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The Influence of a Social Communication Intervention on the Syntactic Complexity of Three Children with Language Impairment

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ABSTRACT

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Research has shown that children with language impairment (LI) exhibit difficulties with both social communication and syntax. This study analyzed the effect of a social communication intervention on syntactic development, focusing on grammatical complexity in three children with LI when enacting stories. The intervention included reading and enacting stories, playing games with picture emotion cards and journaling. Each child's mean length of terminal unit (t-unit), the number and type of subordinate clauses they produced per t-unit, and the grammaticality of their complex sentences was analyzed. While none of the children increased their mean length of t-unit or the grammaticality of their sentences, one participant showed a slight increase in the number of subordinate clauses she used and another participant changed the basic format with which she enacted stories to a more mature format. The results of this study did not support the claim that a single intervention could target both social communicative and syntactic goals simultaneously. There were limitations to this study that, if addressed, could potentially support this claim.

ACKNOWLEDGEMENTS

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DESCRIPTION OF THESIS CONTENT

This thesis is written in a hybrid form that integrates current journal publication format with the traditional thesis format. This includes updated university format requirements for submission. This thesis is part of a larger collaborative project, portions of which may be submitted for publication. Appendix A includes the rules for dividing utterances used for data analysis, Appendix B contains the modified conventions for measuring t-unit length, Appendix C, includes data for the individual study participants and Appendix D includes an annotated bibliography.

Introduction

Children with language impairment (LI) have difficulty understanding and producing language in the face of relatively typical growth in other areas of development (Paul & Norbury, 2012). These difficulties are most commonly characterized by problems in the comprehension and production of vocabulary and syntactic structure. Recent work has suggested that these children may also have difficulties with other aspects of social communication (Adams, 2005; Bishop & Norbury, 2002). For example, children with LI have difficulty dissembling their emotions, recognizing emotions from other's faces, and inferring the emotions experienced by characters in short scenarios (Fujiki & Brinton, 2015). Also reflective of the co-occurrence of structural and social difficulties in these children is that the most recent revision of the Diagnostic and Statistical manual of the American Psychiatric Society indicates that language disorder and social (pragmatic) communication disorder can be co-morbid (American Psychiatric Association [APA], 2013). The purpose of the current study is to determine if it is possible to address structural goals simultaneously with social goals by utilizing a social communication approach.

Syntactic Development in Children with LI

The American Speech-Language-Hearing Association defines language disorder (synonymous with LI) as "impaired comprehension and/or use of spoken, written and/or other symbol systems. The disorder may involve (a) the form of language (phonology, morphology, syntax), (b) the content of language (semantics), and/or (c) the function of language in communication (pragmatics) in any combination" (1993, para. 1). As this definition indicates, structural problems are a defining characteristic of LI, often manifested by difficulty producing and comprehending syntactical forms (APA, 2013; King & Fletcher, 1993). When compared to

typical peers, children with LI often produce shorter sentences with less complex syntax. They also produce grammatical modifications more frequently, especially on forms that involve marking number and tense on verbs (King & Fletcher, 1993; Rice, Smith, & Gayan, 2009).

Syntax begins to emerge when children begin to speak in two-word utterances, at around 18 months (Nippold, Mansfield, & Billow, 2007). As children mature, their utterances become longer and their syntax gets more complex. After age five, most children can produce sentences with all types of subordinate clauses as well (Nippold, Mansfield, Billow, & Tomblin, 2009). During the elementary school years and beyond, syntactic development continues at a slower pace and is characterized by combining previously learned grammatical patterns into longer and more complex utterances. This growth is shown by an increased length of t-unit (described below), and clausal density, the number of main and subordinate clauses per t-unit.

Children with LI acquire language and syntax at a slower rate than do typical children and generally continue to produce grammatically incorrect sentences throughout the preschool years (Nippold & Schwartz, 2002). This difficulty in the development of syntax is characterized by grammatical errors in all types of utterances in both writing and speaking when compared to their typically developing peers (Eisenberg, 2014). Difficulty producing correct syntax persists into the school-age years (Gillam & Johnston, 1992). Intervention that addresses their structural issues often focuses on increasing their ability to comprehend and produce complex syntax (Eisenberg, 2014). Even with intense intervention, however, children with LI develop the use of complex syntax more slowly. These children's intervention goals may not be met quickly, even though their breadth and depth of language ability is increasing (Eisenberg, 2014). As such, syntactic intervention for children is a long-term process.

By the time children have reached pre-school age, mean length of utterance (MLU) is no longer an adequate measure of their language complexity; the t-unit is a better indicator of syntactic development (Hunt, 1970; Nippold, 2009; Nippold, Hesketh, Duthie, & Mansfield, 2005). A t-unit is an utterance that contains a main clause (with subject and verb) and may contain one or more subordinate clauses (Hunt, 1970). For example, the sentence, "The dog played fetch." contains one t-unit, while the sentence, "The dog played fetch after coming to the park." has one t-unit with a subordinate clause. The sentence, "The dog went to the park and he played fetch." has two t-units, because the sentence contains two independent clauses combined by a coordinating conjunction. It has been well documented that the t-unit is a more accurate measure of grammatical complexity in older children than MLU, words per sentence, or analyzing the number of subordinate clauses (Nippold et al., 2009). For purposes of the present study, the t-unit also has the advantage over measures such as MLU in that it is not as influenced by frequently occurring single word utterances. In the current intervention, the clinician posed numerous cloze questions. As most of the responses only required single words, using MLU as the analysis unit would lower the child's score without taking into account the context of the response.

Modeling Procedures to Improve Syntax

There have been many interventions for children with LI that address deficits in syntactic development (Eisenberg, 2014; Paul & Norbury, 2012). Many of these interventions are based on providing the child with consistent modeling of target structures (e.g., focused stimulation, milieu therapy). In these interventions, the child is provided with multiple instances of correct productions of more complex grammatical patterns than they can independently produce. These modeling techniques are generally used in the course of relatively naturalistic interactions.

However, modeling can also be highly structured and provided with external reinforcement, similar to drill techniques. In either case, the child's primary responsibility in the intervention is to listen (Paul & Norbury, 2012). The child is presented with correct productions produced in a variety of contexts over time, allowing the child to hear appropriate productions of the grammatical pattern. Through the repeated exposures to the grammatical pattern, the child acquires the pattern and becomes able to produce the syntactical target independently. Syntactic intervention through modeling for children with LI has been shown to be effective (see McCauley & Fey, 2006). As such, it follows that by incorporating these modeling techniques into an intervention designed to improve aspects of social communication, a single intervention might be used to target both syntactical and social communication deficits. The purpose of this study is to determine the effect of a social communication intervention that has incorporated modeling procedures to address the grammatical limitations in children with LI.

The Current Study

The current study is part of a larger project focusing on the social communication abilities of children with LI. In the larger project, an intervention was designed to improve multiple aspects of social communication. As noted, it was hoped that it might be also possible to facilitate gains in syntactic complexity at the same time. This was done by incorporating modeling procedures into the intervention that focused on complex sentence forms. In a previous paper from the same project, syntactic complexity was examined as the children told stories from wordless books (Smith, 2015). In Smith's study, the participants exhibited no significant syntactical gains shown by increased mean length of t-unit (MLT). However, the clinician noted that the children appeared to become bored with the task of retelling stories from the books, and a decrease in the amount of time spent telling the stories was evident. This paper

uses data from the same time period of the study as Smith's report, but draws on a different data set: language produced during the story reenactment portion of the intervention sessions. It was hoped that the stories used in the intervention sessions were more engaging. The clinician was also able to discuss the stories with the children. The goal of this study was to determine if the intervention could increase syntactic complexity and interactional behavior at the same time.

Method

As noted, data for this study were taken from a larger project evaluating the efficacy of a story-based social communication intervention designed to improve the production of emotion words. Five school-age children with LI received the intervention, which was conducted at an elementary school in Utah. The intervention was provided by a graduate student in speech-language pathology, and was overseen by an ASHA-certified school speech-language pathologist (SLP) and two doctoral-level SLPs. The purpose of this thesis was to determine if the social communication intervention could also produce measurable gains in the children's structural abilities over the course of the 10-week intervention period.

Participants

One boy and four girls with ages ranging from 6:1 to 10:1 (years: months) participated in the study. All of the study's participants were diagnosed with LI and had been receiving speech-language services at the school. None of the participants was identified as needing further assessment during a pure-tone hearing screening and all had IQ scores within the typical range for their age based on a standardized test of intelligence. Both measures were administered by school personnel. For the purpose of this paper, only the three oldest children, one boy and two girls, were evaluated. The other two girls were not evaluated due to the limited number of t-units they produced. The two girls evaluated for this study were sisters.

