Research

# Syntactic Development in Adolescents With a History of Language Impairments: A Follow-Up Investigation

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**Purpose:** Syntactic development in adolescents was examined using a spoken discourse task and standardized testing. The primary goal was to determine whether adolescents with a history of language impairments would differ from those with a history of typical language development (TLD). This is a companion study to one that examined these same adolescents 2 years earlier (M. A. Nippold, T. C. Mansfield, J. L. Billow, & J. B. Tomblin, 2008).
**Method:** The participants were 15-year-old adolescents with a history of specific language impairment (SLI; *n* = 102), nonspecific language impairment (NLI; *n* = 77), or TLD (*n* = 247). A sample of spoken discourse was elicited using a Peer Conflict Resolution (PCR) task and analyzed for mean length of T-unit, clausal density, and subordinate clause use. In addition, 2 subtests from the Clinical Evaluation of Language Fundamentals, Third Edition (E. Semel, E. H. Wiig, & W. A. Secord, 1995), Concepts and Directions and Recalling Sentences, were administered.
**Results:** On the PCR task, the TLD group outperformed the SLI and NLI groups on mean length of T-unit, clausal density, and nominal clause use, and the TLD group outperformed the NLI group on relative clause use. On the standardized testing, the TLD group outperformed the SLI and NLI groups, and the SLI group outperformed the NLI group. Correlation coefficients calculated between the nonstandardized and standardized measures of syntax were statistically significant and positive.
**Conclusions:** Speech-language pathologists may wish to employ the PCR task to examine syntactic development in adolescents as a supplement to standardized testing.

**Key Words:** adolescents, language impairment, complex syntax, language sampling

Adolescents in today's world are expected to use and understand language in a sophisticated manner as they listen, speak, read, and write throughout the school day and beyond. Consider the following typical activities taking place in a public high school:

*It is 9 a.m., and students in health class listen and take notes as their teacher gives a lecture on the prevention of cardiovascular disease. For homework that evening, they are assigned to read a chapter on essential fatty acids. The next morning, they are broken into small groups and assigned to write a report and give an oral presentation on the role of different types of vitamins and minerals in disease prevention. Later that day, the students are asked to describe the outcome of an election during civics class, to compare the features of different microscopes during biology class, and to explain to their principal the nature of an interpersonal conflict that occurred between two teammates during football practice.*

To perform these tasks successfully, adolescents must have a sufficient amount of relevant background knowledge and the ability to use and understand spoken and written language at an advanced level. Given these high expectations in schools today, it is not surprising to learn that when language impairments persist into adolescence, they frequently have a negative impact on academic performance (Aram, Ekelman, & Nation, 1984; Beitchman, Wilson, Brownlie, Walters, & Lancee, 1996; Conti-Ramsden & Durkin, 2008; Johnson et al., 1999; King, Jones, & Lasky, 1982; Snowling,


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Bishop, & Stothard, 2000; Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998), ultimately limiting an individual's vocational options.

This article describes an investigation of language outcomes in 10th-grade adolescents who were identified as having language impairments when they were in kindergarten (Tomblin et al., 1997). In view of the significant growth in language that occurs in typically developing adolescents and the close association of later language development with academic success (Nippold, 2007), it is critical to monitor the progress of young people who have a history of early language impairments. The study focuses on their development of syntax in spoken language.

We chose to examine syntax because it is the structural foundation of sentences (Crystal, 1996). Syntactic competence allows a speaker to generate an infinite number of sentences to express an inexhaustible supply of ideas (Chomsky, 1965). Much of this creative expression is achieved through the use of complex sentences that contain subordinate clauses. Subordination occurs where one clause in a sentence is dependent on another (Crystal, 1996). For example, in the sentence "Jackie played baseball after the rain stopped," the subordinate clause (*after the rain stopped*) must be linked to the main clause (*Jackie played baseball*) to express a complete thought. Three major types of subordinate clauses include *nominal, relative,* and *adverbial* (Crews, 1977; Quirk & Greenbaum, 1973). Each type of subordinate clause enables a competent language user to perform a variety of unique communicative functions. For example, nominal clauses allow the speaker to express feelings, attitudes, and beliefs, as when the main clause of a sentence contains a metacognitive (e.g., *decide, believe, infer,* or *concur*) or metalinguistic (e.g., *argue, report, agree,* or *defend*) verb (e.g., "Mozart decided *that he would move to Paris*" or "The professor argued *that Isaac Newton had invented calculus*"); relative clauses allow the speaker to describe the subject or object of a sentence with precision (e.g., "The girl *who was wearing the red jacket* found the key *that had been missing for many years*"), and adverbial clauses allow a speaker to express concepts of conditionality, time, and purpose (e.g., "*If you take your queen out too soon,* you'll lose the game," "*Before the bus arrived,* Bob and Gary played two games of chess," or "Martin needed surgery for his hand *so that he could play the violin again*"). These examples highlight the advantages a speaker garners in being able to use each type of subordinate clause proficiently.

By 5 years of age, most children have acquired the ability to produce grammatically well-formed sentences containing all types of subordinate clauses (Diessel, 2004), including nominal ("Mommy said *Zoe went outside*"), relative ("The girl saw the boy *who was wearing the mask*"), and adverbial ("*When we get home,* let's watch TV"). Despite these impressive attainments, the ability to express increasingly abstract ideas in longer sentences containing multiple and embedded subordinate clauses continues to develop throughout the school-age years, adolescence, and into adulthood (Berman, 2004; Berman & Verhoeven, 2002; Loban, 1976; Nippold, Hesketh, Duthie, & Mansfield, 2005; Nippold, Mansfield, & Billow, 2007; Verhoeven et al., 2002). To explain the development of syntax beyond the preschool years, it has been hypothesized that cognitive stimulation, an expanding knowledge base, and the acquisition of abstract thought are key factors contributing to this process (Loban, 1976; Moffett, 1968).

