Summer 2013

Treatment Efficacy of Combined Dialogic Reading and Scripting for a Child with Moderate to Severe Communication Impairment

Brittany Marie Horvath

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TREATMENT EFFICACY OF COMBINED DIALOGIC READING AND SCRIPTING
FOR A CHILD WITH MODERATE TO SEVERE COMMUNICATION IMPAIRMENT

A Thesis
Submitted to the John G. Rangos Sr. School of Health Sciences

Duquesne University

In partial fulfillment of the requirements for
the degree of Master of Science

By
Brittany Horvath

August 2013
TREATMENT EFFICACY OF COMBINED DIALOGIC READING AND SCRIPTING FOR A CHILD WITH MODERATE TO SEVERE COMMUNICATION IMPAIRMENT

By

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ABSTRACT

TREATMENT EFFICACY OF COMBINED DIALOGIC READING AND SCRIPTING FOR A CHILD WITH MODERATE TO SEVERE COMMUNICATION IMPAIRMENT

By

Brittany M. Horvath

August 2013

Thesis supervised by Diane L. Williams, Ph.D.

Even though children with moderate to severe communication impairments develop some spoken language, they have difficulty using multiple utterances that are connected by a unitary thought or discourse. Dialogic reading and scripting interventions have previously been shown to be separately effective in increasing the semantic and syntactic skills of children with language impairments. This single-subject study evaluated the use of an intervention that incorporated elements of both of these approaches, using adapted books that included sequenced activities of daily living, to increase the use of procedural discourse by a twelve-year-old child with Down syndrome. The intervention was successful in increasing the child’s ability to produce coherent multi-word utterances and the number of steps to describe procedural sequences. The child’s number of total words and number of different words in the context of the
activities also increased. Gains were still evident 5 months post-treatment with an unfamiliar communication partner.
DEDICATION

I dedicate my thesis to my mentors, Dr. Williams and Mrs. Marra. They have both encouraged me to pursue my goals and have always believed in me. Dr. Williams has provided me with an amazing opportunity to advance my research skills during my time at Duquesne University. I am thankful for her dedication, support, patience, and advice she has given me as I completed this project. Mrs. Marra has provided me with multiple opportunities to advance my clinical skills and knowledge over the past 5 years. I am ever grateful for her time, advice, and support, which she has given me throughout my education.
ACKNOWLEDGEMENT

To Dr. Rusiewicz, who motivated me to pursue my goals and supported me throughout this project. Her love for research has inspired me, and her feedback has challenged me to grow as a person, student, and clinician.

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To the Class of 2013 who have made the past 5 years of my education full of special memories that I will never forget. The endless hours in the clinic and resource room have finally paid off. I will always cherish our trips to Washington D.C, Atlanta, and San Diego and all of the other fun-filled times together.

To my family and friends who provided their love and support throughout this process. Thank you for always believing in me and pushing me to reach for the stars.

To Michael, who has been extremely supportive and has always found a way to make me laugh and alleviate my stress. You always have an ear to listen and a shoulder to lean on, for which I am extremely grateful. Your love and understanding has made all the difference.
To Alicia Taylor, who worked diligently to complete reliability measures and graphs for this project. Your love for Excel spreadsheets is admirable!

And, to the participant and his amazing family who so willingly gave up their time to make this project possible.
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Introduction

Children with moderate and severe cognitive and functional limitations have difficulty learning to use spoken language to communicate, requiring specialized instruction to help them reach their potential. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 2000) individuals classified as having a moderate functional limitation present with moderately affected adaptive behaviors, approximately a second grade level social and academic skills, and an IQ score of 35-40 to 50-55. These individuals are able to learn and acquire language and literacy skills but typically require direct instruction to do so.

Approximately 10% of individuals with intellectual disabilities fall into this category and may grow up to live with a fair degree of independence given some aid. A severe functional limitation is defined as having severely affected adaptive behaviors, difficulty functioning independently, limited language and academic skills, limited literacy abilities, and an IQ range of 20-25 to 35-40 (APA). These individuals may or may not present with comorbid motor and sensory difficulties. Only 3 to 4% of individuals with intellectual disabilities make up this subcategory (APA). Even though these individuals have limited language skills, it is still possible for them to communicate given appropriate treatment that focuses on their strengths rather than their weaknesses.

Causative Conditions Associated with Moderate to Severe Cognitive Limitations

Moderate and severe functional limitations are associated with a number of different causative conditions. Some children have cognitive and functional limitations secondary to prenatal risk factors such as low birth weight, high-risk pregnancy, or a premature birth. However, other causative conditions have a genetic or chromosomal
etiology. Six relatively common genetic syndromes associated with moderate and severe cognitive/functional limitations are Down syndrome, Fragile X syndrome, Prader-Willi syndrome, Angelman syndrome, Williams syndrome, and cri-du-chat syndrome (Nelson, 2010). Other causative conditions such as autism are thought to have a genetic etiology, but this has not been definitively established. Children with these various types of causative conditions associated with intellectual disabilities have different profiles of strengths and weakness but share a common challenge in learning to communicate using spoken language.

Down syndrome is one of the most common genetic causes of mental retardation syndromes and, subsequently, is one of the most common causative conditions associated with moderate to severe cognitive/functional limitations (Nelson, 2010). This syndrome results from trisomy 21, which, as the name implies, is a chromosomal deficit involving three copies of chromosome 21. Children are typically born with 46 chromosomes, but children born with Down syndrome have 47 chromosomes (Nelson). Children with Down syndrome will present with speech and language difficulties due to their physical and cognitive limitations. However, each child is individual and unique, and therefore, will present with different types and severities of problems. In a study completed by Chapman, Seung, Schwartz, and Kay-Raining Bird (1998), it was found that “children with Down syndrome could produce utterances with greater complexity than expected (mean length of utterance, or MLU, >3.0), but omitted more grammatical function words than peers of the same mental age with similar MLUs, thus supporting the hypothesis of a specific deficit of syntactic expression” (p. 872).
Another diagnosis that frequently co-occurs with moderate to severe communication impairments and intellectual disabilities is Autism Spectrum Disorder (ASD). ASD appears before the child is 3 years old and is characterized by impairments in social interaction, nonverbal and verbal communication, and the presence of stereotyped and repetitive behaviors (APA, 2000). Nelson (2010) explains that children with autism also have cognitive limitations that can influence their learning, integration of information into a coherent cognitive schema, and difficulty forming a theory of mind.

**Vocabulary Acquisition**

The process of developing language and acquiring vocabulary skills is challenging for children with moderate to severe cognitive limitations. Early in life, typically developing children undergo a fast paced dynamic process of vocabulary acquisition and language development through social interactions and classroom instructions. Carlson (1981) explained that typically developing children have the ability to select vocabulary of their choice, store this vocabulary, and retrieve new words while they are concurrently actively engaging in their environment. The acquisition of vocabulary may be an area of relative strength for children with moderate to severe cognitive limitations (Chapman, 2006). However, this process is slower paced and challenging. Soto and Dukhovny (2008) explained that children in this special population require “more explicit, intensive, individualized, and repeated exposures to novel words to develop strong associations and automaticity,” (p. 134).

**Discourse Development**

The use of word combinations for communication is also challenging for children with moderate to severe cognitive limitations. Even children in these functioning ranges
who develop some spoken language have difficulty moving from simple 2 to 3 word combinations (telegraphic speech) to using larger units of spoken language or discourse for conversation or relating personal events or narratives (Chapman, 2006; Tager-Flusberg, Paul, & Lord, 2005).

Discourse involves “the organization of sentences into larger cohesive communication units,” (Nelson, 2010, p.46). As children grow into adolescence, they are expected to produce longer utterances to communicate their world knowledge to others. Children who are able to use frameworks to structure their discourse are able to produce longer, more linguistically complex narratives, and they are better at recalling information and identifying what information is important (Naremore, Densmore, & Harman, 2001). Developing discourse skills benefits children by making them active communicators who can tell about their experiences. In turn, these discourse skills help them to succeed in their academic environment.

The three primary categories of discourse are conversation, narration, and expository discourse. Whereas conversation has some accepted social forms, it is usually unpredictable and unstructured. This makes it a particularly challenging form of discourse for children with moderate to severe cognitive/functional limitations to learn. On the other hand, narration and expository discourse have specific structures and typology that can be explicitly recognized and taught which may make it easier for children with cognitive challenges to learn.