Participants were administered the *Clinical Evaluation of Language Fundamentals-5* (CELF-5; Semel, Wiig, & Secord, 2013) to provide a standardized measure of language skills. The *Children's Communication Checklist-2* (CCC-2; Bishop, 2006) was completed by the children's teachers. The CCC-2 provided a general measure of the teacher's perceptions of the child's communication skills. The results of these two baseline measures are provided in Table 1. These scores provide a general overview of each participant's communication abilities.

Table 1

Children's Communication Checklist-2 (CCC-2; Bishop 2006) and Clinical Evaluation of Language Fundamentals-5 (CELF-5; Semel, Wiig, & Secord, 2003) Scores

Instruments	Participants		
	ALK	SS	ADK
CCC-2[1] Subtests			
Speech	1	1	1
Syntax	9	0	1
Semantics	5	0	1
Coherence	2	1	16
Initiation	50	0	37
Scripted Language	25	1	37
Context	25	1	16
Nonverbal Communication	16	1	9
Social Relations	16	5	37
Interests	50	1	91
GCC[2]- percentile	4	1	2
SIDI[3]	15	5	36
CELF-5[4]			
FS[5] Subtest	9	1	50
Core percentile	8	2	23

Note. [1]Children's Communication Checklist-2 (CCC-2). [2]General Communication Composite. [3]Social Interaction Difference Index. [4]Clinical Evaluation of Language Fundamentals- 5 (CELF-5). [5]Formulating Sentences Subtest.

SS (9:9). SS was a Caucasian male who was diagnosed with high-functioning autism at the age of five. This diagnosis was confirmed at age eight by a neuropsychologist at a local children's hospital. The educational team at SS's school did not agree with this diagnosis, however, as SS did not exhibit any repetitive or stereotypical behaviors indicative of autism spectrum disorder (ASD) and was able to self-monitor his behavior. Although he could recognize his own inappropriate behaviors, he often acted impulsively. SS was homeschooled until 2nd grade, and was enrolled in a local public elementary school. He was identified with LI by the school SLP and received articulation and language intervention, along with special services in math, reading, and writing. At age 9:5, SS was identified with specific learning disability (SLD) based on testing by school personnel. At the time of the study his language intervention targets included the production of complex sentences and appropriate topic manipulation.

As determined at the beginning of the study, his scores on all subtests were below the 5th percentile on the CCC-2. On the CELF-5, SS's core language score fell in the 2nd percentile and his score in the formulated sentences subtest fell in the 1st percentile. SS enjoyed interacting socially, but he had difficulty adapting to different settings and responding appropriately to changes in routine. SS also struggled with interpreting the expressions, vocal inflections, and nonverbal responses of his communicative partners. Administration of the Teacher Behavior Rating Scale (TBRS; Hart & Robinson, 1996) indicated poor performance in two main aspects of social behavior: withdrawal and sociability. He exhibited high scores in all areas of withdrawal (indicating greater withdrawal): reticence, social active and social passive withdrawal. He also demonstrated low scores in the subtypes of sociability (indicating poor sociable skills): likeability and prosocial behavior.

ALK (10:1). ALK was a Caucasian female who was identified with LI, articulation deficits and a number of phonological processes in 1st grade. She received speech and language intervention for articulation and syntactic deficits. On the CCC-2, she scored in the 9th percentile on the syntax subtest and in the 2nd percentile for coherence, showing strong deficits in both of these areas. Her overall score on the CCC-2 placed her in the 7th percentile. Her core language score on the CELF-5 was in the 8th percentile. Her score on the formulating sentences subtest was in the 9th percentile. Administration of the TBRS indicated high levels of withdrawal and low levels of sociable behavior. She exhibited poor performance in both subtypes of social behavior and increased withdrawn behavior in reticence and solitary active withdrawal. She displayed typical solitary passive behavior. As reported by the clinician, ALK participated in social conversations and had friends, but had difficulty interpreting the emotions and reactions of her conversational partners. She also struggled with expressing herself due to semantic deficits and syntactical/morphological errors.

ADK (7:11). ADK was a Caucasian female, diagnosed with LI and SLD in 2nd grade. She received intervention for deficits in articulation and language ability. Her score on the CCC-2 confirmed these deficits. She achieved a score in the 4th percentile overall on the test, scoring in the 9th percentile for nonverbal communication and at or below the 1st percentile in speech, syntax and semantics. On the CELF-5, her core language score fell in the 23rd percentile. She performed at the 16th percentile in the word structure subtest and in the 50th percentile in formulated sentences subtest. ADK also received results indicating high levels of withdrawn behavior and low levels of sociable behavior on the TBRS. She displayed significantly increased withdrawn behavior in all three subtypes and low performance in both sociability areas: likeability and prosocial behavior. Her clinician described her as "chatty" and reported she did

not have problems interacting with peers, but explained that she did not add to conversations often. Her clinician speculated that her hesitance to add to conversations could stem from ADK's limited exposure to certain topics, and her difficulties with interpreting, inferring and/or predicting the listener's response.

Design of Intervention

This paper treated each child as a case study in which each participant was analyzed to compare general syntactic ability at the beginning and end of the study period. During the study, each participant met individually with the graduate speech clinician in the speech classroom twice a week for 20-minute sessions, for a total of 20 intervention sessions per child. Baseline data were not collected specifically on syntactic complexity as this was not the focus of the overall study, thus each child was treated as a case study. All sessions were video recorded for later analysis.

Intervention sessions. The lesson plan for each intervention session was the same for each child on a particular day, but was modified during the session to fit each participant's individual needs. The intervention contained the same four tasks: (a) reading a story with emphasis put upon identifying and explaining the emotions experienced by the characters, (b) reenacting the story with stuffed toys to represent the characters, (c) a card game using pictures of different emotions, and (d) writing in a journal, where the activities from the session were reviewed, discussed, and written about. Each activity was designed for children with limited language abilities. The activities for the intervention sessions emphasized the recognition of emotions and the use of emotion words, but syntax was also targeted through modeling. Each utterance by the clinician while reading the story was grammatically correct and contained a full t-unit, with subordinate clauses used often. During the story reenactment portion of the session,

the child would take over the role of one or more characters. The emotions of each character were identified and the cause of the emotion was discussed using words that express causation, including *because, so, if, then,* and *since.* The objective was to stimulate the development of complex sentence forms using these words. Data from the story reenactment portion of the session were analyzed in this paper to determine the effectiveness of the intervention.

Transcription Reliability

To establish transcription reliability, one graduate student and one undergraduate student transcribed 10% of the story reenactment portions of the treatment sessions. The resulting transcriptions were then compared to each other for reliability, using the formula A/N x 100 (where A is the number of morpheme agreements and N is the total number of morphemes in the transcription). Interexaminer reliability was found to be 93%. The transcriptions were then combined to make a standard key to use in establishing reliability with additional examiners.

An additional undergraduate student was later trained to transcribe the story reenactment portions of the intervention sessions. This student transcribed two of these samples which were previously transcribed by the graduate student. These transcriptions were compared to the existing transcription and interexaminer reliability was 91%. The two undergraduate students transcribed 18 and 9 samples, respectively.

Dividing Utterances

Once transcribed, the graduate student and one undergraduate student individually checked five samples for utterance divisions. These samples were compared to each other and discrepancies were discussed until all were resolved and the rules for utterance division were established, based on guidelines from Brinton and Fujiki (1984). The graduate student then

checked the utterance divisions in the rest of the samples using these rules. The guidelines for utterance division are presented in Appendix A.

Data Analysis

The purpose of this study was to analyze the patterns of grammatical complexity over time as a response to the social communication intervention. T-units were used to quantify the grammatical complexity pattern. One graduate student and one undergraduate student analyzed each transcription after all of the video samples were transcribed. As was done for utterance divisions, each student analyzed five samples that were compared to each other and discrepancies discussed until all were resolved. For the analysis, each utterance produced by the child was marked as or as not a t-unit, with incomplete t-units (missing a subject or verb) repetitions or unintelligible utterances excluded. The complete t-units were used to count the total number of morphemes produced by the child in the story reenactment portion of each intervention. The MLT for each session were determined and the number of subordinate clauses per sample was counted. The number of subordinate clauses per t-unit was also calculated. The conventions for counting morphemes are found in Appendix B. The data were recorded for each session and then graphically compared to the other sessions.

