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Form-content discrepancies in the narratives of children with Autism Spectrum Disorder in two elicitation contexts

Brigid M. Crotty
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FORM-CONTENT DISCREPANCIES IN THE NARRATIVES OF CHILDREN WITH AUTISM SPECTRUM DISORDER IN TWO ELICITATION CONTEXTS

By
Brigid M. Crotty

A thesis submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

Speech-Language Pathology

Approved:

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Committee Member                             Vice President for Research and
                                             Dean of the School of Graduate Studies

UTAH STATE UNIVERSITY
Logan, Utah

2016
ABSTRACT

Form-content discrepancies in the narratives of children with Autism Spectrum Disorder in two elicitation contexts

by

Brigid M. Crotty, Master of Science
Utah State University, 2016

Major Professor: Dr. Sandra Gillam
Department: Speech-Language Pathology

The purpose of this study was to examine the relationship between form (grammar) and content (narrative structure) in stories elicited in two contexts (story generation, retell) from school-age children with Autism Spectrum Disorder (ASD) as they participated in a narrative intervention program. This project extended the literature by allowing for examination of the relationship between form and content in a group of children who demonstrated adequate grammatical skills in the presence of poor narrative skills. Further, this study may shed light on potential differences that exist between two commonly used elicitation contexts, retell and generation, for obtaining narratives from children.
ACKNOWLEDGMENTS

I would like to thank Dr. Sandi Gillam and Dr. Ron Gillam for making available to me the Child Language Research Lab (CLRL) data set, as well as the researchers of the parent study, Dr. Daphne Hartzheim, Dr. Breanna Studenka, and Vicki Simonsmeier. I would especially like to thank my committee members, Dr. Sandi Gillam, Dr. Ron Gillam, and Dr. Tom Higbee, for their support and guidance throughout this process.

I give special thanks to the research assistants and staff of the CLRL for their assistance and hard work on this project, particularly Mary Ann Hammon, Samantha DeLucchi, Telesha Fricke, Kamilla Okey, Emily Kunz, Shea Long, Melany Reeder, Mercedes Sanford, Sydney Sneddon, Kate Summers, Taylor Anderson, Megan Israelsen, Amy Nielsen, Madeline Williams, Ryan Pearson, and Allison Hancock. I’d also like to thank my family, friends, and colleagues for their encouragement and patience.

Brigid M. Crotty
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INTRODUCTION

Children with specific language impairment (SLI) typically demonstrate difficulty in language form, content, and use, particularly in oral narratives (Epstein and Philips, 2009). An oral narrative is a spoken story in which the speaker communicates a sequence of events in a coherent, cohesive way. Oral narratives require integration of structural language (grammar), narrative language (content), and pragmatic language (anticipating the knowledge and interests of your communication partner) (Kaderavek & Sulzby, 2000). Specific Language Impairment (SLI) is defined by the American Speech Hearing Association (ASHA) as a “significant impairment in the acquisition and use of language...due to deficits in comprehension and/or production across any of the five language domains” (ASHA, 1993). Unfortunately, a diagnosis of SLI early in life is related to poorer outcomes in later life. For example, Clegg, Hollis, Mawhood, & Rutter (2005) observed psychosocial outcomes for individuals with developmental language disorders (DLD) to be related to significantly poorer prospects for employment and establishing relationships. Individuals with DLD have been shown to be significantly less likely to be live independently, maintain employment and to have weaker social networks than their typically developing peers.

Children with language impairments, including those with a diagnosis of DLD, SLI and Autism Spectrum Disorder (ASD) tend to experience similar difficulties establishing and maintaining social relationships due to deficits in pragmatic language ability (Suh, et al., 2014). One aspect of pragmatics that is often problematic across these populations is the ability to comprehend and formulate narratives.
Generally speaking, while these groups demonstrate difficulty with understanding and formulating the content of narratives, they vary widely in terms of their skills related to language form. Language form refers to the grammatical structure of the story. Form, or grammar, is comprised of morphology (linguistic units used to signal meaning; e.g., “-ed” as in “walked” to indicate past tense), and syntax (organizational structure of language, e.g., parts of speech – nouns (tree), verbs (run), etc.). The content of a narrative refers to the vocabulary and story structure used to create a story. Narrative content, or story structure (character, setting, initiating event, internal response, plan, attempt, consequence) and specific vocabulary (coordinated and subordinated conjunctions, adverbs, elaborated noun phrases, metacognitive and metalinguistic verbs) are used to express the ideas and concepts of the story. These ideas can be expressed with either contextualized content (concrete, immediate concepts; e.g., “This is a book”) or decontextualized content (abstract concepts, not dependent on immediate surroundings; e.g., “Last week, I flew to Japan”). Use refers to the function or purpose of the language used. Halliday (1975) identified seven functions of language, including personal (expressing state of mind or feelings; e.g., “I feel happy”), imaginative (telling stories or role-playing; e.g., “Once upon a time...”), and instrumental (asking for something, e.g., “Can I please have that toy?”). Due to the difficulty individuals with SLI have with these three domains of language, it is not surprising that they often experience significant problems in comprehension and use of narrative discourse that requires integration of these domains.

Both form and content are important aspects of narrative proficiency. In order for a story to be complete, coherent, and interesting, it must contain events, vocabulary and
descriptions that enable the listener or reader to remain engaged, and to remember the actions taken by the characters that are involved. Children with SLI tell shorter stories that do not contain diverse vocabulary and their stories usually contain more grammatical errors than those of their peers (Fey et al., 2004; Greenhalgh & Strong, 2001; Ukrainetz & Gillam, 2009).

Many children with SLI will experience some difficulty in the use of inflectional morphology including past tense, auxiliary (is, are, was) and/or third person singular at some point in his or her development (Leonard, Camarata, Brown, & Camarata, 2004). Therefore, it is not unexpected that as they focus on narrative content, they might experience difficulties in language form. In a representative study, Colozzo et al. (2011) examined story generation abilities of 26 students between the ages of 7;4 (years; months) and 10;6 (year; months), half of whom demonstrated persistent oral language deficits. Two subtests of the Test of Narrative Language (TNL; Gillam & Pearson, 2004) were administered to all children and included the Late for School and Alien’s tasks. Both tasks require children to generate stories from either a series of pictures (Late for School) or a single picture (Alien) after being given a similar story model. A single content score was derived by adding selected items on the two scales, yielding a measure that indicated whether students included minimally required story elements (problem, action, resolution) in the narratives they generated. A form score was also derived from items contained on the two subscales of the TNL that corresponded to the accurate use of grammar, tense and reference to characters. A relative strength of content and form index (RSF) was calculated by dividing the form (grammar, tense, reference) score by the sum of the form and content (problem + action + resolution) scores.
Findings revealed that the narratives of children with SLI tended to contain either adequate content and inadequate grammar, or adequate grammar and inadequate content as compared to their typically developing peers. Only 23% of children with SLI produced narratives that were balanced in form and content. In contrast, 62% of the children developing typically produced balanced stories that contained both adequate form and content. Their findings suggested that children with SLI whose grammatical and narrative abilities are unstable or impaired, may demonstrate difficulty with the “cumulative load” of creating stories that are both grammatical and elaborate in content.

The same may be true of other populations of students who also demonstrate difficulty attaining narrative proficiency. One such population includes students with Autism Spectrum Disorder (ASD). There is some controversy in the literature as to whether students with ASD demonstrate grammatical deficits in addition to the pragmatic and storytelling problems that have been well established (Eigsti et al., 2011; Tager-Flusberg, Paul, & Lord, 2005). These studies suggest an atypical linguistic trajectory of development of language skills for many children with ASD (Lord & Paul, 1997).

