T→I). The I→T condition necessitated the child adding an external causer. However, the T→I condition required the child to tell about the result of the action without naming an overt cause. An example of an I→T alternation for the verb *break* follows:

E: "Look, the toothpick broke. What happened?"

C: "It broke." Exposure Response, Intransitive context elicited

E: "What did I do to the toothpick?" Test Agent Question

C: "You broke it." Test Response, Transitive context elicited

An example of a T→I condition with the verb *drop* is as follows:

E: "Look, I dropped the ball. What happened?"

C: "You dropped the ball." Exposure Response, Transitive context elicited.

E: "What did the ball do?" Test Patient Question

C: "It dropped." Test Response, Intransitive context elicited.

If the child did not provide the targeted transitivity context in his/her exposure response, we asked the child to imitate the correct transitivity, and then proceeded to ask either an agent or patient question.

Table 3. Verb stimuli.

Syntactic category	Semantic category				
	Change of state	Contained motion	Volitional action	Express	Directed motion
Fixed transitive	cut		put, throw		
Fixed intransitive		stay	look, walk, sleep, dance	talk, cry, laugh, roar	go, come, enter
Causative	break, open, pop, stop, close, tear, smash, boil, loosen	turn, drop, move, roll, float, bounce, wind	fly		return
Antipassive	wash		eat, drink, sweep, follow	sing	leave, climb

The latter examples were conducted with causative alternate verbs, which can alternate lexically. However, verbs with fixed transitivity and antipassive verbs need other syntactic methods to alternate from one type of transitivity to another. Appendix A displays examples of the causative alternation task with the four types of transitivity studied.

Response Coding

The children's responses were audio-recorded and transcribed online by an assistant. In the verb elicitation task, a correct response was the production of the target verb. In the causative alternation task, the children's responses to the test question (i.e., the test responses) were coded into the following response categories: lexical, overgeneralization, periphrastic, passive, no alternation, different verb, no response, and adjectival. Lexical responses were when the child used the same verb in the first context elicited and in the test response (refer to the example given in the text previously). Only causative alternate verbs can be alternated lexically in English. Should a child try to alternate the other verb types, an overgeneralization would occur (i.e., "You swam her"). Thus, overgeneralizations were lexical alternations of the antipassive verbs or fixed transitive verbs. Periphrastic responses contained a "made + V" clause, such as "You made her swim." Passive responses contained passive forms such as "The pop got drunk." A no alternation occurred if the child responded to the test question with the same verb and same transitivity as provided to the first question (exposure response). Thus, the no alternation was incorrect in terms of its transitivity. A different verb response occurred if the child provided a different verb than the one provided. A no response was when the child failed to respond, or provided an off-topic response. Adjectival responses occurred when the child described the result of the action rather than the action itself (i.e., responding with "it's clean" rather that "the floor was swept"). Because this study was exploratory, all responses were acceptable. However, one could interpret the no alternation, different verb, adjectival, and no responses as less mature or less demanding syntactically compared to periphrastic and passive responses. Definitions and examples of the coding scheme are presented in Appendix B.

Reliability

Four types of reliability were assessed: language sample transcription reliability, DSS coding reliability, transcription reliability from the causative alternation task, and coding reliability for the causative alternation task. Language sample transcription reliability was achieved through the following method. Initial transcriptions of the language samples for all children were completed by the third and fourth authors with the aid of online transcriptions. The first author then reviewed each tape for accuracy and the transcription was corrected. Last, an independent transcriber, blind to the details of the study, listened to each of the children's samples in their entirety and noted disagreements with the first transcription. Disagreements were then reviewed by the first author and the independent transcriber. Those instances where agreement could not be reached were counted as disagreements. A morpheme-by-morpheme accuracy count was computed. The number of agreements was divided by the number of disagreements and agreements and multiplied by 100. This latter method of computing reliability was conducted for all reliability measures. Language sample transcription reliability was 98% for each group of children.