Results

Complex sentences were produced during the administration of the emotion-based social communication intervention previously outlined. The mean length of t-unit per session and the number and type of complex sentences were gathered and graphed in order to determine if trends existed during the intervention phase. Detailed data for each participant are presented in Appendix C.

SS

The mean length of t-unit produced by SS in each session is presented in Figure 1. His productions were fairly stable and fell within a range of 5.07-7.58 morphemes/t-unit during the 10 sessions, with a mean of 6.36 morphemes/t-unit, and SD of 0.65. The number of subordinate clauses/t-unit he produced during the study had higher variability with mean = 0.27, SD = 0.13. Most of the subordinate clauses he produced were noun complements (53) or coordinated clauses (37), but he also produced five adverbial clauses and one relative clause during the course of the intervention. He produced almost twice as many subordinate clauses/t-unit in the second session compared to the other sessions. Within the 10 sessions, excluding the second session, SS produced between 0.10-0.33 subordinate clauses per t-unit. In the second session, he produced 0.60 subordinate clauses/t-unit and a higher MLT than any other session. For each session, between 25% and 75% of his utterances with subordinate clauses were produced grammatically correct with a mean of 55% (SD = 17%) with no significant trend. Most of the errors involved morphological forms, involving omissions of obligatory conjunctions in coordinating clauses, errors in subject-verb agreement, and tense agreement.
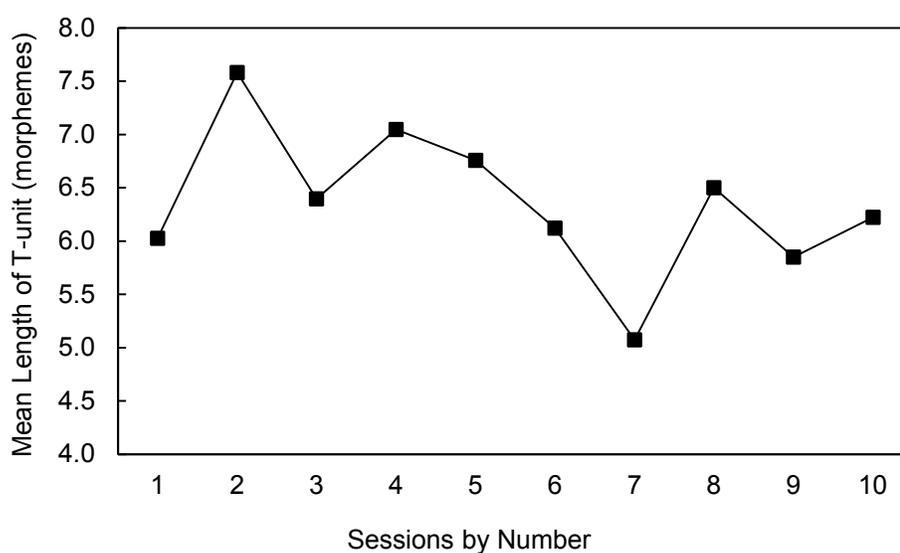
Figure 1. Mean length of t-unit, per session, produced during story enactment for SS.

ALK

ALK's mean length of t-unit, for each session, is presented in Figure 2. The results for ALK were consistent with SS's results, with greater variability shown in the number of subordinate clauses produced per t-unit than MLT, but with no specific trend. Within the 10 sessions, she produced a mean length of t-unit of 6.14 morphemes/t-unit with a SD of 0.70, with a range of 4.93-7.23 morphemes/t-unit. She also produced between 0.13-0.29 subordinate clauses/t-unit, with a mean of 0.22 subordinate clauses/t-unit, with a SD of 0.06. Most of her complex sentences involved noun complements and coordinated clauses. ALK produced only three adverbial clauses and two relative clauses compared to 77 noun complements and 55 coordinated clauses. For each session, between 33% and 100% of utterances with subordinate clauses were produced grammatically correct, with a mean of 73% (SD = 25%), with no significant trend. As with SS, most of the errors involved morphological forms, including errors in subject-verb agreement and tense agreement.
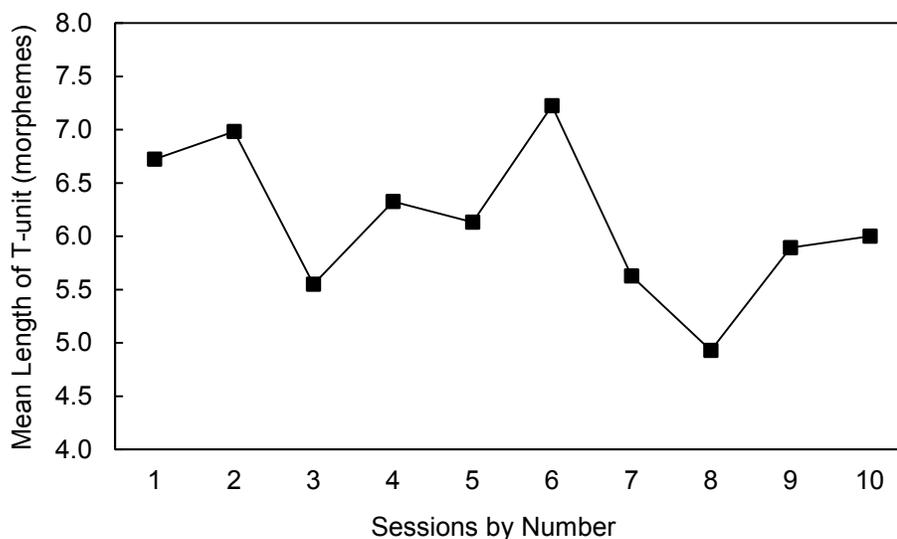
Figure 2. Mean length of t-unit, per session, produced during story enactment for ALK.

ADK

ADK's mean length of t-unit is presented in Figure 3. She had somewhat less variability in mean length of t-unit than the other participants. Her mean length of t-unit ranged between 4.75-6.39 morphemes/t-unit across the 10 sessions with a mean of 5.38 morphemes/t-unit with a SD of 0.45. She produced between 0.06 and 0.27 subordinate clauses/t-unit with a mean of 0.12 subordinate clauses/t-unit with a SD of 0.06. Similar to the other participants, she produced more noun complements and coordinated clauses than other types of clauses. She produced 31 noun complements, 9 coordinated clauses, 1 adverbial clause and 1 relative clause. There was a slight upward trend overall in the number of subordinate clauses produced per t-unit. She produced grammatically correct subordinate clauses in each session with a high degree of variability, ranging between 0% and 100% of subordinate clauses produced correctly, with a mean of 58% (SD = 26%). As with the other children, most of these errors involved morphological forms.
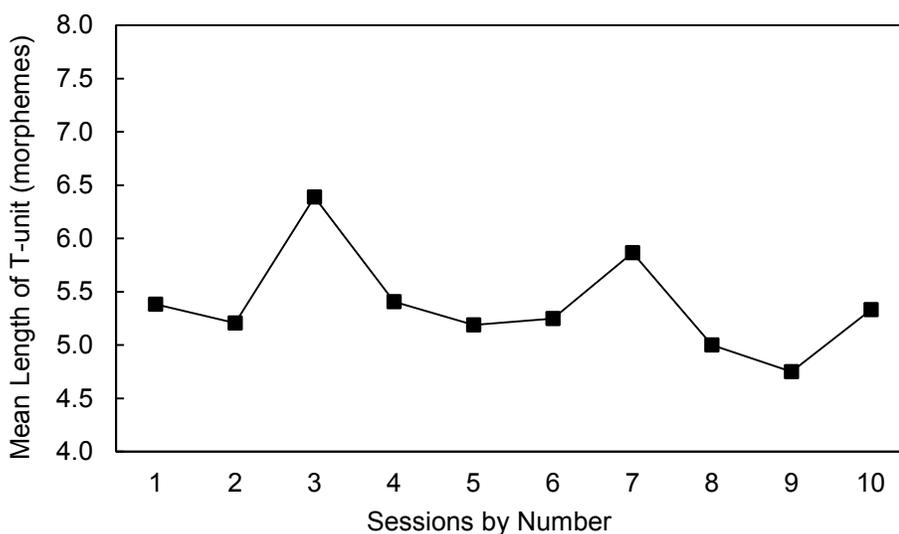
Figure 3. Mean length of t-unit, per session, produced during story enactment for ADK.

Discussion

The current study was performed to examine the impact of an emotion-based social communication intervention on the syntactic complexity of school-aged children with LI. Syntactic growth was tracked by measuring the length of t-units and the use of complex sentences, as well as by examining the grammaticality of those sentences. In general, there appeared to be little systematic change seen in the syntactic abilities of the three children sampled. In the following sections, the performance of each participant is considered in greater detail.