For example, Eigsti et al., (2007) investigated a number of linguistic skills including grammatical complexity in the spontaneous speech of 5-year old children with ASD and compared them to children developing typically (TD) who were matched on non-verbal mental age and lexical ability. They reported that the speech of children with ASD was consistently less grammatical; and they used questions, negation and complex forms inconsistently, but demonstrated greater vocabulary knowledge than their typically developing peers.
Tovar et al., (2015) reported adequate grammatical skills for their 4 year old participants with ASD. Their grammatical knowledge was measured using eye tracking, which limits the social, motor, and contextual components of language. Results showed that the participants consistently comprehended grammatical morphology, even when they were not observed to use the morphemes in their spontaneous speech. The strong grammatical comprehension observed in this study indicated that the grammatical difficulty or misuse of certain morphemes experienced by children with ASD may have been related to contextual or pragmatic issues rather than being based only on grammatical knowledge (Tovar et al., 2015).

The findings of Naigles, Kelty, Jaffery, & Fein, (2011) further supported the hypothesis that the grammatical skills of children with ASD are often intact. The research team completed a longitudinal study to determine if children who were 41 months of age with a diagnosis of ASD engaged in syntactic bootstrapping, or the ability to acquire novel words by mapping onto existing grammatical frameworks, and if so, what some early predictors of this skill were. Previous research showed that children with ASD spontaneously produced, comprehended, and predicted meaning from subject-verb-object ordered sentences (Eigsti et al., 2007; Paul, Fischer & Cohen, 1998; Swensen et al., 2007). However, Minshew, Goldstein & Seigel (1997) suggested that children with ASD acquired language more successfully in the presence of contextual stimuli, and had difficulty generalizing grammatical rules. In the Naigles study, participants heard audio of a novel verb being used in a transitive sentence (e.g. The duck is gorping the bunny) while viewing side-by-side videos, one causative (e.g. duck pushing bunny over) and noncausative (e.g. duck and bunny standing side by side). Their acquisition of the novel
verb in this causative framework was then assessed with intermodal preferential-looking, or eye scanning, by presenting an audio direction (e.g. Find gorping) as the child again viewed the side-by-side videos. The results suggested that the children with ASD were able to learn novel causative verbs, such as gorping, by generalizing the subject-verb-object grammatical pattern. Success with generalizing grammatical patterns was significantly predicted by earlier vocabulary and grammatical knowledge.

Tek et al., (2014) reported similar findings in which students with children with ASD and high language ability demonstrated comparable grammatical morphology in spontaneous speech as compared to that of matched TD peers. Samples were collected at 4-month intervals from the time when students were 2 until they were 4. Samples were analyzed for use of grammatical morphemes, presence and complexity of wh- questions, and mean length of utterance (MLU). Two distinct language groups became apparent within the participants with ASD. Those with higher verbal skills demonstrated similar grammatical development to that of their TD peers, while those with lower verbal skills demonstrated flatter grammatical development over time.

It is possible that, like students with SLI, children with ASD may demonstrate unstable or even deficient grammatical abilities not because of difficulty in grammatical ability, but because they tend to make reference to decontextualized events less often in general, which is a contextual rather than a grammatical challenge (Eigsti et al., 2007; Tovar et al., 2015). This hypothesis was partially supported by Tovar et al. (2015) who removed many contextual components by assessing understanding of grammatical morphology through eye tracking.
The two most commonly used elicitation tasks for obtaining narratives are to ask students to create their own story from a prompt (verbal, picture) or to retell a story (Gazella & Stockman, 2003). These contexts provide differing levels of social-pragmatic support. For example, story retelling provides the student with social-pragmatic support because all of the information needed to tell the story is provided (vocabulary, grammar, syntax, events). In a story retell task, students do not need to create a shared context, decide how to reference characters, or to make decisions about tense or vocabulary choices. Importantly, a story retelling task in which the story is novel and is controlled for length, content and grammatical complexity has the potential to prevent students from recalling the story verbatim (Gazella & Stockman, 2003). For this reason, students with ASD may perform well in a story retelling context. However, a study by Dodwell and Bavin (2008) indicated that story retell tasks may place higher demands on sustained attention and memory. Therefore, the specific language deficits a child experiences will impact the difficulty of this narrative elicitation task.

In contrast, spontaneous elicitation contexts provide no social-pragmatic support, rely heavily on organizational skills, vocabulary and world knowledge and require sophisticated linguistic and integration skills that must be used in real time as the story unfolds (Gillam & Johnston, 1992, p. 1312). Therefore, it is possible that story generation tasks might prove to be more difficult, particularly for students with ASD who demonstrate difficulty when social-pragmatic demands are high.

Thus, while grammatical language is generally considered a strength for individuals with ASD, research demonstrates that varying the demands of the assessment context may result in different linguistic and pragmatic burdens. There is limited research
in observing the interaction of grammatical form and narrative content over time in different elicitation contexts. Retell tasks and story generation tasks presumably provide different levels of contextual support, with retells being a more supported task, and story generation requiring the speaker to draw more heavily on pragmatic language skills. With this study, we hope to observe whether form-content discrepancies between grammar and narrative content occur over the course of an intervention designed to improve narrative content for children with ASD.

The purpose of this study was to examine the relationship between grammatical form and narrative content in stories told by school-age children with Autism Spectrum Disorder (ASD) as they participated in a narrative intervention program. It was hypothesized that as students focused on content that they may experience periods of fluctuation in their use of grammatical form.

A secondary purpose of this investigation was to examine whether the presence of form-content discrepancies differed as a function of elicitation context. It was hypothesized if students with ASD demonstrated form-content discrepancies, they would do so more often in their spontaneously generated stories than those they were asked to retell.

Research Questions

1. Do form-content discrepancies occur when participants are asked to generate a spontaneous story?

2. Do form-content discrepancies occur when participants are asked to retell a story?
Is one story elicitation context (story generation, retell) associated with greater fluctuation in form and content than another?

METHOD

This study was an extension of a previous study conducted by Gillam, Hartzheim, Studenka, Simonsmeier, and Gillam (2014) to determine the efficacy of a narrative intervention with children with Autism Spectrum Disorder (ASD).

Participants

Five children (2 girls and 3 boys) with ASD participated in the narrative intervention of the parent study. Participants were recruited through the Center for Persons with Disabilities in Logan, Utah. All were monolingual English speakers with an educational diagnosis of autism. The children ranged in age from 8 to 12 years (mean age = 9:9). Receptive and expressive language skills were assessed using the Clinical Evaluation of Language Fundamentals-4th edition (CELF-4; Semel, Wiig, & Secord, 2005). Four of the participants obtained standard scores at or below 85 (Table 1-1). One participant, 004, obtained an above average standard score of 114 on the CELF-4. However, this child was included in the study because her stories lacked age-appropriate levels of coherence and cohesiveness.

All of the participants were characterized as “verbally fluent” on the Autism Diagnostic Observation Schedule-2nd edition (ADOS-2; Lord, Rutter, DiLavore, Risi, Gotham & Bishop, 2012). The ADOS defines verbally fluent as being able to produce a variety of sentence types and grammatical structures, speak about both contextual and
noncontextual events, and generate some causal relationships within sentences (e.g., clauses beginning with *if* or *but*). No known comorbidities were present for any participant. Finally, all of the participants obtained standard scores at or above 78 on the *Universal Nonverbal Intelligence Test* (UNIT; Bracken & McCallum, 1998 (Table 1-1).

