Detection of Irregular Verb Violations by Children With and Without SLI

Sean M. Redmond
University of Utah
Salt Lake City

Mabel L. Rice
University of Kansas
Lawrence

Fifty-seven children (ages in years;months: 5;7–8;8) with and without Specific Language Impairment (SLI) participated in judgment and elicitation tasks designed to evaluate their understanding of restrictions associated with irregular verb forms. The performance of the SLI group was similar to the performances of the control groups in that all children demonstrated high levels of sensitivity to violations involving verb-agreement errors (e.g., *he am falling*). The production and acceptance rates of past tense overregularizations (e.g., *he falled*) by the SLI and language-match groups were similar, and both were higher than the age-match group. Differences between affected and unaffected children were observed in their productions and relative levels of sensitivity to infinitive errors in finite positions (e.g., *he fall off*). As expected, children in the SLI group were more likely to produce and accept infinitive forms in finite positions. Children in the SLI group also accepted more finite form errors in VP complement positions (e.g., *he made him fell*) than the control groups, although the latter occurred rarely in children's productions. Implications for understanding morphophonological and morphosyntactic development in children with SLI are discussed.

KEY WORDS: grammaticality judgments, specific language impairment, child language impairment, irregular past tense, language acquisition

Although much is known about the development of regular past tense in children with specific language impairment (Johnston & Schery, 1976; Leonard, 1998; Leonard, Bartolini, Caseli, McGregor, & Sabadini, 1992; Rice, Wexler, & Cleave, 1995; Rice, Wexler, & Hershberger, 1998; Rice Wexler, & Redmond, 1999; Steckol & Leonard, 1979), relatively little is known about their development of irregular past tense. This is interesting because, as Rice, Wexler, Marquis, and Hershberger (2000) have pointed out, an examination of irregular past tense reveals important information about the acquisition of two important dimensions of grammatical morphology. First, children need to acquire the morphophonological component of past tense, the rules for producing the various forms associated with past tense. Children have to learn that they must "add *-ed*" to regular verb stems and that exceptions to the general rule, the irregular forms, involve various alternative phonological processes. Children also need to acquire the morphosyntactic component of morphology, syntactic constraints that govern the insertion of tense forms into clauses that apply regardless of how tense is phonologically realized on the word. The issue here is twofold. First, children have to learn that all clauses representing past contexts require a past tense form, which could be a lexical, copula, or auxiliary

verb (e.g., *fell, was, did*). The second important piece of morphosyntactic knowledge is learning that within matrix clauses, verb phrases contain only one site for past tense forms. In other words, sentences like *Bob made him fell off the chair* are not allowed even though two distinct events have taken place in the past: "he fell off the chair" and "Bob caused his falling to take place" (cf. Chomsky, 1996; Hyams, 1996; Rizzi, 1993; Wexler, 1994).

The relevant distinction between these two dimensions of grammatical morphology is that morphosyntactic constraints determine which word displays past tense within the verb phrase, and morphophonological rules determine how this form is eventually "spelled out." This distinction is important because current theoretical accounts of SLI can be differentiated on the basis of whether faulty morphophonological or morphosyntactic mechanisms are implicated. In this study we investigate further the morphosyntactic and morphophonological competencies of children with SLI in terms of existing theories of the locus of grammatical limitations of affected children.

Morphophonological and Morphosyntactic Accounts of Tense Deficits Associated With SLI

A prominent example of a morphophonological theory of the tense deficits associated with SLI is the Low Phonetic Substance (LPS) account developed by Leonard and his colleagues (Leonard, 1989; Leonard et al., 1992; Leonard et al., 1997). Under this account, children with SLI suffer from a general processing capacity limitation that severely limits their efficiency in identifying and interpreting the relevant details in the language input. One place where these difficulties become amplified is at the interface between phonological processing and the extraction of general morphological paradigms. An interaction occurs here such that when the input presents phonologically challenging forms (e.g., low-salience; word-final consonants; and weak, nonlengthened syllables) in morphological contexts these forms are at risk for being processed incompletely or not at all by children with SLI. The outcome of these processing limitations represent "the functional equivalent of reductions in input frequency" (Leonard et al., 1997, p. 744). Because children's extraction of general paradigms is dependent upon achieving some threshold of word-specific exemplars (cf. Pinker, 1984), development of paradigms for some morphemes like past tense *-ed* and 3rd person singular *-s* are expected to be considerably disrupted. Other morphological paradigms, such as various classes of the English irregular past tense, are not expected to cause difficulty for children with SLI because these forms often contrast with their present tense stems in perceptually salient alternations.

Less clear within the morphophonological framework adopted by the LPS account is the predicted status of overregularization errors (e.g., *falled*) in children with SLI. On the one hand, because the LPS account suggests that the source of difficulties lay in the establishment of the general paradigm for past tense (i.e., learning that past tense = verb stem + *-ed*), we might expect children with SLI to produce few, if any, overregularization errors. However, as Leonard (1994) has pointed out, this prediction does not necessarily follow if we consider the possibility that one result of the proposed distorted processing is that regular bare stems are occasionally placed into the paradigm cell requiring the inflected form. As a consequence, children with SLI may mistakenly hypothesize that some regular verbs belong to the class of irregular verbs that do not alternate with their present forms (i.e., "the zero-marked class": *put, cut, hit*). This allows for a situation where children with SLI develop the general paradigm for past tense that occasionally overextends to irregular verbs at the same time they are producing a high frequency of bare stems with regular verbs.

A consideration of regular bare stem errors as the result of overextensions of the zero-marked class of verbs has also been suggested recently by Marchman, Wulfeck, and Ellis Weismer (1999). This proposal, developed out of connectionist principles, suggests that children with SLI overextend the zero-marked class of irregular verbs because of phonological similarities between verb stems from this class and stems representing other classes of regular and irregular verbs. In contrast to the LPS account, Marchman et al. suggest that tense deficits in children with SLI are the result of their hypersensitivity to morphophonological structure.

A morphosyntactic alternative for the past tense deficits associated with SLI has been provided by Rice and Wexler's Extended Optional Infinitive (EOI) account (Rice et al., 1995; Rice & Wexler, 1996; Rice et al., 1998). In contrast to morphophonological accounts, the EOI account places the difficulty within morphosyntactic knowledge, specifically with the understanding of the obligatory nature of tense. According to this account, children with SLI are delayed in their resolution of a stage observed in normally developing children where tense is not regarded as an obligatory syntactic feature. This optional infinitive stage is characterized by the alternate use of finite and infinitive verb forms by young children in sentences requiring a finite form. Because the infinitive is phonologically represented in English by an uninflected verb stem, the EOI account shares with morphophonological models the prediction that frequent omissions of the *-ed* affix should occur with regular verbs.