Studies have reported, however, that school-age children and adolescents with language disorders are likely to show deficits in complex syntax compared to their peers with typical language development (TLD) when speaking in a variety of genres, including conversational, narrative, and expository (Bishop & Donlan, 2005; Marinellie, 2004; Nippold, Mansfield, Billow, & Tomblin, 2008; Scott & Windsor, 2000; Ward-Lonergan, Liles, & Anderson, 1999). In particular, young people with language disorders tend to produce shorter and simpler utterances with fewer subordinate clauses compared to their typical peers (for a literature review in this area, see Nippold et al., 2008).

In the present study, we elicited samples of spoken discourse using the Peer Conflict Resolution (PCR) task, a tool that had been employed in a recent developmental study of children, adolescents, and adults who were ages 11, 17, and 25 years old ($n$ = 60; Nippold et al., 2007). The task consisted of a set of hypothetical peer conflicts that the examiner read aloud to each participant. After the participant had retold a scenario, the examiner posed a series of questions concerning the nature of the problem, how it might be handled, and what the outcome might be. The PCR task effectively elicited discourse from all age groups, but older speakers outperformed younger ones on key syntactic variables including mean length of T-unit and subordinate clause production. Given that the PCR task revealed age-related growth in syntax, we predicted that it might reveal deficits in syntactic development in adolescents with a history of specific language impairment (SLI) and nonspecific language impairment (NLI) compared to their age-matched peers with a history of TLD.

Children with SLI and NLI have significant delays in the comprehension and/or production of language but do not demonstrate signs of autism, hearing loss, blindness, or neurological disorders. Although children with SLI perform within normal limits on tests of nonverbal intelligence, those with NLI perform below average on nonverbal measures and often have more severe language deficits (Nippold et al., 2008). Because language deficits tend to persist into adolescence, negatively affecting academic progress (e.g., Aram et al., 1984; Beitchman et al., 1996; Conti-Ramsden & Durkin, 2008; Johnson et al., 1999; King et al., 1982; Snowling et al., 2000; Stothard et al., 1998), it is important to study the development of these children during adolescence.

Our prediction regarding syntactic deficits in adolescents with a history of SLI and NLI was supported by the findings of a companion study involving these same adolescents 2 years earlier when they were in eighth grade (Nippold et al., 2008). At that time, samples of spoken discourse were elicited from the participants using the Favorite Game or Sport (FGS) task. This task requested them to describe any game or sport of their choice (e.g., chess, *Monopoly,* basketball, or football) in such a way that someone who had never played before would know how to play, and further to describe some strategies that could help a player win the activity. In that study, the TLD group

outperformed the SLI and NLI groups on mean length of T-unit, and the TLD group outperformed the NLI group on relative clause production. It was also found that a conversational task was unable to reveal any differences between groups in syntactic development. The authors concluded that discourse tasks used with adolescents should be cognitively more demanding than casual conversation to reveal syntactic weaknesses.

Although the FGS task effectively elicited spoken language from all participants and revealed syntactic deficits at eighth grade, there are many other discourse tasks that could be employed as well. With the FGS task, participants selected their own topic, enabling them to speak from a familiar knowledge base. This resulted in a wide variety of games and sports being discussed. It is important to know if a task requiring all speakers to address the same topic, such as a peer conflict, would also reveal syntactic deficits. If so, the option of using another task would add to the speech-language pathologist's repertoire of language-sampling tools that could be used with adolescents. Thus, the first goal of the study was to determine whether the PCR task would reveal deficits in syntactic development in adolescents with a history of SLI or NLI.

The second goal of the study was to examine adolescents' use of key syntactic variables on the PCR task in relation to their performance on a standardized measure of syntactic development. It is frequently recommended that language assessment of adolescents include naturalistic measures, such as language samples, in addition to formal, standardized tests (Larson & McKinley, 2003; Nelson, 1998; Paul, 2007). Standardized tests are useful for documenting the presence of a language disorder (Paul, 2007; Stephens & Montgomery, 1985). However, nonstandardized measures provide a more detailed and realistic view of how the adolescent communicates on a daily basis (Larson & McKinley, 2003). Thus, in addition to the PCR task, standardized testing of syntactic development was conducted. It was of interest to learn how performance would compare on these different types of measures, one more naturalistic and one more formal, a clinically relevant question. We predicted that the PCR discourse task and the standardized testing of syntax would yield similar but not necessarily identical findings. Given the greater time commitment involved in language sampling compared to the administration of standardized tests, it is important to know what types of unique information each approach yields that the other does not. The standardized testing also was used to determine whether the three groups of adolescents, at 10th grade, demonstrated typical or impaired syntactic development, given their original diagnostic categories.

In sum, the present investigation addressed the following questions:

1. How do adolescents with a history of TLD, SLI, and NLI compare in the use of complex syntax on a spoken discourse task that involves the interpretation of hypothetical peer conflicts?
2. How do the findings regarding the use of complex syntax in discourse compare to the results of standardized testing of syntactic development?

## Method

### *Participants*

The participants were 10th-grade students ($n$ = 426; 54% male, 46% female) who were attending a public high school located in an urban, suburban, or rural area in Iowa or Illinois. Approximately 84% were Caucasian, 13% were African American, and 3% belonged to other ethnic backgrounds (Asian, Hispanic, or Native American). All participants spoke English as their primary language. Although the majority spoke Standard American English, a small number spoke various dialects of American English.

