Tense and Agreement Morphemes in the Speech of Children With Specific Language Impairment During Intervention: Phase 2

Laurence B. Leonard
Purdue University, West Lafayette, IN

Stephen M. Camarata
Vanderbilt University, Nashville, TN

Monika Pawłowska
Barbara Brown
Purdue University, West Lafayette, IN

Mary N. Camarata
Vanderbilt University, Nashville, TN

Purpose: The goals of this investigation were to determine whether treatment assists children with specific language impairment (SLI) in the use of grammatical morphemes that mark tense and agreement and whether treatment gains influence the children's use of other, untreated morphemes.

Method: Twenty-five children with SLI participated in 96 intervention sessions designed to facilitate the children's use of third-person singular -s or auxiliary is/are/was.

Results: The children showed significantly larger gains on the target forms than on control forms (e.g., past tense -ed) that were monitored but not included in intervention. Along with possible treatment-related generalization across morpheme types, there was also evidence of one morpheme type influencing another when neither was the target of intervention.

Conclusions: Although the results provide clear evidence for intervention effects, it appeared as if maturational factors also played a role. The findings are discussed in terms of their implications for treatment and for characterizing development in SLI.

KEY WORDS: language intervention, specific language impairment, grammatical morphemes

It is well known that many preschool-age English-speaking children with specific language impairment (SLI) are limited in their use of grammatical morphemes pertaining to tense and agreement. These morphemes include present third-person singular -s, past tense -ed, and both copula and auxiliary is, are, am, was, and were. The children's weakness in their use of these morphemes has been documented in several ways. For example, these children often show lower percentages of use of these morphemes in obligatory contexts than do younger, typically developing children with similar mean length of utterance (MLU; e.g., Leonard, Eyer, Bedore, & Grela, 1997; Oetting & Horohov, 1997; Rice & Wexler, 1996). The use of these morphemes appears to be an especially accurate means of distinguishing children with SLI and same-age peers who are developing language normally, as composite scores based on the use of these morphemes show high levels of both sensitivity and specificity (Bedore & Leonard, 1998; Rice, 1998).

Many children with SLI show increased ability to use these tense and agreement morphemes across time. Nevertheless, even by the early elementary school years, some of these children are not yet at levels of mastery (Marchman, Wulfeck, & Ellis Weismer, 1999; Norbury, Bishop, &
Briscoe, 2001; Rice, Wexler, & Hershberger, 1998). Individual cases have been described who show severe deficits in the use of these morphemes even during adolescence (van der Lely, 1997).

Given the special difficulties that tense and agreement morphemes pose for children with SLI, it is not surprising that there have been efforts to facilitate these children’s use of such morphemes. In fact, language intervention studies of this type have appeared in the literature for some time. The specific morphemes serving as targets have included copula forms (Hegde, 1980; Hegde, Noll, & Pecora, 1979), auxiliary is and are (Ellis Weismer & Murray-Branch, 1989; Leonard, 1975; Wilcox & Leonard, 1978), and present third-person singular -s and past tense -ed (Camarata, Nelson, & Camarata, 1994; Nelson, Camarata, Welsh, Butkovsky, & Camarata, 1996). Several different procedures have been used in these studies, including imitation (Hegde, 1980), modeling (Ellis Weismer & Murray-Branch, 1989), focused stimulation (Culatta & Horn, 1982), and conversational recasting (Camarata & Nelson, 1992). Given the controls used in most of these studies, it would appear that the gains reported can be attributed to intervention effects rather than to extraexperimental factors such as maturation. One exception to this pattern is a study by Fey and Loeb (2002). These investigators reported relatively little success with a procedure in which recasting with yes–no questions (e.g., Is that man eating a cookie?) was used to facilitate children’s use of auxiliary is. Fey and Loeb did not interpret this finding to mean that intervention focusing on auxiliary is cannot be successful. Rather, they viewed their finding as refuting the assumption that an input rich with inverted auxiliary forms will necessarily help children acquire morphemes such as auxiliary is when such morphemes have not yet appeared in the children’s speech.

Even in the studies reporting clear gains in the children’s use of tense and agreement morphemes, these gains have been far from dramatic. Rarely are any children in these studies reported to have acquired mastery of the target morphemes by the end of the treatment period. Considering some of the prominent accounts of the grammatical deficits of SLI, the children’s apparent failure to achieve mastery in these intervention studies could be quite significant.

Rice and her colleagues have described the limited use of tense and agreement morphemes by children with SLI as reflecting their protracted stay in a maturational period in which tense and agreement are treated as optional rather than obligatory in main clauses (e.g., Rice & Wexler, 1996; Rice et al., 1998). It is assumed that during this optional period, children with SLI may produce either the appropriate form (e.g., Daddy rides his bike) or a nonfinite form (e.g., Daddy ride his bike). The latter is roughly akin to the nonfinite phrase in the adult utterance Let’s make Daddy ride his bike. According to Rice (2004), it is an open question as to whether development out of this extended period of optionality can be hastened through efforts at intervention, especially in the absence of signs of maturational change at the point when intervention begins. A similar view has been proposed by van der Lely (1997, 1998), who assumes that the optional use of tense and agreement by children with SLI reflects a relatively permanent state of these children’s grammars. Could it be the case that mastery of tense and agreement morphemes is not a plausible intervention goal for children with SLI?

The goals of intervention are not limited to children’s mastery of the forms specifically targeted for treatment. A crucial factor in language intervention is the ability of the learner to use newly acquired information as the basis for acquiring additional information that was not part of the original intervention material (e.g., Camarata & Nelson, 2006). Such generalization is essential; treatment would be endless if children never made gains beyond the material that was specifically taught. Considering that children with SLI seem to have difficulty with a collection of morphemes that share the features of tense and agreement, it is possible that treatment gains shown by these children on certain tense and agreement morphemes in intervention might generalize to other, untaught morphemes sharing some of the same features. For example, if children’s inconsistent use of present third-person singular -s were related to the present tense and third-person singular status of this morpheme, might gains in the children’s use of this morpheme be accompanied by gains in a morpheme such as is?

Studies of generalization of tense and agreement morphemes during intervention are rather limited. Early studies suggest that gains in the use of copula forms can be expected following intervention that emphasizes auxiliary is and are forms and vice versa (e.g., Gray & Fygetakis, 1968; Hegde, 1980; Hegde et al., 1979; Leonard, 1974). Of course, copula and auxiliary be forms are phonetically identical. Less is known about across-morpheme generalization when the morphemes share certain grammatical features but bear little resemblance to each other in terms of phonetic or distributional properties.

In a recent study, we examined the treatment gains made by children with SLI on a collection of tense and agreement morphemes (Leonard, Camarata, Brown, & Camarata, 2004). Three- to 4-year-old children with SLI were assigned to treatment conditions designed to facilitate use of either present third-person singular -s or auxiliary is/are/was. The children’s use of past tense -ed was also assessed and monitored, although this morpheme did not serve as an intervention target for any group. The children participated in 48 intervention sessions. In each session, a story was read to the child that contained multiple instances of the target form assigned to the child, along with grammatically contrasting forms.
A play period followed during which the clinician responded to the children’s utterances with recasts containing the target form.

Production probe testing following the 48 intervention sessions revealed that the children made significantly larger gains on the target forms (either third-person singular -s or auxiliary is/are/was) than on past tense -ed. The children receiving treatment on third-person singular -s also showed greater gains on auxiliary is/are/was than on past tense -ed even though auxiliary forms were not the focus of intervention. For the children receiving treatment on auxiliary is/are/was, gains on third-person singular -s seemed to be intermediate; use of this morpheme after treatment was numerically but not significantly higher than use of past tense -ed, but unlike the case for -ed, its use was not significantly lower than use of the target.

Although each group showed significantly larger gains on the target form than on past tense -ed, the treatment gains were rather modest. For the children receiving intervention for the use of third-person singular -s, the mean percentage correct use of -s on the probes after 48 sessions was only 35. The highest percentage for any child was 82. For the children receiving treatment on auxiliary is/are/was, the mean percentage correct on these auxiliary forms after 48 sessions was only 24. The highest percentage for any child was 65.

Several conclusions were drawn from these findings. First, it appeared that the gains in the children’s use of the target forms were attributable to the intervention efforts. One of the nontarget forms, past tense -ed, showed significantly smaller gains than the target forms even though, on average, this morpheme is acquired by children at approximately the same age as the forms serving as targets (e.g., Brown, 1973; deVilliers & deVilliers, 1973). Second, changes were also seen in the children’s use of nontarget forms that reflect both tense and agreement: auxiliary is/are/was for the children receiving treatment on third-person singular -s and third-person singular -s for the children receiving treatment on auxiliary is/are/was. This finding suggests that indirect benefits might accrue if the nontarget morpheme shares multiple features with the target morpheme. Such generalization is far from trivial. It implies that after acquiring information and practice with a morpheme reflecting tense and agreement, the children were able to identify other morphemes in their daily linguistic environment that involved the same features, even though these other morphemes had a different topography (function word instead of inflection or vice versa, and following/contracted with a preceding noun instead of attached to a verb or vice versa).

In this article, we report a significant extension of the Leonard et al. (2004) study. There are several reasons to explore these issues further. First, despite significant gains on the target forms, the children did not approach mastery after 48 treatment sessions. Leonard et al. noted that 48 sessions may have been insufficient. In the present study, treatment was extended an additional 48 sessions, for a total of 96 sessions. This issue is important because gains up to the levels demonstrated by the children in Leonard et al. translate into morpheme use that could be characterized as still falling in the optional stage described by Rice and her colleagues. It remains to be seen if children with SLI can move out of this optional stage with the assistance of intervention. Because these children’s protracted stay in the optional stage is described as the result of a maturational principle not yet taking hold (Wexler, 2003), mastery dictated by the timetable of an intervention program may not be a safe assumption.