These errors in tense, however, are not considered to be the result of dropped affixes, bare stem errors, or extensions of the zero-marked class of tensed verbs. Instead, tense errors are regarded as mis-selections of infinitive forms. The EOI account makes substantively different predictions than the LPS account regarding the status of irregular past tense forms in the grammars of children with SLI. The EOI account predicts that because irregular verbs represent finite forms, children with SLI should experience difficulty with these forms, occasionally producing infinitives in sentence positions requiring finite verbs. Likewise, because the proposed limitation is not with the mechanics of "how to indicate tense" but with "whether to indicate tense," the EOI account explicitly predicts that children with SLI and normally developing children should equally regard overregularizations as a tense marking option.

The EOI account makes further predictions not explicated by other models. Whereas morphophonological models are silent about children's knowledge of additional morphosyntactic constraints associated with grammatical features, such as agreement between subject and verbs and the number of verbs within the matrix clause displaying tense, the EOI account predicts that these aspects of morphosyntax should be intact in children with SLI.

Development of Irregular Past Tense by Children With SLI

An uncontested finding is that children with SLI have significant difficulty acquiring regular past tense *-ed*. As noted above, this result is consistent with multiple interpretations of the nature of grammatical deficits associated with SLI. Less clear from the literature is whether children with SLI have particular difficulties with the development of irregular past tense forms.

Morphophonological theories like the LPS account suggest that these should not present particular difficulty for children with SLI. In contrast, the EOI account predicts that the development of regular and irregular past tense should be significantly compromised because both represent finite forms.

In an early investigation, Johnston and Schery (1976) examined grammatical morpheme use in 276 children with language impairments (age range: 3–16 years) and found that higher levels of mean length of utterance (MLU) were required for mastery of both regular and irregular past tense in their study sample than in available norms, although delays were more pronounced for the regular than the irregular past tense. In a longitudinal study of three 7-year-old children, Kahn and James (1983) found a similar pattern of delays, showing relative strengths with irregular verbs. Leonard et al. (1992) studied children with SLI and two control groups, one age-matched and another younger MLU-equivalent, and found differences such that the SLI group performed below the MLU-equivalent group in levels of correct production of regular but not irregular past tense. Differences were observed in the kinds of errors produced, however. A higher proportion of past tense errors produced by the SLI group represented nonpast or bare-stem forms (producing *fall* rather than *fell*), whereas the MLU-match and age-match control groups produced more overregularizations (producing *falled* rather than *fell*). Group differences in favor of control children's production of regular but not irregular verbs were also observed by Leonard et al. (1997) and Oetting and Horohov (1997); both studies found that the SLI group performed below the levels of age-match controls and similarly to the MLU-match controls. Consistent with the results of Leonard et al. (1992), Oetting and Horohov's study sample of children with SLI also had higher rates of bare stem forms and lower rates of overregularization errors.

Marchman et al. (1999) elicited regular and irregular verbs from 62 children with and without SLI (age range: 6–12 years). Twenty-five regular and 27 irregular verbs matched for frequency and phonological properties (stem-final alveolar vs. non-alveolar) were elicited. Consistent with previous investigations, children in the SLI group produced considerably more bare stems than the age-match control group, and even the oldest children in the SLI group continued to demonstrate these limitations. A contrasting result with previous reports was the absence of group-by-class interactions. Instead, Marchman et al. found that the regular and irregular verbs produced by the children with SLI were equally vulnerable to bare-stem errors. Furthermore, similar rates of overregularization were found for the affected and unaffected children, and the two groups showed the same tendency to overregularize the same verbs.

Rice et al. (2000) used longitudinal data collected on 21 children with SLI over a 3.5-year period (age range covered: 4;5–8;9) to examine the development of irregular past tense. Comparisons were made with 23 children of the same age and 20 younger control children of equivalent mean length of utterance (MLU). Growth in irregular past tense was assessed from two different perspectives. One analysis examined children's percent correct use over time and regarded overregularizations as incorrect attempts at tense marking; the percentage was expressed mathematically as correct productions/correct productions + overregularizations + infinitives. The other analysis examined children's percent finiteness marking over time and regarded overregularizations as attempts to produce a finite form: correct productions + overregularizations/correct productions + overregularizations + infinitives. These two indices of

irregular past tense were compared to growth in regular past tense, where percent correct was measured as correct productions/correct productions + bare stems.

Hierarchical linear modeling procedures were used to develop growth curves for these three measures, and the results suggested very similar growth trajectories (linear + quadratic) for the finiteness measure of irregular past tense and the regular past tense measure. Significant group differences favoring the MLU-matched group were evident on both measures throughout the time sampled. The shape and rate of growth observed for the measures of regular and irregular past finiteness marking were also highly similar to growth curves observed in an earlier analysis of 3rd person singular *-s*, copula and auxiliary *BE*, and auxiliary *DO* (Rice et al. 1998). Furthermore, just as development across the copula, auxiliary, and regular verbs demonstrated independence from growth in nonsyntactic areas, growth in levels of finiteness marking on irregular verbs was not affected by growth in children's receptive vocabulary or nonverbal intelligence or by differences in maternal levels of education.

The measure of correct irregular past tense, in contrast, demonstrated a trajectory different from the measures of finite marking (linear only), and performances of the SLI and MLU-matched control groups over the time period sampled were highly similar. Growth in percent correct irregular past tense was also found to be affected by growth in receptive vocabulary. Rice et al. interpret these results as providing strong support for a differentiation between morphophonological and morphosyntactic development as predicted by the EOI account. The deficits in the acquisition of irregular past tense observed in children with SLI appeared to be the result of a general morphosyntactic delay in the obligatory use of finite forms that applies regardless of variations in surface phonology.

A key prediction of the EOI account that differentiates it from morphophonological accounts is the expectation that children with SLI should be competent with other aspects of the morphosyntactic dimension of morphology. Rice and her colleagues have provided evidence that the overwhelming majority of finite verb forms produced by normally developing children and children with SLI agree with their subjects (Cleave & Rice, 1997; Rice et al., 1995; Rice & Wexler, 1996; see also Leonard, 1998). Likewise, errors representing an insertion of regular past tense or 3rd person singular affixes into infinitive verb phrases, such as *you made him walked/walks*, appear rarely in both spontaneous and elicited productions, at rates close to 1% (Rice et al. 1995; Rice & Wexler, 1996; Rice, unpublished data reported in Redmond, 1997). Although these observations suggest that children with SLI understand that finite forms are not allowed in infinitive verb phrases, the available evidence is limited because of the infrequent use of verb complements in spontaneous language samples and the focus on regular past tense forms during elicitation tasks. The opportunity to generate past tense forms in unlicensed sentence positions would also be limited by the overall amount of tense forms produced by children. It is possible that older children with SLI producing higher levels of tense forms might produce errors not observed in younger children.

Using Grammaticality Judgments to Confirm Production Evidence

An important confirmation of the hypothesized limitations with tense observed in affected children's productions would be the documentation of such limitations in their sensitivity to various errors during grammaticality judgment tasks. Evidence of limitations on these tasks allows one to rule out the possibility that the tense-marking deficits may be due to production limitations (cf. Bishop, 1994). An inherent advantage of grammaticality judgments is that they can be used to assess children's competence with infrequent but theoretically important sentence structures and errors, such as infinitive verb phrases and overregularizations. Although not motivated by theoretical considerations, observed differences between the severity of deficits observed during production and judgment tasks could present clinically useful information regarding linguistic "trade-off" effects (cf. Bishop, 1997), allowing for the identification of task parameters that make it easier or more difficult for children to process tense.