**Narrative Structure and Development**

Hudson and Shapiro (1991) suggest that four kinds of knowledge are involved in a child’s comprehension and production of narratives. These include: content
knowledge, structural knowledge, microlinguistic knowledge, and contextual knowledge. Content knowledge, or world knowledge, includes generalized event representations, memories of specific events, memories of stories, and knowledge about social interactions. Structural knowledge, or framework knowledge, includes understanding the structural components of different types of narratives. Frameworks include the generalized mental models of the structure of different types of narratives (Hudson & Shapiro). Microlinguistic knowledge is the understanding of syntax and semantics, cohesive devices, adjustment of verb tenses, and use of pronouns and anaphoric reference. Finally, contextual knowledge is the child’s beliefs about the function of a narrative in a specific context. When a child has adequate knowledge in these four areas, they are able to produce narratives in an organized and coherent manner.

Botting (2002) explained that narratives are a multifaceted form of communication that requires integration of linguistic, cognitive, and pragmatic skills. As children grow, they go from using the informal and unstructured conversational discourse to communicate to using narrative discourse to tell stories (Nippold & Scott, 2010). According to Applebee’s system of narrative development, as described in Paul (2007), children’s narrative skills emerge in a series of five stages beginning at two to three years of age, as soon as word combinations emerge and continuing until five to seven years of age when the child has a fully developed story grammar. These stages and the ages at which they emerge are summarized in Table 1.
Table 1

Stages of Narrative Development (Paul, 2007, p. 40)

<table>
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<th>Stage 1</th>
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<th>Heap Stories</th>
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<td>3 years of age</td>
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<td>Central theme, character, and setting appear; no sign of a plot or temporal/causal events</td>
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<td>Primitive Narratives</td>
<td>Central person, object, and event; 3 story grammar elements appear: initiating event, an attempt or action, and some consequence around the central theme; no conclusion</td>
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<td>Chain Narratives</td>
<td>Cause-effect and temporal relationships; display a concept of a plan or character motivation; no strong plot or ending</td>
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<td>5-7 years of age</td>
<td>True Narratives</td>
<td>Central theme, character, plot, character’s motivations, sequential events, solution; at least 3 story grammar elements are included: initiating event, attempt or action, and a consequence</td>
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The development of narration can be a challenge for children with moderate to severe communication impairments because of their inability to plan, organize, and sequence (Bliss & McCabe, 2006). Although it may be difficult, the ability to produce personal narratives has many advantages and can promote functional communication. Personal narration allows children to describe personal experiences such as going to bed or making a sandwich, events they have actually experienced and with which they are highly familiar. Naremore, Densmore, and Harman (2001) explain that it is important that children use the real life experiences for which they have world knowledge of as a catalyst for their narratives. The development of narrative discourse may also help children form a bridge from conversational discourse to expository discourse, a form of discourse that is important for academic participation (Nippold & Scott, 2010).
Expository Discourse

Expository discourse is defined as using language for explaining and describing and to convey information (Bliss, 2002). Hadley (1998) defines expository discourse as a form of discourse that conveys factual or technical information such as descriptions, procedural directions, and cause-and-effect relationships. Some of the macrostructures for expository discourse include: hierarchical/descriptive, which tells what something is; compare/contrast, which shows how two things are the same and different; procedural sequence, which tells what happened or how to do something or how to make something; and antecedent/consequence or cause/effect, which gives reasons for why something happened (Nelson, 2010).

Expository discourse is a challenging form of communication and can be difficult for children with language impairments because they need to integrate multiple resources, that is, they need to receive input, process information, comprehend the vocabulary and sentences, detect the structure, relate it to their world knowledge, and use frameworks to organize concepts to make sense (Nelson, 2010). However, procedural sequences may be a form of expository discourse that is possible even for children with significant communication challenges to learn, because they can be derived from real life, hands on experiences.

Whereas narrative and expository discourse are generally considered to be different forms of discourse (Nelson, 2010), procedural sequences and personal narratives may actually represent an overlap of these two forms. As described earlier, in a personal narrative, the child talks about an event from daily life, which may include activities of daily living such as getting dressed, getting ready for bed, or getting ready for school.
This narrative form is closely related to the expository discourse form of procedural sequence. The difference between personal narratives about activities and the procedural sequence form of expository discourse is that the former incorporates an actor or main character whereas the latter does not. However, like personal narratives that are based on activities of daily living, procedural sequences incorporate causal-temporal language (i.e., first, then, next) and the sequence of the event provides the underlying structure.

**Scripts**

According to Bliss and McCabe (2006), a script is “a description of a routine event” (p. 128). Naremore et al. (2001) explain that scripts are “used as frameworks to describe routine events and as aids for remembering specific instances of particular events” (p. 70). Scripts can also be defined as an “organized body of knowledge such that a part implies the whole and the whole is more than the sum of the parts” (Nelson & Gruendel, 1981, p. 138). An example of this would be: “Sam washed his face, and then brushed his teeth.” This sentence calls to make all of the associated events of a bedtime routine, which is what Nelson meant by “a part that implies the whole.” As children experience life, they form their own scripts from familiar events. For example, a child will learn a script for dressing himself, if he has the experience of having someone go through the steps with him. Scripts based on routine events can be thought of as the integration of procedural sequences and personal narratives.

Scripts provide children with an outline for content and support memory and recall of events (Naremore et al., 2001). Scripts may be beneficial when working with children with moderate to severe communication impairments who cannot produce complex types of discourse, have difficulty planning and organizing, and cannot produce
complex utterances. They may provide the needed structure and vocabulary in order for children to convert and store an experience into a linguistic form. Some other advantages of scripts are minimal planning and organization, limited agents, and simple sentences (Bliss & McCabe, 2006). Existing scripts can be used as aids when asking a child to produce a narrative because the organizational framework reduces the processing demands (Naremore et al.). According to Naremore and colleagues (1995), “when a child is able to use an existing script to facilitate comprehension or talk about a story, the results are striking” (p.116).

However, the use of a verbal script without any added input may be challenging for children with moderate to severe communication problems. These children may have difficulty converting script knowledge into the linguistic form due to their difficulties with expressive language, syntax, information processing, recalling episodic events, and temporal and causal organization (Naremore et al., 2001). Recounting an experience, giving directions, or verbalizing a script can be too cognitively demanding for children with language deficits. Objects, pictures, or picture/symbol strips in adapted books may be needed as tactile and picture support for the parts of a script to allow the child to demonstrate the ability to access a familiar script before they produce the script in a linguistic form (Naremore et al.).

**Dialogic Reading as an Efficacious Treatment Format**

Given the number of limitations and challenges in language and discourse development with children with moderate to severe communication impairments, it is important to use an intervention strategy with children with moderate to severe communication impairments that provides opportunities to engage in language activities
that explicitly teach them the structures needed for discourse while giving them multiple exposures to vocabulary words in a related context. Dialogic reading, in which an adult provides specific verbal input (i.e. “wh”-questions, follow up questions, repeat/model what the child says, expand the child’s utterances, provide feedback, review concepts and add new ideas, and ask open ended questions) to a child while looking at pictured actions in a book, has been successfully used to promote development of expressive language and vocabulary skills in children with communication impairments (e.g. increased number of total words, increased number of different words, increased MLU. Moreover, dialogic reading (book sharing) could be adapted to incorporate the elements needed to explicitly teach discourse.

The dialogic reading intervention approach is based on Lev Vygotsky’s theory of Social Interactionism, which describes language as a tool of social interaction. Vygotsky believed that mediation and scaffolding by a knowledgeable adult plays an important role in the development of language (Nelson, 2010). The term “scaffolding” comes from the psychologist, Jerome Bruner, and is defined as a way of helping children reach higher levels of learning than they would have reached independently (Nelson, p. 68). According to this theory, development occurs when the adult mediator provides opportunities for the child to learn new language within his or her own zone of proximal development (ZPD), which is “the difference between what a learner can do independently versus with appropriate mediation” (Nelson, p. 68).

Dale, Crain-Thoreson, Notari-Syverson, and Cole (1996) studied the efficacy of shared book reading intervention with 33 young children with language delays and their mothers. One group received a general conversation instruction to improve language
development, while the other group received a shared book reading intervention using a
version of Whitehurst’s Dialogic Reading Training Program (Whitehurts et al., 1988).
The dialogic training program has three broad principles: encouraging participation,
providing feedback, and adapting the style of reading to match the child’s linguistic level
(Hargrave & Senechal, 2000). Encouraging participation includes asking open-ended and
“wh” questions to keep the child actively engaged during the book reading activity.
Feedback is used to expand upon the child’s utterances, give reinforcement, and provide
a model. The style of reading is matched to the child’s linguistic level to encourage the
child to further expand upon their skills while being within their current level of
functioning (Hargrave & Senechal, p. 77).

In the study involving children with language delays, both conversation
instruction and dialogic reading intervention programs emphasized an interactive and
responsive style of communication (Dale et al., 1996). The results of the study included
an increased rate of verbal responses to questions, increased number of different words,
and increased MLU for children who received shared book reading intervention using
Whitehurst’s training program.