These adolescents were part of a larger longitudinal investigation of language development that began when they were in kindergarten (Tomblin et al., 1997). At that time, each child had been given a battery of standardized tests and other informal assessment measures. Language was tested using the five core subtests from the Test of Language Development—Primary, Second Edition (Newcomer & Hammill, 1988), and a narrative comprehension and production task (Culatta, Page, & Ellis, 1983). On each of these measures, raw scores were converted to standard scores. Then, based on those standard scores, five different language composites were formed: grammar, vocabulary, narrative, comprehension, and production. If two or more composite scores were at least 1.25 *SD*s below the mean for a child's chronological age, that child was considered to have failed the language battery ("low language development"). In addition, nonverbal cognition was tested using the Block Design and Picture Completion subtests from the performance scale of the Wechsler Preschool and Primary Scale of Intelligence—Revised (Wechsler, 1989). Standard scores from these two subtests were summed to form a composite Performance IQ. If a Performance IQ below 85 was obtained, the child was considered to have failed this measure ("low cognitive development"). Based on the kindergarten testing, each child was assigned to one of three groups: typical language and cognitive development (TLD; $n$ = 247); low language but typical cognitive development, that is, SLI ($n$ = 102); or low language and low cognitive development, that is, NLI ($n$ = 77). During kindergarten, all participants had passed a battery of screening tests for autism, hearing loss, blindness, and neurological deficits. As part of the larger longitudinal study of language development, each child was reevaluated at 2nd, 4th, 8th, and 10th grades. The current study focuses on their syntactic development at 10th grade.

At 10th grade, the participants had a mean age of 15;10 (years;months; range = 14;6–17;5). Mean ages (and ranges) for each of the groups were as follows: TLD = 15;9 (14;6–17;5), SLI = 15;10 (14;11–16;9), and NLI = 15;10 (15;2–16;8). The groups did not show a statistically significant difference in age, $F(2, 423) = 1.24$, $p = .2909$, $\eta = .08$.

### *Procedures*

Trained examiners, supervised by a licensed speech-language pathologist, conducted all testing in a quiet area at each adolescent's high school. The examiner began by administering a battery of standardized language tests. To

examine syntactic development, the testing included two subtests from the Clinical Evaluation of Language Fundamentals, Third Edition (CELF–3; Semel, Wiig, & Secord, 1995): Concepts and Directions for receptive syntax, and Recalling Sentences for expressive syntax. Standard scores from these two subtests were obtained, and the mean of those scores was used to form a composite of syntactic development (SYN). Because this study focuses on syntax, the adolescents' performance on other aspects of language (e.g., vocabulary or reading) is not reported in this article.

Following the standardized testing, the examiner presented the PCR task using the same procedures that had been employed in the developmental study discussed earlier (Nippold et al., 2007; the procedures are described in detail in that article and are thus not repeated here but simply summarized). Briefly, the examiner read aloud two scenarios to the participant. Both scenarios were hypothetical situations that involved peer conflicts, adapted from Selman, Beardslee, Schultz, Krupa, and Podorefsky (1986). One occurred in a school setting (Story A: "The Science Fair"), and the other occurred in a job setting (Story B: "The Fast-Food Restaurant"). After listening to a scenario, the participant was asked to retell it to the examiner. If the participant left out key pieces of information (e.g., that the boys were assigned to work together on a science project), misreported certain details (e.g., talked about building a car instead of an airplane), or changed the names of the characters (e.g., Bill instead of Bob), the examiner re-presented the story and asked the participant to try again. All participants were able to retell the stories successfully. After that, the examiner began to ask a series of questions that required the participant to reflect on key elements of the story and to offer suggestions on how the problem might be solved. The scenarios and sets of questions are contained in Appendix A of this article.

The PCR task (including both scenarios) required about 9 min to complete. Each participant's interview was audio-recorded using an analog cassette tape recorder. The audio recordings were later transferred to digital format and then mailed to the University of Oregon Language Development Lab, where they were processed.

Each participant's entire interview, including both scenarios, was transcribed and entered into Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 2003). Utterances were segmented into T-units, and each T-unit was coded for its main (i.e., independent) clause and all nominal, relative, and adverbial clauses. Only clauses that contained finite verbs were coded, as this method was effective in revealing syntactic development in the previous study that employed the PCR task to elicit spoken discourse (Nippold et al., 2007). All maze behaviors (e.g., false starts or revisions) that occurred within T-units were placed within parentheses and excluded from analysis. Incomplete T-units were also excluded from analysis, using parentheses. The procedures used to identify complete and incomplete T-units, maze behaviors, main clauses, and subordinate clauses were identical to those used in the eighth-grade study. For ease of reference, those procedures are provided in Appendix B.

As with the eighth-grade study, the coding of every SALT file was checked at least twice, with the majority of coding being conducted by two of the investigators (second and third authors). Any discrepancies between the two judges were resolved through discussion, yielding an agreement level of 100%. As before, the syntactic variables of interest included mean length of T-unit; nominal, relative, and adverbial clause use; and clausal density, which is the average number of clauses produced per T-unit.