Another reason to extend the work of Leonard et al. (2004) is that nontarget morphemes involving tense and agreement might have benefited from progress on the target morpheme. This possibility requires further investigation. In the present study, we add an assessment of the children’s use of copula is/are/was. Children receiving treatment in the use of auxiliary is/are/was might well show gains on copula is/are/was thanks to the phonetic forms that the two types of morphemes share (e.g., Hegde, 1980; Leonard, 1974). Less clear is whether children receiving treatment on present third-person singular -s will show gains on these copula forms. If these children show gains on copula and auxiliary forms as well as on the target, a stronger case can be made that the number of shared features among morphemes is an important factor, apart from the phonetic similarity of these morphemes.

The inclusion of copula is/are/was has an additional benefit. As already noted, earlier studies suggest that children receiving treatment on copula is might show gains on auxiliary is and vice versa. However, little is known about the other allomorphs. For example, if children receiving treatment on auxiliary is/are/was show gains on auxiliary is and was but not on auxiliary are, will they also show progress on copula is and was but not on are? Or, does degree of generalization to copula forms depend in part on the number of auxiliary allomorphs that show gains during treatment? Data of this type will provide information as to the relative importance of phonetic similarity as well as shared tense and agreement features in children’s development of nontarget morphemes.

Another reason to extend the work of Leonard et al. (2004) pertains to the children recruited to participate in the intervention study. Although the children showed clear deficits in expressive grammar as measured by the Structured Photographic Expressive Language Test—Primary (SPLET–P; Werner & Kresheck, 1983) and
Developmental Sentence Scoring (DSS; Lee, 1974), many of the children earned age-appropriate scores on the Peabody Picture Vocabulary Test—III (PPVT–III; Dunn & Dunn, 1997). Children in the age range studied by Leonard et al. (2004; 3;0 [years;months] to 4;4; M = 3;6) with adequate comprehension skills can show significant growth in language skills between the ages of 3 and 5 years, even without intervention (see review in Whitehurst & Fischel, 1994). Leonard et al. (2004) reported that after 48 treatment sessions, the children continued to exhibit low scores on tests of expressive grammar. However, some or many of these children might have proven to be late bloomers if followed for a longer period. We examine this possibility in the present study by determining whether, after 96 treatment sessions, the children continue to display significant deficits in expressive grammar on standardized tests of language.

In summary, in this study we attempted to determine whether a relatively high number of treatment sessions could enable children to reach mastery levels in the use of tense and agreement morphemes. Furthermore, we examined the patterns of change in the nontarget morphemes to discover if generalization was limited to morphemes that were similar phonetically, or extended to other morphemes that shared the grammatical features of tense and agreement. Finally, we wished to determine whether the pattern of results observed was influenced by the unintentional inclusion of children (if any) who may have been late bloomers.

Method

Participants

Twenty-five children participated in the investigation. Along with meeting the customary selection criteria for SLI, the children met other criteria that were specific to this investigation. At the outset of the study, the children ranged in age from 3;0 to 4;4 (M = 3;5). Nineteen of the 25 children were boys. One child was African American, and the remaining children were of European descent. All children came from a monolingual English-speaking home. At the beginning of the investigation, all of the children passed a hearing screening at 20 dB (HL) for each ear at 500, 1000, 2000, and 4000 Hz. During the 12 months preceding the study, no child had experienced an episode of otitis media. All children scored below the 10th percentile on each of these measures. Although the children exhibited limited grammatical skill, all of them showed some degree of use of early-emerging grammatical morphemes such as noun plural -s and/or progressive -ing.

An additional selection criterion was that the children’s parents must have already been in contact with a clinical service provider with concerns about the children’s language development. This criterion added to the validity of the diagnosis of language impairment and, we believe, increased the likelihood that the children’s participation in the intervention program would be long-standing. Once the parents contacted the service providers, these providers informed the parents about the intervention study, and the parents contacted the research project staff. Children were not excluded from receiving other types of clinical services, including speech-language intervention, as a result of enrolling in the study. Six children were receiving therapy once per week through the local school district. These therapy sessions ranged from 30 to 50 min in duration. Another child was enrolled in therapy three times per week for 20-min sessions. Three children were enrolled in a language-based preschool program that ran either 2 or 3 mornings per week. Three children attended a regular preschool 2 mornings per week. Three additional children attended a day care program 5 days per week. The remaining 9 children were not participating in any other education or therapy program. For the children receiving therapy, articulation was the major focus. The language-based preschool programs emphasized language stimulation including vocabulary learning, conversational participation, and basic concepts. For 2 children, some attention was also placed on the use of -ing. The regular preschool and day care programs attended by 6 of the children did not emphasize language stimulation.

The children were also required to demonstrate sufficient phonological ability to use the grammatical morphemes under investigation. Each child had an accuracy score of at least 80% on a 53-item screening test of word-final /s/, /z/, /t/, and /d/ in monomorphemic words (e.g., fox, nose, belt, hand).

An additional criterion for inclusion was a significant limitation in expressive language ability, as measured by both the Structured Photographic Expressive Language Test—Preschool (SPELT—P; Werner & Kresheck, 1983) and Developmental Sentence Scoring (DSS; Lee, 1974). All children scored below the 10th percentile on each of these measures. Although the children exhibited limited grammatical skill, all of them showed some degree of use of early-emerging grammatical morphemes such as noun plural -s and/or progressive -ing.

Finally, the children could show only limited use of the grammatical morphemes that were to serve as targets during intervention or were to be monitored during the intervention period. The children’s limited use of these morphemes was determined through administration of a set of grammatical morpheme probes (see below).

Because 1 of the children (age 4;4) was African American, it was important to ensure that his selection
as a participant was appropriate. Two of the forms of interest in this study, auxiliary was and copula was, are obligatory in both African American English and mainstream American English (e.g., Seymour, Roeper, & deVilliers, 2003). The African American child showed 0% use of both of these forms on probes administered immediately before treatment. Therefore, there was less risk that this child had age-appropriate language abilities and was erroneously included because his dialect permitted variable use of most tense/agreement morphemes.

Receptive language ability was not a criterion used in selecting the children. However, all children were administered the PPVT–III (Dunn & Dunn, 1997). The children’s standard scores spanned a wide range, from 63 to 115 (M = 91). Six of the children earned a standard score below 85.

Eighteen of the 25 children had participated in Leonard et al.’s (2004) intervention study. The intervention described in that report covered 48 sessions. These children continued for an additional 48 sessions, following the same procedures as the first 48 sessions (see below). Some of the children whose data were presented in the earlier report did not continue after the first 48 sessions. The families of these children either moved to another location or had to adopt a new work schedule, or transportation became difficult because of the birth of another child. Seven of these children were replaced by children who met the same selection criteria. The children serving as replacements participated in all 96 intervention sessions.

Tests and Spontaneous Speech Samples

Each child participated in two assessment sessions before admittance into the study. During these sessions, the SPELT–P, LIPS, PPVT–III, screening test of phonology, and hearing screening were administered, and a spontaneous speech sample during play was obtained. The speech samples contained an average of 183 spontaneous utterances (SD = 71). The children’s MLU in morphemes in these samples averaged 2.33 (SD = 0.84). We selected 50 utterances from the samples that consisted of at least a subject and a verb and calculated DSS scores on these samples. However, for several children’s samples, 50 utterances containing both a subject and verb could not be found, and DSS scores for these samples were computed by dividing the total score by the number of subject–verb utterances obtained. In addition, each child’s sample was examined for evidence of the grammatical morphemes of interest. These morphemes were usually lacking from the children’s samples, though the number of obligatory contexts proved too small for meaningful analysis. Copula forms did occur in these samples with some frequency, though the large majority of these appeared in utterances such as What’s this?/What’s that? or in frequently used contexts such as There’s and here’s. Immediately following the 96th intervention session, another spontaneous speech sample was obtained from each child. The mean sample size for these samples was 218 spontaneous utterances (SD = 55), with MLUs in morphemes averaging 3.56 (SD = 1.01). DSS was calculated for each of these samples.

Grammatical Morpheme Probes

To assess the children’s use of the grammatical morphemes, and to monitor the children’s progress in intervention, a set of tasks was designed. Each task involved a number of items in which the children viewed enactments with toys and props and were asked to describe the activities in a way that obligated the grammatical morpheme of interest. The tasks were used to elicit the children’s use of the following grammatical morphemes: (a) third-person singular -s, (b) auxiliary is/are/was, (c) copula is/are, and (d) past tense -ed.

These particular grammatical morphemes were selected for study because (a) they all deal with tense and agreement, an area of special weakness for children with SLI; (b) they have been the subject of a good deal of research with typically developing children; and (c) across typically developing children, these morphemes appear to be acquired at approximately the same age, even though there is individual variation in the particular morphemes that might emerge first or last. Early reports suggested that third-person singular -s, copula is/are, and past tense -ed are used at mastery levels (above 90% in obligatory contexts) by 3 years of age (e.g., Brown, 1973; deVilliers & deVilliers, 1973), with auxiliary is/are mastery occurring somewhat later (Richards, 1990). More recent research suggests slightly less advanced use of these morphemes at 3 years of age. Rice, Wexler, and Cleave (1995) found that a group of typically developing children with a mean age of 3;0 used third-person singular -s and past -ed in 51% and 56% of their obligatory contexts, respectively. Rice et al. also examined the children’s use of copula and auxiliary be forms combined and found average percentages of use of 68%. Fewer studies have focused on children’s use of auxiliary was and copula was. In a study of typically developing children with a mean age of 3;6, Leonard et al. (2003) found that percentages of use for auxiliary was averaged 81%.

Third-person singular -s. We used 12 items to assess the children’s use of the third-person singular -s inflection, adapting the task developed by Schütze and Wexler (2000). The experimenter introduced the child to the toy
character, Egbert the Dinosaur. The child was told that some characters (manipulated by a second experimenter) would appear and tell the child and Egbert about things they do. However, Egbert might hide in his egg when the characters appear, and the child might have to answer Egbert’s questions about what the characters do (see Example 1).