Recent investigations, although few in number, have used grammaticality judgments to study various aspects of grammatical development in children with SLI (Montgomery & Leonard, 1998; Rice et al., 1999; van der Lely & Ullman, 1996). van der Lely and Ullman (1996) investigated morphophonological aspects of regular and irregular past tense by studying children's interpretations of overregularization errors, bare-tem errors, and irregularization errors (i.e., producing *looked* as *leck*) in simple declarative sentences. In this study, the grammaticality judgments of 12 children with "grammatical SLI" (ages 9;3–12;10) were compared to judgments from language-ability-matched groups of unaffected children. The results indicated that children with SLI accepted significantly more bare stems and overregularizations than the language matches, but no significant differences were found between the groups for the irregularization errors. Although production data were obtained on the same sample of children, differences in the computation of percent correct across items did not allow for direct comparisons between production and judgment data (e.g., percent-correct production of regular past *-ed* was computed by combining regular past tense forms and overregularizations).

Rice et al. (1999) used judgments of grammatical well-formedness to evaluate aspects of children's morphosyntactic knowledge, where predictions were motivated by the EOI account. Children were presented with ungrammatical sentences containing omissions of regular past tense, 3rd person singular, copula and auxiliary *BE*, aspectual *-ing*, and subject-verb agreement errors. Data were collected on three groups of children (SLI, chronological age-match controls, and MLU-match controls) over 5 different observation points covering a 30-month span. Under the EOI account, children with an SLI grammar should regard sentences containing bare stems or omitted finite forms (e.g., *he walk, he walking*) as acceptable. In contrast, sentences containing errors of subject-verb agreement or aspectual *-ing* (e.g., *he am happy; he is smile*) should be regarded as unacceptable. These predictions were upheld. The results indicated that children in the SLI group were more likely than chronological-age matches and MLU matches to regard bare stems and omissions as acceptable but were as likely as controls to reject sentences containing subject-verb agreement errors or *-ing* omissions. Growth curve analyses were performed with tense forms, and the results mirrored the production data obtained by Rice et al. (1998). As in the earlier study, mother's education, child nonverbal intelligence, and child receptive vocabulary did not predict growth in grammaticality judgments.

Previous investigations of grammaticality judgments in children with SLI have focused exclusively on their sensitivity to morphological errors within simple, active sentences. What is missing from the available evidence is a complementary examination of children's judgments with irregular past tense verbs from a morphosyntactic perspective where sensitivity to tense errors is evaluated in both simple and complex sentences. Another important gap in the literature is an evaluation of the amount of convergence with complex sentences between judgment and production tasks.

Purpose of the Investigation

In this study, children with and without SLI participated in judgment and elicitation tasks designed to evaluate their understanding of various restrictions associated with irregular verb forms. The specific questions addressed in this study were (1) Are children with SLI more likely than control children to regard infinitives as an acceptable option for tensed irregular verbs in simple active sentences? (2) Are children with SLI more likely than control children to regard overregularizations as an acceptable option for tensed irregular verbs in simple active sentences? (3) Within complex sentences, are children with SLI more likely than control children to regard finite irregular verb forms (i.e., irregular past tense and overregularizations) as an acceptable option for infinitive verbs? (4) Within complex sentences, are there differences in levels of performance across grammaticality judgment and elicited production tasks for children with and without SLI?

Predicted outcomes for questions 1–3 were made based on the EOI account and were as follows: First, children with SLI were expected to demonstrate a greater proclivity than normally developing controls to treat infinitives within simple active sentences as a tense-marking option. Second, children with SLI were not expected to perform differently from language-match controls on overregularization errors. Third, children with SLI were not expected to perform differently from control children in the extent to which they allowed tensed forms to appear in infinitive positions within complex sentences. Predicted outcomes for question 4 were less wedded to the EOI framework. Although the EOI account predicts that substantive differences in the pattern of strengths and weaknesses associated with SLI should not occur across the two tasks (all things being equal), it does not exclude the possibility that significant differences in performance may exist across experimental tasks. For example, it seems reasonable to expect that total levels of correct performance with complex sentences may be lower during grammaticality judgment tasks because of increased task demands associated with the procedure.

Method

Participants

The participants in this study were subjects from the Kansas Longitudinal Study of Morphosyntactic Development. Data collection for the present investigation was initiated when these children were in their third year of participation in the longitudinal study (cf. Rice et al., 1995; Rice et al., 1998). Fifty-seven children whose ages ranged from 5;7 to 8;8 (years;months) participated in this study. Nineteen children had a positive history of SLI and were 8 years old when they participated (range: 7;9–8;6). In the SLI group there were 12 boys and 7 girls: 15 Caucasian, 3 Hispanic, and 1 Native American. Mother's education was assessed on a scale where 1= some high school and 5 = some graduate work. The SLI group mean was 2.45, with a distribution across the entire range; 16 mothers reported that they were high school graduates or above.

Thirty-eight normally developing children from schools in the same communities as the children with SLI participated. Eighteen of these children were 2 years younger than the children with SLI, and 20 were within the same age range. These two groups of children are hereafter referred to as the Language Match (LM) (range: 5;7–6;11) and Age Match (AM) (range: 7;8–8;8)

groups. In the LM group there were 9 boys and 9 girls: 18 Caucasian, and 1 Native American. The mean level of mother's education for the LM group was 4.4. All were high school graduates or above. In the AM group there were 9 boys and 11 girls: 18 Caucasian and 2 African American. The mean level of mother's education was 4.1. All mothers reported they were high school graduates or above. Participants in this study from the SLI, AM, and LM groups were all from English-speaking, monolingual homes.

In the longitudinal study, the two groups of normally developing children served as either chronological-age or MLU-equivalent controls for the SLI group. Data collection was initiated before school entry (AM: 5 years, LM: 3 years). In order to participate, children in the control groups had to meet the following criteria: (a) identified as normally developing by teacher and parents; (b) receptive language skills within normal limits as measured by the Picture Peabody Vocabulary Test–Revised (PPVT-R; Dunn & Dunn, 1981); (c) expressive language skills within normal limits as measured by mean length of utterance in morphemes (MLU) (Leadholm & Miller, 1993); (d) normal intellectual functioning as measured by the Columbia Mental Maturity Scale (CMMS; Burgemeister, Blum, & Lorge, 1972); (e) normal articulation as measured by the Goldman-Fristoe Test of Articulation (GFTA; Goldman & Fristoe, 1986); and (f) normal hearing as measured by a hearing screening at 25 dB at 1000, 2000, and 4000 Hz.