Individual Participant Findings

SS. The findings for SS showed no notable trends in syntactic growth. His utterances were longer and more syntactically complex than the other participants in regard to mean length of t-unit and the number of subordinate clauses per t-unit. His relative strength in these areas from the start of the intervention (when compared to the other participants) indicated that there was less room for increase in t-unit length. However, many of his utterances contained grammatical errors, with only about half of the utterances produced with subordinate clauses being completely well formed. The frequency with which SS produced grammatically correct sentences did not change throughout the course of the intervention. Although his utterances were relatively long, his difficulty with forming grammatically correct utterances negatively impacted his syntactic complexity.

ALK. ALK's variability in her production of subordinate clauses and length of t-units increased as the intervention progressed. However, much of this variability was related to a change in the way she retold the stories. In the first four sessions, ALK often began her character's dialogue with the colloquialism "[character's name or pronoun] was like" instead of taking the role of the character and speaking in the first person tense. From the fifth session on,

ALK stopped using the colloquialism and began speaking almost exclusively in first person and speaking as a character instead of a narrator. This led to a drop in the number of subordinate clauses she produced, even though she was demonstrating an ability to speak from the perspective of another character, a task that is often difficult for children with LI to perform. When this change occurred, ALK's use of complement clauses decreased, because she spoke in the first person tense with "I" to start the dialogue, instead of the third person tense with "He was like" (to indicate that a character was speaking). Speaking in the first person without her favored colloquialism also negatively impacted the mean length of t-unit. The change in the way ALK enacted the stories indicated increased sophistication, even though the number of subordinate clauses she produced and the mean length of t-unit did not appear to change.

ADK. ADK showed a slight upward trend in the number of subordinate clauses she produced per t-unit. She had a downward trend in the number of t-units produced in each session, which most likely tempered this trend, as the number of subordinate clauses produced per t-unit was impacted by the decrease in t-units. Most of ADK's complex sentences involved complement clauses with an "I [verb]" format, such as "I think it will" or "I want to be friends too." Grammatically correct production of complex sentences was highly varied, even though the basic format for her complex sentences did not change. The type of subordinate clauses ADK produced and the mean length of t-unit did not appear to change across the course of the intervention.

General Implications

The performance of the three children in this study did not support the hypothesis that the social communication intervention could also increase the participant's syntactic complexity. Given that the intervention was relatively brief (20 sessions, each about 20 minutes long), these

findings support Eisenberg's (2014) conclusion that syntactic intervention for children with LI requires intensive intervention over a long period of time to show measurable growth. It is possible that more systematic change in the average length of t-unit and the number of subordinate clauses might be observed had the intervention been longer and more intense. The current intervention was designed to be provided within each child's allotted intervention time, both in terms of the number and the length of the individual sessions. Based on available data, the two sessions per week, 20 minute per session schedule is relatively representative of school settings (Brandel & Loeb, 2011). It may be the case that either additional sessions, or longer sessions, would have produced greater growth. However, because the study did not specifically consider intensity, it is not possible to definitively conclude that the amount of time spent in intervention was a critical variable.

It may also be the case that the measures used were not sensitive to the growth that occurred. The primary focus of the intervention was on the child's social communication skills. There were qualitative indications that the children had made positive changes in their productive language skills. For example, the school SLP indicated that it was her impression that all of the children had made possible gains in expressive language. In fact, she was enthusiastic in her description, indicating that she had seen a "tremendous amount" of growth. This statement is meaningful because the school SLP knew each participant well. Additionally, she had expressed a concern, initially, that the intervention provided would not address their difficulties with syntax. It was also notable that SS's mother independently stated that it was her impression that he had made notable gains in language production during the semester. It is possible that these subjective impressions were influenced by factors other than syntactic development. Additionally, the changes that the clinician and the mom saw in the participants

might not be best represented by the structural language they used while enacting the stories. However, it is also important to consider that these insights may be valid.

Limitations of the Study

There were several limitations that could be addressed in future studies. First, it would have been advantageous to use a true experimental design to evaluate this question. This was not possible in the current study because the analysis was performed on video samples that had already been completed and the main focus of the intervention was social communication. Future studies might be structured from the outset to more specifically focus on both behaviors.

Second, using mean length of t-unit to measure progress might not be sensitive to an increase in syntactic ability. For example, ALK's average length of t-unit did not significantly change, yet her typical pattern for forming sentences changed, when she stopped using the phrase "he was like" and instead took the role of the character and spoke from their point of view. This change showed a maturing of her syntactic patterns and a growth in theory of mind that was not reflected in the average length of t-unit or the number of subordinate clauses she produced. As such, it cannot be concluded that a longer t-unit is always indicative of greater communicative sophistication than a short one.

Third, as discussed above, data used to assess the participants' syntactic ability were taken from a relatively small number of samples over a short period of time. By increasing the number of sessions that each child received, it is possible that measurable growth might occur. Examining data from additional intervention sessions could address this issue.

Summary

The current intervention was designed to simultaneously target the production of emotion words and syntactic deficits. The mean length of t-unit, the number and type of subordinate

clauses produced, and the grammaticality of the t-units with subordinate clauses produced during a story enactment task were used to examine progress with syntactic development.

None of the participants showed gains in the mean length of t-units they produced or in the grammaticality of their complex sentences. The results of one participant (ADK) showed an increase in the frequency in which she produced subordinate clauses, but the type and format of the subordinate clauses she used did not change. Although the other two participants (ALK & SS) did not show changes in either their mean length of t-unit or the frequency with which they produced subordinate clauses, ALK did change the format with which she enacted the story, changing from a third person narrative to a first person dialogue. This change did show increased creativity and ability to take the perspective of others, however, it did not produce a marked change in the length of her utterances.

The results of the current study do not support the claim that a single intervention could target both social communication and syntactic goals simultaneously, at least within a 10-week time period. However, the impressions of the school SLP and one of the children's parents about the students' growth shows that the claim that both types of goals could be treated together should be further examined. Small revisions in the intervention process could produce more visible results. These changes may include increasing the length of time and frequency that the students receive the intervention. Structuring the experimental design from the beginning to focus on syntactic complexity would also be advantageous.

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Appendix A

Rules for Dividing Utterances

Brinton, B. & Fujiki, M. (1984). The development of topic manipulation skills in discourse. *Journal of Speech and Hearing Research, 27,* 350-358.

Smith, A. (2015). The efficacy of a social communication intervention to increase syntactic complexity in narratives of children with language impairment (Master's thesis, Brigham Young University). Retrieved from http://scholarsarchive.byu.edu/etd/5269

A. Utterances are major or minor sentences:
   - Major sentences: subject-predicate structure, simple or multiple clauses
   - Minor sentences: social phrases ("hi"), interjections, and back channel responses (murmurs of agreement, brief restatements- things that keep a conversation going but don't really add anything)

B. Any repetition of part of a longer utterance is considered as part of that utterance (i.e., "Yesterday Bob went, Bob went home."

C. A false start is part of the utterance it attempted to start (i.e., "Bob went, Bob went home later").

D. If the utterance is so incomplete that you can't tell what the speaker was going to say, you would transcribe it but not count it as an utterance (count syllables- put # in parenthesis).

E. When two or more speakers are talking at the same time, each utterance is counted separately.

F. Utterance boundaries occur at the end of a phonemic clause also marked by
   - Drop in pitch or loudness across the entire clause or the final syllable
   - A final rise in pitch, or question inflection
   - An unfilled pause (2 seconds)
   - Lengthening of the final syllable
   - The use of a stereotyped "ending expression" (such as "you know", "or something")
   - The completion of a grammatical clause with a subject-predicate combination
   - The end of a word
   - Gesture

Additional conventions for utterance division

1. If a conjunction does not link topically related clauses—count each clause as a new utterance with no deletion (all different topics stringed together with "and").

2. By convention: "and, and…" Keep the first "and" even if no deletion, if clauses seem to go together topically. Then if the subject continues "and, and, and" count as separate utterances.

3. Stacked back channel utterances are considered separate utterances if one second separates them (all other utterances must have a 2 second pause to be divided on the basis of pause length).

4. Affirmation and negation occurring at the beginning of an utterance are considered separate utterances if there is a one-second pause or elongation of the word.

5. Tags (with upward intonation) are considered a separate utterance if at least a one second pause precedes the tag.

6. "I see" is considered a separate utterance.
7. Back channel utterances which overlap a pause within the conversational partner's utterance are considered one utterance. (Back channel utterances are the filler that generally shows you are listening and interested, e.g., yeah, uh-huh, hmm, okay.)
8. Choice questions (if conversational partner is given less than 2 seconds to respond) are considered as part of the same utterance.
9. In cases in which the meaning suggested by intonation conflicts with syntactic information, intonation overrides syntactic formation.