1. Dog: In the summer, I love to go swimming. Do you? I swim all day long.
   (Demonstrates)
   Egbert: Oh-oh, I didn’t see. What does that dog do all day?
   Exper 2: He _____

   Auxiliary is/are/was. Our task for auxiliary is/are/was forms was adapted from McShane and Whitaker (1988). The task involved 18 items, 6 for each of the 3 auxiliary forms is, are, and was. Two additional items created obligatory contexts for auxiliary were. We used these additional items only to highlight the relevance of number in past progressive contexts. A puppet show theatre was used as the setting. The theatre was placed on a table. The child and one experimenter were seated at one end of the table, where they could see the performance. A second experimenter was seated at the other end of the table, behind the stage curtain. The child was introduced to the puppets Scaredy Cat (used for is/are) and Sleepy Bear (used for was) and was informed that Scaredy Cat wanted to hear about the shows but was scared of everything and might hide when the show was on. Because she was curious, Scaredy Cat might ask about the actions on stage while she was hiding and unable to see. For the is/are items, the curtain opened, and the second experimenter made the character(s) perform an action (e.g., two toy dogs drive a car around in circles). During the action, Scaredy Cat said to the child, “I can’t see. Please tell me about the show.” For was items, the child was told that Sleepy Bear liked to watch shows but sometimes fell asleep during the shows and needed to be told what had happened. The curtain then opened, and the character performed an action (e.g., Daisy Duck sweeping the floor) for 12 s. Sleepy Bear fell asleep as the curtain opened and woke up just after the curtain had closed. Sleepy Bear then said to the child, “I fell asleep. Please tell me about the show.”

   Copula is/are/was. The task used for copula is/are/was resembled the task for auxiliary is/are/was except that static events rather than actions were shown to the child. Eighteen items were used, 6 for each of the morphemes is, are, and was. Two additional items created obligatory contexts for copula were, to highlight the potential importance of number as well as tense. For each item, two characters were presented along with toys or props associated with each. For copula is and are items, the first experimenter commented on the scene and described the toys or props of one character. She then began a parallel sentence for the child to complete by describing the toys or props of the second character. For example, after the second experimenter placed Telly and Big Bird next to their respective toy wagons, the first experimenter said, “Look at the wagons! Telly’s wagon is small, but Big Bird’s wagon ______.” For 3 of the is items and 3 of the are items, the experimenter’s description of the first character’s toys or props included is, as in the example above. For the remaining 3 is and 3 are items, the experimenter’s descriptions included are (as in “Bear’s towers are tall, but Ojo’s tower _____”). Items for copula was were similar to the copula is and are items except that the first experimenter began the description after the curtain had closed. For 3 of the 6 copula was items, the experimenter’s description of the first character’s toys or props included was, and for the other 3 items, the experimenter’s description included copula were (e.g., “Cookie Monster’s cars were orange, and Pooh’s car ______”).

   Past -ed. Twelve items were used to assess the children’s use of the past tense -ed inflection. The task used for this morpheme type was also adapted from Schütze and Waxler (2000). The child was introduced to a puppet, Pooh, and was told that Pooh often forgets to watch what is happening. We then asked the child to help Pooh by describing the actions that had just been performed. For each item, there were two toy characters that were made to perform distinct actions. Before performing the action, each character asked the child a choice question about the object to be acted on. After hearing the child’s answer, the character immediately performed the action. Pooh, who had not been paying attention, then asked what had happened (see Example 2).

2. Experimenter: Elmo wants to draw something.
   Elmo: Should I draw a smiley face or a cat?
   Child: A smiley face.
   (Elmo then draws a smiley face.)
   Experimenter: Zoe wants to push something.
   Zoe: Should I push my motorcycle or my train?
   Child: Your train
   (Zoe then pushes her train.)
   Pooh: I forgot to watch. Could you tell me what just happened?
   Experimenter: (Holding up the first set of props)
   Elmo drew a smiley face (holding up the second set of props), and Zoe ______

As seen in the example above, the items were designed to promote the use of direct objects with possessive pronouns (his, her) or indefinite articles. These represented phonetic contexts that would facilitate the transcriber’s judgment of whether -ed was present in the child’s response.
**Administration of the Probes**

The grammatical morpheme probes were administered to each child immediately before treatment (Time 1), after 48 treatment sessions (Time 2), and again after 96 treatment sessions (Time 3). The judge who transcribed the children’s responses was not aware of the treatment condition to which a child was assigned and, consequently, did not know which morpheme type, if any, constituted the target. This judge helped administer the probes for some of the children; therefore, she often knew whether a given probe session represented the first, second, or third time the child had received the probes. However, the judge was also responsible for transcribing responses from audiorecordings of probe sessions that she had not attended. On some occasions, she transcribed responses from later probe administrations before she transcribed responses from earlier probe administrations. Because these were audiorecordings that lacked visual clues, she was often unaware of the sequence in which these sessions had taken place. The transcriptions were scored by another judge who had not taken part in the probe sessions.

**Treatment Conditions**

The children were assigned to either a treatment condition that focused on third-person singular -s (n = 15) or a treatment condition that focused on auxiliary is/are/was (n = 10). These assignments were made without regard to the children’s ages, test scores, or pretreatment levels of use of third-person singular -s versus auxiliary is/are/was. The mean age for the children receiving treatment on third-person singular -s (the 3S children) was 3;5. The children receiving treatment on auxiliary is/are/was (the AUX children) had a mean age of 3;6. The 3S children had somewhat higher LIPS scores (M = 109) and PPVT-III scores (M = 94) than the AUX children (LIPS M = 103, PPVT-III M = 86). Administration of the probes at Time 1 revealed that all children showed less than 25% use of the target form to which they were assigned (range = 0%–18%; see below).

The children’s assignment to treatment conditions followed a method designed to keep the personnel serving as clinicians naive both to the hypotheses of the study and to the other grammatical morphemes being monitored. Each child’s assignment to a treatment condition was determined by the condition that was available at the child’s research site at that particular time interval. We did not delay any child’s treatment to permit him or her to take part in a different treatment condition, and no child who otherwise qualified for the study was excluded because of the particular treatment condition that was available. Note that all of the children could have benefited from either condition, given their limited levels of use of the grammatical morphemes under investigation.

The method of assignment proceeded as follows. We saw the children at two sites: Purdue University and Vanderbilt University. At each site, several personnel (speech-language pathologists and/or speech-language pathology students) were employed to play the role of clinicians. The clinicians at the same site during the same time period provided treatment in the same condition, using either third-person singular -s or auxiliary is/are/was as the target. During the same time, all of the clinicians at the other site provided treatment in the other condition. The clinicians at each site were not aware that different morphemes were serving as targets for other children. The clinicians providing treatment were not involved in the assessment of the children before, during, or after treatment. They had no knowledge of the children’s degree of use of the target morphemes during these assessments and were unaware that other morphemes were also being monitored.

This method of assigning children to treatment conditions was chosen rather than random assignment to conditions because the latter would have resulted in the clinicians at each site becoming aware of the larger collection of grammatical morphemes actually being monitored in the study. This awareness might have influenced the clinicians’ behavior during the treatment sessions, rendering the two treatment conditions less distinct.

We informed the children’s parents that the primary purpose of the treatment sessions was to assist children in the development of their sentence structure (grammar). However, the specific morpheme type serving as the target was not identified. (It can be recalled that all potential targets could have served as developmentally appropriate goals for every child.) Parents were invited to observe the treatment sessions. Given that the stories contained grammatical structures in addition to the forms serving as targets, and the clinicians’ responses to the child were not limited to recasts (see below), we did not believe that the parents’ observations of these sessions would prompt them to emphasize the morpheme types serving as targets in their own interactions with their children. When parents did request information regarding ways to assist their children’s language development, we provided them with suggestions concerning book reading, vocabulary stimulation, and general responsiveness to their children’s conversational bids.

**Treatment Procedures**

The 3S and AUX treatment conditions followed identical procedures except for details dictated by the choice of targets. Each treatment session involved two types of activities. In the first activity, the clinician read a story to the child while acting out the events in the story using toys and props. In the second activity, the clinician provided conversational recasts of the child’s utterances.
during play. The stories used in the first activity contained multiple examples of the target form (see below) and thus represented a version of focused stimulation. During conversational recasting, each of the clinician’s recasts of the child’s utterances contained the target form. These two procedures of focused stimulation and conversational recasting were selected as the procedures to use because the literature provides considerable support for their success with grammatical targets (see review in Leonard, 1998).

3S treatment. Children assigned to the 3S condition participated in 96 treatment sessions, 4 per week. In most cases, the children participated 2 days per week, with 2 sessions held on each day. A play period or a language stimulation activity occurred between the 2 treatment sessions. This schedule resulted in a treatment regimen that spanned 24 weeks (6 months), although after the 48th treatment session, probes were readministered, resulting in a participation period that extended beyond 6 months for each child. Sessions were rescheduled if days were missed due to illness or vacation.

Each treatment session began with the clinician reading a brief story and acting out the story with a corresponding set of toys. Forty-eight different stories were written for this purpose. These 48 stories were used during the first 48 sessions, and then reused, in a different random order, during the subsequent 48 sessions. Thus, each story was used twice, with from 2 weeks to 3 months separating the first and second use of the story. The target form, third-person singular -s, appeared 12 times in each story, with at least six different verbs. The stories were designed so that they contained no instances of auxiliary or copula be forms and no instances of past -ed. To increase the likelihood that the grammatical features carried by -s would be clear to the child, the script of the story also contained contrastive elements. Four sentences contained the third-person plural verb form (that carries no overt inflection, e.g., They run) using verbs that were inflected with -s elsewhere in the story (e.g., runs). Similarly, four sentences were included with irregular past forms of verbs (with third-person singular subjects, e.g., She ran) that had appeared with -s. Four additional sentences contained one of the previously inflected verbs in a nonfinite context with a third-person singular subject (e.g., Let’s watch the girl run). Nonfinite contexts were instances in which the nonfinite verb and its subject appeared in the embedded clause of the clinician’s question (e.g., “Did you see Jessica ride her new bike?”), statement (“I saw the monkey go in a tree”), or request (e.g., Let’s have Bobby drive the tractor”). Excerpts from one story containing these manipulations with the verbs love, eat, and buy can be seen in Example 3).