Children in the SLI group were recruited for the longitudinal study while they were in preschool from the caseloads of certified speech-language pathologists. All of the children had been identified as having a language impairment at preschool, and most had been receiving services since that time. They all had receptive/expressive language impairment, without severe speech impairment or limited "intelligibility." At entry into the longitudinal study, they met the following criteria (Rice et al., 1995): (a) previously identified as having a language impairment by a certified speech-language pathologist; (b) receptive language performance on the PPVT-R one standard deviation or more below the mean; (c) expressive language performance one standard deviation or more below age expectations as measured by MLU from a sample of at least 150 utterances; (d) normal intellectual functioning as measured by the CMMS; (e) passing score on a probe screening for articulation competency, with consistent use of final -t, -d, -s, and -z, and only minor mispronunciation on the GFTA; and (f) normal hearing acuity as measured by a hearing screening. In addition, the Test of Language Development Primary, 2nd Edition (TOLD-P:2; Newcomer & Hammill, 1988) was administered to each child. The SLI group mean on the Spoken Language Quotient was 75.9 (standardization sample: M = 100, SD = 15). Two children were within one standard deviation of the mean on this test, with quotients of 88 and 93, but were included because they met the other criteria.

At the time of this study, during the 7th round of the ongoing longitudinal investigation, children in all three groups continued to demonstrate profiles evident at their entry into the study. Children in the control groups continued to demonstrate normal to above-normal levels of performance across all measures, and children in the SLI group at age 8 years continued to show Specific Language Impairment as evidenced by their normal levels of performance on the nonverbal measure, the CMMS, and significant limitations on standardized language test performance (PPVT-R and TOLDP:2), MLU, and composite tense marking. See Table 1 for a descriptive summary of the participants by group. This outcome is consistent with the recent findings of Johnson et al. (1999) that young children with SLI are very likely to persist in this level of language functioning for an extended period of time.

Description of the Judgment Task

Judgments were elicited from children as they observed scenarios involving various toys and actions. The children were introduced to a couple of action figures referred to in the task as "moonguys" and were told that they "were from outer space and were just learning to speak English, so sometimes they say things right but sometimes they say things not so good. Sometimes they aren't quite right about the little parts of English." The children were then instructed to "listen carefully to how the moonguys talk" and to tell the examiner "if what they said was right or not so good."

The task consisted of two phases: the training phase and the experimental phase. During the training phase children were presented with 5 grammatical and 5 ungrammatical sentences within a story-type format and asked to make judgments. Feedback was provided on the accuracy of the child's response; and when errors occurred, correct responses were provided. It was during the training phase that a reliable response contrast was established for each child. Grammatical errors in the practice items consisted of omissions of progressive *-ing* and errors of subject-verb agreement (e.g., *the robot is stand; the robot am looking*). For the majority of the children, corrective feedback was not necessary during the training phase, and all three groups performed very well on the 10 training items (total number correct on practice items: SLI: M = 8.95, SD = 1.05; LM: M = 9.11, SD = 1.23; AM: M = 9.90, SD = .45).

During the experimental phase, when feedback was not provided, children were presented with 15 grammatical and 25 ungrammatical sentences that incorporated

Table 1. Participant profiles at time of study: group means (and standard deviations).

Group	Number	Age [a]	CMMS [b]	MLU [c]	PPVT-R raw [d]	PPVT-R standard [e]	TOLD-P:2 [f]	Composite tense [g]	Mother's education [h]
SLI	19 (12 boys)	96.79 (3.12)	99.4 (11.6)	4.85 (.84)	79.8 (8.87)	84.7 (10.52)	79 (7.6)	89 (.06)	2.5
LM	18 (9 boys)	74.72 (4.03)	117.3 (12.9)	4.86 (.52)	88.6 (8.89)	118.4 (9.86)	108 (9.9)	98 (1.95)	4.5
AM	20 (9 boys)	96.05 (3.94)	114.8 (13.9)		103.9 (6.53)	114.6 (9.77)	108 (9.4)	99 (.02)	4.1

Note. Groups: SLI = Specific Language Impairment; LM = Language Match MLU-equivalent; AM = Age match.

[a] Age in months

[b] Columbia Mental Maturity Scale, age deviation score at round 5 for AM group

[c] Mean length of utterance in morphemes, not collected on AM group

[d] Picture Peabody Vocabulary Test–Revised, raw score

[e] Picture Peabody Vocabulary Test–Revised, Standard Score

[f] Test of Language Development Primary (2nd ed.), spoken language quotient at round 5 for AM group

[g] Composite tense, representing the arithmetic mean of percent correct use in spontaneous and elicited 3rd person singular *–s*, regular past *–ed*, copula and auxiliary *BE*

[h] Scale of 1 = some high school and 5 = some graduate school

irregular verb forms in either finite or nonfinite sentence positions. A story-type format was continued through this phase. Thirty test sentences were constructed using five verbs (*fall, throw, catch, dig, swim*), three verbal forms (infinitive, correct past, overregularization—for example, *fall, fell, falled*), and two sentence contexts. The particular verbs used in this study represent a subset of irregular verbs that have been part of a past tense experimental probe developed for the longitudinal study (Rice et al., 2000). These verbs were selected for the following reasons: They are monosyllabic forms that have clear meaning referents and are easy to elicit. They appeared frequently as past forms within the participant's spontaneous language samples over the course of the longitudinal study (thereby suggesting they were known to the children). They also appeared as overregularized forms in previous samples from the participants and were reported by Shipley, Maddox, and Driver (1991) as verb forms likely to be overregularized by children ages 6–8 years. Another important criterion is that these verbs could appear as verb complements for the periphrastic causative construction with the main verb *make,* which was used in the experimental task (see Redmond, 1997, for further discussion).

The two-sentence contexts examined in this study were simple declaratives with verbal forms in finite sentence position and *make* + VP periphrastic sentences with verbal forms in nonfinite sentence position. In this first investigation of finite and nonfinite verb sites within the same sentence, it was important to select a sentence context that is meaningful to young children and that offers a clear distinction between finite and nonfinite contexts. The *make* + VP structure appears early on in children's spontaneous utterances and has been reported as a default response by children with SLI in an experimental causative verb elicitation task (Loeb et al., 1998). For these reasons it was chosen as the experimental context of this study.[1]

Sentences 1–6 present the sentences used for the verb *fall*. Asterisks (*) are used to indicate ungrammatical sentences.

* 1. The space guy robot fall into the pool.

2. The space guy robot fell off a block.

* 3. The space guy robot falled into a sandbox.

4. He made the robot fall into the pool.

* 5. He made the space guy fell into the pool.

* 6. He made the space guy falled off a block.