Table 1-1

*Mean scores on the CELF-4 and the UNIT for all participants prior to intervention.*

<table>
<thead>
<tr>
<th>Participant Set 1</th>
<th>Gender</th>
<th>Age</th>
<th>CELF-4</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>female</td>
<td>10;8</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>003</td>
<td>female</td>
<td>9;5</td>
<td>114</td>
<td>115</td>
</tr>
<tr>
<td>004</td>
<td>male</td>
<td>8;4</td>
<td>79</td>
<td>103</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participant Set 2</th>
<th>Gender</th>
<th>Age</th>
<th>CELF-4</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>002</td>
<td>male</td>
<td>10;9</td>
<td>62</td>
<td>78</td>
</tr>
<tr>
<td>005</td>
<td>male</td>
<td>9;6</td>
<td>48</td>
<td>91</td>
</tr>
</tbody>
</table>

Prior to intervention, participants 001, 003, and 004 were able to construct stories that contained basic elements (e.g., initiating event, attempts, consequences), but were not able to elaborate with internal responses (emotional state), or plans (solutions). Participants 002 and 005 did not include basic story grammar elements in their constructed narratives, and instead produced simple descriptions of objects or actions.
For example, in his first baseline session, 002 generated the following story after looking at a picture prompt:

There’s a lot of kids and parents at the beach.
They like to be at the beach.
They’re trying to find seashells.
They’re getting wet.

While highly grammatical, this story contained no causal narrative framework, and instead simply described the scene in the picture.

Design

A single subject multiple baseline across participants design was utilized for this study. The five participants were divided into two groups (higher language ability, lower language ability) prior to initiating a 3-phase intervention program consisting of baseline, intervention, and maintenance phases. The first group of participants demonstrated higher language ability as measured using the CELF-4 (CELF-4 ≥ 79) and included participants 001, 003, and 004. The second group of participants demonstrated lower language ability (CELF-4 ≤ 62) and included participants 002 and 005. All participants began baseline sessions within the same week in order to control for external influences.

The outcome measure for determining whether stable baselines were achieved (and whether increases in performance were observed) was a measure of narrative proficiency (Monitoring Indicators of Scholarly Language; MISL), which will be described in the next section. Basically, students were asked either to tell a story that corresponded with a picture prompt, or to retell a story told by the examiner. All the
stories were audio recorded on digital recorders, transcribed by research assistants, and scored using the MISL rubric. The procedures for eliciting the narratives will be described below.

One participant from each language ability group, 001 (high) and 002 (low), began intervention after participating in baseline sessions during which no clear observable upward trend in narrative scores were observed (participant 001; n=5) and (participant 002; n=4). Intervention for the remaining participants (003, 004, 005) began on a staggered schedule, when no upward trends were observed in their narrative scores, and clear upward trends in narrative ability were observed for participants 001 and 002. This staggered schedule was implemented in order to control for maturation. Two maintenance sessions were conducted following the completion of intervention to determine if treatment effects were maintained.

Table 2-1

*Number of Sessions Completed by Participants in Each Time Point*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participant Set 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>001</td>
<td>5</td>
<td>23</td>
<td>2</td>
</tr>
<tr>
<td>003</td>
<td>12</td>
<td>19</td>
<td>2</td>
</tr>
<tr>
<td>004</td>
<td>9</td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td><strong>Participant Set 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>002</td>
<td>4</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>005</td>
<td>10</td>
<td>27</td>
<td>2</td>
</tr>
</tbody>
</table>
Narrative Intervention

The Supporting Knowledge in Language and Literacy narrative intervention program (SKILL; Gillam, Gillam & Laing, 2012) was used as the approach to narrative treatment in the study by Gillam et al. (2014) that provided the foundation for the current study. SKILL is a manualized narrative intervention program that contains three phases. In Phase I, participants learn core story grammar elements, such as character, setting, initiating event, internal response, plan, attempt, consequence, and reaction. A character is a person or thing in a story that speaks or acts (e.g. Dorothy in the Wizard of Oz). A setting is where a story takes place (e.g. the Emerald City in the Wizard of Oz). An initiating event, sometimes called the problem, is something that occurs in the story to set the plot in motion (e.g. Dorothy needing to get home). An internal response is a mental or emotional response from a character in a story (e.g. Dorothy feeling afraid upon meeting the Cowardly Lion). A plan is an idea for addressing the initiating event (e.g. Dorothy planning to ask the Wizard for help). An attempt occurs when a character acts on the plan (e.g. Dorothy asking the Wizard for help). A consequence is what occurs as a result of the attempt (e.g. Dorothy ultimately getting to return home). A reaction is a character’s response or feeling about the consequence (e.g. Dorothy being pleased to return home).

In Phase II, participants learn to elaborate their narratives through the use of more complex linguistic structures that mark mental states (thought, decided) and causal language (because, so) including the use of elaborated noun phrases, subordinating (when, because) and coordinating conjunctions (for, and, nor, but, or, yet, so) and expanded vocabulary. In this phase, awareness is drawn to relationships between
macrostructure elements (content of the story, story grammar components), and microstructure elements (use of elaborated linguistic structures). Phase III was designed to encourage participants to develop meta-cognitive skills, to learn to judge the adequacy of their stories and to eventually be able to edit their work independently. Icons for each of the story elements, graphic organizers containing the elements in a temporal sequence, and checklists for editing are provided in this phase. These supports are introduced in Phase I (except for the editing rubric) and used to introduce and practice targeted narrative concepts throughout the program. They are withdrawn in a scaffolded fashion as participants demonstrate mastery.

The SKILL program was designed to be delivered at each individual’s rate of learning. During intervention, participants attended twice-weekly sessions lasting 50 minutes each, with the content of each session determined by their progress from previous sessions. Participants advanced to the next phase of intervention (e.g. from Phase I to Phase II) as they mastered the skills targeted in the previous sessions or phases.

Exit testing was conducted at the end of each phase to determine whether it was appropriate to move to the next phase. If a participant did not meet the exit criteria, additional instructional materials provided in the manual were used to remediate the necessary skills. Skills targeted for Phase I included the ability to identify all story grammar icons; give examples or definitions for each icon; create a story that contained all elements using a storyboard; and answering comprehension questions about the story grammar elements. Skills that were targeted for Phase II included creating a story using a complex storyboard that contained: all story elements, 2 or more feeling words, the words because or so, 1 or more mental or linguistic verbs, 1 or more adverbs, and 1 or more
elaborated noun phrases; answering comprehension questions about a story told to them by the examiner; recalling details associated with story elements. After completing Phase III, students were expected to be able to create stories that contained complex episodes and to judge their adequacy independently.

Outcome Measures

To judge whether students were making progress in their narrative abilities, stories were elicited from students after each intervention session. Stories were elicited in two contexts: story generation and retell. The story elicitation contexts were alternated such that every other intervention session students were asked to either generate or retell a story. During the baseline and maintenance periods, two stories were elicited each session, one from each elicitation context. In the story generation context, children were presented with a picture containing a single scene with no obvious initiating event (nothing that clearly motivates a character into action) and asked to create their own story. In the retell context, examiners told the child a story and asked him or her to retell it. No visual or verbal supports were used during the elicitations of these narratives. This procedure was used throughout the baseline, intervention, and maintenance periods.