3. Do you know what Harry loves? He loves cookies. He eats cookies all the time. He buys cookies with his own money. Let’s have Harry buy some Oreos … He bought enough to share! … Now Harry and his sister eat the Oreos together. They love cookies!

It was assumed that the presentation of multiple instances of third-person singular -s along with grammatically contrastive forms would be beneficial to the children’s learning. However, recall that some investigators (Rice, 2004; Rice & Wexler, 1996) have assumed that children with SLI treat tense and agreement as optional and sometimes select a nonfinite form in place of the appropriate tense/agreement form. If the children’s problem included or was limited to a failure to grasp the obligatory nature of the -s inflection in third-person singular finite contexts, the presentation of grammatically appropriate verb forms may not be sufficient. Therefore, in each story, we also included a deliberate error by the clinician that she immediately and overtly corrected (see Example 4).

4. I see the ice cream man! … Look what he makes! *He make ice cream sundaes! Whoops, I mean he makes ice cream sundaes.

Immediately following the story, the child and clinician played with the toy characters and props used in the story. As the child and clinician played, the clinician introduced additional toys and props in order to maintain the child’s interest. During this play phase, the clinician provided 12 recasts that contained third-person singular -s forms. To keep track of the recasts already provided and to help the clinician anticipate potential recasts, the clinician used a list containing the verbs that had been used in the story and that were relevant to the toy characters and props at hand. Recasts were defined as conversationally appropriate replies to utterances produced by the child. The clinician’s goal was to provide a recast containing a third-person singular -s form of the same verb used in the child’s preceding utterance. If the child’s spontaneous play with the toys and props did not result in a moderate rate of utterances that could be readily recast with the target form, the clinician made the toy characters perform some of the actions used in the story in the hope that the child would describe them. Recasts of these descriptions were then provided. If this strategy did not lead to a sufficient number of recasts, the clinician provided the child with choice questions about which of two actions should be performed by the toy character. While acting out the selected action, the clinician provided a recast of the child’s response. For example, if the clinician asked, “Should she play on the swing or run to the store?” and the child responded “Run to the store,” the clinician might reply with, “She runs really fast!” as she has the character perform the action.

Although providing recasts was a priority during the play segments, the clinicians were always responsive
to the children’s requests and questions and were free to initiate conversation about the materials. However, we had to ensure that the other tense/agreement forms being monitored were not produced so frequently by the clinician as to wash out the effects of the exposure to third-person singular -s. Recall that the clinicians were not aware that other morphemes were being monitored. Therefore, steps had to be taken to reduce the frequency with which these morphemes would be produced without calling attention to them. This was accomplished by providing clinicians with a list of sentence constructions that could be used in utterances that were not recasts. These constructions were described to the clinicians as utterances that had wide applicability and should be practiced to the point of feeling natural to the clinicians. On this list were sentence constructions with modal verbs such as, “Yeah, he sure can eat a lot!” and “She’ll run over here”; yes–no questions with auxiliary do, such as, “Do you have a dog?”; and references to first person, such as, “I like soccer too.”

In summary, across the 96 treatment sessions, there were 1,152 presentations of the target in stories (96 × 12) and 1,152 presentations of the target in recasts (96 × 12). The total number of target exposures during the intervention period, then, was 2,304.

AUX treatment. The procedures used for AUX treatment were the same as those used for 3S treatment. There were 48 different stories, each used twice (once during the first 48 sessions, once during the second 48 sessions). Each story contained four examples of auxiliary is, four of auxiliary are, and four of auxiliary was. The lexical verbs used with these different auxiliary verbs overlapped (e.g., is helping, is running, are helping, are sleeping, was running, was sleeping). In addition, four (overlapping) verbs appeared in nonfinite contexts, as in, “Do you see him helping his mom?” In each story, the clinician failed to use the auxiliary form and immediately self-corrected, as in, “**Spot just running all over. Whoops, I mean, Spot was just running all over.**” Only is, are, and was as auxiliary verbs were used in the stories; copula forms did not appear. Similarly, neither third-person singular -s nor past tense -ed appeared in any of the stories.

As can be seen from the examples, in AUX treatment, as in 3S treatment, there were contrasts between third-person singular and plural (is–are), between present and past (is–was), and between finite and nonfinite (are helping–helping). In each story, for AUX treatment and 3S treatment, the target morphemes were presented 12 times in total. However, in AUX treatment, three overt morphemes—is, are, and was—served, collectively, as targets.

The recasting segment of each session was conducted as in 3S treatment, except that the recasts were four of each of the auxiliaries is, are, and was, for a total of 12. Across the 96 treatment sessions, then, there were 1,152 presentations of auxiliary targets in the stories (384 of each auxiliary form) and 1,152 presentations of these targets in recasts, for a total of 2,304 exposures, with 768 exposures for each of the three auxiliary forms.

### Procedural Validity

All clinicians underwent training in the proper treatment procedures before their participation in the study. During this training period, the clinicians interacted with pilot children. As the clinicians attempted to carry out the activities, any deviations in procedure were pointed out to them, and they had an opportunity to practice the procedures additional times to ensure that they could carry them out accurately.

To assess procedural validity during the study itself, we randomly selected recordings for 24 treatment sessions and scored them for accuracy of implementation. Fourteen of these sessions involved third-person singular -s as the target and 10 sessions focused on auxiliary is/are/was. The stories were scored in terms of the number of words omitted, added, or substituted and, importantly, the number of target verbs changed. Of the total of 4,734 words contained in the 24 stories, 83 or 1.75% were modified in some way, through omission, addition, or substitution. Of the total of 288 target verbs, 7 (2.43%) were produced incorrectly. Thus, more than 98% of the words in the story were read accurately, and over 97% of the target verbs were presented as originally intended.

The stories did not contain any instances of the non-target tense/agreement morphemes being monitored; nevertheless, the clinicians could have produced these in their subsequent nonrecast comments to the children. As noted earlier, we tried to minimize the number of such productions by providing a list of preferred constructions to use in nonrecast utterances. However, it was important to determine how often these were actually produced by the clinician. There were 32 productions of these forms in the 24 sessions. Twenty-six of these productions were productions of the copula. Considering that these sessions contained a total of 288 recasts of the target form by the clinician (24 sessions with 12 recasts each), as well as 288 productions of the target in the stories, we had no reason to believe that the 26 copula productions would in any way reduce the impact of the intervention.

### Scoring and Reliability

The children’s responses to the probes at Time 1, Time 2, and Time 3 were scored for accuracy of the grammatical morphemes of interest. For each set of
items, we calculated the number of items for which the child supplied the appropriate morpheme. If a child used a lexical item that differed from the one anticipated, this was scored assuming it could be construed as a plausible attempt to respond and was not a perseveration of a previous response. Thus, a production of comb or combed in place of brushed was considered to be scorable. Items were repeated if the child was inattentive and did not respond or responded with a description of a detail that was not central to the prompt (e.g., This a Golden Retriever). For each morpheme type, the child’s percentage correct was computed by dividing the number of productions of the appropriate morpheme by the number of items for which a scorable response was obtained. This figure was then multiplied by 100. The resulting percentages correct were then arcsine transformed for statistical analysis. For auxiliary and copula forms, responses on items obligating is, are, and was were combined for the major analyses. However, for additional analyses, we compared the children’s performance on the three phonetic forms of is, are, and was. In addition to analyzing the children’s correct responses, we also examined the nature of the children’s errors. When children failed to use the appropriate morpheme, we noted whether an omission occurred or whether an inappropriate morpheme was used as a substitute (e.g., the production of auxiliary is in a context requiring auxiliary are).

We calculated the reliability of transcribing the children’s responses to the grammatical morpheme probes by randomly selecting the transcriptions from 12 children and comparing them with the transcriptions prepared by an independent judge. Agreement was determined on an item-by-item basis, and percentages of agreement were calculated for each child and for each grammatical morpheme. Percentages of agreement across the children ranged from 92 to 98. Across the grammatical morphemes, percentages of agreement ranged from 95 (for auxiliary are) to 98 (for past -ed).

**Results**

Six of the children scored above 0% on the Time 1 probe for the target form to which they had been assigned. To determine whether Time 1 score should serve as a covariate, we computed correlations between the Time 1 score on the target and the scores at Time 2 and Time 3. No correlations were significant. The children’s Time 1 use of the target forms bore no relationship to their scores on probes administered after intervention had begun. For example, the child with the highest Time 1 score on third-person singular -s (18%) scored lower than 5 other children at Time 3. The 2 children with the highest scores for third-person singular -s at Time 3 (100%) scored 0% and 8% at Time 1. Given the absence of a relationship, analyses of variance (ANOVs) rather than analyses of covariance were computed.

To evaluate the children’s progress in the acquisition of the four morpheme types of interest, a mixed model ANOVA was performed. Participant group (3S, AUX) served as a between-subjects factor, while morpheme type (third person singular -s, auxiliary is/are/was, copula is/are/was, past tense -ed) and time (Time 1, Time 2, Time 3) served as within-subjects factors. The scores were the arcsine transformations of the percentage of appropriate productions of the morpheme type in obligatory contexts on the probes administered at each time point. Effect sizes were measured using d (Cohen, 1988), where d values of 0.50 and 0.80 are considered medium and large effect sizes, respectively.

The results are illustrated in Figure 1 (for the 3S children) and Figure 2 (for the AUX children) and summarized in Table 1. The ANOVA revealed that there was no significant main effect for participant group, F(1, 23) = 0.66, p = .423, indicating that the two participant groups made similar gains overall. However, there was a significant main effect for both morpheme type, F(3, 69) = 10.48, p < .001, and time, F(2, 46) = 31.84, p < .001. In both cases, post hoc least significant difference (LSD) tests at the .05 level were conducted to probe into the details of the comparison. The post hoc test of morpheme type showed that there were significant differences between past -ed and each of the other three morpheme types (ds = 0.98 to 1.23). On the other hand, the differences between third-person singular -s, auxiliary is/are/was, and copula is/are/was were not significant. Thus, in terms of overall scores across time periods, the children’s performance on these three morphemes was

**Figure 1.** Mean percentages correct (+SEs) on the grammatical morpheme probes at each time point by the children receiving treatment on third-person singular -s (3S children; third sing = third-person singular; aux = auxiliary).
comparable, while their performance on past -ed trailed behind. Post hoc testing of time, in turn, showed that there were significant differences between scores obtained at each successive point in the intervention (d = 1.03, 1.47). This finding suggests that the children continued to make significant gains throughout the course of the study.