Appendix B

Conventions for Measuring Length of T-Unit

The following list of conventions was modified from Smith (2015), with the basis for the conventions derived from Hunt (1970) and Steffani (2007).

1. Eliminate incomplete t-units or sentence fragments.
2. Eliminate entire t-unit if some part is unintelligible.
3. Eliminate repetitions of an utterance (i.e., only count one "when" in "when, when, when they were looking").
4. Eliminate utterances that are not part of the narration, but are part of the child's conversation with the clinician (i.e., "Did I miss a page?" or "I think").
5. Eliminate direct repetitions of the clinician.
6. Eliminate fillers such as "um" or "uh." (i.e., getting "I don't, um, ah, John is." In response to "Who is responsible for this" would count as 2 morphemes (John is)).
7. Eliminate incomplete t-units due to a missing subject or verb (i.e., "and look inside of it").
8. Include the final version of the phrase when it is repeated or falsely started (i.e., eliminate "And he gets" in the utterance "And he gets, and he followed them in the house").
9. Eliminate "the end" from the morpheme count.
10. Include expressions such as "ahh," "hmm," or "ehh" when they are used as expressions of the character being portrayed, not as fillers.

Appendix C

Individual Participant Data

Table 2

Type of Subordinate Clauses Produced by Each Participant

	SS		ALK		ADK	
Session	Total SC	Type of SC	Total SC	Type of SC	Total SC	Type of SC
1	4	2 NC 2 Coordinated	8	7 NC 1 Coordinated	6	6 NC
2	30	3 Adverbial 15 NC 12 Coordinated	16	1 Adverbial 1 Relative 9 NC 5 Coordinated	4	1 Adverbial 1 Relative 1 NC 1 Coordinated
3	10	1 Relative 8 NC 1 Coordinated	13	1 Relative 9 NC 3 Coordinated	3	2 NC 1 Coordinated
4	6	2 NC 4 Coordinated	16	10 NC 16 Coordinated	4	3 NC 1 Coordinated
5	11	8 NC 3 Coordinated	10	8 NC 2 Coordinated	3	2 NC 1 Coordinated
6	4	1 NC 3 Coordinated	9	5 NC 4 Coordinated	3	2 NC 2 Coordinated
7	6	3 NC 3 Coordinated	19	1 Adverbial 14 NC 4 Coordinated	5	5 NC
8	4	2 NC 2 Coordinated	7	2 NC 5 Coordinated	3	2 NC 1 Coordinated
9	13	1 Adverbial 9 NC 3 Coordinated	8	4 NC 4 Coordinated	2	2 NC
10	8	1 Adverbial 3 NC 4 Coordinated	19	1 Adverbial 9 NC 9 Coordinated	8	6 NC 2 Coordinated

Note. SC = subordinate clauses; NC = Noun Complement.

Data for SS

Table 3

Summary of T-Unit and Subordinate Clause Results for SS

Session	Number of T-units	MLT	Number of SC	SC per T-unit	Grammatically Correct SC
1	68	5.38	6	0.09	67
2	48	5.21	4	0.08	42
3	54	6.39	3	0.06	67
4	32	5.41	4	0.13	50
5	37	5.19	3	0.08	63
6	16	5.25	3	0.19	33
7	30	5.87	5	0.17	25
8	29	5.00	3	0.10	75
9	24	4.75	2	0.08	55
10	30	5.33	8	0.27	71

Note. Grammatically correct subordinate clauses reported in percentages. MLT = mean length of t-unit; SC = subordinate clauses.

Data for ALK

Table 4

Summary of T-Unit and Subordinate Clause Results for ALK

Session	Number of T-units	MLT	Number of SC	SC per T-unit	Grammatically Correct SC
1	68	5.38	6	0.09	100
2	48	5.21	4	0.08	53
3	54	6.39	3	0.06	78
4	32	5.41	4	0.13	57
5	37	5.19	3	0.08	83
6	16	5.25	3	0.19	33
7	30	5.87	5	0.17	100
8	29	5.00	3	0.10	100
9	24	4.75	2	0.08	88
10	30	5.33	8	0.27	42

Note. Grammatically correct subordinate clauses reported in percentages. MLT = mean length of t-unit; SC = subordinate clauses.

Data for ADK

Table 5

Summary of T-Unit and Subordinate Clause Results for ADK

Session	Number of T-units	MLT	Number of SC	SC per T-unit	Grammatically Correct SC
1	68	5.38	6	0.09	67
2	48	5.21	4	0.08	50
3	54	6.39	3	0.06	50
4	32	5.41	4	0.13	50
5	37	5.19	3	0.08	100
6	16	5.25	3	0.19	67
7	30	5.87	5	0.17	60
8	29	5.00	3	0.10	0
9	24	4.75	2	0.08	50
10	30	5.33	8	0.27	86

Note. Grammatically correct subordinate clauses reported in percentages. MLT = mean length of t-unit; SC = subordinate clauses.

Appendix D

Annotated Bibliography

Adams, C. (2005). Social communication intervention for school-age children: Rationale and description. *Seminars in Speech and Language, 26*, 181-188. doi:10.1055/s-2005-917123

        Adams provides a framework and a rationale behind social communication intervention (SCI). Social communication is "using language in interpersonally appropriate ways to influence people and interpret events" (p. 182). The main aspects that contribute to social communication and which children with social communication problems (SCP) exhibit are: (a) social interaction (intersubjectivity and recognizing that other people are social beings), (b) social cognition (theory of mind and understanding that other's communicative intent may be deeper than the literal definition of the words used), (c) pragmatics, and (d) language processing.
        Addressing all four of these areas of concern, Adams formulated a framework that can be used to increase the effectiveness of SCI. First, the SCI needs to be adaptable. In recognizing that the people who interact and live with a child with a SCP have a very important role in the child's language development, these interactants are given social adaptation strategies to maximize their communication with the child. Second, the SCI should have social flexibility, where changes are made in routines, other's emotions are identified, and metaphors and hidden meaning is discussed. Using narratives in SCI is especially productive in creating scenarios where social flexibility is required. Narratives provide a coherent base upon which the other aspects of social flexibility and social communication can be built. Therapy centered on building sequences and narratives with goal-oriented outcomes helps the child form better sequences in their own communication. An SCI should also provide metapragmatic therapy, where the formal rules and aspects of pragmatics are explicitly taught and put into practice. An SCI with each of these three main components promote greater language ability in children with language impairment.
        Relevance to the current work: The SCI used in the current study is based on many of the principles addressed in this article.

Adams, C., Lockton, E., Freed, J., Gaile, J., Earl, G., McBean, K., . . . Law, J. (2012). The social communication intervention project: A randomized controlled trial of the effectiveness of speech and language therapy for school-age children who have pragmatic and social communication problems with or without autism spectrum disorder. *International Journal of Language & Communication Disorders, 47*, 233-244. doi:10.1111/j.1460-6984.2011.00146.x

        This purpose of this study was to determine the effectiveness of an intensive manualized social communication intervention (SCIP) on language skills, pragmatic ability and broader social communication. This study was conducted using a randomized control trial design, the first of this type of study available for children with pragmatic language impairment. Eighty-eight students, ranging in age from 5;11 (years; months) to 10;8, were assigned to either receive SCIP or treatment as usual (TAU). Each student received individualized treatment based off of

the manual for the intervention, but within a specified framework, ensuring the intervention provided was consistent for each child in the SCIP group. The standardized assessment of overall language performance administered after the intervention period did not show that the SCIP had a significant effect upon the children's language abilities when compared to TAU on the Clinical Evaluation of Language Fundamentals-Fourth Edition. Significant intervention effects were shown for the SCIP intervention over TAU on parent-reported social communication, social behavior and language skills, as well as on teacher-rated classroom learning skills. This study provides a framework for future studies which center on SCIP intervention.

Relevance to the current work: This current thesis is based on a project that has similarities to the study presented in this article. Both studies attempted to show improvements in structural language and social communication ability. Also, these studies have used the perceptions of the student's teachers and parents as a metric for determining progress. Both studies can be used by future researchers as evidence regarding the effectiveness of social communication intervention.