General Transcription Procedures

Stories were digitally recorded and uploaded to a secure server. Research assistants, a primary transcriber and a secondary transcriber, blind to the purpose of the study transcribed each narrative using the Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 2004) software and coding procedures. Stories were
segmented into communication units (C-units): one main clause and any dependent clause(s) or phrase(s) as defined by Loban (1976). The following types of utterances were excluded when coding form: mazes, abandoned utterances, and comments. Mazes were denoted by ( ) and included filled pauses (e.g., “And (uh) he (uh) got the batteries”) or revisions (e.g., So they yelled BOO as (fast) loud as they could). Abandoned utterances were denoted by > and included incomplete utterances (e.g., “And it’s >”). Comments were denoted by (( )) and included statements or questions not considered to be part of the story (e.g., “There are two humming birds named Sam and Max ((I just don’t remember his name))”). The research assistants reviewed one another’s transcriptions for discrepancies, and resolved any inaccuracies by consensus. The primary and secondary transcribers were 96% reliable with one another for C-unit segmentation, and 96% reliable for identification of mazes (Gillam et al., 2014)

Stories (self-generated, retells) were scored for form (grammaticality) and narrative proficiency (content). These outcome measures are described in the next section.

Form (Grammaticality)

Grammaticality was determined by assessing each narrative’s adherence to the standard set of structural features making up the English language. Each C-unit was scored as either grammatical [GR] or ungrammatical [UG] by two independent raters. A percent grammaticality score was calculated for each story by dividing the total number of grammatical utterances by the total number of utterances and multiplying by 100 (e.g. 001 treatment session ten had 16 total utterances, 13 of which were grammatical; (13 ÷
16)*100 = 81.3% grammatical). Percentages were calculated for generated stories (Table 3-1) and retells (Table 3-2).

A coding protocol was used to guide decision making about whether an utterance was grammatical or not. This coding protocol is provided in Appendix A. Specific grammatical errors that were noted included tense errors (e.g., “he never come back” for “he never came back”), omissions or substitutions of closed-class words (e.g., “putting his hard hat” for “putting on his hard hat”), or bound morphemes (e.g., “careful” for “carefully”), and word order errors (e.g., “he played yesterday football” for “he played football yesterday”). This coding system was similar to that used by Colozzo et al. (2011) in the types of grammatical errors noted.

As students progressed through the program, their grammaticality was expected to fluctuate as a result of a focus on narrative content. Therefore, their grammaticality scores were reported for each session, averaged for each phase of instruction (Phases I, II, III) and for maintenance, and for the total intervention period (Phases I + II + III). These data points were used to examine potential discrepancies between narrative content (MISL scores) and form (grammaticality).

Two expert raters, the first author and one additional research assistant, coded each narrative for grammaticality. Reliability was determined by identifying whether raters assigned the same code (i.e. GR, UG) to each utterance or not. The percentage of reliable utterances was calculated by dividing the total number of utterances that were agreed upon by total number of utterances that were scored, and multiplying by 100. The two raters were found to be 90.7% reliable for coding grammaticality.
Narrative content was scored using the Monitoring Indicators of Scholarly Language (MISL) rubric (Gillam & Gillam, 2013). Versions of this rubric were used in the parent study to determine narrative proficiency (knowledge of story elements and perspective taking) in self-generated stories and those that were retold by children. In the current study, the narrative content score obtained from the MISL was used to reflect the child’s performance on five story grammar elements. Three of these story elements were judged to be minimal requirements for a complete episode as outlined in the Stein and Glenn (1979). These three story elements included initiating event, attempt, and consequence. Character and setting were also included, with each being assigned a score that reflected how it was used in the story. For example, more sophisticated use of an element would earn a score of 3 (elaborated), followed by 2 (present), 1 (emerging) and 0 (absent). The total possible score for narrative content using this MISL score was 15.

As students progressed through the program, their narrative content scores were expected to change and presumably improve and stabilize over time. Therefore, their content scores were reported for each session, averaged for each phase of instruction (Phases I, II, III) and for maintenance, and for the total intervention period (Phases I + II + III). These data points were used to examine potential discrepancies between form (percent grammaticality) and narrative content (MISL scores). The MISL score was obtained from each narrative by adding character, setting, initiating event, attempt and consequence. Each story was scored by two expert raters. Inter-rater reliability was calculated by dividing the total number of judgments by the total number
of items and multiplying by 100. Inter-rater reliability was 92% for the MISL content scores.

Calculating Form-content Discrepancies (FCD)

The presence of a form-content discrepancy (FCD) was determined by calculating z-scores for narrative form, using percent grammaticality, and narrative content, using raw scores from the MISL. A z-score was obtained for every story elicited during intervention and maintenance sessions by comparing the score achieved in that session to the average score obtained during baseline. For example, across nine baseline sessions, participant 004 was 74.6% grammatical in retells. In treatment session twelve, participant 004 was 91.7% grammatical. When the z-score formula \([x – \text{mean})/\text{standard deviation}\] was applied, \([(91.7-74.6)/29.5]\), a z-score of .58 was obtained. These z-scores are represented in Figures 1 through 10, with the x-axis, or 0, representing average baseline scores.

A FCD was judged to have occurred when there was a \(\geq .50\) z-score difference between the form and content scores (Grammaticality v. MISL) for each story. Each FCD was then indicated as favoring form over content or content over form by determining which z-score was greater. For example, in treatment session six, participant 001 had a grammatical form z-score of .07 and a narrative content z-score of .96, for a z-score difference of .89. In this case the FCD favored content, as that z-score was higher. In treatment session three, participant 001 had a grammaticality z-score of 3.02 and a narrative content z-score of -0.14, for a z-score difference of 3.16. In this case the FCD favored form, as that z-score was higher.
The percentage of FCDs experienced in each elicitation context (story generation and retell) during each phase of intervention was calculated. This percentage was calculated by determining the number of FCDs (Table 4-1, Table 4-2) experienced in an elicitation context (story generation, retell) in a phase (I, II, III) and dividing by the total number of narratives elicited using that context during that phase, then multiplying by 100. For example, participant 002 experienced 4 FCDs in 5 retell narratives produced in Phase II of intervention. Thus, 002 experienced FCDs in 80% ([4/5]*100) of the stories elicited at that time point. This procedure was used to control for the fact that students did not remain in each phase for equal periods of time.

In addition, for each FCD, it was noted whether the score favored content (content z-score higher than form z-score) or favored form (form z-score higher than content z-score). FCDs in which content was favored were taken as an indication that the student was focused on narrative content at the expense of grammaticality (form). FCDs in which form was favored were taken as an indication that the student was focused on form at the expense of narrative content. A percentage of FCDs favoring content was calculated in each elicitation context (story generation and retell) by determining the number of FCDs favoring content and dividing by the total number of FCDs in that elicitation context, then multiplying by 100. For example, participant 003 experienced 9 FCDs in story generation, 8 of which favored content. Thus, 003 favored content in 88.9% ([8/9]*100) of FCDs experienced in story generation.
RESULTS

The first research question concerned changes in the ratio of grammatical accuracy (form) to narrative complexity (content) during story generation tasks as participants progressed through an intervention program designed to improve narrative ability. The second research question concerned changes in the ratio of grammatical accuracy to narrative complexity during story retell tasks during the same period of time. The third research concerned comparing the degree of fluctuation experienced in one elicitation context over the other. For each participant, the data for grammaticality and narrative content will be summarized across the 3 phases of instruction first, followed by description of any form-content discrepancies (determined by cut-off score of ≥.50 z-score difference). The data for all participants will be discussed for story generation context followed by the story retell elicitation context.