Even though there is a limited body of evidence-based research regarding
dialogic reading as an intervention to facilitate expressive language acquisition in
children with severe communication impairments, it is a growing area of interest. Based
on the results of existing research on this topic, it is evident that there is a correlation
between word learning and expressive vocabulary gains and the effects of dialogic shared
book reading. For instance, Liboiron and Soto (2006) found that shared book reading
promotes language use in natural and language rich contexts for addressing expressive
language, narrative, and vocabulary skills of children with severe communication disorders. Data collection in this preliminary study took place in two phases in a special education classroom with an eleven-year old girl with cerebral palsy who used a Dynavox 3100. During the shared book reading activities, researchers gave the student multiple opportunities to engage in verbal communication while being provided cues (e.g. pointing, gestures, print reference). The intervention resulted in the child’s increased ability to narrate a story and become familiar with print conventions. Another valuable aspect of this study was the contrast between previous research regarding the idea that children who have severe communication impairments are passive and do not ask questions or actively engage in expressive language tasks such as initiating topics or elaborating on the stories. The participant actively engaged in the shared book reading activity and established joint attention while having fun in her natural environment (Libero & Soto, 2006).

Soto and Dukhovny (2008) assessed the effectiveness of shared book reading with a seven-year-old girl with a diagnosis of perisylvian syndrome using a single-subject design. They included three literacy activities: a pre-reading activity, shared book reading intervention, and a post-reading activity. The pre-reading activity was completed in order to gain an understanding of what the child’s vocabulary knowledge was prior to the treatment, and the post-reading activity was completed in order to analyze the amount of comprehension she maintained following treatment. The participant made gains in the number of different words she produced and number of total words. She also began to use language with increased complexity and was able to generalize and maintain these gains in skills during the post-reading activities (Soto & Dukhovny).
According to Soto and Dukhovny (2008), shared book reading is a productive way for children to acquire their language skills because it promotes learning new vocabulary and linguistic structures, establishes joint attention, and provides opportunities for children to engage in an activity with the help of an adult that is beyond their independent language skills. They found that providing multiple exposures to target words, multiple opportunities to use the word, repeated practice, and providing adequate pause time were important strategies to incorporate in the shared book reading intervention. It was also important for the child to be an active participant in the shared book reading activity and to answer questions and label. Shared book reading appeared to be beneficial in helping the child to acquire expressive vocabulary by asking “open-ended questions, labeling questions, binary choices, cloze procedures, and modeling,” (Soto & Dukhovny, p. 142).

**Purpose of the Study**

Children with moderate to severe communication impairments have difficulty moving from short telegraphic utterances to discourse. Scripts, which incorporate elements of personal narratives and procedural sequenced expository discourse, may provide the needed structure and experiential base to help these children bridge the gap from the acquisition of spoken words to spoken discourse. Dialogic reading is an intervention strategy that has been successfully used to improve children’s expressive language skills, more specifically discourse and spoken vocabulary. It provides opportunities to learn discourse structures and provides multiple exposures to vocabulary words.
Despite the evidence to support the use of dialogic reading and scripts, as independent factors, there have been no studies that have examined the combined use of dialogic reading intervention with scripts. Dialogic reading of books involving a scripted daily routine may be clinically useful for the development of discourse and spoken vocabulary in children with moderate to severe communication impairments.

The purpose of this single subject design study is to evaluate the efficacy of a dialogic reading intervention that incorporates scripts from activities of daily living on the subject’s vocabulary and use of basic forms of discourse.

**Research Questions**

The primary research questions are as follows:

1. Does combined dialogic reading and scripting intervention [depicting scripts from activities of daily living] increase the production of coherent multi-word utterances during procedural sequences of familiar activities by a child with moderate to severe communication impairment?

2. Does combined dialogic reading and scripting intervention [depicting scripts from activities of daily living] increase the verbal description of the number of steps of the procedural sequence by a child with moderate to severe communication impairment?

3. Does combined dialogic reading and scripting intervention [depicting scripts from activities of daily living] increase the number of total words and number of different words produced by a child with moderate to severe communication impairment?
**Independent variables**

The independent variable in this study is the combined dialogic reading intervention and scripting intervention with adult scaffolding. More specifically, the dialogic reading intervention incorporated books adapted with picture symbols and text that include sequenced activities of daily living that are highly familiar to the child (i.e. getting dressed, taking a bath, going to bed, etc.).

**Dependent variables**

The dependent variables include measures of spoken vocabulary skills and connected discourse. More specifically, the data includes number of coherent multi-word utterances, verbal description of the number of steps of the procedural sequences, number of total words (NTW), and number of different words (NDW). This data was collected by transcribing language samples and was measured using the Systematic Analysis of Language Transcripts (SALT) software and application of decision rules related to the appropriateness and congruence of the steps of the procedural sequences.
Methods

The study is a single-case design with one participant with a moderate to severe communication impairment.

Participant

The participant was a twelve-year-old male with a diagnosis of moderate to severe expressive and receptive language disorder secondary to his primary diagnosis of Down syndrome. He was recruited from attendees of the Duquesne University Speech-Language-Hearing Clinic where scores of one test of his language skills were determined from the historical information available in the child’s clinic file. The participant completed the Peabody Picture Vocabulary Test, Fourth Edition (PPVT-4; Dunn & Dunn, 2007) on November 8, 2011 at the age of 11-1. See results in Table 2. These test results verify that his receptive language skills are less than 2 standard deviations below the mean and place him in the “extremely low” receptive language area. No other appropriate standardized language test scores were available; therefore, the investigator administered an age appropriate standardized measure prior to enrollment in the study to verify that the child has a moderate to severe communication impairment. The participant completed the Expressive One-Word Picture Vocabulary Test, Fourth Edition (EOWPVT-4; Brownell, 2010) in order to obtain another age appropriate standardized measure of his expressive language. These scores verify that he has a severe expressive language deficit. Results are included in Table 2.
Table 2

Results of standardized assessments prior to enrollment

<table>
<thead>
<tr>
<th>Assessment</th>
<th>PPVT-4</th>
<th>EOWPVT-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Score</td>
<td>46</td>
<td>30</td>
</tr>
<tr>
<td>Standard Score</td>
<td>28</td>
<td>&lt;55</td>
</tr>
<tr>
<td>Percentile Rank</td>
<td>&lt;0.1</td>
<td>1</td>
</tr>
<tr>
<td>Age Equivalent</td>
<td>3:3</td>
<td>2:9</td>
</tr>
<tr>
<td>Description</td>
<td>Extremely Low</td>
<td>Severe</td>
</tr>
</tbody>
</table>

The participant must have had a recent hearing screening/evaluation in order to participate in the study. The participant had to pass hearing screenings at 25 dB for frequencies of 500 Hz, 1000 Hz, and 2000 Hz. The results of his audiological evaluation were determined from the historical information available in the child’s clinic file. His hearing is borderline normal hearing sensitivity bilaterally for speech and tones. He is able to respond to speech at conversational levels. Results of his tympanogram revealed normal middle ear function bilaterally.

A standard representational hierarchy assessment was performed to ascertain that the participant could identify black and white line drawings and colored line drawings. In this assessment, the child was shown depictions of common items (i.e., black and white line drawings and picture symbols). The child had to consistently identify 80% of the targeted item as depicted in either black and white line drawings or picture symbols to meet eligibility for participation in the intervention. The participant was unable to identify 80% of the targeted items in black and white line drawings, but he identified 80% of the targeted items in picture symbols. His errors included semantic errors (e.g., coat/shirt, bread/sandwich, ball/toys, and bus/train).

A natural language sample (NLS) of 50 utterances was used as a screening procedure and was collected at the initial baseline session following guidelines provided
by the National Institute of Deafness and Other Communication Disorders (NIDCD) working group (Tager-Flusberg et al., 2009). Minimum inclusion criteria included having at least 50 different word roots and a MLU of at least 1.5 based on the NLS of 50 utterances. This level of language is considered indicative of a moderate to severe communication impairment while suggesting readiness for the further development of word combinations. The natural language sample was completed at the initial baseline session and results are as follows: 71 different words and a MLU of 2.26. These scores verified the child’s ability to participate in the study.

Research team members included one certified speech-language pathologist, one speech-language pathology graduate student, and an additional research assistant. The participant was recruited through professional networks of research team members (e.g., clinical instructors at the Duquesne University Speech-Language-Hearing Clinic.

Setting

The study took place in one of the treatment rooms in the Duquesne University Speech-Language-Hearing Clinic. Each room is equipped with a mirrored, one-way observation window and a wall-mounted video camera and wireless, integrated microphone system for audio recording. The parents sat in an observation room and were able to watch the sessions through the one-way observation window.