According to the EOI Account, children with SLI demonstrate a protracted use of infinitives in main clauses where a finite form is required. This account predicts that the children in the SLI group should accept sentences like 2 and be more likely than children

[1] It is important to note that it is not our claim that the *make* + VP context is representative of the entire class of complex sentences with subordinate clauses. Instead, there are complex sentences that have finite verbs in the subordinate clause, and there are complex sentences that have "*to* + stem verbs" in the subordinate clause. The technical interpretation of the architecture of complex sentences is not fully worked out (see Haegeman & Gueron, 1999, for examples and discussion; Quirk et al. 1985). For the purpose of this initial inquiry into the issue, it is sufficient to have a sentential context for finite and nonfinite verbs that is clearly meaningful to children and allows for possible confusion between finite and nonfinite surface morphology, and the *make* + VP structure provides that.

in the control groups to also accept sentences like 1. Sentence 3 represents ungrammatical sentences that all three groups of children should find acceptable to some degree because the verbs used represent verbs likely to be overregularized by 6- to 8-year-old children. Because many of the morphophonological mechanisms of children with SLI are assumed to be similar to those of normally developing children, differences between the SLI and LM groups in sensitivity to overregularization errors is not anticipated under the EOI Account. Finally, the EOI Account predicts that sentences like 4 should be clearly preferred over sentences like 5 and 6 by all three groups of children.

The remaining 10 sentences served as control items during the experimental phase and were interspersed throughout the test items. Five of the grammatical and 5 of the ungrammatical sentences used correct and incorrect agreement forms in auxiliary BE + verbing constructions. Sentences 7 and 8 present the control items for the verb *fall*.

7. The space guy robot is falling over.

* 8. The space guy robot am falling again.

The purpose of the control items was to estimate a within-group baseline of performance with non-tense marking errors by which to compare children's performances with the test items. Based on the predictions of the EOI Account, children from all three groups should accept sentences like 7 and consistently reject sentences like 8. Furthermore, where deficits are predicted to occur across the three groups (such as the SLI group's use of infinitives) performance on these items should be significantly lower than their performance on the control items.

Experimental Controls on the Judgment Task

Several adjustments in the judgment task were made to ensure that the influence of processing confounds on the children's abilities to make grammaticality judgments was minimized. For example, the infinitival context used in this study requires a longer sentence than the finite context. The influence of sentence length on the children's judgments was controlled by placing the verb form of interest within the sixth syllable position in each sentence. To do this within the simple declarative finite context, the subject noun phrase in these sentences was elaborated (e.g., *the space guy robot falled* vs. *he made the robot falled*). The sentence lengths across both types of sentences ranged from 8 to 10 syllables, with a mean of 8.75 syllables. The difference in noun phrase length was expected to have minimal effect on the children's ability to judge the well-formedness of the sentences presented to them because it presents very little in the way of additional grammatical or semantic complexity.

Other controls were added across the test and control items to ensure similarity in processing demands across items. Random presentation of items was not possible because of the story-type presentation format. This format was crucial to the children's ability to get an appropriate semantic interpretation and to guard against truth-value judgments (i.e., judging a sentence incorrect on the basis of actuality or plausibility) (Blackmoore, Pratt, & Dewbury, 1995; McDaniel & Cairns, 1996). However, items were spaced such that control-test items (finite/nonfinite contexts and bare stems, irregulars and overregularized forms) alternated. To guard against errors that could be due to expectancy effects, response runs of grammatical and ungrammatical sentences were no longer than four. An additional control was the use of a vowel-initial word following each verb form to guard against distortion-induced errors resulting from coarticulation effects during stimuli presentation. For example, "*the space guy robot fall off a block*" was used instead of "*the space guy robot fall down*" to avoid the possible reading of *fall* as *falled* in the second case.

Description of the Production Task

A production task was used to elicit the verbs *fall, throw, catch, dig,* and *swim* in both simple sentences requiring a tensed form and complex sentences requiring an infinitive form (10 sentences total: 5 verbs × 2 sentence types). In the first part of the production task, children were presented with two pictures: one depicting an ongoing activity (e.g., a circus performer falling into a net) and that same activity at its completion (e.g., a circus performer in a net). Children were instructed to tell the examiner what the character did. The target response was a complete sentence, a simple declarative sentence that included a subject and verb. In the second part of the production task, children were told to pretend that "when somebody pushes a button on a video game controller it makes a toy robot do things." The examiner then pushed buttons and manipulated the toy robot into performing various actions. He then asked the children, "What did I do to the robot?" The target response was a complete sentence, a complex periphrastic sentence of the frame "You made the robot VERB," in which the matrix verb MAKE and its infinitival complement were required.

Training and Reliability

Three examiners, including the first author, collected the data. Children were evenly distributed among the examiners across the three groups. The examiners were not blind to the status of the children. To establish consistency in the administration of the grammaticality judgment and production tasks, 6 normally developing

pilot subjects (age range: 5;0–7;4) were recruited for examiner training sessions. Each examiner was required to reach 95% agreement with each of the other examiners before administering the protocol to the participants. Six of the 56 participants (2 from each group) were used to measure interrater reliability during data collection. Children's responses were recorded online by a second examiner. Interrater agreement was calculated using the total number of agreements divided by the total number of agreements + disagreements and yielded a value of 96% (288/300) for the judgment task and 97% (58/60) for the production task.

Twelve children (4 from each group) were randomly selected and retested by a different examiner to measure the test-retest stability of the judgment procedures. The total number of correct responses to grammatically correct sentences was used to measure the stability of the children's responses over time and across examiners. Significant levels of correlation were observed between the children's test and retest scores: Pearson $r = .822$, $p = .001$. Differences between test/retest scores were due to improved performance during the re-administration.

Results

Grammaticality Judgment Task

The purpose of the grammaticality judgment task was to assess the ability of 8-year-old children with SLI to detect errors that violated different morphophonological and morphosyntactic constraints of tense marking on irregular verb forms. Grammatically correct sentences or ungrammatical sentences containing bad agreement, overregularizations, and bare stems were presented to the participants (see Table 2 for a summary of item groupings). Within simple sentences, two different kinds of errors were investigated: nonadult forms marked for tense (overregularization errors) and nonadult infinitive forms. In complex sentences, past tense irregular forms were presented in nonfinite sentence sites. Both overregularized and irregular past tense forms were inserted into the infinitival complement of a periphrastic sentence to generate ungrammatical sentences. Data were analyzed with a combination of nonparametric and parametric statistics.

Preliminary Analyses of Judgment Task

Forty experimental items were presented to each participant, and the following group means of total correct responses were observed: SLI: $M = 24.45$, $SD = 6.14$; LM: $M = 29.5$, $SD = 6.46$; AM: $M = 35.25$, $SD = 3.16$. An omnibus ANOVA verified the presence of significant group differences [$F(2, 55) = 23.83$, $p < .0001$ (η^2 .464)], and follow-up Dunn-Sidak pair-wise analyses indicated that the following pair-wise comparisons reached the .05 level of significance: AM > LM > SLI. Subsequent analyses were directed at characterizing the observed differences between the affected and unaffected groups and the younger and older groups as being one of lower overall performance across the different items or as the presence of different patterns of error responses.