An independent judge coded 20% of the responses (randomly selected) on the causative alternation task. The independent coding was compared to the original coding. Interjudge agreement was 93% for the AC comparisons, 86% for the children with SLI, and 94% for the LC comparisons.

DSS reliability was determined for the SLI and the LC groups by having an independent judge code a random selection of 20% of each child's DSS sample. The number of utterances for which the independent judge and the original coder assigned the same number of DSS points was divided by the number of total utterances in the reliability sample and multiplied by 100. Interjudge reliability was 97% for the LC group and 91% for the group with SLI.

Results

Our primary questions were concerned with: (a) the alternation responses to the causative alternation task and (b) the frequency of overgeneralizations. Because of the low number of participants, nonparametric statistics were utilized. Before reporting the results for the causative alternation task, it is first necessary to evaluate the results of the verb elicitation task in an effort to shed light on the children's verb labeling ability. A Cochran Q-test, which tests matched sets of frequencies, indicated group differences in the verb elicitation task, with the AC children labeling the verb event correctly 84% of the time compared to a 76% accuracy for the children with SLI, and 52% accuracy for the LC comparisons ($Q = 25.57, p < .001$). Subsequent pairwise comparisons using a Wilcoxon Signed Ranks Test were conducted. The Wilcoxon measures the direction and the magnitude of the difference between individual pairs. We found that the LC children and the children with

SLI labeled fewer verbs correctly than the AC children ($T = 0$, $p < .01$, one-tailed for both comparisons), and that the LC children labeled fewer verbs than the children with SLI ($T = 0$, $p < .02$, two-tailed; Siegel, 1956).

We evaluated the causative alternations of the children by first dividing the 43 verbs into those in which the task required intransitive to transitive alternations (I→T; $N = 26$); and those verbs in which the task required transitive to intransitive alternations (T→I; $N = 17$). This division of the task's verbs was conducted not only to simplify the results, but primarily because the two alternations are conceptually quite different in terms of what the child needs to do, namely, add a cause agent or remove a cause agent. We also divided the possible responses to the alternation task into 3 families or sets of response types: less mature responses, intermediate responses, and more mature responses. Responses were divided into these families because we thought it was likely that children with SLI would produce fewer mature responses that had more complex syntactic demands. The less mature responses included no alternations, no responses, different verbs, and adjectival responses. We thought that these responses would be the least demanding. The intermediate response was a lexical alternation. We were unsure whether a lexical alternation would be more or less difficult for children, so this was placed in a family of its own. Passive and periphrastic constructions were considered to be more mature responses. An a priori alpha level of .05 was set. However, because the less mature family had multiple responses, we adjusted the alphas to control for family-wise error rates. An adjusted alpha level of .02 was set for the less mature response types in the I→T condition (i.e., no response, no alternation, and different verb, .05/3) and an adjusted level of .01 was adopted for the less mature response types in the T→I condition (i.e., no response, no alternation, different verb, and adjectival, .05/4). Wilcoxon Signed Ranks Tests were used in all analyses (Siegel & Castellan, 1988). The number of overgeneralization responses were too few to conduct statistical analyses.

Alternation Responses

In the I→T condition, where a cause agent is added, there was no significant difference between the children with SLI and the AC and LC children in the number of less mature responses (i.e., no response, no alternation, different verb). The AC children had fewer no responses compared to the LC children ($T+ = 27$, $p = .0156$, one-tailed). No differences were noted in the intermediate response category of lexical alternations. Significant differences were observed in the more mature response category. The children with SLI and the LC children produced fewer periphrastic responses compared to the AC children ($T+ = 25$, $p = .0391$ [SLI] and $T+ = 26$, $p = .0234$ [LC], one-tailed).