Materials

Books. The primary materials used in this study were six commercially available children’s books (see titles of books in Table 3). The books were chosen because each consisted of a sequenced activity of daily living that should be familiar to most children. Each sequence involved a functional routine for young children (i.e. going to bed, getting
dressed, taking a bath) and provided a clear, visual depiction of these sequenced procedures. Each book was adapted to the participant’s language ability by creating a script to relate the sequence rather than using the provided text. This was done in order to support comprehension and decrease the participant’s cognitive load. The adapted scripts were also rendered by using picture symbols and text from the Writing with Symbols software (WWS; Mayer-Johnson, 2000) and involved 2-4 word utterances. These symbol sequences were affixed to the appropriate page in each book. The book [Getting Dressed (Sparling, 1984)] was used for the first baseline phase and a different book [Time for School Little Dinosaur (Herman, 1990)] was used for the second baseline phase. Two new books [My Bathtime Book (Fernandes, 1986a); I Can Make a Sandwich (Ashley, 2005)] were used during the first treatment phase, and two other books [My Bedtime Book, (Fernandes, 1986b); Good Morning Little Bert! (Gorbaty, 1987)] were used for the final treatment session. In addition to the picture symbols affixed to the pages of the books, picture sequence strips that correlate with the books’ procedures were used during the retelling activities that are described in detail below to support the child’s verbal productions. These strips were created using picture symbols and text from the Writing with Symbols software.

Table 3

<table>
<thead>
<tr>
<th>Baseline 1</th>
<th>Treatment 1</th>
<th>Baseline 2</th>
<th>Treatment 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting Dressed</td>
<td>My Bathtime Book</td>
<td>Time for School Little Dinosaur</td>
<td>My Bedtime Book</td>
</tr>
<tr>
<td>I Can Make a Sandwich</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Props. Materials that are appropriate for performing each procedural sequence were incorporated after reviewing the books. For example, the participant acted the steps
of making a sandwich after completing a dialogic reading activity practicing the adapted script about how to make a sandwich. To do this, he was provided two pieces of plastic bread, pretend peanut butter, and pretend jelly.

**Procedures**

**Study Design**

The study employed a single case, treatment replication design (A-B-A-B) where, following an initial baseline period, the treatment of dialogic reading (book sharing) combined with scripting was applied, withdrawn, and applied again. The second A-B (baseline – treatment) phase was a replication of the first A-B phase. The second treatment phase was used to eliminate ethical issues of designs that end in withdrawal of treatment and to provide further evidence of treatment efficacy.

During each of the baseline phases (A1 and A2), the participant attended twice weekly sessions for 3 sessions (a total of 6 sessions across the two baseline sessions). During the treatment phases (B1 and B2), the subject participated in intervention twice per week for 6 sessions (a total of 12 sessions across the two treatment phases). Each baseline session was approximately 30 minutes in length, and each treatment session was approximately 50 minutes in length. The child participated for a total of eighteen sessions. See Figure 1 for a graphic representation of the study design.

![Treatment Design](image)

**Figure 1.** Treatment design showing the distribution of the number of sessions
**Baseline Sessions (A1 and A2).** Baseline data was collected in two phases (A1 and A2). The purpose of collecting baseline data is to “document a pattern of behavior in need of change and to document a pattern that has sufficiently consistent level and variability, with little or no trend, to allow comparison with a new pattern following intervention” (Kratochwill et al., 2010). Therefore, baseline data was collected for three sessions in each phase. The investigator met individually with the participant for a minimum of two sessions per week. Each baseline session was least 30 minutes long. During each session, there were two script/shared book-reading activities without adult scaffolding that took approximately ten minutes each in order to gain an understanding of the child’s spoken vocabulary and basic discourse skills were prior to the treatment. In between these two activities, the child received a ten-minute “break” to engage in play with the clinician. During breaks, the child played with Little Tykes bowling, Mr. Potato head, blocks, and bean bag toss.

The baseline sessions consisted of the child listening to the clinician read a book aloud. He followed along by observing text/symbols that were created using Writing with Symbols software and affixed to the pages of the book. The book was a commercially available one that contained illustrations depicting a procedural sequence of a task of daily living. The child was then asked to verbally retell the sequence from the story without reviewing the pictures in the book. Next, the child was asked to verbally retell the sequence when provided picture support from illustrations in the pages of the book. Finally, the child was asked to verbally produce the sequence provided picture symbol strips (scripts) with text and symbols that depict each step. He did not use picture support from the book’s illustrations during this retelling. This was done in order
to identify if the sentence symbol strips were a strong enough support independently to
elicit an improved number of coherent multiword utterances and number of steps. This
sequence (book reading, retelling without picture support, retelling with picture support,
and retelling with picture symbol strips) was repeated one time.

**Intervention Sessions (B1 and B2).** During the two treatment phases (B1 and
B2), the participant was provided combined dialogic reading and scripting intervention
individually in a quiet room with minimal distractions at the Duquesne University
Speech-Language-Hearing Clinic twice a week for 12 sessions. The graduate student
investigator, hereafter referred to as “the clinician”, provided the intervention. Parents
and family members observed from the observation room on the other side of a one-way
mirror. Each session lasted approximately 40 minutes and consisted of 2 combined
dialogic and scripting activities that lasted approximately 15 minutes each and a 10-
minute “break” in between the two activities.

According to Senechal (1997), an influential technique for the acquisition of
expressive vocabulary is asking open-ended questions during repeated readings.
Therefore, the activities in the therapy session consisted of the clinician reading an
adapted book (as outlined in Table 3) involving picture symbols and text support aloud to
the subject. He followed along by observing text/symbols that had been created using
Writing with Symbols software and affixed to the pages of the book. Later, the clinician
asked open-ended questions to facilitate the participant’s productions of the verbal retell.

According to Soto and Dukhovny (2008) “expressive vocabulary intervention
should include opportunities for the children not only to hear the novel words but also to
use them in sentences to facilitate their lexical and phonologic representation,” (p. 138).
To incorporate the element of active participation, after the reading the child was asked to verbally retell the sequence while looking at the illustrations in the book with support from the text and symbols that depicted each step. Next, without the book, the child was asked to verbally retell the sequence using the picture symbol strips with text and symbols that depicted each step. The child was then asked to verbally retell the script of the sequence while using props to act out the depicted task of daily living (e.g. using two pieces of bread, peanut butter, and jelly to act out the sequence of making a sandwich). The child was asked open-ended questions such as: What do you do first? What’s next? or What do you do last? Next, the child was asked to verbally retell the sequence given picture support from illustrations of a version of the book that did not contain picture symbols. Finally, the child was asked to verbally retell the sequence without the support of illustrations or picture symbols.

**Data Collection**

Data was collected during a 3-session no-intervention baseline period, a 6-session intervention period, a second 3-session no-intervention baseline period, and a final 6-session intervention period. Data collection consisted of video recordings and language transcripts as follows:

**Video recordings.** Each session was video-recorded on the Intelligent Stream Recorder by Paragon Development Systems in the Duquesne University Speech-Language-Hearing Clinic. The participant’s speech was recorded using a Sennheiser bodypack wireless transmitter with a lavalier microphone, which has a frequency range of 740-776 MHz. A second video recording was collected during each session using a separate video camcorder mounted on a tripod in the room. This second recording was
used in case the clarity of the speech sample from the ISR system was problematic and as a backup in case of equipment failure.

**Language Transcripts.** Based on the video recordings, the graduate student researcher created a language transcript for each session following the rules for transcription as indicated in the *Systematic Analysis of Language Transcripts*-English version (SALT; Miller & Chapman, 2010) software program. The transcription was completed on a Dell Optiplex 960 desktop as the graduate student reviewed the video. The SALT program was then used to analyze and generate measurements of the transcribed language. Each transcript began and ended with the participant’s first utterance that was relevant to the task. Unintelligible words were coded as “X” which is consistent with the SALT transcript protocol. The language transcript was input into the SALT software for automatic analysis of number of total words, number of different words, and number of coherent multi-word utterances.