Bishop, D., & Norbury, C. (2002). Exploring the borderlands of autistic disorder and specific language impairment: A study using standardised diagnostic instruments. *Journal of Child Psychology and Psychiatry, 43*, 917-929. doi:10.1111/1469-7610.00114

Children with semantic and pragmatic disorders have many characteristics in common with autism spectrum disorder (ASD). The authors sought to show that there is a difference between the two disorders (as opposed to semantic-pragmatic disorders being a descriptive term for the language difficulties of people with ASD). In order to determine this, two groups of children with language-impairment were administered three diagnostic assessments for children with ASD. Group selection into group PLI (pragmatic language impairment) or group SLI-T (typical specific language impairment) depended on their pragmatic ratings on a teacher-rating assessment. Bishop and Norbury found a high correlation between high impairment scores on the Autism Diagnostic Schedule – Generic (ADOS-G) and a low pragmatic composite score on the Children's Communication Checklist (CCC), showing that children with evidence of ASD according to the ADOS-G generally also had pragmatic impairments. However, the reverse was not true; many children with no evidence of ASD displayed pragmatic impairments on the CCC. Children without indications of ASD but with PLI had similar characteristics. They tended to be sociable and talkative, able to use both verbal and non-verbal communication. Although the children with PLI tended to focus on topics that interested them, they still displayed good reciprocal social interaction.

Relevance to the current work: This article provided more information on the characteristics of PLI and SLI-T. These characteristics are shown in the participants of the current study, namely difficulty understanding emotions and interpersonal relationships, and the ability to use both non-verbal and verbal communication to express themselves, but often with restricted topics. It also provided further insight on SS's diagnosis of autism, which was questioned by his educational team.

Brandel, J., & Loeb, D. (2011). Program intensity and service delivery models in the schools: SLP survey results. *Language, Speech, and Hearing Services in Schools, 42*, 461-490. doi:10.1044/0161-1461(2011/10-0019

The authors wanted to determine the typical current practice for speech and language therapy in public schools and to provide insight into the factors that contribute to the current practice. The school-based intervention decision-making (SIDM) model proposed by the authors consists of three major domains to be addressed while scheduling and providing intervention: (a) student, (b) speech-language pathologist (SLP), and (c) workplace. A variety of factors in each area change the way speech and language therapy is administered. A questionnaire completed by 1,897 certified SLPs working in the public schools provided the data for this study. Students in preschool to 5th grade with moderate to severe disabilities received intervention 2-3 times a week for 20-30 minute sessions and older students received intervention services once per week for a 20-30 minute session. Also, students with a mild disability typically received intervention once per week for a 20-30 minute session, regardless of their grade. In most cases, students with more severe disabilities received individual intervention, while students with less severe communication difficulties received intervention in groups. The researchers hypothesized that this pattern is derived from the size of SLPs caseloads and the preferences of the SLP. The SLPs interviewed as part of this study generally believed that the intervention time given to each student was appropriate for each student to make appropriate gains while allowing them to see every student on their caseload.

Relevance to the current work: The current intervention's duration and frequency (20 minute sessions, twice per week) compares with the typical school intervention duration and frequency outlined in this article.

Brinton, B., & Fujiki, M. (2014). Social and affective factors in children with language impairment. In C. A. Stone, E. R. Silliman, B. J. Ehren, & K. Apel (Eds.), *Handbook of language and literacy: Development and disorders* (2nd ed.), 173-189. New York, NY: Guilford Press.

This chapter highlights the social and affective factors that are often involved with language impairment (LI). Children with LI frequently exhibit social and emotional problems, but these difficulties are not readily linked to their linguistic deficits. While children with LI have difficulty resolving conflicts and engaging in social play, they also exhibit deficits in social tasks that are not language-intensive, which led the authors to suggest that language difficulties are not the sole cause of children with LI's social difficulties. Children with LI also demonstrate high levels of withdrawn behavior, especially reticence, which make social relationships even harder to create and maintain. Children who struggle with social interaction tend to continue to struggle as adolescents and adults, especially in the areas of social competence, socioemotional behavior, perceptions of well-being and self-esteem. The authors conclude that further research need be done to learn more about how social competence, emotional intelligence and language abilities are connected in children with LI in order to provide better intervention for these children.

Relevance to the current work: This chapter gives more information on the social difficulties faced by children with LI, which allows clinicians to effectively provide intervention for them.

Eisenberg, S. (2014). What works in therapy: Further thoughts on improving clinical practice for children with language disorders. *Language, Speech, and Hearing Services in Schools, 45*, 117-126. doi:10.1044/2014_LSHSS-14-0021

This article offers a review of the research focusing on what does and does not help children with LI learn syntactical features. Children with LI continue to learn grammatical structures more slowly than their typically-developing peers, even with intensive therapy. The intervention strategies and goals could take more time to be reached than expected by the clinician, which can lead to the rejection of therapeutic techniques prematurely. The author examined the research on therapy dose, dose frequency and dose form, and came to several conclusions. She stated that children with LI require a concentrated high dose of instruction to learn syntactical forms, which is generally better facilitated through pull-out sessions. Also, she concluded that continually introducing new grammatical features before a previous feature has been mastered and periodically going back to review the previously-taught feature is more effective than waiting to introduce a new syntactical form until the previous grammatical feature has been mastered. The author suggested that intervention should feature highly-concentrated therapy doses provided over several sessions. The sessions should be spread out over time and the child with LI be actively producing the targeted form. In order to provide this therapy, Eisenberg suggested that a typical therapy session include highly-structured drill practice, followed by an application activity for greater generalization.

Relevance to the current work: This article was helpful in explaining why measurable progress in syntactical growth may not be shown in the current work, due to the short time span of the study. This article also provided clinicians, including the current researchers, with well-researched and concise guidelines of how to help children with LI learn syntactical features with the greatest efficiency.

Gerber, S., Brice, A., Capone, N., Fujiki, M., & Timler, G. (2012). Language use in social interactions of school-age children with language impairments: An evidence-based systematic review of treatment. *Language, Speech, and Hearing Services in Schools, 43*, 235-249. doi:10.1044/0161-1461(2011/10-0047

This article presented the results of an ASHA-sponsored review of the treatments for disorders of social language use in school-age children. The authors assert that although intervention in language form and content for children with language impairment (LI) is critical for improving language ability, these interventions alone will not adequately address social communication deficits. Deficits in pragmatic abilities are possible in children with LI, even if their semantic and syntactic abilities are intact. From the 836 originally identified articles, the review examined 8 studies, which were the only studies that tested the efficacy of pragmatic interventions on children with LI between the ages of 5 to 11 years. Each accepted study was evaluated for methodological quality, participant and treatment characteristics, and research

stage. The authors were unable to make empirically supported recommendations for standard clinical practice changes due to the limited number of studies available. As such, the researchers concluded that there is still much work to be done in the form of systematic studies before a true evaluation of pragmatic intervention methods can be performed. Until such an evaluation can be performed, the authors suggest that clinicians make clinical judgements based upon their own experience with intervention procedures and their understanding of the child's pragmatic and linguistic difficulties.

   Relevance to the current work: This article provides a rationale why social communication interventions need to be further researched; there is not a large enough body of evidence to make empirically supported recommendations for how social communication intervention should be performed. The authors also support the claim made in the current work that a social communication intervention can also address difficulties with language content and form.

Gibson, J., Adams, C., Lockton, E., & Green, J. (2013). Social communication disorder outside
   of autism? A diagnostic classification approach to delineating pragmatic language
   impairment, high functioning autism and specific language impairment. *Journal of Child
   Psychology and Psychiatry, 54*, 1186-1197. doi:10.1111/jcpp.12079

   The purpose of this article was to take a classification-based approach to determine the differences between children with pragmatic language impairment (PLI), high-functioning autism (HFA) and specific language impairment (SLI). Sixty-two children were sorted into three groups (PLI, HFA, or SLI) based on diagnosis and their scores on a battery of diagnostic tests. The researchers found that the significant predictors for differentiating SLI and PLI were social functioning and expressive language ability. The group with PLI exhibited higher ability in expressive language, but also higher atypicality in social functioning. The children with PLI also had greater difficulty with structural language than children with HFA, but fewer problems with initiation, nonverbal language, and restriction of interests. Children with PLI and SLI also showed a greater receptive than expressive language ability, but the children with HFA had language abilities nearly equal in both domains, with a slight, nonsignificant tendency towards better expressive language. The researchers theorized that this difference could be a diagnostic marker to differentiate between PLI and HFA.

   Relevance to the current work: This article provides a lot of information on the potential differences between PLI and HFA and the potential for misdiagnosis of HFA, even though there is no gold-standard criteria for PLI. One of the participants in the current study, SS, has been diagnosed with HFA. Due to his lack of repetitive and restricted behaviors and interests, as well as his superior receptive language ability compared to his expressive language ability, SS may exhibit PLI instead of HFA.