In the T→I condition, where the child is to remove the cause agent, differences were observed in the less mature responses. The AC children produced fewer different verb responses compared to children with SLI and the LC children ($T+ = 21$, $p = .0156$ [SLI], one-tailed; $T+ = 21$, $p = .0156$, one-tailed). An informal analysis revealed that most of the time children with SLI used different verbs with antipassive verbs (69% of the time) and fixed transitive verbs (33% of the time). Volitional action verbs were substituted with different verbs 43% of the time. The AC children also produced fewer adjectival responses compared to the children with SLI ($T+ = 15$, $p = .0313$). No differences were observed for the intermediate category of lexical alternations. Significant differences were found for the more mature responses. The children with SLI and the LC children produced fewer passive structures than the AC children ($T+ = 28$, $p = .0078$, [SLI] and $T+ = 26$, $p = .0234$ [LC], one-tailed).

In addition to the pairwise comparisons, the individual results from the children with SLI revealed an intriguing subgroup difference. Three of the children with SLI (Subjects 1, 3, and 4) were similar to the AC children in the number of periphrastic constructions they produced for fixed intransitive verbs (ranging between 12 and 24 for the children with SLI and 14 to 22 for the AC children). These same children with SLI produced the only passive sentences for the SLI group. Three of the other children with SLI (Subjects 5, 6, and 7) relied upon a nonalternation strategy while the last child with SLI (Subject 2) used a no response strategy. Thus, the latter four children with SLI appear to have a less advanced grammatical system that would be unnoticed outside of the demands of the causative alternation task.

Frequency of Overgeneralizations

Our second question concerned the frequency of overgeneralizations elicited from the children. We elicited a total of 18 overgeneralizations with seven verbs (i.e., *cut*, *leave*, *sleep*, *sweep*, *swim*, *throw*, and *walk*) across all child participants (See Table 3). Although low in number, these values are consistent with the frequency of Braine et al.'s responses when we analyze the data in a manner similar to their study (Pye, Loeb, Redmond, & Richardson, 1994).

The children with SLI produced slightly fewer overgeneralizations compared to both AC and LC comparisons (Refer to Table 4; $n = 4$ vs. 6 and 8 respectively). Six of the seven children in the language-comparison group and four of the seven children in the age-comparison group overgeneralized the causative alternation;

Table 4. Frequency, semantic characteristics, and direction of overgeneralizations.

	Intransitive→Transitive	Transitive→Intransitive
SLI (*n* = 4, .02) 3 of 7 children	sleep (S4)	cut (S3, S6), throw (S6)
AC (*n* = 6, .04) 4 of 7 children	walk (S2), leave (S2)	cut (S5, 6), throw (S7), sweep (S7)
LC (*n* = 8,.05) 6 of 7 children	swim (S3,7), sleep (S2), walk (S1,3,5,7)	throw (S4)

Note. SLI = Specific Language Impairment; AC = Age comparisons; LC = Language comparisons; (S) = Subject; *n* = number overgeneralizations; ( ) = the proportion of overgeneralizations—calculated by dividing the number of overgeneralizations by the total possible number of verbs that could be overgeneralized—number of subjects (7) x number of verbs that could be overgeneralized (24) =168. All verbs except the causative verbs can be overgeneralized (See Table 1).

whereas three of the seven children with SLI produced overgeneralizations.

The type of verbs that were overgeneralized were also of interest. Five of the seven verbs that were overgeneralized belonged to the volitional action category (i.e., *sleep*, *sweep*, *swim*, *throw*, and *walk*). However, most verbs in the causative alternation task were volitional verbs, leading to a frequency bias. When the proportion of responses within each semantic category are computed it does not appear that an overwhelming number of responses are from the volitional action verbs as a whole (See Table 5).

The children with SLI appeared to be more like the age comparisons and less like their language comparisons with respect to which verbs they overgeneralized. They overgeneralized a volitional action verb when assigning cause from intransitive to transitive contexts similar to their language-matched peers, yet they also overgeneralized a change of state verb when deleting the cause from the verb (T→I).