**Reliability**

An additional research assistant (a graduate student in speech-language pathology) watched 10% of the narrative samples from each of the four phases (A1, A2, B1, and B2), which were selected at random to measure reliability of the transcription of the language samples. The research assistant independently created a second transcript from the video recordings. These transcripts were then compared word by word, and phrase by phrase, to the transcript created by the graduate student investigator and that transcript was marked to indicate the number of words for which there were disagreements (i.e., omissions, additions, or different words). Interrater reliability was measured through a unit-by-unit agreement ratio, which is a strict method of scoring
agreement which requiring that “two observers agree on the individual instances of the response being measured,” (Hedge, 1994, p. 130). Hedge explained that unit-by-unit agreement ratio is calculated by identifying the number of units (words in the language sample that are measured) that the observers agreed upon; then, the total number of units of disagreement is determined. These numbers were calculated using the following formula: \( \frac{A}{A + D} \times 100 \). Inter-rater reliability for transcript words exceeded .85 (Cohen’s Kappa coefficient). There were less than five instances where the rater disagreed with the initial transcript. Following calculation of the inter-rater reliability measure for transcription, a third rater, a certified speech-language pathologist resolved any discrepancies between the two original raters to create the final transcripts that was used for data analysis.

In addition to the measures provided by the SALT software, the graduate student investigator coded each of the book and picture symbol supported retellings for coherence of the utterances. That is, a judgment was made as to whether an utterance was connected to the immediately preceding utterance (scored as “connected”) or not (scored as “unconnected”). In addition, the number of steps of the original sequence that were retold in the subject’s version was counted. An additional research assistant (graduate student in speech-language pathology) independently reviewed 10% of the transcripts from the book supported, book unsupported, picture symbol strip supported, and picture symbol strip unsupported retellings for each of the four treatment phases (A1, A2, B1, and B2). She made the judgments of connectedness and number of steps. Reliability of connectedness of utterances was analyzed using Cohen’s Kappa statistic to determine consistency between the two raters (the investigator and a research assistant).
Cohen’s Kappa was used to measure data related to connectedness of utterances in the language sample. Inter-rater reliability for connectedness of utterances exceeded .85 (Cohen’s Kappa coefficient). There were only 3 instances where the rater questioned the connectedness of utterances coded by the original coder. As above, a certified speech-language pathologist reviewed any areas of disagreement between the two raters to resolve the differences before final data analysis. Inter-rater reliability for number of steps also exceeded .85. The two raters had no disagreements for number of steps.

**Data Analysis**

The language transcripts yielded the following dependent variables: number of coherent multi-word utterances, verbal description and number of steps of procedural sequences, number of total words (NTW), and number of different words (NDW). The data was then graphed with the session number on the x-axis and the relevant measure or outcome variable on the y-axis. A visual analysis of the data collected was used to determine whether there is a relationship between the independent variable and the outcome variable and the strength of that relation as described in Kratochwill et al. (2010). Six features were examined: 1) level, 2) trend, 3) variability, 4) immediacy of the effect, 5) overlap, and 6) consistency of data patterns across similar phases. These features were assessed individually and collectively to determine if there is a causal relationship between the independent variable of script/shared book reading intervention and the outcome variables.

Level is the mean measure for each of the dependent variables in a phase. Trend is “slope of the best-fitting straight line for the data within a phase” (Kratochwill et al., 2010, p. 78). Variability is the standard deviation of each measure about the trend line.
Immediacy of the effect is “the change in level between the last three data points in one phase and the first three data points of the next” phase (Kratochwill et al., p. 78). Overlap is the proportion or percentage of data points from one phase that overlaps with the data points from the comparison phase [with the desired outcome being a small percentage of overlap or conversely a large percentage of non-overlapping data (PND)]. Consistency is a comparison of the data from similar phases (baseline to baseline; treatment to treatment) to determine the extent to which these phases resemble each other.

Additionally, effect size between baselines and treatment measures were calculated (Beeson & Robey, 2006). An effect size is a “quantity that characterizes the degree of departure from the null state” (p. 3). Effect size determines how much change is effected by the treatment rather than how fast the change is taken place. Determining an effect size provides a measure of change observed through the independent variable of combined dialogic book reading and scripting treatment. Effect sizes were calculated for each series of data points and then averaged to represent the treatment effect for the subject (p. 6).

**Measure of Fidelity**

Two of the six videotapes from each of the treatment phases (for a total of four) were viewed by an additional graduate student in speech-language pathology. She coded the behaviors of the clinician/interventionist during delivery of the intervention. Each intervention procedure was rated as follows: 1 – did not implement, 2 – implemented variably, 3 – consistently and appropriately implemented. The purpose was to obtain a measure of the fidelity with which the intervention was delivered. Overall, the
investigator received a score of 3 which indicated that the intervention procedure was carried out consistently and appropriately (see Appendix A).
Results

Coherent Multiword Utterances and Number of Steps

The two primary measures of interest were the number of coherent multiword utterances (utterances consisting of two or more words that were related to the previous (or following utterance) and the number of related steps that were verbally produced to describe the procedural sequence. The number of coherent multiword utterances and the number of steps are highly linked measures; the number of possible coherent multiword utterances will always be N-1 compared to the number of steps verbally produced because of the linkage aspect of the measures. The use of one “coherent utterance” would mean that the child produced two related utterances to express the steps of the target procedural sequence. However, it was theoretically possible for the participant to express knowledge of a step of the sequence without using a multiword utterance, (that is, by using a single spoken word) which is why these two measures need to be considered separately. For each phase, there was an expected number of steps and possible number of coherent multiword utterances depending upon the book that was being read. During the first baseline phase, one book [Getting Dressed (Sparling, 1984)] was used and contained a possible number of five steps with four possible coherent multiword utterances. The first treatment phase included My Bathtime Book (Fernandes, 1986a) which had six steps possible with five possible coherent multiword utterances, and it included How to Make a Sandwich (Ashley, 2005) which had a possible number of five steps with four possible coherent multiword utterances. The second baseline phase utilized the book Time for School (Herman, 1990) and contained a possible number of five steps with four possible coherent multiword utterances. The second treatment phase
included the two books *My Bedtime Book* (Fernandes, 1986b) and *Good Morning* (Gorbaty, 1987) which both had a possible number of six steps with five possible coherent multiword utterances. The number of steps used started with five and extended to six so that the length of the sequences was not too difficult for the participant but also provided the opportunity for him to demonstrate growth in his ability to recall the steps and to produce the related multiword utterances. In each phase, during each session the child was given two opportunities to complete the task so that the performance reported for each session represents a mean of the two trials.

**Without picture support or review of book.** Figure 1 indicates the mean number of coherent multiword utterances and the mean number of steps for the two baseline and the two treatment sessions based on the count data for each phase. Across the three initial baseline sessions, the child retold the procedural activity without picture support using an average of 2.0 coherent utterances to express a step in the target procedural sequence (range 1-3) and produced an average of 3.3 steps (range 2-4). During the first phase of the treatment sessions, the participant retold the procedural activity without picture support using an average of 4.3 coherent utterances (range 4-5) and produced an average of 5.25 steps (range 4-6). Across the second baseline sessions, the child used an average of 2.2 coherent utterances (range 0-5) with an average of 3.5 steps (range 2-4). Across the second phase of the treatment session, the child used an average of 4.75 coherent utterances (range 4-5) with an average of 5.9 steps (range 5-6).
Figure 2. Coherent multiword utterances and number of steps used by the participant across the study phases without the therapist reviewing the book or providing other support.

Figure 3 shows the participant’s performance expressed as a percent correct for each phase so that the different phases can be compared (due to the differing number of possible steps and coherent multiword utterances based on the book that was used). During the first baseline phase, the participant used the expected number of steps to describe the depicted procedural sequence an average of 67% of the time (range 60%-80%) and the expected number of coherent multiword utterances an average of 50% (range 37.5%-62.5%) of the time. During the first treatment phase, the participant used the expected number of steps an average of 96% of the time (range 90%-100%) and the expected number of coherent multiword utterances an average of 97% of the time (range 90%-100%). During the second baseline phase, the participant used the expected number of steps an average of 70% of the time (range 50%-80%) and the expected number of coherent multiword utterances an average of 54% of the time (range 0%-88%). During the second treatment phase, the participant used the expected number of steps an average of 98.7% of the time (range 97.5%-100%) and the expected number of coherent
multiword utterances an average of 95% of the time (range 80%-100%). During the two treatment phases, the participant made gains in his ability to produce coherent multiword utterances and a longer verbal description of steps in the procedural sequence without picture support.

**Figure 3.** Coherent multiword utterances and number of steps used by the participant across the study phases without reviewing the book or providing support expressed as a percent of the expected number.