Gillam, R., & Johnston, J. (1992). Spoken and written language relationships in language/learning-impaired and normally achieving school-age children. *Journal of Speech and Hearing Research, 35*, 1303-1315. doi:10.1044/jshr.3506.1303

In this article, spoken and written narratives from both typically developing (TD) children and children with language impairment (LI) were analyzed. The authors wanted to determine the differences between the cognitive and linguistic aspects of spoken and written language, as shown by structural and cognitive complexity differences. Ten children with LI were matched with 30 TD children. Each child produced two spoken and two written stories, each based on a given picture. Each story sample was segmented into t-units and only the longest written and spoken story for each child was analyzed further. The researchers looked at a variety of linguistic and syntactic markers for the analysis, including the mean length of t-unit in morphemes. They found that in general, spoken narratives contained longer sentences, but that these sentences were not generally more complex than were those found in written narratives. Children with LI tended to produce a higher percentage of correct complex t-units in spoken narratives than written narratives; the opposite was true with most groups of TD children. However, the group with LI produced a higher percentage of grammatically incorrect sentences than the TD group in both simple and complex sentences and the group with LI produced more errors in written than spoken narratives. The authors supported the claim that children with LI have greater difficulty with productive syntax and that these difficulties do not resolve with age. The authors also hypothesized that the greater difficulty with syntactic form found in the LI group may be due to the greater linguistic demands inherent in writing tasks.

Relevance to the current work: This article supports the format of the current intervention, as the participants produce stories orally in two of the tasks. This study relates well to the intervention, as both are studying narratives and children with LI.

Hunt, K. (1970). Syntactic maturity in schoolchildren and adults. *Monographs of the Society for Research Development, 35*, iii-iv, 1-61.

In this article, Hunt summarizes the development of research methods for studying syntactic development. A variety of methods for determining syntactic complexity were cited, especially in the area of utterance division, each with its own strengths and limitations. As school-aged children mature, the length of their utterances doesn't increase, but the number of subordinate clauses produced does increase. In order to differentiate between complex sentences (which have subordinate clauses) and compound sentences (which are two independent clauses combined by a conjunction), Hunt proposed the use of the t-unit. A t-unit is defined as "one main clause plus any subordinate clause or non-clausal structure that is attached to or embedded in it" (p.4). A t-unit is the shortest unit that could produce a grammatically correct sentence and therefore separates compound sentences into two or more t-units. This concept is important because less grammatically-mature children often combine ideas into a run-on sentence by adding the conjunction "and." If a researcher just looked at utterance length, a child producing run-on sentences would seem to be more advanced grammatically than a child using subordinate clauses in a shorter, more concise utterance. Hunt concluded that syntactic maturity is better measured using t-units and analyzing the use of subordinate clauses rather than strictly studying utterance length.

Relevance to the current work: This article provides the basis for using t-units in syntactic complexity research. Examining the mean length of t-unit and the number of subordinate clauses in the current work follow Hunt's recommendations to see if the intervention shows an increase in syntactic complexity for the participants.

Iluz-Cohen, P., & Walters, J. (2012). Telling stories in two languages: Narratives of bilingual preschool children with typical and impaired language. *Bilingualism: Language and Cognition, 15*, 58-74. doi:10.1017/S1366728911000538

The authors wanted to determine how language impairment (LI) affects narrative production in bilingual children. More specifically, they studied how the narratives of children with typical language development (TLD) differ from the narratives of children with LI, in regards to the narrative structure as well as syntactic and lexical development. Eight children with TLD and nine children with LI looked through two picture books of familiar stories, one in each of the two languages studied. The children were then asked to tell the story following the pictures in the book. Both groups of children had similar narrative structure, but they differed in lexical and syntactic measures. Children with TLD outperformed children with LI in every lexical and syntactical measure, including mean length of utterance and the number of grammatical errors. However, children with LI and children with TLD produced narratives with a similar structure, with the story grammar elements produced in the same proportion across both groups. As a contrast to monolingual children with TLD, bilingual children with TLD also had difficulties with verb inflections, prepositions, articles, pronouns and gender marking with a frequency that resembled the speech difficulties of the bilingual children with LI. Given these similarities, the authors suggest that a wide range of lexical, morphosyntactic, sociolinguistic and psycholinguistic measures should be used to distinguish bilingual children with TLD from those with LI.

Relevance to the current work: This article is highly related to the current study as both involve narrative production in children with LI.

King, G., & Fletcher, P. (1993). Grammatical Problems in School-Age Children with Specific Language Impairment. *Clinical Linguistics & Phonetics, 7*, 339-352. doi:10.1080/02699209308985571

The researchers wanted to evaluate the language of children with specific language impairment (SLI), to see if the language of these children is characterized by errors in verb argument structures. The mapping rules for verbs requires linking the semantic properties of the verb with its syntactic complement. In most English-language cases, verb-mapping is predictable, but there are exceptions to the typical rules depending on the specific verb and the context in which it is used. The researchers compiled conversations of at least 100 complete utterances from 14 children with SLI aged between 7;0 and 9;8 and 11 children with typical language who had been matched to the children with SLI by mean length of utterance (MLU) aged between 3;0 and 5;4. Each morpheme was tagged for presence or absence, as well as main verbs, auxiliaries, modals, copula verbs and the verb compliments. King and Fletcher found that almost all morpho-syntactic errors found in the utterances were errors of omission. The deletion

of required morphemes for persists into the school-age years for the children with SLI. The researchers also found that most of the identified errors seemed to represent persistence at a stage of grammatical development long after children with typical language ability had left it behind. The children with SLI omitted obligatory compliments of a wider range of verbs than their peers with typical language.

Relevance to the current work: This article provides greater information about the syntactic development of children with SLI and the structural problems they exhibit which are characteristic of LI and persist into school-age years. The children in the current study exhibit these similar characteristics.

Nippold, M. (2009). School-age children talk about chess: Does knowledge drive syntactic complexity? *Journal of Speech, Language, and Hearing Research, 52*, 856-871. doi:10.1044/1092-4388(2009/08-0094)

The purpose of this study was to determine if varying degrees of topic knowledge impacted language productivity and syntactic complexity. The participants of this study were 32 school-age children who played chess. The children were interviewed by "naïve" adults with little to no experience as chess players. The children were administered three speaking tasks: General Conversation (to provide basic background information), Chess Conversation (child's personal experience with chess), and Chess Explanation (expository task about chess techniques and strategy). Each interview was recorded, transcribed, divided into t-units and analyzed for syntactic complexity. A U.S. Chess Federation Master also separated the participants into two groups based on their degree of chess experience: expert or novice. Both groups of chess players produced significantly increased number of t-units, mean length of t-units, clausal density and production of subordinate clauses during the Chess Explanation task compared with both the Chess Conversation and General Conversation tasks. However, the experts and novices did not significantly differ on any syntactic factors in any of the speaking tasks. As such, the author concluded that syntactic complexity is strongly influenced by the task, but not by their knowledge of the topic. This study supports the hypothesis that complex thought leads to complex language, as the child is more driven to explain a topic they enjoy in longer and more complex ways. Thus, a child's syntactic ability is best measured when they are explaining a topic that they understand and are excited to discuss.

Relevance to the current work: This article provides evidence that syntactic complexity is most accurately shown when the child is engaged in the topic and motivated to explain it.

Nippold, M., Hesketh, L., Duthie, J., & Mansfield, T. (2005). Conversational versus expository discourse: A study of syntactic development in children, adolescents, and adults. *Journal of Speech, Language, and Hearing Research, 48*, 1048-1064. doi:10.1044/1092-4388(2005/073)

The purpose of this study was to compare the differences between conversational and expository discourse in children, adolescents and adults. The authors hoped to establish normative data about the development of syntax in both conversational and expository discourse. A total of 120 participants were divided by age into six different groups with two child groups,

two adolescent groups and two adult groups. A conversational language sample was elicited as the participant was asked to talk about common topics, such as work, family, friends and pets. The participant was then asked to select a favorite game or sport and discuss it in order to gather an expository discourse sample. Across all age groups, the expository discourse had higher syntactic complexity than conversational discourse. Syntax also continued to develop into early adulthood, to remain stable into middle age. The authors concluded that the best indicators of growth were the mean length of t-unit and relative clause production, which had more sensitivity to developmental gains than the other measures used in the study. Nippold and her colleagues also concluded that expository discourse encouraged the use of more types of clauses and more frequent dependent clause productions than conversational discourse, with much longer t-units produced as well.