Data Reduction and Analyses of Sensitivity to Different Violations

Data reduction and analyses of the grammaticality judgments were guided by the procedures and terminology developed in signal detection theory (Egan, 1975; Green & Swets, 1966). Following Rice et al. (1999), observed proportions of hits (acceptance of a grammatical sentence) and false alarms (acceptance of an ungrammatical sentence) were used to calculate the nonparametric statistic A′ based on the following formula provided by Grier (1971): $0.5 + (y - x)(1 + y - x)/4y(1 - x)$, where x = proportion of false alarms and y = proportion of hits.

An A′ value was calculated for each participant on 5 different kinds of grammatical/ungrammatical contrasts, and these values were used as the dependent variable for a series of univariate ANOVAs and follow-up Dunn-Sidak pair-wise comparisons to detect the presence of

Table 2. Examples of grammatical and ungrammatical sentences used in grammaticality judgment task.

Contrast	Grammatical sentence	Ungrammatical sentence
C. Control Sentences Good vs. Bad Agreement	The space guy robot **is** falling over	The space guy robot **am** falling again
1. Finite Forms vs. Infinitives in Finite Positions	The space guy robot **fell** off a block	The space guy robot **fall** off a block
2. Irregular Past vs. Overregularizations in Finite Positions	The space guy robot **fell** off a block	The space guy robot **falled** off a block
3. Infinitives vs. Finite Forms in Infinitive Positions	He made the robot **fall** into the pool	He made the robot **fell** into the pool He made the robot **falled** into the pool

significant group differences.[2] Group performances across the five different contrasts are displayed in Table 3. In each case, observed variations from correct judgments across the three groups were due to children's accepting ungrammatical sentences (False Alarms) rather than rejecting grammatical sentences (Misses). The results of the ANOVA analyses are described below.

Control Sentences: Good vs. Bad Agreement

The purpose of the control items used here was to establish an expected level of accuracy with the experimental materials including the selected irregular verbs and sentence lengths used in this investigation. The control contrast used grammatical sentences that contained correct verbal agreement on the auxiliary element within a Subj. + Aux. + VERB-ing sentence frame (e.g., *the space guy robot is falling over*). The ungrammatical sentences contained incorrect verbal agreement within the same sentence frame (e.g., *the space guy robot am falling again*). Each of the five targeted verbs appeared twice (i.e., in one grammatical and one ungrammatical sentence). The A′ values for all three groups indicated sensitivity to grammatical violations of this kind (SLI: M = .85, SD = .19; LM: M = .86, SD = .13; AM: M = .98, SD = .07). Significant group differences were detected [$F(2, 55) = 4.816$, $p = .012$ (η^2 .149)], and follow-up analyses revealed that the following pair-wise comparisons were significant at $p < .05$: AM > SLI = LM.

Finite Sentence Positions: Irregular Past vs. Infinitives

A key finding coming out of the Kansas longitudinal investigation is that children with SLI demonstrated an extremely protracted use of infinitives in sentence positions that require tensed regular and irregular verbs relative to their normally developing peers (Rice et al., 1998; Rice et al., 2000). Rice et al. (1999) documented similar results for children's judgments of infinitive errors on regular verbs in finite sentence positions. One of the hypotheses guiding this study was the prediction that these children would continue to regard infinitives as a tense marking option during grammaticality judgment tasks with irregular verbs. To test this hypothesis, the relative acceptance of grammatical sentences containing irregular past tense forms in the finite sentence

[2] An alternative strategy for the data analyses reported here would be to treat performance on the control sentences as a covariate, as a way of controlling for variance attributable to differences in the ability of the children to make grammaticality judgments. The strategy was carried out in a series of ANCOVAs, which yielded identical outcomes. We conclude that variance on the control tasks does not influence the outcomes and report the ANOVA outcomes only.

Table 3. Group performances across five grammatical contrasts (standard deviations are shown in parentheses).

Contrast	Hits "Yes" to Grammatical Sentences	False Alarms "Yes" to Ungrammatical Sentences	A'
Control Sentences			
Good vs. Bad Agreement	SLI: 84% (.230)	SLI: 23% (.262)	SLI: .85 (.19) [a] *
	LM: 92% (.170)	LM: 24% (.243)	LM: .86 (.13) [a]
is/am	AM: 97% (.007)	AM: 4% (.139)	AM: .98 (.07) [b]
Finite Forms vs. Infinitives in Finite Positions	SLI: 79% (.220)	SLI: 45% (.361)	SLI: .71 (.27) [a]
	LM: 89% (.219)	LM: 31% (.276)	LM: .83 (.17) [a]
fell/fall	AM: 97% (.107)	AM: 12% (.136)	AM: .93 (.07) [b]
Correct Irregularizations vs. Overregularizations in Finite Positions	SLI: 79% (.220)	SLI: 68 % (.169)	SLI: .57 (.23) [a]
	LM: 89% (.219)	LM: 59% (.170)	LM: .65 (.19) [a]
fell/falled	AM: 97% (.107)	AM: 36% (.206)	AM: .82 (.19) [b]
Infinitives vs. Finite Forms in Infinitive Positions			
a. Infinitive vs. Irregularization	SLI: 77% (.254)	SLI: 62% (.342)	SLI: .54 (.32) [a]
	LM: 86% (.225)	LM: 38% (.328)	LM: .74 (.18) [b]
fall/fell	AM: 94% (.114)	AM: 7% (.163)	AM: .96 (.06) [c]
b. Infinitive vs. Overregularization	SLI: 77% (.254)	SLI: 53% (.299)	SLI: .62 (.26) [a]
	LM: 86% (.225)	LM: 24% (.326)	LM: .84 (.17) [b]
fall/falled	AM: 94% (.114)	AM: 4% (.105)	AM: .98 (.06) [c]

Note. Groups: SLI = Specific Language Impairment; LM = Language Match MLU-equivalent; AM = Age match.

***** Group differences identified by follow-up pairwise comparisons at $p < .05$ are indicated.

positions (e.g., *the space guy robot fell off a block*) was contrasted with ungrammatical sentences containing infinitives in the finite sentence positions (e.g., *the space guy robot fall off a block*). As in all the other contrasts used in this study, the targeted verbs appeared in both grammatical and ungrammatical sentences. Group A′ means on this contrast indicated that all three groups were sensitive to violations containing incorrect bare stems in finite contexts, although the SLI group had the lowest A′ value (SLI: M = .71, SD = .27; LM: M = .83, SD = .17; AM: M = .94, SD = .07). Significant group differences were detected [$F(2, 55) = 7.472$, $p = .0013$ (η^2 .214)], and follow-up analyses indicated that the following pair-wise comparisons were significant at $p < .05$: AM > SLI = LM. These results are consistent with earlier grammaticality judgments elicited from these children with other finite forms (Rice et al., 1999). Although differences in the predicted direction were observed, group differences between the children with SLI and the younger normally developing children did not reach statistical significance.