**Effect Size.** The researcher analyzed the participant’s use of coherent multiword utterances and number of steps verbally produced during the procedural sequence activity. Baseline and post treatment measures were examined for differences and the effect size was calculated as described by Beeson and Robey (2006). First, data from the first baseline were averaged to represent \( A_1 \), and then calculated to determine the standard deviation \( S_1 \). Then, the results obtained from the post-treatment measure directly after the intervention protocol and 5 months post treatment was indicated as \( A_2 \). The following formula was used to calculate effect size:

\[
\text{Effect Size} = \frac{A_2 - A_1}{S_1}
\]
The effect size for immediately after the intervention protocol for percent correct of expected number of coherent multiword utterances produced by the participant was 3.67 and 2.74 for percent correct of expected number of steps. These results indicate that there was a small-medium effect size immediately post treatment. The effect size for five months post treatment for the percent correct of expected number of coherent multiword utterances was 3.67 and 2.74 for percent correct of expected number of steps. This indicates that for number of coherent multiword utterances there was a small-medium effect size five months post treatment.

*Visual analysis of coherent multiword utterances.* A visual analysis of the data collected was used to determine whether there was a relationship between the independent variable and the outcome variable and the strength of that relation (as described in Kratochwill et al., 2010). The interpretation of the results of the visual analysis, including the predictable baseline pattern, level, variability, trend, immediacy of the effect, degree of overlap, and consistency of data patterns across similar phases is described in the following section.

*Predictable baseline pattern.* In determining the predictability of the baseline pattern, the measurement of interest was the number of coherent utterances or utterances two or more words in length used to express the steps of the target procedural sequence that were related to the immediately preceding utterance. In the three initial baseline sessions, the participant used a range of 1 to 2 coherent multiword utterances. Therefore, minimal consistency of the targeted behavior was displayed and the baseline of the behavior was judged to be established.
Level. The level is the mean of all data points within a phase and is indicated by a solid horizontal line for each phase in Figure 4. For the participant’s verbal production of the procedural sequence without support, the mean percent correct for number of coherent multiword utterances was 50% at Baseline Phase 1, 96.7% within Treatment Phase 1, 54.3% during Baseline Phase 2, and 95% during Treatment Phase 2.

![Figure 4](image)

*Figure 4.* Level or mean of all data points within a phase for number of coherent multiword utterances produced without picture support.

Variability. The variability refers to “the fluctuation of the data (as reflected by the data’s range or standard deviation) around the mean” (Kratchowill et al., 2010, p. 5). Plus and minus one standard deviation around the mean is indicated by the dotted lines in Figure 4. The mean of the percent correct for number of coherent multiword utterances at the first baseline was 50% with a standard deviation of 12.5; mean for the first treatment phase was 96.7% with a standard deviation of 5.2; mean for the second baseline phase was 54.3% with a standard deviation of 47.5; and, the mean for the second treatment phase was 95.0% with a standard deviation of 8.4. For verbal retell without review of the book or support, the most variability in performance occurred for the two baseline phases with less variability in performance during the two treatment phases. The large standard deviation in the second baseline indicates that the child’s production of coherent
multiword utterances became very variable when the intervention was withdrawn. He returned to a relatively stable performance when the intervention was re-introduced during the second treatment phase.

*Trend.* The trend is the “slope of the best-fitting straight line for the data within a phase” (Kratochwill, et al., 2010, p. 78) and is shown in Figure 5 below as a solid line within each phase. For the initial baseline, the data shows a consistent level, with little or no trend. Once the intervention was introduced during the treatment phase, the participant’s productions immediately increased and continued at a relatively high level of performance until the treatment was withdrawn in the second baseline phase. In the second baseline phase, the participant’s performance was much more variable with an immediate decrease in performance but then an increase with a resulting steep increasing trend line. When the treatment was re-introduced, the participant’s productions continued at a high level with a trend line with only a slight rise.

![Figure 5](image.png)

**Figure 5.** Trend or best fitting straight line and variability for number of coherent multiword utterances produced without support.

*Immediacy of Effect.* Immediacy of the effect is “the change in level between the last three data points in one phase and the first three data points of the next” phase (Kratochwill et al., 2010, p. 78). As shown in Figure 6, the last three data points of one
phase and the first three data points of the next phase were visually compared using shapes to indicate which data points are being compared (i.e., ovals, rectangles, and triangles). Comparison revealed that there was an immediate effect on the number of coherent multiword utterances produced between the first baseline and first treatment phase, the first treatment phase and second baseline, and the second baseline and second treatment phase.

**Figure 6.** Visual analysis of immediacy of effect for number of coherent multiword utterances produced without support. Similar shapes are used to indicate which data points should be compared to each other.

*Degree of overlap.* The degree of overlap of data points between each adjacent phase was analyzed. Overlap is the proportion or percentage of data points from one phase that overlaps with the data points from the comparison phase [with the desired outcome being a small percentage of overlap]. As depicted in Figure 7, the use of coherent multiword utterances to describe the procedural sequence without picture support had 0 overlapping data points (0%) between the first baseline and the first treatment phase, 0 between the first treatment phase and the second baseline (0%), and 1 between the second baseline and the second treatment phase (17%), suggesting a strong effect each time the treatment was introduced and withdrawn.
**Figure 7.** Visual analysis of degree of overlap for number of coherent multiword utterances produced without support when comparing adjacent phases.

*Consistency across phases.* Consistency is a comparison of the data from similar phases (baseline to baseline; treatment to treatment) to determine the extent to which these phases resemble each other and is shown in Figure 8 by the linked ovals. The data patterns of similar phases indicated a consistent pattern between the two treatment phases. However, between baseline phases the pattern was inconsistent with much more inconsistent use of coherent multiword utterances in the second baseline than in the first baseline phase.

**Figure 8.** Visual analysis of the comparison of the consistency for number of coherent multiword utterances produced without support across similar phases.

*Visual analysis of number of steps.* A visual analysis of the data collected for the number of steps verbally produced to retell the procedural activity without picture
support was used to determine whether there was a relationship between the independent variable and the outcome variable and the strength of that relation. The participant’s performance on the two measures of coherent multiword utterances and number of steps were highly linked; therefore, the visual analysis indicated results similar to those of the coherent multiword utterances. The results of this visual analysis are provided in Appendix C.

**Effects of Different Cues on Performance**

In addition, to examining the effects of the overall intervention on the participant’s use of coherent multiword utterances and the number of steps of the procedural sequences, the effects of different elements of the intervention were also analyzed. These elements included 1) the use of picture support from the illustrations in the books, 2) the use of scripts or sentence symbol strips presented separately from the book depicting the sequence of the activity, 3) the use of sentence symbol strips attached to the pages of the books, and 4) the use of props.

**Picture support.** The effect of picture support, which was the illustrations in the books that were not adapted with sentence symbol strips, was examined for the two baseline and the two treatment sessions. Picture support was provided following the dialogic reading activity where the child simply followed along with the clinician as she read the book aloud. The child was allowed to look at the illustrations in the book as he retold the targeted procedural sequence. The count data for the means of the coherent multiword utterances and number of steps produced in this condition are shown in Figure 9, and the percent correct is shown in Figure 10. Across the three initial baseline sessions, the child retold the procedural activity with picture support from the
illustrations in the books using the total amount of coherent multiword utterances possible (as determined by Number of Steps-1) 58.33% of the time (range 25%- 75%), which represents an average of 2.33 coherent utterances (range 1-3). He produced the expected number of steps 76.7% of the time (range 70%- 80%), which is an average of 3.83 steps (range 3-4). During the first phase of the treatment sessions, the participant retold the procedural activity with picture support from illustrations in the books using the expected number of coherent multiword utterances 96.7% of the time (range 90%-100%), which is an average of 4.33 coherent utterances (range 4-5). He produced the expected number of steps 97.3% of the time (range 92%- 100%), which is an average of 5.3 steps (range 5-6). Across the second baseline sessions, the child used the expected number of coherent multiword utterances 79.3% of the time (range 63%- 100%), which is an average of 3.17 coherent utterances (range 1-5). He produced the expected number of steps 80% of the time (range 80%), which is an average of 4.0 steps (range 3-5). Across the second phase of the treatment session, the child produced the expected number of coherent multiword utterances 98.3% of the time (range 90%- 100%), which is an average of 4.92 coherent utterances (range 4-5). He used the expected number of steps 97.2% of the time (range 83%- 100%), which is an average of 5.8 steps (range 5-6).

The child’s baseline performance suggests that support from the illustrations in the books was not sufficient to help him to produce longer coherent utterances that expressed the procedural sequence. However, during the treatment session, his productions with support from the illustrations in the book increased. The difference between the two conditions is that, prior to being cued with the illustrations from the book during the treatment sessions, the child had rehearsed the sequence with the support of the books
adapted with picture symbols and the scripts or sentence symbol strips. Following this rehearsal, his production of coherent multiword utterances to express the procedural sequence increased in response to the illustrations from the book. His decrease in performance in response to the support from the illustrations from the book during the second baseline sessions gives further support to the conclusion that the illustrations from the book were not a sufficient cue for his productions of coherent multiword utterances and sequenced steps.