## Results

The first question of the study was as follows: How do adolescents with a history of TLD, SLI, and NLI compare in the use of complex syntax on a spoken discourse task that involves the interpretation of hypothetical peer conflicts? For the PCR task, the results are shown in Table 1. The number

**TABLE 1. Performance on the Peer Conflict Resolution task for the three groups.**

| Measure | TLD | SLI | NLI |
|---|---|---|---|
| Total T-units | | | |
| *M* | 28.21 | 26.74 | 25.95 |
| *SD* | 7.45 | 6.27 | 6.27 |
| Range low | 15.00 | 12.00 | 14.00 |
| Range high | 78.00 | 54.00 | 44.00 |
| Mazes[a] | | | |
| *M* | 34.65 | 34.85 | 34.89 |
| *SD* | 16.66 | 17.39 | 17.05 |
| Range low | 0 | 0 | 5.88 |
| Range high | 82.76 | 80.56 | 76.47 |
| Mean length of T-unit | | | |
| *M* | 9.84 | 9.14 | 8.90 |
| *SD* | 2.00 | 1.62 | 1.79 |
| Range low | 5.96 | 6.07 | 5.00 |
| Range high | 16.64 | 14.37 | 12.48 |
| Clausal density | | | |
| *M* | 1.46 | 1.39 | 1.37 |
| *SD* | 0.25 | 0.20 | 0.19 |
| Range low | 1.06 | 1.00 | 1.00 |
| Range high | 2.30 | 2.29 | 1.92 |
| Nominal clause use[a] | | | |
| *M* | 23.60 | 19.41 | 18.68 |
| *SD* | 15.74 | 12.68 | 12.82 |
| Range low | 0 | 0 | 0 |
| Range high | 84.00 | 64.10 | 58.33 |
| Relative clause use[a] | | | |
| *M* | 6.16 | 5.35 | 4.24 |
| *SD* | 5.30 | 4.76 | 4.53 |
| Range low | 0 | 0 | 0 |
| Range high | 39.29 | 17.86 | 24.14 |
| Adverbial clause use[a] | | | |
| *M* | 16.58 | 14.63 | 13.69 |
| *SD* | 11.45 | 11.30 | 09.98 |
| Range low | 0 | 0 | 0 |
| Range high | 61.90 | 67.86 | 44.44 |

*Note.* TLD = typical language development, $n = 247$; SLI = specific language impairment, $n = 102$; NLI = nonspecific language impairment, $n = 77$.

[a]Reported as percentage of T-units per sample.

of complete T-units is reported as a measure of language productivity. The percentage of T-units that contained maze behaviors is also reported. Because all mazes within T-units were excluded from syntactic analyses, it was important to know if the groups differed in the amount of talk that could be analyzed. Key syntactic variables include mean length of T-unit; clausal density; and nominal, relative, and adverbial clause use. Each type of subordinate clause is reported as the percentage of total T-units containing that type. The data were analyzed with a series of one-way analyses of variance (ANOVAs). Given the large number of variables, a conservative level of alpha (.01) was employed.

The results were not statistically significant for the total number of T-units produced, $F(2, 423) = 3.78$, $p = .0235$, $\eta = .13$, or for the production of mazes, $F(2, 423) = 0.01$, $p = .99$, $\eta = .007$. Thus, the groups did not differ in the amount of language that was available for syntactic analyses. Statistically significant differences occurred for mean length of T-unit, $F(2, 423) = 9.74$, $p < .0001$, $\eta = .21$, clausal density, $F(2, 423) = 7.02$, $p = .0010$, $\eta = .18$, and nominal clause use, $F(2, 423) = 5.01$, $p = .0071$, $\eta = .15$, but not for adverbial clause use, $F(2, 423) = 2.48$, $p = .0850$, $\eta = .11$. The results approached statistical significance for relative clause use, $F(2, 423) = 4.43$, $p = .0125$, $\eta = .14$. All effect sizes were small (Cohen, 1969, p. 276). Tukey tests indicated that the TLD group outperformed the SLI and NLI groups on mean length of T-unit, clausal density, and nominal clause use, and that the TLD group outperformed the NLI group on relative clause use. The SLI and NLI groups did not differ on these variables.

It should be noted that the wide range of scores on the nonstandardized variables reported in Table 1 indicates that there was some overlap in performance across groups. In other words, some adolescents at 10th grade were not performing in ways that were consistent with the majority of participants in their group, at least in terms of their syntactic development. The standardized testing of syntactic development conducted in 10th grade as part of this study should be useful in examining these patterns more fully.

Hence, we turn now to the second question of the study: How do the findings regarding the use of complex syntax in discourse compare to the results of standardized testing of syntactic development? To address this question, we begin by reporting the performance of the three groups on the SYN, a composite based on two subtests from the CELF–3 (Semel et al., 1995). These data are shown in Table 2. On this measure, a one-way ANOVA yielded a statistically significant difference between groups, $F(2, 423) = 113.75$, $p < .0001$, $\eta = .59$. The effect size, calculated using the eta coefficient (Meline & Schmitt, 1997), was large (Cohen, 1969, p. 276). Tukey testing indicated that the TLD group outperformed the SLI and NLI groups, and that the SLI group outperformed the NLI group. Thus, in terms of their overall performance, the groups continued to differ in ways that were consistent with their original diagnostic categories. Once again, however, it should be noted that the wide range of standard scores, reported in Table 2, indicates there was some overlap between the groups, where for example, some adolescents in the SLI and NLI groups obtained relatively high scores whereas some in the TLD group obtained relatively low scores.

**TABLE 2. Performance on the standardized measure of syntactic (SYN) development.**

| SYN | TLD | SLI | NLI |
|---|---|---|---|
| *M* | 10.03 | 7.02 | 5.76 |
| *SD* | 2.58 | 2.39 | 2.17 |
| Range low | 3.00 | 3.00 | 3.00 |
| Range high | 15.50 | 12.00 | 11.50 |

*Note.* TLD, $n = 247$; SLI, $n = 102$; NLI, $n = 77$; SYN = composite based on Concepts and Directions and Recalling Sentences subtests from the Clinical Evaluation of Language Fundamentals, Third Edition (Semel et al., 1995).