Finite Sentence Positions: Correct Irregulars vs. Overregularizations

The degree to which children from each group regarded overregularized forms as an acceptable tense-marking option was addressed through a paired set of grammatical and ungrammatical sentences within the experimental items. Each of the five targeted verbs appeared as a correct irregular past tense form in the finite sentence position and as an overregularized form in the finite sentence position (e.g., *the space guy robot falled off a block*). The results of this third grammatical contrast indicated that all three groups demonstrated a willingness to accept overregularizations as a past tense marking option within finite contexts. Mean A′ values indicated that both the SLI and LM children were likely to judge overregularized forms as acceptable as past tense irregular forms, whereas the AM group demonstrated a higher degree of sensitivity to overregularization violations (SLI: M = .57, SD = .23; LM: M = .65, SD = .19; AM: M = .82, SD = .19). Significant group differences were detected, [$F(2, 55) = 7.28$, $p = .0016$ (η^2 .209)], and follow-up analyses indicated that the following pair-wise comparisons were significant at $p < .05$: AM > SLI = LM. This result suggests that children with SLI and younger normally developing MLU-matches regard overregularizations as a grammatical variant for finiteness marking.

Nonfinite Sentence Positions: Infinitives vs. Irregular Past and Infinitives vs. Overregularizations

The hypothesis that children with SLI would not regard finite forms (irregular past and overregularized forms) as nonfinite options within complex sentences was evaluated through two sets of contrasts of grammatical and ungrammatical sentences. In the first set, grammatical sentences containing infinitival forms of each of the five verbs in the infinitival sentence position (e.g., *he made the robot fall into the pool*) were contrasted with a complementary set of ungrammatical sentences that contained the irregular past tense form in an infinitival sentence position (*he made the robot fell into the pool*). In the second set, ungrammatical sentences containing overregularized forms (e.g., *he made the robot falled into the pool*) were contrasted with the grammatically correct sentences. Mean A′ values for both sets of contrasts were highly similar and indicated that whereas the control children were highly sensitive to grammatical violations containing finite forms in nonfinite sentence positions, the SLI group's performance was near chance. Infinitives versus Irregular Past: SLI: M = .54, SD = .32; LM: M =.74, SD = .18; AM: M = .96, SD = .10 [$F(2, 55) = 15.45$, $p < .0001$ (η^2 .36)]. Infinitives versus Overregularizations: SLI: M = .62, SD = .26; LM: M = .84, SD = .17; AM: M = .98, SD = .06 [$F(2, 55) = 17.10$ (η^2 .383)]. Significant group differences were detected in both contrasts at $p < .0001$, and follow-up analyses indicated that across both contrasts the following pair-wise comparisons were significant at $p < .05$: AM > LM > SLI. These results indicated that contrary to the prediction that the affected children knew the distinction between finite and nonfinite irregular verb forms, all three verb forms (irregular past tense, bare stem, and overegularization) were regarded as acceptable in infinitival contexts for the children in the SLI group. Given the interpretative framework of the EOI Account this result was unexpected.

Within-Group Analyses

For each group, follow-up paired t tests were performed to determine whether children's sensitivity across the various tense violation types was significantly different from their performance with the control sentences. For the SLI group, means for all four types of tense violations were significantly lower than those for the control sentences, suggesting that these children experienced difficulties that exceed an expected baseline level of difficulty (obtained p values: finite infinitives = .021, finite overregularizations = .0001, nonfinite irregulars = .0001, nonfinite overregularizations = .0001). For the LM group, significant differences were observed with finite overregularizations and nonfinite irregulars only (obtained p values: finite infinitives = .257, finite overregularizations = .0001, nonfinite irregulars = .004, nonfinite overregularizations = .495). For the AM group, ceiling effects were observed on all tense violations except finite overregularization errors, where the observed p value associated with the difference between these items and the control sentences was .001.

Analysis of the Production Task

Results from the children's productions of irregular verbs in finite and nonfinite sentence positions are presented in Tables 4 and 5. Results from the simple sentence-elicitation task, where the target form was a finite irregular verb in a matrix clause, are discussed first (Table 4). Consistent with earlier characterizations of finiteness marking in this group of children, the SLI and LM groups were highly similar in their levels of correct productions of irregular verbs in simple sentences (SLI: M = 40, SD = 26.8; LM: M = 40, SD = 33.6; AM: M = 79, SD = 30.1). Both group means were significantly lower than those for the AM group [$F(2, 55) = 12.34$, $p < .0001$ (η^2 .310)]. The following pair-wise comparisons were significant at $p < .05$: AM > SLI = LM. These two groups were also similar in their productions of overregularization errors, and both were significantly higher than the AM group (SLI: M = 48, SD = 27.1; LM: M = 58, SD = 32.8; AM: M = 19, SD = 27.9) [$F(2, 55) = 9.65$, $p < .0001$ (η^2 .260)]. The following pair-wise comparisons were significant at $p < .05$: SLI = LM > AM. What differentiated the affected children from the younger unaffected children was the higher proportion of infinitive forms produced by the SLI group (SLI: M = 11, SD = 20; LM: M = 2.2, SD = 6.5; AM: M = 0, SD = 0) [$F(2, 55) = 4.46$, p =.016 (η^2 .139)]. The following pair-wise comparisons were significant at $p < .05$: SLI > LM = AM. These results indicated that as predicted by the EOI account, differences persisted between the children with SLI and their normally developing peers in their production of infinitives in sentence positions requiring finite forms. Children in the SLI group also performed significantly worse with these items during the judgment task than they did with the control items (a pattern not observed in the control groups).

Performance during the grammaticality judgment task indicated that children with SLI were less sensitive to grammatical errors in complex sentences. In these sentences, a finite form was used when a nonfinite form was required. In order to evaluate whether this characterization was limited to properties particular to the judgment task, a complex sentence-elicitation task was administered to the three groups of children. These results are displayed in Table 5. The overwhelming majority of responses from all three groups was the correct use of the infinitive form in the infinitival contexts (SLI: 91%, LM: 98%, AM: 99%). Because of ceiling effects in both control groups, analyses of variance were not performed. The production results are in striking contrast to those obtained during the judgment task, where children in the SLI group performed at near chance levels.

Table 4. Production of irregular verbs in finite sentence positions (standard deviations are shown in parentheses).

Group	Irregular Past	Overregularizations	Infinitives	Double Marked [a]
SLI	40% (26.8)	48% (27.1)	11% (20)	1% (4.5)
LM	40% (33.6)	58% (32.8)	2% (6.5)	0
AM	79% (30.1)	19% (27.9)	0	2% (6.2)

Note. Groups: SLI = Specific Language Impairment; LM = Language Match MLU-equivalent; AM = Age match.

[a] These were errors in which the regular affix was used with the past tense form (e.g., *felled*).

Table 5. Production of irregular verbs in infinitival sentence positions (standard deviations are shown in parentheses).

Group	Infinitives	Irregular Past	Overregularizations	Aspectual *-ing* [a]
SLI	91% (15.2)	2% (15.2)	4% (8.2)	3% (13.4)
LM	98% (6.47)	1% (4.71)	1% (4.71)	0
AM	99% (4.59)	1% (4.59)	0	0

Note. Groups: SLI = Specific Language Impairment; LM = Language Match MLU-equivalent; AM = Age match.