Individual variation was observed in form (grammaticality) (Table 3-1; Table 3-2) and content (narrative complexity) (Table 3-3; Table 3-4) in both elicitation contexts over the course of intervention. All of the participants experienced form-content discrepancies (FCDs) in which the z-scores for form and narrative content differed by ≥.50, with some favoring content and some favoring form, in the story generation context (Table 4-1) and in the retell context (Table 4-2). The data for children in the higher language ability group, as evidenced by their scores on the CELF-4, are discussed first (001, 003, 004) followed by data for children in the lower language ability group (002, 005).
**Participant 001**

Participant 001, age 10:8, completed 5 baseline sessions, 23 intervention sessions and 2 maintenance sessions (Table 2-1). During baseline, her language skills were judged to be in the low-average range (Table 1-1) as measured using the CELF-4. Grammaticality across each phase is shown for generated stories in Table 3-1, and for retells in Table 3-2. As can be seen in these tables, grammaticality fluctuated over the course of intervention in generated stories, exceeding baseline (87.06%) in Phases I (92.41%) and III (89.49%), and falling below baseline in Phase II (76.58%) and maintenance (78.63%). In the retell context, grammaticality decreased below baseline (85.36%) during Phase I (82.42%), then steadily increased over time to surpass baseline at maintenance (94.74%).

Content scores (MISL) are shown in Table 3-3 for story generation, and in Table 3-4 for retells. In both elicitation contexts, 001 experienced a slight gradual improvement in narrative content from baseline to maintenance, increasing from 9.40 to 12.00 in generated stories, and from 10.80 to 13.00 in retells.

FCDs are shown for the story generation task in Table 4-1 and for the retell task in Table 4-2. Participant 001 experienced more FCDs in generated stories than retells during Phase I (generated = 60%; retells = 50%); more FCDs in generated stories compared to retells during Phase II (generated = 100%; retells = 50%); but more FCDs in retells (100%) compared to generated stories (75%) during Phase III. She demonstrated an equal number of FCDs (100%) for each context during the Maintenance phase. Overall, she experienced a FCD in 78.5% of all sessions when asked to generate a story as compared to 69.2% of sessions when she was asked to retell a story.
Of the form-content discrepancies that occurred during story generation, 72.7% favored content, meaning that the content z-score was higher than the form z-score (Table 4-1; Figure 1). During story retell, slightly more (77.8%) of the observed form-content discrepancies favored content (Table 4-2; Figure 2).

**Participant 003**

Participant 003, age 9;5, completed 12 baseline sessions, 19 intervention sessions and 2 maintenance sessions (Table 2-1). During baseline, her language skills were judged to be in the high-average range (Table 1-1) as measured using the CELF-4. However, her stories were incoherent and disorganized, making them difficult to understand.

Grammaticality decreased considerably from baseline (88.36%) to Phase I (70.47%), then increased over time, ultimately exceeding baseline levels at maintenance (96.55%) in generated stories (Table 3-1). In retells (Table 3-2) grammaticality increased from baseline (87.79%) to maintenance (95%), fluctuating over the course of intervention, though never dropping below baseline.

Content scores exceeded baseline levels in both elicitation contexts (Table 3-3; Table 3-4), gradually increasing from 9.42 to 11.50 in generated stories, and increasing from 9.75 to 14.50 in retells.

FCDs are shown for the story generation task in Table 4-1 and for the retell task in Table 4-2. Participant 003 experienced an equal number of FCDs in both generated and retell contexts (75%) during Phase I; and more FCDs in generated stories than retells during Phases II (generated = 100%; retells = 66.7%) and III (generated = 100%; retells = 50%). During maintenance, 003 demonstrated more FCDs in retells (100%) as compared
to generated stories (0%). Overall, she experienced a FCD in 75% of all sessions when asked to generate a story as compared to 72.7% of sessions when she was asked to retell a story.

Of the form-content discrepancies that occurred during story generation, 88.9% favored content, meaning that the content z-score was higher than the form z-score (Table 4-1; Figure 3). During story retell, slightly fewer (87.5%) of the observed form-content discrepancies favored content (Table 4-2; Figure 4).

**Participant 004**

Participant 004, age 8;4, completed 9 baseline sessions, 21 intervention sessions and 2 maintenance sessions (Table 2-1). During baseline, his language skills were judged to be in the below average range (Table 1-1) as measured using the CELF-4.

Grammaticality fluctuated only slightly over the course of intervention in generated stories (Table 3-1), falling below baseline (84.50%) at maintenance (81.08%). In retells (Table 3-2), grammaticality increased from baseline (74.65%) to maintenance (88.24%), never falling below baseline over time.

Content in the both elicitation contexts exceeded baseline levels. In generated stories, 004’s narrative content score increased from 6.89 to 12.00 (Table 3-3). In retells, 004’s narrative content score increased from 6.22 to 13.00 (Table 3-4).

FCDs are shown for the story generation task in Table 4-1 and for the retell task in Table 4-2. Participant 004 experienced more FCDs in generated stories as compared to retells during Phase I (generated = 83.3%; retells = 66.7%); an equal number of FCDs (100%) in both elicitation contexts during Phase II; more FCDs in generated stories as
compared to retells during Phase III (generated = 100%; retells = 0%); and an equal number of FCDs (100%) in both contexts during the Maintenance phase. Overall, he experienced a FCD in 92.3% of all sessions when asked to generate a story as compared to 75.0% of sessions when he was asked to retell a story.

Of the form-content discrepancies that occurred during story generation, 100% favored content, meaning that the content z-score was higher than the form z-score (Table 4-1; Figure 5). During story retell, fewer (77.8%) of the observed form-content discrepancies favored content (Table 4-2; Figure 6).

**Participant 002**

Participant 002, age 10:9, completed 4 baseline sessions, 32 intervention sessions and 2 maintenance sessions (Table 2-1). During baseline, his language skills were judged to be in the significantly below average range (Table 1-1) as measured using the CELF-4.

Grammaticality fluctuated over the course of intervention in generated stories (Table 3-1), increasing above baseline (93.75%) during Phase I (98.41%), decreasing during Phases II (91.32%) and III (91.45%), and increased at maintenance (100%). In the retell context (Table 3-2), grammaticality decreased below baseline (91.67%) during Phases I (88.02%), and II (85.61%), then steadily increased in Phase III (90.71%) and maintenance (100%).

Content scores are shown in Table 3-3 for story generation, and in Table 3-4 for retells. In both elicitation contexts, his narrative content scores at maintenance exceeded baseline levels, moving from 1.25 to 11.00 in generated stories, and from 3.25 to 8.00 in retells.
FCDs are shown for the story generation task in Table 4-1 and for the retell task in Table 4-2. Participant 002 experienced more FCDs in generated stories (100%) as compared to retells during Phases I (75%) and II (80%); and demonstrated an equal number of FCDs (100%) for story generation and retells during Phase III and the Maintenance phase. Overall, he experienced a FCD in 100% of sessions when asked to generate a story as compared to 83.3% of sessions when he was asked to retell a story.

Of the form-content discrepancies that occurred during story generation, 100% favored content, meaning that the content z-score was higher than the form z-score (Table 4-1; Figure 7). During story retell, slightly fewer (93.3%) of the observed form-content discrepancies favored content (Table 4-2; Figure 8).

**Participant 005**

Participant 005, age 9;6, completed 10 baseline sessions, 27 intervention sessions and 2 maintenance sessions (Table 2-1). During baseline, his language skills were judged to be significantly below average (Table 1-1) as measured using the CELF-4.

In generated stories (Table 3-1), 005’s grammaticality fell considerably from baseline (81%) to Phase I (59.34%), then increased to 82.68% at maintenance. In the retell context (Table 3-2), grammaticality declined from baseline (79.67%) to Phases I (62.66%) and II (60%), then steadily increased over time to maintenance (74.11%).