**Figure 9.** Coherent multiword utterances and number of steps used by the participant across the study phases given picture support from the illustrations in an unadapted book.

**Figure 10.** Coherent multiword utterances and number of steps used by the participant across the study phases given picture support from the illustrations in an unadapted book as a percent of the expected number.
**Scripts (sentence symbol strips) support.** Scripts or sentence symbol strips with picture symbols and text arranged in order of the targeted sequence were provided separately from the book as another type of support during the baseline and treatment sessions.

Across the three initial baseline sessions, the child retold the procedural activity with support from sentence symbol strips using an average of 3.5 coherent utterances (range 3-4); this corresponds to him using the total amount of coherent multiword utterances possible 87.7% of the time (range 75%-100%). See count data presented in Figure 11 with percentage data in Figure 12. Also during the initial baseline phase, he produced an average of 4.5 steps (range 4-5), which means he used the expected amount of steps 90% of the time (range 80%- 100%). During the first phase of the treatment sessions, the participant retold the procedural activity with support from sentence symbol strips using an average of 4.5 coherent utterances (range 4-5), which means he produced the expected number of coherent multiword utterances 100% of the time (range 100%). Also he produced an average of 5.5 steps (range 5-6), which means he produced the expected number of steps 100% of the time (range 100%). Across the second baseline sessions, the child used an average of 2.83 coherent utterances (range 1-4), which means that he used the total amount of coherent multiword utterances possible 71% of the time (range 38%- 100%). He also produced an average of 3.5 steps (range 3-4); therefore utilizing the expected amount of number of steps 70% of the time (range 60%- 80%).

Across the second phase of the treatment session, the child used an average of 5.0 coherent utterances (range 5); therefore utilizing the expected number of coherent multiword utterances 100% of the time (range 100%). During this last treatment phase,
he also produced an average of 6.0 steps (range 6), which means he produced the expected and the expected number of steps 100% of the time (range 100%). The results indicate that the use of scripts was effective in improving the child’s coherent multiword production and increasing his number of steps verbally produced in the procedural sequence. However, the decrease in his performance during the second baseline when the intervention was withdrawn suggests that the use of the picture scripts alone was not sufficient to increase his use of coherent multiword utterances to describe the steps of the sequenced procedures.

Figure 11. Count data for the number of coherent multiword utterances and number of steps used by the participant across the study phases given picture support from scripts separately from the book.
Adapted books. During the two treatment phases, an additional type of support was books that were adapted with picture symbols to cue the expected multiword utterance for each page. Adapted books were included only during the two treatment phases. Each book was adapted to the participant’s language ability by creating a script to relate the sequence rather than using the provided text. This was done in order to support comprehension and decrease the cognitive load during production. The adapted scripts were rendered by using picture symbols and text from the Writing with Symbols software (WWS; Mayer-Johnson, 2000) and represented 2 to 4 word utterances. These symbol sequences were affixed to the appropriate page in each book.

During the first phase of the treatment sessions, the participant retold the procedural activity with the support of an adapted book using an average of 4.33 coherent utterances (range 4-5), which means that he utilized the expected number of coherent multiword utterances with an average of 98.33% of the time (range 90%-100%). He also produced an average of 5.5 steps (range 5-6), which means that he produced the expected target number of steps 100% of the time. Across the second phase of the treatment
session, the child used an average of 5 coherent utterances (range 5), which means he produced the target number of coherent multiword utterances 100% of the time. He also produced an average of 6 steps (range 6), which means that he utilized the expected number of steps 100% of the time. Refer to Figures 13 and 14 for a visual display of the results of the use of adapted books on the outcome measures. The results suggest that the use of the adapted books was effective in improving the child’s number of coherent multiword utterances and number of steps to verbalize the procedural sequences.

**Figure 13.** Count data for the number of coherent multiword utterances and number of steps used by the participant during the treatment phases given picture support from adapted books.

**Figure 14.** Percent correct of coherent multiword utterances and number of steps used by the participant across the study phases given support from adapted books.
**Props.** During the treatment sessions, props that were appropriate for performing each procedural sequence were incorporated after reviewing the books. For example, the participant acted out the steps of making a sandwich after completing a dialogic reading activity about this procedure. He, therefore, had an opportunity to practice the adapted script about how to make a sandwich. The child was provided two pieces of plastic bread, pretend peanut butter, and pretend jelly, which he used to act out the steps as he verbally produced the procedural sequence.

During the first phase of the treatment sessions, the participant retold the procedural activity with the support of props using an average of 3.67 coherent utterances (range 2-5), which means that he produced the expected number of coherent multiword utterances with an average of 73.33% of the time (range 60%-80%). During this phase, he produced an average of 4.58 steps (range 2-6), which means he produced the target number of steps 84.5% of the time (range 50%-100%). Across the second phase of the treatment session, he used an average of 4.67 coherent utterances (range 3-5), which correlates to him using the expected number of target coherent multiword utterances 93.33% of the time (range 80%-100%). He also produced an average of 5.91 steps (range 5-6), which means he produced the target number of steps 98.6% of the time (range 92%-100%). Refer to Figures 15 and 16 for a display of the results of the use of props on the outcome measures. The data suggest that the child initially had difficulty producing a large number of steps and coherent multiword utterances to convey the steps of the sequenced procedure when using the props, but as the sessions continued his ability to do so increased and stabilized.
**Figure 15.** Count data for the number of coherent multiword utterances and number of steps used by the participant during the treatment phases given picture support from props.

**Figure 16.** Percent correct of coherent multiword utterances and number of steps used by the participant across the study phases given support from props.

**Additional Analyses**

**Semantic Analysis.** A secondary focus of the treatment was to increase the participant’s use of a variety of words. Therefore, a semantic analysis was completed of the spoken words the child used when retelling the procedural sequence without picture support for each session during the four phases. The semantic measures of interest were the number of total words (NTW) and number of different words (NDW). The results are
shown in Figure 17 and indicate that the child’s NDW and NTW increased during the treatment sessions. Across the three initial baseline sessions, the child retold the procedural activity without picture support using an average NTW of 12.33 (range 8-15) and an average NDW of 6.67 (range 6-9). During the first phase of the treatment sessions, the participant retold the procedural activity without picture support using an average NTW of 17.67 (range 13-23) and an average NDW of 11.08 (range 9-14). Across the second baseline sessions, the child used an average NTW of 10.5 (range 7-14) and an average NDW of 9.33 (range 7-12). Across the second phase of the treatment session, the child used an average NTW of 19 (range 16-27) and an average NDW of 15.58 (range 12-21).

At times during each phase of the study, the participant exceeded the expected NDW and NTW for a particular activity or procedural sequence. For example, during the first phase of the treatment sessions, the child was expected to retell how to make a peanut butter and jelly sandwich. One of the expected steps was “jelly on bread.” However, the child produced “Get jelly. Jelly on bread.” Another example of this was during the second phase of the treatment sessions when he produced “put on underwear and jammies” when the expected step of the sequence was “put on pajamas.” His production of the steps in these scenarios exceeded the expected NDW and NTW. Overall, the semantic analysis indicates an improvement in the child’s semantic skills during the treatment sessions. In particular, the child was able to take the expected sequence and make it his own by adding his own information and relating it to his personal environment.
Summary of semantic analysis. Having the participant begin producing a variety of words was a secondary goal of this study. During each verbal retelling of the procedural sequence, NTW and NDW were calculated to analyze the potential changes in the participant’s semantic skills. Although this measure was variable and did not make steady and consistent gains, it is worthy to note that during the treatments, there was an improvement in the NDW and NTW produced during the last treatment session relative to these measures from the initial baseline phase.

Syntactic/Morphological Analysis. The mean length of utterances in morphemes (MLU) was calculated to examine the structural and complexity changes in the participant’s productions across the baseline and treatment sessions. Figure 18 presents the data across the four phases of the study. Across the three initial baseline sessions, the child retold the procedural activity without picture support using an average MLU in morphemes of 2.83 (range 2.6-3.0). During the first phase of the treatment sessions, the
participant retold the procedural activity without picture support using an average MLU in morphemes of 2.52 (range 2.0-2.86). Across the second baseline sessions, the child produced an average MLU in morphemes of 2.64 (2.25-3.33). Across the second phase of the treatment session, the child used an average MLU in morphemes of 2.68 (range 2.45-3.0). These results suggest that the treatment had no significant effect on MLU which was not unexpected given the semantic focus of the overall intervention.

**Figure 18.** Mean length of utterances produced during retelling of the sequenced procedure without picture support for baseline and treatment phases. The line indicates the level for the MLU at the last treatment session compared to the initial baseline sessions.