As illustrated in Table 4, the direction of the overgeneralization, transitive or intransitive, appears to be an individual difference in children. Individual children tend to overgeneralize in one direction, but not the other. Most of the younger children's overgeneralizations fell into the intransitive to transitive contexts (It slept→ You slept the baby).

Table 5. Semantic categories of overgeneralizations.

	Change of state	Volitional action	Directed motion
SLI	cut (.14)	throw, sleep (.02)	
AC	cut (.14)	throw, sweep, walk (.03)	leave (.03)
LC		swim, sleep, walk, throw (.09)	

Note. SLI = Specific Language Impairment; AC = Age comparisons; LC = Language comparisons; ( ) = proportion of verbs overgeneralized calculated by taking the number of change of state, volitional action, or directed motion verbs that were overgeneralized divided by the number of possible change of state overgeneralizations (e.g., change of state (2) x subjects (7) = 14, 2/14 = 1.4), volitional action overgeneralizations, or directed motion overgeneralizations.

Summary

Children with SLI produced more of the less mature responses (i.e., different verb and adjectival) and fewer mature responses (periphrastics and passives) compared to AC children. The children with SLI produced slightly fewer overgeneralizations, but in general, did not appear to differ in frequency or type of overgeneralization when compared to the AC children.

Discussion

The verb use of children with SLI supported the syntactic deficit hypothesis. These children could use the lexical alternation for causative verbs as well as their similar aged peers; however, they lacked the syntactic resources to cope with verbs that have a fixed transitivity as evidenced by their decreased passive and periphrastic responses. The use of more different verbs and adjectival responses in the T→I condition is another piece of evidence to support the view that the syntactic requirements of removing cause create special problems for these children. Different verbs allow the child to alternate to another transitivity context without using a special syntactic construction (e.g., "The ball fell." vs. "The ball was thrown."). Adjectival responses also provide an avenue for the child to respond without using a passive construction (e.g., "The floor is clean." vs. "The floor was swept."). Interestingly, children with SLI used significantly more different verbs and adjectival responses only in the T→I condition, further supporting the notion that passive forms were particularly

problematic. In addition, the individual data showed that three of the children with SLI used a nonalternation strategy and a fourth used a no response strategy frequently. The nonalternations and no responses may reflect an earlier strategy of dealing with the causative alternation.

The overgeneralization data suggest greater difficulty with the syntactic requirements than the semantic requirements of the task. Children with SLI did not produce more overgeneralizations than either AC or LC comparisons. In addition, at least 3 of the 7 children with SLI produced overgeneralizations, which suggests evidence of a broad range rule. These data indicate that some children with SLI use verbs productively and appear to have similar patterns of overgeneralizations in terms of semantic categories when compared to the AC group. Further, the children with SLI and their LC peers overgeneralized different semantic categories. These overgeneralization data do not support the semantic deficit hypothesis.

However, an explanation that rules out the semantic deficit hypothesis is tentative for three reasons. First, the characteristics of the children in this study were such that they all displayed morphosyntax problems according to diagnostic testing. The syntactic deficit hypothesis may have been supported in the present study because of these children's syntactic deficits. However, recall that the children in this study also displayed semantic deficits as can be seen from their performance on the verb elicitation task. Despite this semantic weakness, their primary difficulty was in the area of using mature syntactic devices to alternate verbs. Second, future studies including a larger number of children with SLI who display severe levels of semantic involvement as well as syntactic deficits are needed to test the two competing hypotheses. Third, most of the analyses undertaken in this study focused on syntactic categories. A larger sample would allow us to evaluate semantic categories and syntax-semantic interactions.