To examine these patterns further, Table 3 reports the percentage of participants in each group who performed above average (standard score > 10), within the average range (standard score = 7–10), or below average (standard score < 7) on the syntactic composite, given $M = 10$ and $SD = 3$ (Semel et al., 1995). As expected, the majority of adolescents in the TLD group (80.97%) performed within the average range, whereas the majority in the NLI group (72.73%) performed below average. Adolescents in the SLI group were divided between average (48.04%) and below average (51.96%) performance on the syntactic composite. Notably, only those in the TLD group performed above average (9.72%). Although these patterns are generally consistent with the original kindergarten diagnoses, some participants at 10th grade performed in unexpected ways, given their original diagnostic category. Thus, it cannot be assumed that all adolescents will show a predictable pattern of syntactic development.

To examine possible associations between the standardized and nonstandardized measures of syntactic development, Pearson product–moment correlation coefficients were calculated using each participant's scores on each of the variables. Reported in Table 4, all results were statistically significant and positive, including the correlations between the nonstandardized measures: mean length of T-unit, clausal density, and nominal, relative, and adverbial clause use. Correlations were particularly strong between mean length of T-unit and clausal density ($r = .85$), mean length of T-unit and nominal clause use ($r = .71$), clausal density and nominal clause use ($r = .86$), and clausal density and adverbial clause use ($r = .76$).

## Discussion

This study sought to determine if a PCR task of spoken discourse would reveal deficits in the use of complex syntax

**TABLE 3. Percentage of participants in each group performing at different levels on the SYN.**

| SYN | TLD | SLI | NLI |
|---|---|---|---|
| Above average | 9.72 | 0 | 0 |
| Within average | 80.97 | 48.04 | 27.27 |
| Below average | 9.31 | 51.96 | 72.73 |

*Note.* TLD, $n = 247$; SLI, $n = 102$; NLI, $n = 77$. Categories are based on $M = 10$ and $SD = 3$.

**TABLE 4. Pearson product–moment correlation coefficients calculated between syntactic variables on the Peer Conflict Resolution task and the SYN ($n$ = 426).**

| Variable | MLTU | CLDEN | NOM | REL | ADV | SYN |
|---|---|---|---|---|---|---|
| MLTU | 1.00 | .85*** | .71*** | .35*** | .67*** | .32*** |
| CLDEN | | 1.00 | .86*** | .38*** | .76*** | .30*** |
| NOM | | | 1.00 | .15* | .38*** | .21*** |
| REL | | | | 1.00 | .13* | .17** |
| ADV | | | | | 1.00 | .26*** |
| SYN | | | | | | 1.00 |

*Note.* MLTU = mean length of T-unit; CLDEN = clausal density; NOM = nominal clause use; REL = relative clause use; ADV = adverbial clause use.

*$p$ < .01. **$p$ < .001. ***$p$ < .0001.

in 10th-grade adolescents having a history of SLI or NLI compared to their peers with a history of TLD. The findings indicated that on the PCR task, the TLD group outperformed both the SLI and NLI groups on mean length of T-unit, clausal density, and nominal clause use, and that the TLD group outperformed the NLI group on relative clause use. However, the SLI and NLI groups did not differ on any of these measures.

These findings are largely consistent with a companion study involving these same adolescents 2 years earlier, when they were in eighth grade. At that time, a different spoken discourse task was employed in which the participants were asked to explain the rules and strategies of their favorite game or sport (FGS task; Nippold et al., 2008). Findings from the eighth-grade study indicated that the TLD group outperformed the SLI and NLI groups on mean length of T-unit and that the TLD group outperformed the NLI group on relative clause use. This suggests that the PCR and FGS tasks may be useful clinical tools for eliciting spoken discourse in adolescents.

Another purpose of the present study was to determine how the findings from the PCR task, a nonstandardized task examining natural language production, would compare to the findings from a standardized measure of syntactic development. It was important to ask this question because it is frequently recommended that language assessment of adolescents include not only standardized measures but also nonstandardized measures such as language samples (Larson & McKinley, 2003; Nelson, 1998; Paul, 2007). The results indicated that the SYN distinguished between the three groups, with a large effect size obtained on this variable. In contrast, the effect sizes were small for all syntactic variables on the PCR task, a finding that was consistent with the FGS task in the eighth-grade study (Nippold et al., 2008).

In general, these findings support a pattern of stability in which children who were identified as having language impairments as kindergartners continued to show difficulties in spoken language as adolescents, particularly when the early language impairment was accompanied by low cognition (NLI group). This suggests that children who begin their formal educations with language impairments are likely to require the support services of a speech-language pathologist throughout their school years. Nevertheless, despite the statistically significant differences between groups on both the nonstandardized and standardized measures, there was variability within each of the three groups. Thus, it cannot be assumed that all adolescents with a certain diagnostic label will continue to perform in ways that are consistent with the majority of their group. Hence, in clinical contexts, each adolescent must be evaluated on an individual basis.

Because samples of spoken discourse offer insight into how an adolescent actually uses language to communicate in natural settings, it is important to supplement standardized testing with language samples. This view is strengthened by the present results indicating that each of the nonstandardized measures, particularly mean length of T-unit and clausal density, was associated with the SYN. Thus, there was a positive relationship between the two types of measures, even though the coefficients were in the low to low-moderate range. Given that mean length of T-unit was most closely associated with the SYN ($r$ = .32), this variable may be especially important to consider, a view that is consistent with Hunt's (1970) claim that it is a useful index of later syntactic development. This study also found that mean length of T-unit and clausal density were strongly correlated ($r$ = .85), a result that was consistent with the eighth-grade study (Nippold et al., 2008). This indicates that as sentence length increases, subordination can be expected to increase as well. In addition, each type of subordinate clause—nominal, relative, and adverbial—was closely associated with mean length of T-unit and with clausal density, indicating that all three types of clauses contribute to syntactic complexity in spoken discourse.