Content in the both elicitation contexts (Table 3-3; Table 3-4) exceeded baseline levels. In generated stories, 005’s narrative content scores increased from 1.20 to 6.00 (Table 3-3). In retells, 005’s narrative content scores increased from 2.70 to 8.50 (Table 3-4).
FCDs are shown for the story generation task in Table 4-1 and for the retell task in Table 4-2. Participant 005 experienced more FCDs in generated stories than in when retells during Phases I (generated = 100%; retells = 87.5%) and II (generated = 100%; retells = 50%); and an equal number of FCDs (100%) in both elicitation contexts during Phase III and the Maintenance phase. Overall, he experienced a FCD in 100% of all sessions when asked to generate a story as compared to 86.6% of sessions when he was asked to retell a story.

Of the form-content discrepancies that occurred during story generation, 100% favored content, meaning that the content z-score was higher than the form z-score (Table 4-1; Figure 9). During story retell, an equal number (100%) of the observed form-content discrepancies favored content (Table 4-2; Figure 10).

DISCUSSION

The purpose of this study was to observe the interaction between form and content in the stories told by school-age children with ASD over the course of their participation in a narrative intervention. It was hypothesized that periods of fluctuation, or form-content discrepancies (FCDs), would be experienced in grammatical form as students focused on narrative content. A secondary purpose was to observe whether the narrative elicitation context, story generation or retell, impacted the relationship between grammatical form and narrative content. Because story generation requires more knowledge of and use of contextual and pragmatic cues as well as stable grammatical and syntactic skills, it was hypothesized that participants would experience more FCDs when asked to generate their own stories than when asked to retell stories told to them.
The participants made varying levels of improvement in the complexity of their narratives as they participated in the narrative intervention (Gillam et al., 2014). Despite this variation, all participants experienced form-content discrepancies (FCD), in which the z-scores for form and narrative content differed ≥ .50 when compared to the previous session.

There was a high degree of individual variation from one child to the next over the course of intervention in terms of their form and content changes. When children produced coherent, complex narratives that were aesthetically appropriate, they tended to do so at the expense of grammaticality, as evidenced by the presence of a FCD with content higher than form.

The differences between the story generation and retell data provided compelling evidence for a differential impact of context on performance. All of the participants experienced fluctuations between form and content in both contexts. For some of the participants, this resulted in a tendency to focus on grammatical form over content that was observed to occur more often in the story generation context than the retell context (001, 003), while one participant experienced more fluctuations in the retell context as compared to story generation (002), and other participants experienced fluctuations equally between contexts (004, 005). While form-content discrepancies occurred in both contexts for all participants, their tendency to focus on one or the other differed by participant and by context. Prior language ability as measured by the CELF-4 did not appear to be related to this tendency.
Participant 001

Participant 001’s grammatical skills were within the average range during baseline in both story generation and retells. Her narratives consistently contained adequate character elaboration, but they did not contain complete narrative episodes, which required the use of initiating event, action, and consequence. She demonstrated gradual improvements in her ability to generate and retell stories over the course of intervention, and began to consistently include complete causally linked narrative episodes.

As she focused on developing her narrative skills, her grammatical skills were observed to fluctuate slightly in the story generation context indicating that her ability to simultaneously manage form and content while generating her own stories, was difficult for her. This was not as prevalent in the retell context. Form-content discrepancies were observed to occur in most stories in both contexts (69.2% or greater). This participant more frequently favored content over form in both elicitation contexts. However, she experienced more FCDs in story generation than in retells, and the discrepancies between her form and content scores were greater than the discrepancies observed in the retell context. She favored her stronger skill of form in Phase I of story generation as she became acquainted with the targets of the narrative intervention. She then experienced a sharp decrease in her form scores in Phase II of story generation, while simultaneously experiencing a sharp increase in her content scores. This suggests that story generation may have been a more difficult context for 001, impacting her ability to produce narratives balanced in form and content.
**Participant 003**

Participant 003 also demonstrated typical grammatical skills in both elicitation contexts during baseline. She demonstrated adequate elaboration of character in her retells, however her stories contained limited use of story grammar elements in both contexts.

She was observed to experience a dramatic decline in her grammatical skills for self-generated stories early during intervention (Phases I and II), as her narrative content scores steadily improved. Her content scores improved similarly in her retells, however her grammatical scores were observed to remain stable in this elicitation context.

Form-content discrepancies were observed to occur in both elicitation contexts (72.7% or greater), with slightly more occurring in the story generation than the retell context. As with participant 001, the FCDs she experienced more frequently favored content than form in both elicitation contexts. The dramatic decline in grammatical skills observed during Phases I and II of the story generation context could indicate that story generation may have been more difficult for 003. The degree of discrepancy between form and content was much greater in story generation as compared to retell, which further suggests that it may have been more challenging for 003 to simultaneously manage both form and content in generated stories as compared to retells.

**Participant 004**

Participant 004 demonstrated greater grammatical accuracy in generated stories (average) than retells (below average) at baseline. His narratives did not contain adequate elaboration or evidence of critical story grammar elements in either context.
He demonstrated steady, gradual improvements in his ability to generate stories and retell stories over the course of intervention, and began to consistently produce complete causally linked, coherent stories. Form-content discrepancies were observed most in the story generation context. As he focused on narrative content, his grammatical skills were observed to fluctuate in both elicitation contexts, but fluctuated with more variability in the retell context. These fluctuations continued into the maintenance period. This suggested that he was having difficulty in balancing form and content in his narratives. In contrast to participants 001 and 003, it is likely that both contexts were equally difficult for 004, causing similar dissonance between grammatical and semantic/discourse level processing.

**Participant 002**

Recall that participants 002 and 005 had poorer language skills to begin with in comparison to participants 001, 003, and 004. Participant 002 demonstrated typical grammatical skills in both generation and retell contexts, although they were slightly stronger in spontaneously generated stories. His narrative content scores were low in both elicitation contexts with his stories lacking consistent elaboration of all story grammar components.

Form-content discrepancies were observed to occur in both elicitation contexts (83.3% or greater), with slightly more occurring in the story generation than the retell context. He was observed to make the most drastic improvement in story generation, with the most notable growth occurring during Phase II. His grammatical skills were not observed to change measurably at this time however, suggesting that he was able to
balance form and content in this elicitation context. His content scores in his retells were significantly less impressive than in story generation although they did improve slightly over time. While his grammatical ability appeared to be within normal limits during the retell context, it was slightly lower across all phases of intervention in retells as compared to generated stories. Additionally, he experienced a decrease in form during Phases I and II of retells that was not observed in generated stories. This suggests that maintaining adequate form while acquiring content was more challenging for 002 in the retell context than in generated stories.

**Participant 005**

Participant 005’s grammatical skills were slightly below average at baseline in both generated stories and retells. His stories contained no complete episodes and frequently contained only one story grammar element. In most cases, he simply labeled an object or described an action that he saw in the scene or heard in the story told to him.

This participant demonstrated the most fluctuation between form and content with discrepancies occurring in almost every story in both elicitation contexts (86.6% or greater), with slightly more occurring in the story generation context. In generated stories, he demonstrated slow but steady progress in including more story grammar elements and this was maintained during the follow-up period. His grammatical skills were observed to decline significantly as he focused his attention on content, with the most notable difficulties occurring during Phases I and II. In retells, this participant demonstrated similar slow, steady although somewhat variable gains in narrative content scores. His grammatical skills were observed to decline more dramatically in the retell
context than in the story generation context and did not return to baseline during Phase II or in the maintenance period, although his content scores continued to improve.

Both contexts seemed to be equally challenging for this participant, as evidenced by greater difficulty balancing form and content in story generation, and lower form overall in retell.

**Overall Findings**

All of the participants experienced form-content discrepancies in both elicitation contexts, with more observed in the story generation than the retell context. All participants favored content over form more often in both elicitation contexts. Participants 004 and 005 did not appear to experience fluctuations in form and content associated with one context over the other. Participants 001 and 003 experienced more fluctuation between form and content in story generation. Participant 002 had more difficulty balancing form and content in retells.