Implications for Normal and Impaired Language Acquisition

This study also addressed overgeneralizations and verb acquisition in the context of current theories of language acquisition. According to Pinker (1989), overgeneralizations occur when the child overextends an innate broad rule and tries to lexically alternate verbs that should not be alternated. Thus, the child has not learned the narrow semantic class that constrains some verbs to alternate and others not to alternate. Pinker proposed that children learn the verbs to which the rule applies by focusing on the narrow range semantic classes that participate in the causative alternation. The broad rule of causative alternation should apply only to cases that involve direct causation. To apply the broad rule, the child must also understand the narrow range semantic constraints on verb alternation. Initially, Pinker would predict that children should overgeneralize the causative alternation to all verbs within a specific narrow range verb class, and only to those that involve direct causation. Our results with the young LC children support this hypothesis in part. The younger children overgeneralized in one semantic category, yet that category is one of volitional action, which does not involve direct causation. However, the children may have interpreted our actions upon the manipulables as direct causation (i.e., we moved the figure's legs to make the man walk); thus, overriding the concept of volitional action. Alternatively, they may not have a complete understanding of internal control of the action (Levin & Rappaport, 1992). In addition, the children in this study alternated verbs that were in semantic classes which do not allow for lexical alternation, indicating an incomplete rule system that has yet to constrain non-alternating semantic classes of verbs. We also found that all of the children tended to overgeneralize in one direction or the other, which suggests that individual differences may guide the directionality of overgeneralization. The children with SLI in the study produced overgeneralizations similar to those produced by their age-matched peers, suggesting comparably constrained semantic representations.

Clinical Implications

Selecting verbs for intervention should take into account functional as well as formal aspects of the verb system (Crystal, 1985). Traditional measurements of semantic and syntax development have been largely a separate venture. Assessment of semantics frequently involves standardized tests of vocabulary understanding or production highly biased toward nouns. Given that the children with SLI in this study showed poorer naming abilities than their age comparisons, it seems appropriate to use a more specific level of analysis. Some researchers (Watkins, Rice, & Moltz, 1993) have already started to use measures such as verb type-token ratios (vttr). Children's performance on the causative alternation task can also provide valuable information about their knowledge of the causative alternation rule as well as the number of syntactic devices available to show and to relinquish cause.

Intervention implications include incorporating verbs from a variety of semantic categories and transitivity contexts to diversify the verb repertoires of children with language impairment. The clinician's sensitivity to the type of verb and allowable syntactic methods of alternation are particularly important considerations for planning intervention. When selecting

verbs for intervention, the clinician might evaluate multiple properties of verbs (e.g., semantic and syntactic qualities) and determine which verbs might be especially problematic for a given child. This report suggests that alternations involving passive and periphrastic constructions might be particularly challenging for children with SLI. These children might compensate by producing more adjectival phrases and different verbs. The clinician first needs to determine whether the child has a particular verb in her lexicon. The next step is to evaluate the child's ability to alternate verbs in different transitivity contexts. The causative alternation allows us to evaluate a range of children's verb knowledge and to follow Crystal's (1985) recommendation, made over a decade ago, to take into account semantic, syntactic, and functional contexts of verb targets.

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References

Bishop, D. V. M. (1992). The underlying nature of specific language impairment. *Journal of Child Psychology and Psychiatry, 33*, 3–66.

Bowerman, M. (February, 1996). *Argument structure and learnability: Is a solution in sight?* Paper presented at the Berkeley Linguistic Society, Berkeley, CA.

Bowerman, M. (1974). Learning the structure of causative verbs: A study in the relationship of cognitive, semantic, and syntactic development. *Papers and Reports on Child Language Development, 8*, 142–178.

Braine, M. D. S., Brody, R. E., Fisch, S. M., & Weisberger, M. J. (1990). Can children use a verb without exposure to its argument structure? *Journal of Child Language, 17*, 313–342.

Burgemeister, B. B., Hollander Blum, L., & Lorge, I. (1972). *Columbia Mental Maturity Scales*. Los Angeles: Western Psychological Services.

Carrow-Woolfolk, E. (1985). *Test of Auditory Comprehension of Language*. Allen, TX: DLM Teaching Resource.

Crystal, D. (1985). Some early problems with verbs. *Child Language Teaching and Therapy, 1*, 46–55.