[a] Present Progressive: *you made the robot falling.*

Discussion

The results of the study offer support for many of the predictions that were generated by the EOI account, which regards the tense deficits in children with SLI to be the result of deficiencies in the consideration of tense as an obligatory feature of sentences. For example, relative to control sentences, children in the SLI group were less sensitive to errors involving infinitival forms instead of irregular past tense in finite positions. These children also produced significantly more infinitive forms for irregular past tense during the elicitation task. In contrast, children in the control groups demonstrated high levels of sensitivity to these errors and produced few infinitive errors, suggesting that the SLI group demonstrated particular difficulty with the obligatory nature of irregular past tense. Another area of convergence between predictions and outcomes is that both the SLI and LM groups demonstrated high levels of sensitivity to errors involving incorrect subject/verb agreement and low levels of sensitivity to errors involving

overregularizations in finite sentence positions. This suggests that both the SLI and LM groups were capable of making reliable judgments of well-formedness and that overregularizations represented tense-marking options to both of these groups of children. At the same time, the SLI group lagged behind the higher levels of sensitivity (.82–.98) of the AM group. The implication of this result is that morphophonological development in children with SLI is comparable to that of younger, normally developing children with similar levels of MLU and vocabulary development—a key prediction of the EOI account. Thus, our irregular past tense production and judgment data in simple sentences replicate the judgment results reported in Rice, Wexler, and Redmond (1999) with copula, auxiliary, and regular verbs and the production results obtained by Rice et al. (2000) with irregular verbs.

In contrast, our data from simple sentence contexts are difficult to reconcile with morphophonological accounts of tense-marking deficits associated with SLI which highlight phonological distinctions between morphological variants of tense marking. For example, Leonard's LPS account does not predict the difficulties we observed in our study sample of children with SLI in their detection and production of infinitive errors because the particular irregular verbs used in this study contrast with their infinitive forms in highly salient ways. Likewise, according to the connectionist account of Marchman et al. (1999) the irregular verbs used here should not be particularly problematic because they do not end in /t/ or /d/, the phonological characteristics that presumably make verbs vulnerable to zero-marked errors. In other words, the significant limitations of children with SLI in detecting and producing errors with these particular irregular verbs cannot be characterized as a propensity to "drop affixes," "produce bare stems," or "zero-mark forms."

Extending our discussion to the complex sentence data, it is clear that interpretive challenges exist for morphosyntactic accounts as well. Outcomes from this study that were not predicted by the EOI account occurred during the judgment task when children with SLI were asked to detect errors involving finite forms in infinitival positions (e.g., *he made the robot fell / falled into the pool*). This result was surprising given the low frequency of such errors observed in the elicited productions of these children. Further evidence that children with SLI do not have particular difficulty producing infinitival verbs in the kind of complex sentence examined here comes from a re-analysis of the production data of Loeb et al. (1998), who asked children with SLI and normally developing controls about the patient or agent of an action after observing a scene with toys. Verbs presented in an intransitive context (for example, "*Look, the pig is swimming*") followed by an agent question ("*What did I do to the pig*?") were used to elicit periphrastic sentences. Across 7 children with SLI, a total of 66 periphrastic responses were elicited, and only 4 (6%) of those responses contained an inflected verb in the complement phrase. Considering the production outcomes of Loeb et al., as well as the findings reported here, we regard it as unlikely that children from our study sample were accepting tensed forms in unlicensed sentence sites because they did not know the difference between finite and nonfinite sentence sites. So, if the problems these children were experiencing with nonfinite sentence positions cannot be attributed to underlying limitations with this aspect of morphosyntax, then what accounts for their performance at chance levels?

It is important to consider first if there were any inadvertent differences between the two sentence types used in the judgment task that may have encouraged the children with SLI to accept finite forms in sentences where a nonfinite form was required. Sentence length or the position in the sentence where the targeted verb appeared did not contribute to these differences because stimuli were carefully balanced along these dimensions across the different sentence types. One possibility is that differences in the noun phrases used in the two sentence types may have contributed to differences in the affected children's processing of the sentences. Perhaps the longer subject noun phrases in the simple sentences (*the space guy robot falled off the block* vs. *he made the robot falled into the pool*) were more facilitative of the comprehension and interpretation of the simple sentences because of redundancy of information. However, when Montgomery (1995) examined the effect that redundant words had on children's sentence comprehension he found that children with SLI performed significantly worse on sentences that included redundant words in the subject and object noun phrases than on sentences of similar length that did not include redundant words. Thus, redundancy effects would have adversely affected performance on the simple sentences rather than the complex sentences.

Although both the LPS and the connectionist accounts are silent about children's knowledge of morphosyntactic constraints associated with tense marking outside the matrix verb context, morphophonological accounts may provide some clarification of the discrepancies that appeared across the judgment and production of errors in complex sentences. For example, an explanation from a morphophonological perspective for the observed split in performance between the judgment and elicitation tasks is that children with SLI simply could not process the regular affix on the infinitive overregularization. In other words, these children parsed ungrammatical sentences such as *he made the robot falled out of the pool* as the grammatically correct *he made the robot fall out of the pool*. However, one complication with

this line of explanation is the finding that children in the SLI group regarded both overregularizations and irregular past forms, which contrast in highly salient ways with their bare stems, as acceptable infinitive forms.

In this study we selected the *make* + VP periphrastic construction and a set of developmentally appropriate irregular verbs as a particularly apt context for initiating our investigations into children's intuitions about morphosyntactic constraints within complex sentences. It is possible that the observed discrepancy between the production and judgment data was specific to the semantic/grammatical properties of the sentence stimuli selected for this study. Before a conclusive assessment of the competence of children with SLI in this area of morphosyntax can be made, follow-up investigations must examine other verbal forms and other subordinate clause contexts. The influence of additional syntactic cues such as the infinitive marker *to* and pronominal forms on children's determination of finite/nonfinite sites within sentences (e.g., *he told him to fall off the block*) need to be tested as well. The advancement of this particular line of investigation would provide information that is useful for intervention efforts by specifying which syntactic parameters make it easier or more difficult for children with SLI to process complex sentences.

Overall, the outcomes of this study add further to our understanding of the matrix clause representation of children with SLI; that is, these children accept infinitive irregular verbs as well as overregularized verb forms as attempts at finiteness, an outcome that is in a direct parallel to their production performance. On the other hand, this first investigation of children's judgments of morphophonological variation in matrix clauses versus VP complement phrases shows that judgments of complex sentences can be discrepant from their productions. Complex interactions of morphophonology, morphosyntax, and language processing/parsing strategies are probably at work in such contrasts. It is beyond the scope of this study to clarify these interactions. In the interests of scientific progress, we call for further investigations that systematically disentangle these dimensions.

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Contact author: Sean M. Redmond, PhD, University of Utah, Department of Communication Disorders, 390 S. 1530 E., BEHS Room 1201, Salt Lake City, UT 84112-0252. Email: sean.redmond@health.utah.edu

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Sean M. Redmond, and Mabel L. Rice
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