Regarding the PCR task, it is interesting to consider some possible reasons for why the SLI and NLI groups performed below the TLD group. Recall that with the PCR task, participants were asked to talk about specific interpersonal conflicts and to reply to questions requiring an understanding of complex human behaviors and emotions, problem-solving skills, and the ability to predict outcomes. It is possible that the PCR task, with its focus on interpersonal issues, places significant intellectual demands on a speaker, which might make the task particularly challenging for adolescents in the NLI group with documented cognitive impairments. This view is consistent with the hypothesis that complex thought is driving the use of complex language in speakers of all ages, including children, adolescents, and adults (Nippold, in press; Nippold et al., 2005), and further that adolescents' deficits in the use of complex syntax in spoken discourse may partially reflect limitations in their knowledge of the topic of discussion. It is also consistent with the hypothesis proposed by Moffett (1968) over 40 years ago that syntax continues to develop beyond the preschool years as a result of cognitive stimulation, an expanding knowledge base, and the increasing ability to engage in abstract thought.

In the present study, we did not formally measure adolescents' knowledge of interpersonal relationships, awareness of other peoples' thoughts and feelings (theory of mind), or abstract reasoning. In future studies using the PCR task, investigators may wish to do so, particularly in view of studies indicating that young people with language impairments often experience difficulties with interpersonal relationships, evidencing substantially weaker social skills than their peers with TLD (Brinton & Fujiki, 1993; Brinton,

Fujiki, & McKee, 1998; Fujiki, Brinton, Isaacson, & Summers, 2001; Fujiki, Brinton, & Todd, 1996; Hart, Fujiki, Brinton, & Hart, 2004).

Informal analyses of responses to the examiner's questions on the PCR task suggested that adolescents in the SLI and NLI groups were less knowledgeable than those in the TLD group, and that speakers in the NLI group were even less informed than those in the SLI group. Appendix C contains examples of transcripts of randomly selected speakers from each of the groups answering the same sets of questions. The responses of speakers in the NLI group seem particularly weak in comparison to the others.

With respect to Story A, "The Science Fair," Speaker 1, a girl with TLD, offers more than one solution to the problem, realizes that the outcome is uncertain, and considers the perspectives of both characters in the story, Melanie and Debbie. In contrast, Speaker 2, a girl with SLI, offers few details for her solution and its possible outcome, and does not elaborate on the emotions of the two characters. Speaker 3, a girl with NLI, seems quite unaware of the basic interpersonal problem. Similarly, with respect to Story B, "The Fast-Food Restaurant," Speaker 4, a boy with TLD, offers more than one solution to the problem and indicates in detail how one of the characters, Mike, might articulate his views so that the other character, Peter, will understand. This speaker also considers the advantages and disadvantages of his preferred solution from the perspectives of both Mike and Peter. Speaker 5, a boy with SLI, also considers the perspectives of the two characters but offers fewer details than Speaker 4. Speaker 6, a boy with NLI, responds defensively, relying on an authority figure to solve the problem, rather than trying to solve it himself. In future research, investigators may wish to formally measure adolescents' knowledge of peer relationships and social skills in conjunction with their performance on spoken discourse tasks such as the PCR.

In future research, it would also be important to measure each participant's comprehension of the scenarios that are employed. In the present study, the scenarios were fairly brief and straightforward, and each participant was required to retell each one accurately before the questioning began. These procedures helped to ensure that the participant was attending to the task. However, it is possible that some participants may have had some subtle difficulties processing the details of the scenarios related to their language impairments. Thus, another limitation of the present study was that comprehension of the scenarios was not examined with any formal, objective tools.

### *Clinical Implications*

Experts in the area of adolescent language impairments frequently recommend that standardized testing be supplemented by language sampling (Larson & McKinley, 2003; Nelson, 1998; Paul, 2007). Although conversational language-sampling tasks are commonly recommended for speakers of all ages (Larson & McKinley, 2003), they are insensitive to syntactic deficits in adolescents with language impairments (Nippold et al., 2008). In contrast, there is evidence from the present study and from the eighth-grade study (Nippold et al., 2008) that other types of discourse tasks can reveal syntactic deficits in adolescents with a history of SLI and NLI. Hence, in addition to the FGS task, it is recommended that the PCR task be considered as another option for eliciting samples of spoken discourse in adolescents during language assessments. In view of the positive associations between the standardized and nonstandardized measures of syntax found in the present study, speech-language pathologists may wish to employ the PCR task with adolescents whose performance on standardized tests is below average, for it is those students who may be especially vulnerable to syntactic deficits in natural speaking situations.

After eliciting a language sample, transcribing it into T-units, and entering it into SALT, the speech-language pathologist may wish to code the sample for the use of subordinate clauses, keeping in mind that mean length of T-unit, clausal density, and nominal clause use were the variables on which the TLD group outperformed both the SLI and NLI groups on the PCR task. After analyzing the sample for syntactic complexity, it may be useful for the speech-language pathologist to examine it more subjectively, evaluating the content of the adolescent's responses to questions concerning the nature of the conflict, how it should be handled, and what the outcome might be. This type of qualitative analysis is important because young people with language impairments often have poor peer relationships (Brinton & Fujiki, 1993; Brinton et al., 1998; Fujiki et al., 1996, 2001; Hart et al., 2004).

The results of the language-sampling analyses might then be used to plan intervention. When clients demonstrate deficits in complex syntax, speech-language pathologists often target those problems directly, employing activities such as asking the client to imitate the desired sentence types, to combine simple sentences into complex sentences, or to engage in sentence completion tasks in an effort to increase the overall length and complexity of the speaker's utterances. While there is evidence that these types of intervention activities can be effective, the newly learned skills may not generalize to natural language production unless they are addressed in meaningful communicative contexts (Eisenberg, 2006; Paul, 2007). Thus, the speech-language pathologist might consider focusing more attention on the content of what is being said and factors that might motivate a speaker to use complex syntax.