Fletcher, P., & Ingham, R. (1995). Grammatical impairment. In P. Fletcher & B. MacWhinney (Eds.), *The handbook of child language* (pp. 603–622). Oxford: Blackwell Publishers.

Fluharty, N. B. (1978). *Fluharty Preschool Speech and Language Screening Test*. Allen, TX: DLM Teaching Resource.

Gardner, M. F. (1990). *Expressive One-Word Picture Vocabulary Test- Revised*. Novato, CA: Academic Therapy Publications.

Hall, W. S., Nagy, W. E., & Linn, R. (1984). *Spoken words: Effects of situation and social group on oral word usage and frequency*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Johnston, J., Kamhi, A., & McDonald, J. (1981). Patterns of predicate use in language impaired children. *Proceedings from the Second Wisconsin Symposium on Research in Child Language Disorders, 2*, 17–28.

Kail, R., & Leonard, L. B. (1986). Word-finding abilities in language-impaired children. *ASHA Monograph, 25*, Rockville, MD.

Kelly, D., & Rice, M. (1994). Preferences for verb interpretation in children with specific language impairment. *Journal of Speech and Hearing Research, 37*, 182–192.

King, G., Schelleter, I., Sinka, I., Fletcher, P., & Ingham, R. (1995). Are English-speaking SLI children with morpho-syntactic deficits impaired in their use of locative-contact and causative alternating verbs? *Reading Working Papers in Linguistics, 2*, 45–65.

Klee, T., Schaffer, M., May, S., Membrino, I., & Mougey, K. (1989). A comparison of the age-MLU relation in normal and specifically language-impaired preschool children. *Journal of Speech and Hearing Disorders, 54*, 226–233.

Lee, L. (1974). *Developmental sentence analysis*. Evanston, IL: Northwestern University Press.

Leonard, L. B. (1988). Lexical development and processing in specific language impairment. In L. L. Lloyd & R. L. Schiefelbusch (Ed.), *Language perspectives: Acquisition, retardation and intervention* (2nd ed.). Austin, TX: Pro-Ed.

Leonard, L., Bolders, J. G., & Miller, J. A. (1976). An examination of the semantic relations reflected in the language usage of normal and language-disordered children. *Journal of Speech and Hearing Research, 19*, 371–392.

Leonard, L., Schwartz, R., Chapman, K., Rowan, L., Prelock, P., Terrell, B., Weiss, A., & Messick, C. (1982). Early lexical acquisition in children with specific language impairment. *Journal of Speech and Hearing Research, 25*, 554–564.

Levin, B. (1993). *English verb classes and alternations: A preliminary investigation*. Chicago: University of Chicago Press.

Levin, B., & Rappaport Horav, M. (1992). A preliminary analysis of (de)causative verbs in English. Unpublished manuscript. Northwestern University, Evanston, IL.

Loeb, D., Pye, C., Redmond, S., & Richardson, L. (1996). Eliciting verbs from children with specific language impairment. *American Journal of Speech-Language Pathology, 5*, 17–30.

Lord, C. (1979). "Don't you fall me down": Children's generalizations regarding cause and transitivity. *Papers and Reports on Child Language Development, 17*, 81–89.

Paul, R., & Smith, R. (1993). Narrative skills in 4-year-olds with normal, impaired, and late-developing language. *Journal of Speech and Hearing Research, 36*, 592–598.

Pinker, S. (1989). *Learnability and cognition: The acquisition of argument structure*. Cambridge, MA: MIT Press.

Pye, C. (1991). Acquiring lexical constraints on causatives in K'iche' Maya. *Papers and Reports on Child Language Development, 30*, 96–103.

Pye, C., Loeb, D., Redmond, S., & Richardson, L. (1994). When do children acquire verbs? In E. V. Clark (Ed.), *Proceedings of the Twenty-fifth Annual Child Language Research Forum*. Stanford, CA: CSLI.

Rice, M., & Bode, J. (1993). GAPS in the lexicon of children with specific language impairment. *First Language, 13*, 113–132.