The ANOVA also yielded a number of significant interactions between the main factors. The only interaction that was not significant was the Participant Group × Time interaction, F(2, 46) = 0.14, p = .873, indicating that both groups made similar progress between the successive time points. In contrast, the Participant Group × Morpheme Type interaction was significant, F(3, 69) = 4.07, p = .01. Post hoc testing showed that for the 3S children, scores for the target, third-person singular -s, were significantly higher than those for auxiliary is/are/was (d = 0.44) and past -ed (d = 1.20), but they were not significantly different from the scores for copula is/are/was. Both auxiliary is/are/was (d = 0.77) and copula is/are/was scores (d = 1.25) were significantly higher than scores for past -ed, but they were not significantly different from each other. The results for the AUX children parallel those for the 3S children in that scores for the target, auxiliary is/are/was, were significantly higher than scores for third-person singular -s (d = 0.77) and past -ed (d = 1.32), but they were not different from copula is/are/was scores. However, here the parallel ends, because copula is/are/was was significantly different from both third-person singular -s (0.68) and past -ed (1.17), whereas third-person singular -s was not different from past -ed. Thus, the AUX children had a sharp contrast, with the target and copula is/are/was as the stronger morphemes and the other group’s target and past tense -ed as the weaker morphemes. The 3S children, on the other hand, showed more of a gradation, with the target being the strongest morpheme, followed in order by copula is/are/was, the other group’s target, and past tense -ed.

Table 1. Mean percentages for each participant group on the probes for each grammatical morpheme type at each time period.

<table>
<thead>
<tr>
<th>Morpheme type</th>
<th>3S children</th>
<th>AUX children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time 1</td>
<td>Time 2</td>
</tr>
<tr>
<td>Third-person singular -s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>4.47</td>
<td>33.40</td>
</tr>
<tr>
<td>SD</td>
<td>6.12</td>
<td>32.06</td>
</tr>
<tr>
<td>Auxiliary is/are/was</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>8.73</td>
<td>15.53</td>
</tr>
<tr>
<td>SD</td>
<td>17.95</td>
<td>20.27</td>
</tr>
<tr>
<td>Copula is/are/was</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>13.87</td>
<td>33.20</td>
</tr>
<tr>
<td>SD</td>
<td>21.70</td>
<td>30.06</td>
</tr>
<tr>
<td>Past tense -ed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>0.93</td>
<td>0.73</td>
</tr>
<tr>
<td>SD</td>
<td>3.61</td>
<td>2.84</td>
</tr>
</tbody>
</table>

Note. 3S children = participant group receiving treatment on third-person singular -s; AUX children = children receiving treatment on auxiliary is/are/was. Target morpheme types are in bold.
The Morpheme Type × Time interaction also proved to be statistically significant, F(6, 138) = 3.53, p = .003. Post hoc testing was carried out to determine the change in each morpheme across time. Third-person singular -s and auxiliary is/are/was exhibited similar profiles, showing significant increases between each successive time point (ds = 1.42, 0.70, and 1.10, 0.93 for third-person singular and auxiliary, respectively). Copula is/are/was improved significantly from Time 1 to Time 2 (d = 1.21), but the difference between Time 2 and Time 3 was only marginally significant (p = .055). Past tense -ed did not differ significantly between Time 1 and Time 2 or between Time 2 and Time 3. It did, however, increase significantly from Time 1 to Time 3 (d = 1.34). Thus, while the children improved in their use of all morphemes with time, their gains were the most pronounced and consistent in the case of third-person singular -s and auxiliary is/are/was. Copula is/are/was showed a less dramatic increase following the initial period of change from Time 1 to Time 2. Past tense -ed showed the slowest progress, which was only visible when measured over a longer period of time (Time 1 vs. Time 3).

The relatively slow progress on past tense -ed was even more apparent when scores for this morpheme were directly compared with the scores for the other morphemes at each time point. At Time 1, there were no differences among the four morpheme types. At Time 2 and Time 3, the scores for past -ed were significantly lower than those for each of the remaining three morpheme types (ds = 1.17–1.72 for Time 2; ds = 1.21–1.35 for Time 3). Third singular -s, auxiliary is/are/was, and copula is/are/was did not differ from each other at Time 2 and Time 3, with the exception of the contrast between copula is/are/was and auxiliary is/are/was which was significant (and favoring the copula) at Time 2 (d = 0.55).

As expected, the three-way interaction among group, morpheme type, and time also reached the level of statistical significance, F(6, 138) = 2.95, p = .01. The details of this interaction are shown in Table 2. Post hoc testing (LSD) at the .05 level indicated that both groups showed a significant increase in their use of their respective targets from Time 1 to Time 2 (d = 1.96 for 3S group; d = 3.21 for AUX group), as well as between Time 2 and Time 3 (d = 1.25 for 3S group; d = 0.93 for AUX group). For both groups, there was no significant difference between the target and any of the other morpheme types at Time 1. However, at Time 2, for both groups, the target was significantly greater than both past tense -ed (d = 2.41 for 3S group; d = 1.32 for AUX group) and the morpheme serving as the target for the other group (d = 0.88 for 3S group; d = 1.52 for AUX group). The same proved true for Time 3 (ds = 0.65–1.46 for 3S group; ds = 0.99–2.57 for AUX group). The target did not differ from the copula forms at Time 2 for either group and was significantly higher than the copula at Time 3 only for the 3S group (d = 0.40).

The copula was not the target for either group. Nevertheless, it showed a significant increase in use from Time 1 to Time 2 (ds = 0.97, 1.95), with no difference between Time 2 and Time 3. At Time 2, both groups showed greater use of the copula than of past tense -ed (ds = 1.11–3.68) and the morpheme serving as the target for the other group (ds = 0.92–1.25). At Time 3, for both groups, the copula continued to show significantly higher scores than past tense -ed (ds = 1.03–2.10). In addition, for the AUX group, the copula was marginally higher (p = .051) than the morpheme serving as the target for the other group.

For both groups, the morphemes serving as a target for the other group showed no significant change from Time 1 to Time 2. However, for both the 3S and AUX children, a significant increase was seen from Time 2 to Time 3 (ds = 0.94–1.24), with the difference between Time 1 and Time 3 also significant (ds = 1.32–1.51). At Time 2, this morpheme was produced to a significantly lesser degree than both the target and the copula and did not differ from past tense -ed. This finding held for both groups (ds = 0.89–0.92 for 3S group; ds = 1.25–1.48 for AUX group). At Time 3, this morpheme was used by both groups to a higher degree than past tense -ed (ds = 0.74–1.06).

Past tense -ed showed no significant change from Time 1 to Time 2 for either group. For the 3S children, this morpheme was produced to a greater extent at Time 3 than at Time 2 (d = 1.73); this was not true for the AUX children. Furthermore, the Time 3 past tense -ed scores for the 3S children were not significantly higher than those of the AUX children. Although at Time 1, past tense -ed scores were no lower than the scores for the other morphemes, by Time 2 these scores were lower than the scores for the target form of each group and for the copula is/are/was forms for each group. At Time 3, for both groups, past tense -ed scores were significantly lower than the scores for each of the other three morpheme types. (These effect sizes were shown earlier.)

### Table 2. Differences contributing to the significant interaction among participant group, morpheme type, and time.

<table>
<thead>
<tr>
<th>Morpheme type or time</th>
<th>3S group</th>
<th>AUX group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third singular -s</td>
<td>T1 &lt; T2 &lt; T3</td>
<td>T1 = T3</td>
</tr>
<tr>
<td>Auxiliary is/are/was</td>
<td>T1 &lt; T2 &lt; T3</td>
<td>T1 &lt; T2 &lt; T3</td>
</tr>
<tr>
<td>Copula is/are/was</td>
<td>T1 &lt; T2 = T3</td>
<td>T1 &lt; T2 = T3</td>
</tr>
<tr>
<td>Past tense -ed</td>
<td>T1 &lt; T2 = T3</td>
<td>T1 = T2</td>
</tr>
<tr>
<td>Time 1</td>
<td>-ed = Aux = Cop = is/-are/was</td>
<td>= is/-are/was</td>
</tr>
<tr>
<td>Time 2</td>
<td>-ed = Aux &lt; Cop = is/-are/was</td>
<td>= is/-are/was</td>
</tr>
<tr>
<td>Time 3</td>
<td>-ed &lt; Aux = Cop &lt; is/-are/was</td>
<td>= is/-are/was</td>
</tr>
</tbody>
</table>

Note. T = Time; Aux = auxiliary; Cop = copula. Target morpheme types are in bold.
Although the correlations computed at the outset provided no indication that the children’s Time 1 levels of use were related to their use at later time points, we also inspected the data from children who showed 0% use of all morpheme types at Time 1. As can be seen in Figure 3 (for the 3S children) and Figure 4 (for the AUX children), the patterns of change seen for these children resembled the pattern seen for the larger group. Gains in the target form appeared larger than gains in past tense *-ed* and the form serving as the target for the other group. The copula, despite not being used at all at Time 1 by these particular children, showed a clear increase by Time 2.

There was a great deal of individual variation in the gains the children made on the different morphemes. In both groups, there were children who made no progress at all (0%) on the target by Time 3. There were 3 such children in the 3S group and 1 child in the AUX group. Ten of the 3S children showed variable use of the target at Time 3 (range = 23%–85%), and variable use of the target was seen by 7 of the AUX children (range = 11%–65%). The remaining 2 3S children and 2 AUX children used the target form in 100% of obligatory contexts at Time 3.