It is possible that the social-pragmatic demands of the retell context were significantly less than in the story generation task, making is easier for some participants to maintain grammaticality while focusing on narrative content. For other participants, the retell context may have been more challenging due to increased demands on sustained attention and auditory memory. For participants 001, 003, and 004, grammaticality was not observed to fall significantly below baseline during any phase of the intervention when students were asked to retell a story, while participants 002 and 005 did experience a dip below baseline in their form scores. In addition, all of the participants demonstrated stable or steady increases in their narrative content scores over baseline levels. Only one
participant demonstrated more FCDs in the retell context than the generation context (002). For 001 and 003, the story generation context appeared to be more taxing on the linguistic system resulting in fluctuating grammatical accuracy as narrative content improved. Participants 004 and 005 appeared to experience equal difficulty balancing form and content in both elicitation contexts.

This study supports findings reported by Colozzo et al., (2011) who reported that the narratives of children with SLI tended to contain either adequate content and inadequate grammar, or adequate grammar and inadequate content as compared to their typically developing peers. However, the current study adds to the literature by showing that children may demonstrate difficulty with the “cumulative load” of creating stories that are both grammatical and elaborate in content even when their grammatical skills are intact.

In addition, this is the first study that has examined the relationship between grammatical form and narrative proficiency as children are in the process of learning to tell better stories. The data suggest that the relationship may change over time, with fluctuations occurring at different points in the intervention process. Interestingly, there did not appear to be anytime during intervention when fluctuations did not occur. It is possible that these fluctuations may lesson or cease over time as student’s narrative skills stabilize. The students in the current study participated in only two maintenance sessions, which makes it difficult to determine whether this was the case.

This is the first study that has examined form-content discrepancies in the two most commonly used narrative elicitation contexts; story generation and story retell. The findings suggested that children may perform differently in the two contexts, with some
students experiencing more difficulty in one than the other. The story generation task may be more demanding than the retell context for some students with ASD, while the retell context may be more demanding for other students. In many cases, students appeared to have more difficulty focusing on content over form in the story generation context, which was the purpose of the intervention program. At the very least, it may be important to elicit stories in both contexts to be sure and gain representative samples of their narrative content abilities.

Implications

The literature has suggested that grammatical ability may be a strength for children with ASD (Tovar et al., 2015). Consistent with this prediction, four of the five participants in this study began with adequate grammatical skills. However, even with strong grammatical skills, participants had significant difficulty producing narratives that were grammatical and contained adequate content. At maintenance, the content scores for all five participants exceeded baseline levels in both elicitation contexts, and grammatical accuracy was observed to exceed baseline levels for four of the five participants in the retell elicitation context. Three of five students were able to maintain or exceed baseline grammatical accuracy in the story generation context. Fluctuations in form and content were observed to occur in the stories of all participants with some favoring form and others favoring content, and was related to the Phase of intervention and the story elicitation context. This is an important finding because it suggests that clinicians should be aware of potential fluctuations that may occur in grammatical accuracy as children learn to tell stories with sufficient content. Fluctuations between form and content may
occur as students shift their focus between maintaining grammatical accuracy and learning to tell better stories.

Limitations and Future Research

There are limitations to this study. Due to the small sample size and varied language ability of the participants at the onset of the study, the results could not be reliably compared at a group level. Future research could extend this project by recruiting a larger participant set and matching for language ability in order to better investigate the impact of different elicitation contexts on form-content discrepancies, as well as exploring potential predictive factors for identifying the elicitation context in which an individual may be more successful. Additionally, this study was completed using data collected for a previous study (Gillam, et al., 2014) focusing on the development of narrative proficiency. Therefore, the participants’ performance in grammatical form over the course of intervention did not impact the presentation of intervention materials. Future research would benefit from a study design that accounted for the development of narrative proficiency and grammatical content over time, while also incorporating a longer maintenance period to observe any continuing fluctuation or stabilization that may occur following intervention.
### Phase Means and Standard Deviation for Percent Grammaticality in Generated Stories

<table>
<thead>
<tr>
<th>Participant Set 1</th>
<th>Baseline</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Maintenance</th>
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<tbody>
<tr>
<td>001</td>
<td>87.06(4.29)</td>
<td>92.41(8.16)</td>
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<tr>
<td>004</td>
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<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Maintenance</th>
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<tbody>
<tr>
<td>002</td>
<td>93.75(12.50)</td>
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<td>91.45(8.39)</td>
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<td>n=4</td>
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<tr>
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Table 3-2

*Phase Means and Standard Deviation for Percent Grammaticality in Retells*

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<th>Maintenance</th>
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<td>82.42</td>
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<td>91.12</td>
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</tr>
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<td>89.15</td>
<td>90.42</td>
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<th>Phase II</th>
<th>Phase III</th>
<th>Maintenance</th>
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Table 3-3

*Phase Means and Standard Deviation for Narrative Content in Generated Stories*

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<td>(3.00)</td>
<td>(0.71)</td>
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*Note.* Total possible score: 15
Table 3-4

*Phase Means and Standard Deviation for Narrative Content in Retells*

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*Note.* Total possible score: 15
### Table 4-1

*Form-content Discrepancies Experienced in Generated Stories*

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<th>Phase III</th>
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<th>Total</th>
<th>FCDs Favoring Content</th>
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<td>3/3</td>
<td>3/4</td>
<td>2/2</td>
<td>11/14</td>
<td>8/11** 72.7%</td>
</tr>
<tr>
<td></td>
<td>60%</td>
<td>100%</td>
<td>75%</td>
<td>100%</td>
<td>78.5%</td>
<td></td>
</tr>
<tr>
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<td>3/4</td>
<td>3/3</td>
<td>3/3</td>
<td>0/2</td>
<td>9/12</td>
<td>8/9 88.9%</td>
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<tr>
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<td>75%</td>
<td>100%</td>
<td>100%</td>
<td>0%</td>
<td>75%</td>
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<tr>
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<td>3/3</td>
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<td>2/2</td>
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<td>12/12 100%</td>
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<tr>
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<td>83.3%</td>
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<td>100%</td>
<td>100%</td>
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<td></td>
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<td>2/2</td>
<td>19/19</td>
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<td>100%</td>
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<td>100%</td>
<td>100%</td>
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<td>4/4</td>
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<td>16/16</td>
<td>16/16 100%</td>
</tr>
<tr>
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<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* *x/n; x=number of FCDs; n=number of stories completed at specified time point
**x/n; x=number of FCDs favoring content; n=total number of FCDs
Table 4-2

Form-content Discrepancies Experienced in Retells

<table>
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<th>Phase II</th>
<th>Phase III</th>
<th>Maintenance</th>
<th>Total</th>
<th>FCDs Favoring Content</th>
</tr>
</thead>
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<td>2/4*</td>
<td>2/4</td>
<td>3/3</td>
<td>2/2</td>
<td>9/13</td>
<td>7/9**</td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>50%</td>
<td>100%</td>
<td>100%</td>
<td>69.2%</td>
<td>77.8%</td>
</tr>
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<td>1/2</td>
<td>2/2</td>
<td>8/11</td>
<td>7/8</td>
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<td>100%</td>
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<td>0/1</td>
<td>2/2</td>
<td>9/12</td>
<td>7/9</td>
</tr>
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<td>0%</td>
<td>100%</td>
<td>75.0%</td>
<td>77.8%</td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>6/8</td>
<td>4/5</td>
<td>3/3</td>
<td>2/2</td>
<td>15/18</td>
<td>14/15</td>
</tr>
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<td></td>
<td>75%</td>
<td>80%</td>
<td>100%</td>
<td>100%</td>
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<td>93.3%</td>
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<td>3/3</td>
<td>2/2</td>
<td>13/15</td>
<td>13/13</td>
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<td>100%</td>
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<td>86.6%</td>
<td>100%</td>
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</table>