Scarborough, H., Wyckoff, J., & Davidson, R. (1986). A reconsideration of the relation between age and mean length of utterance. *Journal of Speech and Hearing Research, 29*, 394–399.

Siegel, S. (1956). *Nonparametric statistics for the behavioral sciences*. New York: McGraw-Hill.

Siegel, S., & Castellan, N. J. (1988). *Nonparametric statistics for the behavioral sciences* (2nd ed.). New York: McGraw-Hill Book Company.

St. Louis, K. O., & Ruscello, D. M. (1987). *Oral Speech Mechanism Screening Examination–Revised*. Austin, TX: Pro-Ed.

Tomasello, M. (1992). *First verbs*. New York: Cambridge University Press.

Watkins, R., Rice, M., & Moltz, C. (1993). Verb use by language-impaired and normally developing children. *First Language, 13*, 133–144.

Werner, E., & Kresheck, J. (1983). *Structured Photographic Expressive Language Test*. DeKalb, IL: Janelle Publications.

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Appendix A.

Causative Alternates (Either Intransitive→Transitive or Transitive→Intransitive)

(I→T) E: The bubble popped. (Intransitive) DISCOURSE SETUP
E: What happened to the bubble? (Patient Question)
C: It popped. (Intransitive) EXPOSURE RESPONSE
E: What did I do? (Agent Question) TEST QUESTION
C: You popped the bubble (Transitive) TEST RESPONSE

(T→I) E: I popped the bubble. (Transitive) DISCOURSE SETUP
E: What did I do? (Agent Question)
C: Pop the bubble (Transitive) EXPOSURE RESPONSE
E: What did the bubble do? (Patient Question) TEST QUESTION
C: It popped. (Intransitive) TEST RESPONSE

Fixed Transitives (Transitive→Intransitive)

E: I cut the paper. (Transitive) DISCOURSE SETUP
E: What did I do? (Agent Question)
C: You cut the paper (Transitive) EXPOSURE RESPONSE
E: What did the paper do? (Patient Question) TEST QUESTION
C: It cut. (Lexical = overgeneralization) TEST RESPONSE

Fixed Intransitives (Intransitive→Transitive)

E: This pig is staying. (Intransitive) DISCOURSE SETUP
E: What is the pig doing? (Patient Question)
C: The pig is staying. EXPOSURE RESPONSE
E: What did I do to the pig? (Agent Question) TEST QUESTION
C: You made her stay (Periphrastic) TEST RESPONSE

Antipassives (Either Intransitive→Transitive or Transitive→Intransitive)

(T→I) E: He's drinking the pop. (Transitive) DISCOURSE SETUP
E: What did he do? (Agent question)
C: He drinked the pop. (Transitive) EXPOSURE RESPONSE
E: What happened to the pop? (Patient question) TEST QUESTION
C: It was drunk. (Passive) TEST RESPONSE

(I→T) E: She's singing. (Intransitive) DISCOURSE SETUP
E: What did she do (Patient Question)
C: She sang. (Intransitive) EXPOSURE RESPONSE
E: What did I do to the pig? (Agent Question) TEST QUESTION
C: You made her sing (Periphrastic) TEST RESPONSE

Appendix B. Examples of Coding Procedure.

Cut	"I cut the paper" → "It was cut" = passive
	"It cut" = overgeneralization
	"You cut the paper" = no alternation
	"It broke in two" = different verb
Break	"I broke the stick" → "It broke" = lexical
	"You made it break = periphrastic
	"It got broken" = passive
	"You broke the stick" = no alternation
	"You snapped it in two" = different verb
Swim	"She is swimming" → "You made her swim" = periphrastic
	"You swam her" = overgeneralization
	"She is swimming" = no alternation
Eat	"He is eating" → "You made him eat it" = periphrastic
	"It ate" = overgeneralization
	"It's all gone" = adjectival
	"It was eaten" = passive