For example, it has been reported that children, adolescents, and adults use substantially greater syntactic complexity during expository discourse compared to conversational discourse, particularly when explaining something intricate and of high personal interest (Nippold, in press). This suggests that intervention for syntax should occur during activities in which adolescents are encouraged to talk about complex topics that interest them. To be effective, language intervention with adolescents must be cognitively stimulating and relevant to their lives. During adolescence, positive peer relationships are a major source of personal growth and emotional well-being, offering friendship, support, and guidance as a young person makes the often bumpy journey from the protected world of childhood to the autonomy of adulthood (Schickedanz, Schickedanz, Forsyth, & Forsyth, 2001). Given the importance of peer relationships to adolescents' social and emotional development, efforts to

build their knowledge base in this domain may be an excellent context in which to address the use of complex syntax.

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## Appendix A

Peer Conflict Resolution Scenarios (Nippold et al., 2007, p. 187)

**Story A: "The Science Fair"**

John's* (Debbie's) teacher assigned him (her) to work with three other boys (girls) on a project for the science fair. The boys (girls) decided to build a model airplane that could actually fly. All of the boys (girls) except one, a boy (girl) named Bob (Melanie), worked hard on the project. Bob (Melanie) refused to do anything and just let the others do all the work. This bothered John (Debbie) very much.

Questions:

1. What is the main problem here?
2. Why is that a problem?
3. What is a good way for John (Debbie) to deal with Bob (Melanie)?
4. Why is that a good way for John (Debbie) to deal with Bob (Melanie)?
5. What do you think will happen if John (Debbie) does that?
6. How do you think they both will feel if John (Debbie) does that?

**Story B: "The Fast-Food Restaurant"**

Mike and Peter (Jane and Kathy) work at a fast-food restaurant together. It is Mike's (Jane's) turn to work on the grill, which he (she) really likes to do, and it is Peter's (Kathy's) turn to do the garbage. Peter (Kathy) says his (her) arm is sore and asks Mike (Jane) to switch jobs with him (her), but Mike (Jane) doesn't want to lose his (her) chance on the grill.

Questions:

1. What is the main problem here?
2. Why is that a problem?
3. What is a good way for Mike (Jane) to deal with Peter (Kathy)?
4. Why is that a good way for Mike (Jane) to deal with Peter (Kathy)?
5. What do you think will happen if Mike (Jane) does that?
6. How do you think they both will feel if Mike (Jane) does that?

*Male names (John, Bob, Mike, Peter) were used with male participants, and female names (Debbie, Melanie, Jane, Kathy) were used with female participants in an effort to increase each adolescent's ability to relate to the main characters.

## Appendix B

Definitions of Syntactic Variables (Adapted From Nippold et al., 2008)

**Mean Length of T-Unit**

A T-unit consists of one main clause and any attached subordinate clauses (Hunt, 1970). A main clause contains a subject and a finite verb (Crews, 1977). In the sentence "He drank lemonade," *he* is the subject and *drank* is the verb. This utterance can stand alone as a single T-unit because it is a main clause. In the present study, subjects were usually nouns (*Hamburgers* were served with catsup), noun phrases (*The fast-food restaurant* was in Davenport), pronouns (*She* enjoys cooking), or proper names (*Mike* likes the grill). However, gerund (*Grilling burgers* is more fun) and infinitive (*To work the grill* was his preference) phrases were allowed when used in subject position.

The following utterance is a single T-unit but has an additional subordinate clause, making it a complex sentence: "He drank lemonade *while he watched the parade.*" As Hunt (1970) explained, "any complex or simple sentence would be one T-unit, but any compound or compound-complex sentence would consist of two or more T-units" (p. 4). Thus, in the present study, if a speaker produced two or more main clauses continuously, joined by a coordinating conjunction such as *and, but,* or *so*, that utterance was segmented into separate T-units. For example, the following utterance, a compound sentence spoken continuously, is actually two T-units, separated at the slash:

It doesn't get on Melanie's bad side / and it's not confrontational.

As another example, the following utterance, a compound-complex sentence that was spoken continuously, was segmented into two T-units, separated at the slash, where the first T-unit is a simple sentence and the second one is a complex sentence:

You have three other people / and then you have Bob who is not helping at all.

In the present study, SALT automatically calculated mean length of T-unit for each language sample by dividing the total number of words by the total number of T-units (excluding all words contained within parentheses).

**Subordinate Clauses**

There are three types of subordinate clauses: nominal, relative, and adverbial (Crews, 1977; Quirk & Greenbaum, 1973).

1. Nominal clauses express feelings, attitudes, or beliefs (e.g., I think *Bob is lazy*).
2. Relative clauses describe nouns (e.g., The teacher *who gave the assignment* was Mr. Jones).
3. Adverbial clauses express conditionality, time, or purpose (e.g., *When they finish the project*, they will all feel good).

For the present study, all subordinate clauses were required to have a subject and a finite verb (Crews, 1977). Each T-unit produced in the conversational and expository samples was coded for its main (i.e., independent) clause (IC) and each instance of nominal (NOM), relative (REL), or adverbial (ADV) clause. This is illustrated below where each T-unit is numbered, and each code is placed after the main verb of the clause:

1. If I were [ADV] Debbie, I would have [IC] a conversation with Melanie.
2. I think [IC] Debbie would feel [NOM] better if Melanie talked [ADV] to her.
3. Debbie would like [IC] to get the credit that she deserves [REL].