Two children from the 3S group and 1 child from the AUX group showed 0% use of copula *is/are/was* at Time 3. The highest levels of post test copula use by the 3S and AUX children were 94% and 95%, respectively. Five of the 3S children and 4 of the AUX children failed to produce any of the morpheme types that served as the target for the other group. No child in the 3S group scored 100% on this morpheme type; the highest score in this group was 80%. One child in the AUX group showed 100% use of this morpheme type. Finally, for the morpheme type showing the lowest scores, past tense *-ed*, 7 3S children and 8 AUX children did not produce this form at all at Time 3, and no child in either group scored 100%. The highest scores seen for the 3S and AUX groups were 71% and 33%, respectively.

The ANOVA revealed that the target forms made the greatest gains overall, whether measured in terms of change throughout the treatment period or in terms of performance relative to other morpheme types. However, in view of the individual variability, we also inspected the data to determine how many of the children showed relatively high scores on the target form. For 11 of the 25 children, scores on the target form were higher than scores on all other morpheme types at Time 2. For Time 3, 17 of the 25 children had higher scores on the target than on all other morpheme types. It can be recalled that 4 children made no gains at all on the target. Most of the remaining exceptions were children whose gains on the copula form were slightly larger than those on the target. This was more likely to occur at Time 2 than at Time 3; at the Time 3 testing point, 17 children’s scores were higher for the target form than for all other morpheme types, whereas only 4 children’s scores were highest on copula *is/are/was*. When scores on the target form are compared with those on past tense *-ed*, the results are more dramatic. At Time 2, 18 of the children had higher scores on the target than on past tense *-ed*. For Time 3, this was true for 20 of the 25 children. These findings indicate that although the highest scores by the children were most likely to be seen for the target forms, there were exceptions to this trend.

The children also differed in terms of the point at which the largest gains were seen on the target form. Six children showed comparable gains from Time 1 to Time 2 and from Time 2 to Time 3. Seven children showed larger

---

**Figure 3.** Mean percentages correct (+SEs) on the grammatical morpheme probes at Time 2 and Time 3 by those children in the 3S group who showed 0% use of each grammatical morpheme type at Time 1.

**Figure 4.** Mean percentages correct (+SEs) on the grammatical morpheme probes at Time 2 and Time 3 by those children in the AUX group who showed 0% use of each grammatical morpheme type at Time 1.
the same phonetic forms (scores on copula is/are/was, the latter two correlations (.600 and .507) were related (auxiliary scores and Time 3 copula scores, was less clearly related (copula Time 2 scores for the target for the AUX children, auxiliary is/are/was, was significantly related to Time 3 past tense -ed at Time 3 (r = .645, p = .009). Time 3 scores on third-person singular -s were also significantly related to Time 3 past tense -ed scores (r = .544, p = .036). Time 2 scores for the target for the AUX children, auxiliary is/are/was, were not correlated with the Time 2 scores of any morpheme type. However, Time 3 scores on auxiliary is/are/was were significantly related to Time 2 scores on copula is/are/was (r = .731, p = .016) and marginally related to Time 3 scores on copula is/are/was (r = .593, p = .071).

The relationship between auxiliary is/are/was and copula is/are/was in the AUX children’s speech could certainly be due to the fact that the two morpheme types shared the same phonetic forms. However, the direction of the relationship is not clear. Given that auxiliary forms were the targets during intervention for these children, treatment could have led to changes in the children’s use of auxiliary forms, which, in turn, led to improvement in their use of copula forms. However, the finding that Time 2 scores on copula is/are/was were correlated with Time 3 scores on auxiliary is/are/was suggests another possibility: Children who had begun using copula is/are/was by Time 2 may have been developmentally ready to make major strides in their use of auxiliary is/are/was. To examine this possibility further, we computed the correlations between auxiliary and copula use by the 3S children. These children did not receive treatment on either of these morpheme types. For these children, Time 2 scores for auxiliary is/are/was were significantly related to Time 2 scores for copula is/are/was (r = .626, p = .013). Copula Time 2 scores were also related to Time 3 auxiliary scores (r = .600, p = .018). The converse, Time 2 auxiliary scores and Time 3 copula scores, was less clearly related (r = .507, p = .054). However, despite the different p values, the latter two correlations (.600 and .507) were not significantly different from one other. Finally, Time 3 scores on copula is/are/was and Time 3 scores on auxiliary is/are/was were highly related (r = .800, p < .001).

Because our auxiliary and copula probes examined the same phonetic forms (is, are, and was), we performed a separate ANOVA to determine whether the three phonetic forms were used to the same degree across auxiliary and copula contexts. We used a mixed model ANOVA with participant group (3S, AUX) as a between-subjects factor and morpheme type (auxiliary, copula), phonetic form (is, are, was), and time (Time 1, Time 2, Time 3) as within-subjects factors. As was found in the preceding ANOVA, the two groups did not differ (and indeed were highly similar), F(1, 23) = 0.03, p = .860. As expected, time proved significant, F(2, 46) = 27.94, p < .001. Post hoc (LSD) testing revealed that each successive time point was associated with significantly higher scores than the preceding time point. Morpheme type was significant, F(1, 23) = 4.67, p = .04. The children’s overall use of copula forms was greater than their use of auxiliary forms. Phonetic form was marginally significant, F(2, 46) = 3.02, p = .059. Post hoc testing indicated that auxiliary/copula is (M = 29.19, SD = 36.90) was used to a significantly greater degree than was auxiliary/copula was (M = 23.25, SD = 36.52). Auxiliary/copula are did not differ from either of the other phonetic forms. No interactions approached significance. The absence of a Morpheme Type x Phonetic Form interaction, F(2, 46) = 0.19, p = .827, is especially noteworthy, because it suggests that there were no clear discrepancies between the auxiliary and copula in the particular phonetic forms that were stronger or weaker.

Given that the verb form was is obligatory in African American English, we examined the African American child’s use of was relative to is and are. Time 3 scores for auxiliary is, are, and was were 67%, 17%, and 71%, respectively. For copula is, are, and was, the scores were 25%, 17%, and 33%, respectively. The differences between is (a form that is variable in African American English) and was (a form that is obligatory in African American English) were small. It is true that this child’s profile differed somewhat from many of the other children in that is was not the form showing the highest percentages of use. On the other hand, because neither auxiliary was nor copula was approached mastery levels by Time 3, when the child was age 4;11, this child’s use of was could not be interpreted to be age appropriate.

An inspection of the children’s errors indicated that for all morpheme types, omission was the predominant type of error. Substitutions were primarily restricted to occasional productions of auxiliary/copula is for are or was, for both the 3S and AUX children.

The spontaneous speech samples obtained immediately after the 96 treatment sessions were examined for use of the target forms. The 3S children’s mean percentage of use of the target form, third-person singular -s, was 45.00 (SD = 31.19). The AUX children’s mean percentage of use of the target form (auxiliary is/are/was) was 55.89 (SD = 37.68).

Finally, to gauge the children’s overall language development, DSS scores were calculated on the basis of spontaneous speech samples obtained after the last treatment session. Recall that all children were below the 10th
percentile for their age group at the outset of the study. At the end of intervention, 11 of the 15 children in the 3S group and 9 of the 10 children in the AUX group continued to score below the 10th percentile for their age group. Of the 4 children in the 3S group scoring above the 10th percentile, 3 of the 4 scored below the mean but within 1 SD for their age. The remaining child scored just above the mean. The 1 child in the AUX group scored well above the mean for his age.

We examined the children’s performance on the probes to determine whether the children with age-appropriate DSS scores following treatment were the children showing the highest scores on the probes at Time 3. Of the 5 children with DSS scores in the normal range, 2 showed 100% use of the target form at Time 3. The remaining children scored 85%, 77%, and 75%, well above the group average for this time period. Thus, these children made up half (2 of 4) of the children who scored 100% on the target form at Time 3. The children with age-appropriate DSS scores did not show a profile across morpheme types that differed from that of the other children. For 4 of the 5 children, the highest scores at Time 3 were seen for the target form and the lowest scores were seen for past tense -ed. The copula form had the second highest score for all but 1 child.

**Discussion**

Several conclusions seem to be warranted based on these results. We introduce them here and return to them in greater detail together with a discussion of alternative interpretations. First, it appears that intervention indeed facilitated the children’s use of the target form, although only a few of the children’s gains were suggestive of mastery levels. Second, gains in certain morphemes seemed to promote gains in others, but some of this generalization might not have been treatment induced. Third, when auxiliary and copula forms are considered together, the children seemed more likely to use *is* than to use *was*. Finally, as many as 5 of the children in the study may have been late bloomers. If so, their data may have inflated the posttreatment scores. Nevertheless, these data conformed to the profile seen for the larger group, with the greatest gains seen for the target form and the smallest gains seen for past tense -ed. Each of these conclusions will be discussed in some detail below.

**Intervention Facilitated the Children’s Gains on the Target Form**

Several pieces of evidence support the conclusion that the children’s gains on the target form were significantly fostered by the intervention. First, the target forms were the only morpheme types to increase significantly across all phases of intervention, increasing significantly from Time 2 to Time 3 as well as from Time 1 to Time 2. A maturational spurt might have been responsible for a change from one time period to the other, but it seems less likely that for these morpheme types alone, such a spurt would extend consistently across all time points. This would be an especially noteworthy coincidence given that the forms showing the extended spurt were different for the two groups. A second piece of evidence supporting the interpretation that intervention played a significant role in the gains on the target form comes from the finding that at both Time 2 and Time 3, the children’s use of the target was greater than their use of past tense -ed. Thus, the 3S children used third-person singular -s to a greater degree than past tense -ed at both time points but used auxiliary *is/are/was* more consistently than past tense -ed only at Time 3. The AUX children, in contrast, used auxiliary *is/are/was* more consistently than past tense -ed at both time points but used third-person singular -s more consistently than past tense -ed only at Time 3.