       Relevance to the current work: This article provided substantial background information on the development of syntax and the different rationales behind the measurement of syntactic complexity. Many of these rationales were used in the current study.

Nippold, M., Mansfield, T., & Billow, J. (2007). Peer conflict explanations in children, adolescents, and adults: Examining the development of complex syntax. *American Journal of Speech-Language Pathology, 16*, 179-188. doi:10.1044/1058-0360(2007/022)

       The purpose of this study was to examine the syntactic complexity of expository discourse (as opposed to conversational discourse) in typically-developing children, adolescents and young adults. The researchers hoped to establish a baseline for typical expository language development for these age ranges. The introduction of this article explains that growth in syntax during school-age years and beyond entails combining previously-learned basic syntactical structures into longer, multi-embedded utterances. Sixty participants were interviewed and administered a peer conflict resolution (PCR) task, where scenarios involving conflicts were presented and the participants were asked questions about the scenario. As a contrast to the PCR task, the participants were also asked to explain the rules and strategies in their favorite game or sport (FGS). As expected, the adult group outperformed the other groups in the use of subordinate clauses. The researchers found that the PCR task elicited greater syntactic complexity than the FGS task for all three age groups. Syntactic complexity was measured by mean length of t-unit and clausal density. Both PCR and FGS are concluded by the researchers to be more effective than general conversation to elicit the use of complex syntax.

       Relevance to the current work: The introduction of this article provides a basic timeline of typical syntactic development, explaining at what age syntactic milestones are typically reached.

Nippold, M., Mansfield, T., Billow, J., & Tomblin, J. (2009). Syntactic development in adolescents with a history of language impairments: A follow-up investigation. *American Journal of Speech-Language Pathology, 18*, 241-251. doi:10.1044/1058-0360(2008/08-0022)

       The purpose of this study was to examine the language outcomes and syntactic development of adolescents in high school who had been identified with LI in kindergarten.

Nippold and her colleagues also compared the use of complex syntax in discourse to the results of syntactic development standardized testing. Syntactic development and competence were studied because syntax provides the structural foundation of sentences, allowing a speaker to express any idea in a variety of ways. The production of subordinate clauses allows the speaker to express communicative functions more concisely and precisely. By the age of 5, typically developing children have acquired the ability to produce each type of subordinate clause correctly in conversation, but children with LI show deficits in complex syntax. Children with LI generally produce shorter and simpler utterances with fewer subordinate clauses than their typical peers; these differences continue throughout adolescence, negatively impacting academic performance in children with LI. The researchers found that children with typical language development outperformed their peers with specific language impairment or nonspecific language impairment in mean length of t-unit, clausal density, and nominal clause use. These results replicated those of a companion study performed two years prior. Both informal and standardized testing provided crucial information about the language abilities of each participant.

   Relevance to the current work: This article provided substantial background information on syntactic development and the various rationales for studying syntax in children with LI. Many of the measures used to analyze syntactic complexity were used in the current study.

Nippold, M., & Schwarz, I. (2002). Do children recover from specific language impairment?
   Advances in Speech-Language Pathology, 4, 41-49.
   doi:10.1080/14417040210001669221

   This article reviews the literature on recovery from language disorders, especially specific language impairment (SLI). There is a large body of evidence that children can naturally recover from stuttering and the authors hoped to find evidence that a similar recovery occurs in children with SLI. If natural recovery occurs, parents and professionals would be able to save time and expense while allowing the child's language to progress. If natural recovery did not occur, the child could be involved in more intense early intervention efforts. After reviewing a large quantity of articles in this area, the authors concluded that the possibility of recovery from SLI when diagnosed after the age of 3 is small. This possibility is especially remote when the child exhibits moderate-severe deficits in multiple domains and performs in the low-average range on IQ tests. Although children with SLI may show some natural recovery, later tests of complex language ability continue to show lingering weaknesses.

   Relevance to the current work: This article is relevant because provides more evidence that the language of children with SLI develops differently than the language of typical children and that intervention is required for significant language growth for children with LI.

Paul, R., & Norbury, C. (2012). Principles of intervention. In R. Paul (Ed.), *Language disorders*
   from infancy through adolescence (4th ed.). St. Louis, MI: Elsevier Inc.

   In this chapter, the authors detailed the three basic approaches to language intervention. These basic approaches are tailored to the client and desired objective in order to provide the most effective intervention. One approach is the clinician-directed approach, where the clinician specifies all aspects of the intervention. The clinician-directed approach often features drill,

modeling and drill play, and is the least naturalistic approach. This approach allows the clinician to maximize the number of opportunities for production of the desired target. Another approach to language intervention is the child-centered approach. In this approach, the clinician structures an activity to allow the targeted response to be produced in a naturalistic environment, generally centered on play or conversation. The clinician uses techniques such as self-talk, imitation, expansion, extension, building up and breaking down sentences, and recasting in order to give the client a correct model for the target pattern, which leads to the client being able to comprehend and produce the pattern. The third basic approach, the hybrid approach, combines elements from the other two approaches. The hybrid approach targets a small set of language goals at once and the clinician maintains much of the control over activity selection, but tempts the child to produce the target spontaneously in relatively natural environments. The major subtypes of the hybrid approach are focused stimulation, vertical structuring, milieu teaching and script therapy. There is a great body of evidence which shows that hybrid approaches are effective in teaching language skills.

   Relevance to the current work: The social communication model which was used in this study uses a hybrid approach to intervention. Modeling was frequently used by the clinician to teach and emphasize the syntactic patterns which were targeted. Given the evidence provided in this text, it is expected that the hybrid approach used will lead to the participant's language to exhibit increased syntactic complexity.

Reed, V., MacMillan, V., & McLeod, S. (2001). Elucidating the effects of different definitions of
   "utterance" on selected syntactic measures of older children's language samples. *Asia
   Pacific Journal of Speech, Language and Hearing, 6*, 39-45.
   doi:10.1179/136132801805576842

   This article examined the different measures used to divide spoken language into utterances. The authors explain that utterances are the fundamental unit analyzed in most language measurements, yet there is no standard definition for "utterance" across clinicians and researchers. In this article, four commonly-used definitions for utterance (t-unit, c-unit, developmental sequence scoring [DSS], and tone unit) were used for syntactic analyses of older children's spoken language ability. Since the tone unit is more strongly impacted by intonation patterns and pauses than the other measures and younger children speak with more frequent and longer pauses in their speech than older children, this measure was affected the most by the age of the speaker. A total of 10 typically developing, 11-year-old males were asked to retell the "very best story" they could and explain "very well" how to play a game. The subsequent language samples were recorded, transcribed, and later segmented in four different ways according to each utterance division definition analyzed in this study. Each type of utterance was analyzed using seven measures of syntactic ability, including mean length of t-unit, number of dependent clauses and number of dependent clauses per utterance. The researchers found that the type of utterance division definition used created statistically significant differences for each of the measures. The researchers concluded that the definition used by subsequent clinicians and researchers for segmenting utterances can have a significant impact on their results, and suggested that future researchers choose the utterance segmentation definition that best fits their methodology.

Relevance to the current work: A variety of utterance division methodologies were considered while planning the current work. This article provided relevant background information about the different methods for dividing utterance and the basic attributes of each.

Rice, M., Smith, S., & Gayan, J. (2009). Convergent genetic linkage and associations to language, speech and reading measures in families of probands with specific language impairment. *Journal of Neurodevelopmental Disorders, 1*, 264-282. doi:10.1007/s11689-009-9031-x

The purpose of this article to determine if there is a genetic link between language, speech and hearing abilities. The researchers sought to replicate the previously identified genetic qualitative markers and genes linked to speech sound disorders (SSDs) and reading disabilities (RD) and see if these links spread to specific language impairment (SLI) phenotypes as well. This study involved 86 probands (or persons with the desired trait of SLI), 134 siblings of the probands and 102 parents and other relatives. Each participant produced a DNA sample and received assessments for speech, language, reading, and nonword repetition. The researchers performed linkage analyses to screen for target chromosomal regions in areas that had previously been identified to have genes that affect RD to see if there were genetic similarities or differences between the probands and their families. The authors determined that there is a high likelihood that loci exist in the chromosomal regions they analyzed that affect not only RD and SSD, but SLI as well. Further analysis found that the gene KIAA0139 on chromosome 6 might affect language ability, speech impairments and text comprehension simultaneously. This study supports the hypothesis that language abilities are affected by multiple genes interacting together.

Relevance to the current work: This study provided more information about the nature of the syntactic deficits characteristic of language impairment.