**Clausal Density**

Clausal density reflects the amount of subordination a speaker uses. This was calculated by summing all of the coded main and subordinate clauses contained in the sample and dividing this number by the total number of T-units produced (or the total number of main clauses produced because every T-unit has just one main clause), a method developed by Hunt (1970). This procedure is illustrated below:

46 = Main clauses
35 = Subordinate clauses:
    10 = Nominal
    14 = Relative
    11 = Adverbial
81 = Total clauses
46 = Total T-units
1.76 = Clausal density

**Excluded Language Production**

*Mazes.* Mazes included false starts (e.g., uh, well, uh, er), revisions (e.g., her leg I mean), and parenthetical utterances (e.g., lemme see). All instances of these behaviors were excluded from analysis by using parentheses.

*Incomplete T-units.* An incomplete T-unit occurred when an utterance lacked a main clause in that it was missing a subject, finite verb, or both (e.g., but so; yours; to the school). These behaviors also were excluded from analysis by using parentheses. Exceptions to this rule occurred when a speaker deleted the subject in a conventionalized manner (e.g., Examiner [E]: What will happen? Adolescent [A]: Depends on Kathy's decision), used an imperative (Don't forget; Take it from me), or answered a question with the subordinate conjunction *because* (E: Why did she say that? A: Because she was angry). These types of utterances were classified as complete T-units. Although utterances that began with subordinate conjunctions technically were adverbial clauses, an exception was made for *because* when it began a clause that was a "stand-alone" answer to a question; these utterances were counted as main clauses and therefore T-units. This was done to avoid excluding a large number of utterances from the data set that actually functioned as T-units. Thus, it is emphasized that no T-units were excluded from analysis unless they were incomplete (and did not meet the criteria for being a T-unit).

## Appendix C

Examples of Adolescents' Responses on the PCR Task

Note: Each code is placed immediately after the main verb of the clause.

**Story A: "The Science Fair"**

Speaker 1: Girl with TLD, age 15;5, mean length of T-unit = 12.68
Examiner: What is a good way for Debbie to deal with Melanie?
Adolescent: She could just ask [IC] her if she would participate [NOM] a little bit more. And if that doesn't work [ADV], then she could try [IC] to get some of the other girls in the group to talk to her too.
Examiner: What do you think will happen if Debbie does that?
Adolescent: Depending on what Melanie does [NOM], if she's [ADV] cooperative, she'll probably do [IC] some more work. And if she's [ADV] not, then she won't do [IC] any work. And Debbie will probably have [IC] to think of something else to get her to work like go talk to her teacher or something.
Examiner: How do you think they both will feel if Debbie does that?
Adolescent: I think [IC] Debbie will probably feel [NOM] better. But Melanie will probably feel [IC] kind of bad or like she called [NOM] out or something. And she'll probably be [IC] a little bit angry or mad.

Speaker 2: Girl with SLI, age 15;8, mean length of T-unit = 7.13
Examiner: What is a good way for Debbie to deal with Melanie?
Adolescent: Tell [IC] somebody. Tell [IC] an adult. Or talk [IC] to her about it.
Examiner: What do you think will happen if Debbie does that?
Adolescent: Melanie might get [IC] mad if she tells [ADV] her that's [NOM] a problem.
Examiner: How do you think they both will feel if Debbie does that?
Adolescent: Melanie might be [IC] mad. Or Debbie might be [IC] happy.

Speaker 3: Girl with NLI, age 16;3, mean length of T-unit = 6.83
Examiner: What is a good way for Debbie to deal with Melanie?
Adolescent: She could just explain [IC] how to make an airplane.
Examiner: What do you think will happen if Debbie does that?
Adolescent: I don't know [IC].
Examiner: How do you think they both will feel if Debbie does that?
Adolescent: Happy.

**Story B: "The Fast-Food Restaurant"**

Speaker 4: Boy with TLD, age 15;9, mean length of T-unit = 11.82
Examiner: What is a good way for Mike to deal with Peter?
Adolescent: Mike could trade [IC] jobs with him. Or he could say [IC], "This is [NOM] my favorite job and it's [NOM] like the first time I actually get [REL] to work at this, let me do [NOM] what I wanna do [NOM], please."
Examiner: What do you think will happen if Mike does that?
Adolescent: Peter might not be [IC] too happy with him. But his arm will heal [IC]. He'll get [IC] better eventually.
Examiner: How do you think they both will feel if Mike does that?
Adolescent: I think [IC] Mike would be [NOM] content because he's still working [ADV] at the grill. If anything, he'll probably be [IC] happy because he likes [ADV] the grill. Peter wouldn't exactly be [IC] too happy because he has [ADV] to take out the garbage and it might hurt [ADV] his arm. I'm [IC] not quite positive how much garbage they have [REL]. But if it hurts [ADV] his arm, it'll heal [IC] eventually. He can go [IC] see a doctor and take time off of work. He might like [IC] that.

Speaker 5: Boy with SLI, age 15;10, mean length of T-unit = 9.18
Examiner: What is a good way for Mike to deal with Peter?
Adolescent: Mike could let [IC] him do it for a little while and then switch again. Let [IC] him rest up.
Examiner: What do you think will happen if Mike does that?
Adolescent: He won't get [IC] as much time on the grill as he wants [ADV] to. But at least he will help [IC] out his friend.
Examiner: How do you think they both will feel if Mike does that?
Adolescent: Peter will probably feel [IC] thanks that he actually got [NOM] some time for his arm to rest. And Mike, even though he missed [ADV] like part of his time on the grill, he still got [IC] to help out a friend.

Speaker 6: Boy with NLI, age 16;0, mean length of T-unit = 7.58
Examiner: What is a good way for Mike to deal with Peter?
Adolescent: Just go [IC] tell his boss, "he's bothering [NOM] me and he won't leave [NOM] me alone."
Examiner: What do you think will happen if Mike does that?
Adolescent: Peter might get [IC] fired.
Examiner: How do you think they both will feel if Mike does that?
Adolescent: Mad.