Can an alternative interpretation be offered, that intervention played little or no role in the children’s gains on the target forms? One possible interpretation would be that past tense -ed was an especially difficult morpheme type and did not constitute an appropriate basis of comparison with the target form. However, based on the normal child language literature, development in the use of this morpheme type is expected during the same period of language development as the other morpheme types used.

A different argument against our interpretation of treatment effects makes just the opposite point: Because the 3S children showed gains even in the use of past tense -ed between Time 2 and Time 3, there were no morpheme types that failed to show change and therefore no reason to single out one of them, the target form, as benefiting from intervention. The thinking behind such an argument would be based on the logic reflected in multiple-baseline treatment designs. However, such designs examine behaviors that either have a very long and shallow developmental trajectory in the clinical population under study (e.g., children with autism; children with Down syndrome) or are not likely to be learned outside of treatment. Both the clinical population under investigation in the present study (children with SLI) and the duration of the intervention period used (6 months) made it unlikely that we could find any language form that was developmentally comparable to the target forms and yet show no change across the entire study. Of course, even though past tense -ed showed some degree of change in the 3S children, their use of this morpheme type was nevertheless significantly lower than their use of the target form, even at Time 3. Furthermore, past tense -ed showed no change from Time 1 through Time 3 in the speech of the AUX children, and the Time 3 past tense -ed scores for these
children did not differ significantly from those of the 3S children.

Perhaps a stronger argument against the interpretation of treatment effects comes from the data for copula is/are/was. For both the 3S and AUX children, gains from Time 1 to Time 2 were seen for the copula forms as well as the target, and these two types of morphemes did not differ at Time 2. Such findings invite the interpretation that the gains in the target may have been due to maturation alone. Yet, for both the 3S and the AUX children, gains continued from Time 2 to Time 3 for the target forms but not for copula is/are/was. Furthermore, at Time 3, the 3S children made greater use of the target form than the copula forms. Although this was not true for the AUX children, gains in the use of their target, auxiliary is/are/was, might be expected to benefit the use of copula is/are/was as well.

Although we believe the children’s gains in the use of the target form were attributable to treatment effects, it was clear that after 96 sessions, many of the children were not approaching mastery levels. In fact, 3 of the 15 3S children continued to show no use of the target form; the same was true for 1 of the 10 AUX children. Ten of the 3S children and 7 of the AUX children showed variable use of the target at Time 3. The remaining 2 3S children and 2 AUX children used the target form in 100% of obligatory contexts at Time 3. We cannot contend that this use reflected full mastery of these forms. The 2 AUX children showing 100% use on the auxiliary probes at Time 3 did show 100% and 95% use of auxiliary forms in their posttreatment spontaneous speech samples. However, the 2 3S children who showed 100% use of third-person singular -s on the probes at Time 3 showed only 55% and 88% use of this morpheme in the posttreatment spontaneous speech sample.

However, the children’s scores on the probes, even when higher than their spontaneous speech levels of use, are clearly not the result of drill or some other artificial source. The probes did not resemble any experience that the children received during the intervention activities themselves. It can be recalled that the children listened to stories and heard recasts of their own utterances. They were not presented with structured activities or elicitation probes during these experiences. It is certainly true that the probes administered after the 96th treatment session constituted the third time that the children had received the sentence completion items requiring use of the target form. However, it was also the third time that they had received sentence completion items for all of the nontarget morpheme types. Given that the target form was used to a greater extent at Time 3 than the past tense -ed and the morpheme type serving as the target for the other group, it seems that the experience of hearing and responding to the sentence completion items was not sufficient to account for the gains observed.

Although few children demonstrated use that could be interpreted as reflecting mastery, it is noteworthy that significant gains in target use were seen from Time 2 to Time 3. No child showed 100% use at Time 2. This finding compares favorably to findings reported by Fey, Cleave, and Long (1997). The participants in their study were children who were originally seen for a 5-month intervention phase reported by Fey, Cleave, Long, and Hughes (1993). In the Fey et al. (1997) study, the children were seen for a second 5-month intervention phase. The gains during the second 5-month phase were apparent but not as strong as those seen during the initial 5-month intervention period. Nevertheless, these gains were greater than those seen for children who did not continue in the intervention program after the first 5-month phase. The goal of intervention in these studies was an increase in morphosyntactic ability more generally rather than an increase in the use of tense and agreement morphemes in particular.

Given the modest gains in the use of the target forms exhibited by most of the children in the present study, we can point to changes in the procedure that might be considered in future studies. Based on their own study and a review of the intervention literature, Proctor-Williams, Fey, and Loeb (2001) calculated that the rate of recasts for effective treatment should probably be at least 0.80 recasts per minute. When calculated in the same manner, the rate in the present study was approximately 0.80 per minute. That is, each session lasted for approximately 20 min. The story required approximately 5 min, allowing the remaining 15 min to be devoted to recasts (12 recasts/15 min = 0.80). Thus, our recast rate may have been toward the low end of the rate deemed effective by Proctor-Williams et al. If we had increased the rate of recasts in our study, the children’s gains may have been greater. On the other hand, if simply hearing the target form in a meaningful context is the relevant factor rather than hearing the target form in a recast, our rate of presentation was rather high. The target was produced 12 times in the story. Thus, in the 20-min session, the child heard the target 24 times, corresponding to a rate of 1.20 per minute (24 presentations/20 min = 1.20).

Possible Generalization Effects

The second conclusion is that gains in the use of particular morpheme types may have fostered gains in the use of others. One possible example is seen in the relationship between auxiliary and copula forms. Generalization between auxiliary and copula forms is not a new finding. Previous treatment studies have provided evidence that children with SLI make gains in the use of auxiliary forms after intervention that focused on copula forms and vice versa (Gray & Fygetakis, 1968; Leonard,
In our study, we found that the AUX children's use of copula and auxiliary forms did not differ at Time 2 or at Time 3. Because auxiliary *is/are/was* served as the target, it would not be surprising to find gains in copula use that closely paralleled those seen for the target.

However, details in the data suggest that the nature of the auxiliary–copula generalization may have taken a somewhat different form, at least for the 3S children. Because neither the auxiliary nor the copula forms were the intervention target for these children, either the treatment-related gains on third person singular -s triggered changes in the auxiliary and copula forms, or the changes in the auxiliary and copula forms were unrelated to intervention. We did not find any significant correlations suggesting that the gains in these children's use of third-person singular -s were related to changes in auxiliary or copula forms, although it is true that significant gains from Time 1 to Time 2 were seen for both third-person singular -s and copula *is/are/was*. A corresponding change was not observed for the auxiliary forms until Time 3.

It is thus possible that the relationship between the auxiliary and copula forms for the 3S children was not directly linked to intervention. For example, it may be the case that the children began to acquire use of the copula forms independent of intervention and these gains led to gains in their use of auxiliary forms. The findings consistent with such a view are the gains from Time 1 to Time 2 on copula forms but not auxiliary forms and the significant correlation between Time 2 scores on the copula and Time 3 scores on the auxiliary. An important qualification is that this correlation was not significantly higher than the correlation between Time 2 scores on auxiliary forms and Time 3 scores on copula forms.

The change from Time 1 to Time 2 in the 3S children's copula use might have stemmed from the fact that the copula was the morpheme type most likely to be used by a child at Time 1 (see Figures 1 and 2). Although differences among the morpheme types were not statistically significant at Time 1, we cannot rule out the possibility that this numerical advantage reflected a real difference in developmental readiness. It is also the case that the probes for the copula forms were the only probes that allowed the children to hear an example of the morpheme type in the experimenter's preceding sentence, as in “Bear's towers are tall, but Ojo's tower _____.” For one-half of these items, the particular morpheme (*is, are, or was*) produced by the experimenter was not the one required in the child's response. However, even for those items that included the same morpheme, children would have to have had some emerging ability with copula forms to take advantage of this information. An inspection of Figure 3 and Figure 4 suggests that the copula was used to a somewhat greater extent than the auxiliary at Time 2 even by the children who failed to use any of the morpheme types at Time 1. Presumably, these children did not have sufficient ability with copula forms at Time 1 to take advantage of the copula information contained in the examiner's preceding sentence. Thus, it is possible that the copula's development was a maturationally driven event that occurred in parallel with intervention-related changes in the target form.

It might be argued that the data reveal a second instance of generalization, in which treatment-related gains on third-person singular -s exerted an influence on the children's use of past tense -ed. The evidence consistent with this type of generalization comes from two sources. First, the 3S children's scores on third-person singular -s at both Time 2 and Time 3 were significantly related to their past tense -ed scores at Time 3. These relationships were not seen for the AUX children, whose scores on third-person singular -s even at Time 3 still averaged below 25%. This morpheme did not serve as a target for these children. The second source of evidence was that only the 3S children's scores on past tense -ed showed a significant gain during the course of the study. This was seen in the significant difference between Time 2 and Time 3 scores. For the AUX children, past tense -ed scores did not show a significant increase at any point. However, we rather doubt that past tense -ed actually showed evidence of generalization. Two findings lead us to this conclusion. First, the Time 3 scores for past tense -ed for the 3S children were not significantly higher than the past tense -ed scores for the AUX children. Second, at Time 3, past tense -ed scores were significantly lower than the scores of all other morpheme types for the 3S children as well as for the AUX children. Although it would be reasonable to assume that the target form for the 3S children would outpace changes in past tense -ed, we do not see why past tense -ed should lag behind the other untreated morpheme types if it was the beneficiary of generalization effects.

**Development of Copula/Auxiliary Is Outpaces Development of Copula/Auxiliary Was**

A third conclusion is that when copula and auxiliary forms are taken together, *is* appears more likely to be used by the children than *was*. Previous studies comparing these forms are rather limited. McShane and Whitaker (1988) found that typically developing children use *was* with some consistency by 3 years of age. An early study by Ingram (1972) suggested that *is* and *are* emerge in the speech of children with SLI at an earlier age than *was*. Leonard et al. (2003) found only a numerical difference
favoring is/are over was in the speech of preschoolers with SLI. Separate analyses of the singular and plural present tense forms were not done. However, percentages for is were clearly higher than those for are.