*Note.* *x/n*; x=number of FCDs; n=number of stories completed at specified time point

**x/n**; x=number of FCDs favoring content;

n=total number of FCDs
Figure 1. **Participant 001 Grammar and Content z-scores in Generated Stories**

![Participant 001 - Story Generation](image)

Figure 2. **Participant 001 Grammar and Content z-scores in Retells**

![Participant 001 - Retell](image)
Figure 3. Participant 003 Grammar and Content \(z\)-scores in Generated Stories

![Diagram](image1)

Figure 4. Participant 003 Grammar and Content \(z\)-scores in Retells

![Diagram](image2)
Figure 5. Participant 004 Grammar and Content z-scores in Generated Stories

Participant 004 - Story Generation

Figure 6. Participant 004 Grammar and Content z-scores in Retells

Participant 004 - Retell
Figure 7. Participant 002 Grammar and Content z-scores in Generated Stories

Figure 8. Participant 002 Grammar and Content z-scores in Retells
Figure 9. *Participant 005 Grammar and Content z-scores in Generated Stories*

![Graph showing z-scores for Story Generation for Participant 005 across different phases.](image)

Figure 10. *Participant 005 Grammar and Content z-scores in Retells*

![Graph showing z-scores for Retell for Participant 005 across different phases.](image)
REFERENCES


Naigles, L. R., Kelty, E., Jaffery, R., & Fein, D. (2011). Abstractness and continuity in
the syntactic development of young children with autism. *Autism Research, 4*(6),
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performance of optimal outcome children and adolescents with a history of autism
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language development reveal two distinct language profiles among young
disorders, 44*(1), 75-89.

APPENDICES
Appendix A. GRAMMATICALITY CODING PROTOCOL

Grammatical/Ungrammatical

General Notes
- Score each utterance as grammatical [GR] or ungrammatical [UG] by placing code at the end of each utterance, before the punctuation mark, with a space between the last word of the utterance and the opening bracket
  - i.e. The boy is jumping [GR].
- Only score final production, so ignore anything in ( ) or (( ))
- If sentence is not a complete utterance, it should be labeled as an “Abandoned utterance” (marked by > at the end of the utterance in SALT; ex: So then he > ) and we will not code it as [GR] or [UG]

Examples - the following are grammatical:
- Utterances beginning with conjunctions such as And, Because, or But
- Interjections/Sounds such as ah, woo, phew
- Abbreviated words such as gonna, wanna, shoulda
- Non-words/Made-up words such as dolphinable (made-up word by one of the participants), as long as it used grammatically in the sentence
- Grammatical sentence that doesn't say what participant intended (i.e. one participant said “He got knocked out in the cold”; he meant to say “He got knocked out cold”, but this is scored as grammatical since it is grammatically correct)
- Implied that (or other subordinate conjunction) for a subordinate clause (i.e. one participant said: “The brothers were happy the ghost was gone”; implied that between “were” and “happy”

The following are ungrammatical
- No clear referent for a pronoun
- Subject-verb disagreement
- Incorrect word order
- Incorrect verb tense
- Omitting or misusing a subordinate clause
Appendix B. CURRICULUM VITAE

Brigid Crotty
(February 2016)

EDUCATION

Utah State University, Logan, UT

Master of Science, Speech Language Pathology (expected graduation Spring 2016); GPA: 3.88

Utah State University, Logan, UT

- Bachelor of Science, Communicative Disorders (completed via Distance Education); GPA: 3.84

Loyola Marymount University, Los Angeles, CA

- Bachelor of Liberal Arts, Psychology; Minors: Dance, Classics (Ancient Greek); GPA: 3.29

AWARDS

Frederick Q. Lawson Fellowship

- Emma Eccles Jones College of Education and Human Services at Utah State University

THESIS

CONFERENCES PRESENTATIONS


RESEARCH EXPERIENCE

Utah State University – Child Language Research Lab 2014 –2015

Research Assistant

- Provided research support to Dr. Sandra Gillam
- Managed team of undergraduate research assistants in data analysis and interpretation

CLINICAL EXPERIENCE

Marquis Vermont Hills Skilled Nursing Facility, Portland, OR 2016

Speech-Language Pathology Student Intern
• Assessed, diagnosed, and provided speech-language services for adults in a sub-acute rehabilitation setting in the following areas: dysphagia, aphasia, apraxia, cognition, receptive-expressive language, pragmatic language

• Supported functional communication during activities of daily living

• Collaborated with patients, family members, and interdisciplinary therapy team to identify treatment goals

Birch Creek Elementary School, Smithfield, UT 2015

Speech-Language Pathology Student Intern

• Assessed, diagnosed, and provided speech-language services for elementary school children in the following areas: articulation, receptive-expressive language, AAC, pragmatic language, auditory processing

• Conducted IEPs and coordinated with other IEP team members

• Organized academically applicable language and social language treatment groups

Utah State University Speech-Language-Hearing Center, Logan, UT 2014-2015

Speech-Language Pathology Student Clinician

• Assessed, diagnosed, and provided speech-language services for children and adults in the following areas: receptive-expressive language, articulation, AAC, fluency, dysphagia, dysarthria, aphasia, apraxia

• Developed and executed evidence-based treatment plans

• Communicated with parents, spouses, and clients regarding treatment and home programming materials

Up-to-3 Early Intervention, Logan, UT 2015
Speech-Language Pathology Student Intern

- Assessed language, articulation, and feeding in clients ages birth-3
- Provided education and training to parents regarding communication and language facilitation strategies
- Identified alternative communication modalities for clients as appropriate
- Developed goals to be included in Individualized Family Service Plans

USU Center for Persons with Disabilities – Clinical Services 2014

Speech-Language Pathology Graduate Clinician

- Collaborated with an interdisciplinary diagnostic team
- Completed assessments and interpreted diagnostic information for clients in an ASD clinic
- Provided recommendations and resources to clients and their families

PROFESSIONAL EXPERIENCE

Gateway Learning Group, San Francisco, CA 2012 – 2013

Senior Behavior Therapist

- Provided 1:1 therapy and school support to children with Autism and other special needs
- Implemented individual academic and behavioral programs using ABA, PRT, VB, and DTT
- Supported the development of language and communication through verbal language, sign, and various AAC methods (i.e. PODD, PECS, VIA, GoTalk, Proloquo2go)

Anova Center for Education, San Rafael, CA 2011– 2012
Classroom Assistant

- Provided academic instruction to students in a special education classroom
- Implemented behavior management plans and deescalated students in challenging situations
- Facilitated use of functional language and supported development of pragmatic language

The Bay School, Santa Cruz, CA 2008 – 2010

Senior Instructor, Case Manager

- Provided intensive 1:1 behavioral therapy for students with autism
- Coached functional skills for independent living
- Taught functional communication with verbal language, sign, and AAC
- Offered vocational support for students with autism

ADDITIONAL EXPERIENCE

URLEND-Utah Regional Leadership Education in Neurodevelopmental and related Disabilities 2015

Trainee

- Attended and participated in interdisciplinary seminars on a range of disability-related topics
- Provided evidence-based recommendations to families during parent-directed consultations
- Collaborated on a survey effectiveness study of early intervention services
- Observed in a wide variety of interdisciplinary clinical settings

Fitchburg State University, Fitchburg, MA 2009-2010
• Completed coursework in Applied Behavior Analysis (ABA)