Our finding that is was produced to a greater degree than was may be related to the present tense–past tense distinction. In Swedish, children with SLI use present tense inflections (e.g., -er in hon leker “she plays”) as proficiently as do younger typically developing children matched for MLU. However, they use past tense inflections (e.g., -te in hon lekte “she played”) less consistently than younger MLU controls and less consistently than they use present tense inflections (Hansson & Leonard, 2003; Hansson, Nettelbladt, & Leonard, 2000). In Swedish, present and past tense inflections are comparable in that they both mark tense but not agreement (e.g., -er is used for jag leker “I play” as well as for hon leker “she plays”), whereas, in English, is and was both mark tense and agreement. Present tense is and past tense was are not identical in their contexts, as was is used in first-person singular contexts that use am in present tense. Nevertheless, is and was are much more comparable than past tense -ed and third-person singular -s. The fact that the past tense form appears to be more difficult for children with SLI lends credence to the possibility that past tense is more problematic than present tense forms in SLI.

“Late Bloomer” Effects on the Data

The DSS scores for 5 of the 25 children’s spontaneous speech samples after treatment were above the 10th percentile. Two of these children’s scores were above the mean for their age. Based on DSS scores, at least, these 5 children might have been late bloomers, children who were slow in the initial stages of language development but who caught up to peers and should not have been regarded as children with SLI. To a large degree, the children’s probe performance at Time 3 was consistent with this view. Of the 4 children who scored 100% on the target form at Time 3, 2 were among the children scoring above the 10th percentile on the DSS. However, none of these children showed uniformly high degrees of use across the morpheme types under investigation. Instead, these children showed the profile characteristic of the data as a whole, with the highest scores on the target form, next highest for copula is/are/was, and the lowest scores on past tense -ed. Thus, although several late bloomers may have been included in our participant pool, their influence on the data appeared to be that of raising the scores, not of changing the relative standing of the morphemes. One interesting implication of this finding is that although one could argue that the possible late bloomers did not require treatment in the first place, their response to treatment—with larger gains on the target form than on other morpheme types—was not unlike that of the remaining children.

Our acknowledgment that late bloomers could have been included in the participant pool should not be construed as evidence that this was in fact the case. Our interpretation of the data has been very cautious. One might plausibly argue instead that treatment with these 5 children was especially successful, leading them to make gains in grammatical areas well beyond the morpheme types under investigation. Consequently, they showed age-appropriate grammatical skills, at least as measured by the DSS. Three observations make this alternative interpretation quite reasonable: (a) The treatment sessions provided the children with a great deal of language stimulation over 6 months’ time; (b) in the course of the stories and play sessions, the children heard many different grammatical structures that could extend their grammatical knowledge (e.g., forms that contrasted with the target forms); and (c) the proportion of children showing large treatment benefits appeared to be no higher than the proportion seen in studies using somewhat older children with SLI (e.g., Fey et al., 1993).

Implications for Characterizing Development in SLI: Maturation, Treatment, and Optionality

In spite of the relatively strong evidence for treatment effects, we must acknowledge that the findings add credibility to the view that children’s acquisition of tense and agreement morphemes is heavily influenced by maturational processes that are not easily accelerated through intervention efforts. When we visually compare the children’s average gains across the 6 months of intervention with the corresponding slopes in the longitudinal study reported by Rice et al. (1998), few differences are seen. On the other hand, there are important differences between the children with SLI in the present study and those participating in the Rice et al. study. Specifically, the children in the present study were considerably younger (mean age = 3;5 at Time 1) than the children in the Rice et al. investigation (mean age = 5;0 at the outset), and few were using the target form at all, whereas in the Rice et al. study, the mean ranged from approximately 20% to 45% use depending on the morpheme. Furthermore, the gains across the 6-month period in the present study also resembled those seen for the younger typically developing children in the Rice et al. study. These typically developing children’s ages were similar to those of the children with SLI in the present study, though their initial use of the morphemes in question was considerably higher (means = 40% to 65%). Therefore, although the slopes reflecting change in the present study do not seem steeper than those reported in nonintervention longitudinal studies,
we have no cases of children with the same diagnosis, the same age, and the same low levels of use to use as a basis of comparison. Without treatment, the children in our study might have shown much shallower slopes across the 6-month span. Certainly, the finding of larger gains for target forms than for nontarget forms adds credence to this possibility.

Other studies of children with SLI suggest that maturational processes may play an important role in the gains made in the use of tense and agreement morphemes by children during treatment. Goffman and Leonard (2000) conducted a retrospective longitudinal study of preschoolers with SLI enrolled in a language intervention program. The children made substantial progress in lexical skills, often approaching or reaching age-appropriate levels. However, gains in the use of tense and agreement morphemes were much more limited. One difference between the Goffman and Leonard study and the present study is that our study placed more emphasis on tense and agreement morphology, at least as reflected in the target form.

Although difficulties with tense and agreement morphemes seem to be a hallmark of English-speaking children with SLI, it may be that intervention aimed at expressive morphosyntax of any type is not sufficiently powerful to lead to mastery without significant assistance from maturation. In a meta-analysis of intervention studies that used children’s random assignment to treatment and control groups, Law, Garrett, and Nye (2004) reported that there was mixed evidence concerning the effectiveness of intervention for expressive syntax. The evidence was somewhat stronger for children who did not also have problems in the area of language comprehension. The outcome measures varied in these studies, and tense and agreement morphemes were not the primary targets. Therefore, rather than supporting the specific notion that tense and agreement mastery is an especially challenging goal for intervention, our findings might be reflecting the real but nondramatic effects of intervention aimed at any component of morphosyntax.

We recognize the very important role that maturational processes play in the progress that children may make in intervention. In fact, we have referred to it elsewhere in terms of developmental readiness to acquire the target form (Leonard, 1981; Leonard et al., 2004; see also Fey, 1986). However, as suggested by scholars such as Rice (2004), maturational processes may loom as even larger factors than we have acknowledged in the past. According to Rice, when children with SLI seem to treat tense and agreement morphemes as optional for an extended period of time, the children are in a maturational state that prevents them from grasping that these morphemes are obligatory. This may well be true. Yet, we believe that even during a period of optional use, treatment effects might be seen. For example, 10 children who had scores above 0% in their use of the target form at Time 2 continued to make gains from Time 2 to Time 3 even though they were still showing optional use (less than 100% use) at Time 3. (We exclude here children who rose to 100% use at Time 3 and children whose use at Time 2 was still 0%.) How should this change from Time 2 to Time 3 be characterized? Clearly, the optional–obligatory dichotomy does not capture it, as the children were showing optional use at both Time 2 and Time 3. This type of change may well represent the interaction between maturation and treatment effects. Although by Time 3, these particular children may not have acquired the insight that the morphemes should be treated as obligatory, it appears that they developed a preference for including the tense and agreement forms. It seems possible that even when maturational factors prevent children from acquiring complete knowledge of the adult grammar, intervention may induce production biases in children that more closely approximate more mature use of the grammar.

**Clinical Implications**

Much more language intervention research is needed before we have a thorough understanding of the nature of change that occurs in the grammatical abilities of children with SLI. For example, Fey, Long, and Finestack (2003) have identified 10 factors in the literature that can be integrated into intervention procedures designed to facilitate children’s grammar. Yet only a few of these factors have been combined in published language intervention research to date. Only when more of these factors have been evaluated will we be able to truly understand the interplay between change that is maturationally driven and change that is significantly influenced by intervention.

Nevertheless, we feel that the interactive role of maturational and intervention identified in this study has direct clinical application. Not surprisingly, all of the children showing 0% use of the target form at Time 3 also showed 0% at Time 1. However, some children showing 0% at Time 1 were using the target form at levels of 15% to 75% by Time 2 and showed even higher levels of use by Time 3. Even if we are correct in assuming that the changes from Time 2 to Time 3 were influenced by treatment, it seems that maturational readiness is a crucial factor in determining which children showing 0% at Time 1 will rise above 0% in the coming months. Several authors have advocated the use of dynamic assessment as a means of making this distinction (e.g., Olswang & Bain, 1996). A potential target form may be appropriate for children who show some ability to imitate and even produce the form with considerable cuing. If children fail to show such ability, the form may not be an appropriate target. We cannot assume that maturational readiness will
always be revealed through dynamic assessment, but it appears to be a well-justified method to increase the likelihood that intervention efforts will have maturational factors on their side.

Clinical implications also follow from our finding that treatment-related changes occurred within the period of optionality, after the children were already producing the target inconsistently and before they reached mastery levels. This finding suggests that even if a period of optionality is maturationally based, clinicians’ efforts can indeed assist children in increasing the degree to which target forms are used. Because the probes used to assess progress were unrelated to the kinds of activities used during the intervention sessions, the children’s gains appeared to represent true changes in ability levels. This outcome may be even more noteworthy considering the fact that intervention involved the use of focused stimulation and recasting, two procedures that do not even require the child to produce the target form. Future studies may reveal that alternative procedures that include a production component lead to even better results.

Acknowledgments

The research reported in this article was supported by National Institute on Deafness and Other Communication Disorders Research Grant R01 DC004544. We thank Meghan Fitzgerald and Wenonah Campbell for their extremely valuable help in creating the stories used in the intervention sessions and for their assistance in devising appropriate scoring forms. We also thank Catherine Bush and Jill Omer for their skill in organization, record keeping, and clinician training and Patricia Deevy for her help on technical matters. A special thanks also to Sonja Solomonson for assisting with a range of duties. We are also grateful to the many individuals who served as clinicians, assistants during assessment, or transcribers: Whitney Boone, Emily Durnil, Katie Camarata, Rhola nd Cleveland, Angie Fontenot, Tara Robinson, Kate Kardel, Vanessa Smith, Katie Woodworth, Amy Hanrahan, Elly Huskey, Marlo Mewherter, Cindy Shamburger, Gretchen Melpolder, Deb Riley, Kristen Witte, Darcy Kazarian, Stephanie Cotton, Martha Leven, Sharon Murphy, Dana Gombus, Courtney Copeland, Michelle Stoller, and Christine Frazier.

References