**Summary of syntactic analysis.** The MLU in morphemes was calculated during each phase of this study during the verbal productions of the procedural sequence without review of the book or picture/script support to assess the structural and complexity changes in the participant’s productions. There was no observable change in the child’s overall syntactic skills during this study.

**Post Treatment**

At the end of the last treatment session, an unfamiliar conversational partner asked the child to retell the six procedural sequences introduced throughout the course of
the study without reviewing the books. The child was cued by presentation of the cover of the book. For all six procedural sequences, the child produced a mean of 4.3 coherent multiword utterances (range 3-5) with a mean of 5.5 steps (range 4-6). A semantic analysis for the total sample demonstrated that he produced a mean NTW of 16 (range 13-18) and a mean NDW of 13.33 (range 9-17). A syntactic analysis for the total sample demonstrated that the child produced an average MLU in morphemes of 2.75 (range 2.57-3).

Five months post-treatment, the child was asked to retell the six procedural sequences again to a different unfamiliar conversational partner without support and without prior review of the books. He was again cued by presentation of the cover of each book. The child produced a mean of 4.33 coherent multiword utterances (range 3-5) with a mean of 5.33 steps (range 4-6), demonstrating strong recall of the targeted sequences.

The child demonstrated the ability to maintain his improvements immediately after the treatment and 5 months post-treatment. He maintained his improvements in his ability to produce coherent multiword utterances and a significant number of steps to retell the six procedural sequences. Refer to Figures 19 and 20 for results of the post treatment procedural sequence retellings.
Figure 19. Number of coherent multiword utterances produced during the verbal retell for each procedural sequence produced to an unfamiliar communication partner during immediate and delayed post-treatment sessions.

Figure 20. Number of steps produced during the verbal retell for each procedural sequence produced to an unfamiliar communication partner during immediate and delayed post-treatment sessions.

Validity

Validity of the intervention was assessed in order to evaluate the effectiveness through a qualitative interview/survey with the participant’s parent. Questions were worded by the graduate student researcher who conducted the interview and was based on a “general interview guide approach” (Turner, 2010) that is structured but allows
flexibility. Turner found that the “general interview guide approach” was useful in interviews because he could “ask questions or change questions based on participant responses to previous questions; the questions were structured, but adapting them allowed him to explore a more personal approach to each interview,” (p. 755). The type of questions included in the interview/survey was regarding the parent’s perceptions on whether the treatment strategy was effective, relevant, and able to be easily manipulated in the home environment.

The participant’s mother answered questions for the interview. Questions during the interview included: What are your impressions of the intervention? Have you noticed any differences in your child’s spoken language? If so, can you tell me about that? Have you already used the intervention technique at home? Can you give me some examples?

Overall, his mother felt that the combined dialogic reading and scripting intervention was beneficial for her child and had appropriate length and content. It was reported that he was producing more spontaneous language in the home environment, and more readily interacting and providing appropriate responses during conversations. Also, he has improved his sustained attention and ability to sit and pay attention to a task for an increased period of time. His mother stated “I couldn’t be more thrilled with what my son has learned; it was a good experience to see him learning and succeeding.” See Appendix B for the full interview.

Summary of Results

This single-subject study found that with one child with a moderate-severe communication impairment, a combined dialogic reading and scripting intervention was effective in improving the production of coherent multiword utterances and number of
steps during procedural sequence activities involving 5 to 6 steps. This participant improved his discourse skills as well as made semantic gains through increasing his production of different words and total words. The child’s mother also reported improvements in his ability to participate in conversations at home and noted that he is using more language.
Discussion

The purpose of this study was to evaluate the efficacy of a dialogic reading intervention that incorporated scripts from activities of daily living to develop the use of sequenced discourse by a child with moderate to severe communication impairment. In this single-subject study, combined dialogic reading and scripting intervention had a positive effect on discourse skills for this particular child. Specifically, he had an increased number of coherent multiword utterances and increased number of steps when describing 5 to 6-step sequenced activities without picture support. In addition, post-treatment measures immediately after the intervention was completed and 5 months later indicated that the child had maintained these skills without re-review of the books. Based on parent report, the child also demonstrated some carry-over of these skills to the home environment.

In addition to overall measures of effectiveness, the response of the child to different types of support provided during the intervention were analyzed. These elements were 1) the use of picture support from the illustrations in the book, 2) the use of scripts or sentence symbol strips presented separately from the book depicting the sequence of the activity, 3) the use of sentence symbol strips attached to the pages of the books, and 4) the use of props with which the child could act out the depicted sequence.

Based on a comparison of the child’s performance at baseline and his performance during the treatment phases, picture support from the illustrations in the book was not sufficient to cue his productions of coherent multiword utterances with the expected number of steps to describe the procedural sequence. The child’s performance during the second phase of baseline sessions provided particularly strong evidence for
this conclusion; the participant had a decrease in performance when this was the only type of support provided. When the intervention was reinstated during the second treatment phase, the child’s performance returned to its previous high levels.

The next type of support analyzed was the scripts or sentence symbol strips with picture symbols and text arranged in order of the targeted sequence that were provided separately from the book. This support was provided during both baseline sessions as a control for the variable of the picture symbols being presented in the order of the script. In other words, the question was, “Were the picture symbols presented in order a strong enough cue to elicit the coherent multiword utterances and expected number of steps without any additional types of cuing or support?” This type of support was more effective than the illustrations from the books in increasing the child’s production of coherent multiword utterances and the use of increased number of steps for the procedural sequence. However, the child’s decrease in performance during the second baseline session when the intervention was withdrawn suggests that the use of the scripts alone was not sufficient to elicit a higher level of use of coherent multiword utterances to describe the steps of sequenced procedures. Further support for this conclusion was provided by the child’s return to a high level of performance when the intervention was reinstated during the second treatment phase.

The books that were adapted with picture symbol strips directly attached to each page to cue the participant’s productions were effective in improving his number of coherent multiword utterances and number of steps described as indicated by the child’s high level of performance whenever these cues were provided during the two treatment phases. One of the limitations of the design of the current study are that no definitive
conclusion can be drawn as to the effectiveness of this type of cue separately from the other elements of the dialogic reading plus scripting intervention. However, the immediate and consistent effect of this type of cue on the child’s performance across four different books suggests that it is an essential element of the intervention that provided the scaffolding the child needed to increase his use of procedural discourse. Potential reasons for the effectiveness of this type of cue will be discussed further below.

The last type of support evaluated was the use of props with which the child could act out the depicted procedural sequence. Initially, the child’s verbal performance decreased when the props were presented. However, as the sessions continued, his ability to use a larger number of coherent multiword utterances and number of steps increased and stabilized. The activities with the props were included in the design of the intervention because the thought was that they would serve as a bridge to encourage the generalization of the use of the procedural sequence. The design of the current study did not directly test this assumption. However, based on information from the parent interview, the child did demonstrate some generalization of his increased procedural discourse abilities during actual activities of daily living. Whether or not this would have occurred without the incorporation of the activities with the props is unknown.

The findings of this study were consistent with previous research that indicated that separately, dialogic book reading and scripting were effective intervention strategies for children with communication impairments. Dale et al. (1996) reported that the use of a dialogic book reading intervention resulted in an increased rate of verbal responses to questions, increased number of different words, and increased mean length of utterance (MLU) for children, ages 3 to 6 years, who had mild to moderate language delays. The
results of the current study also indicated that interactive sharing of adapted books resulted in an increased rate of responses and number of different words for this child with moderate to severe communication problems secondary to DS. However, unlike the results for the Dale et al. study, the participant in the current study did not have an increased MLU. However, Dale et al. reported that “the lower functioning children appeared to gain more in verbal engagement and vocabulary, whereas higher functioning children gain more in MLU” (p. 231). The results of the current study are, therefore, consistent with those for the lower functioning children in the Dale et al. study. The results from the current study may be due to the persistent nature of the participant’s language problem secondary to his diagnosis of DS, his relatively advanced age compared to the participants in the earlier study, and his low baseline MLU. However, despite the lack of an increase in MLU, the dialogic book reading format appeared to be an effective one for increasing the language skills even for this adolescent with DS who had more challenging language problems.

Soto and Dukhovny (2008) reported that several elements of their intervention protocol appeared to be important for the positive effect of shared book reading on the acquisition of expressive vocabulary with a 7-year-old user of AAC. These included providing multiple exposures to a target word, multiple opportunities to use the word, repeated practice, and adequate pause time. The intervention protocol in the current single subject design study utilized the strategy of multiple exposures, multiple opportunities to use the word, and repeated practice by going through the complete intervention protocol two times during each session. The protocol included an initial reading of the book aloud to the participant to expose him to the target vocabulary. He
was then allowed to go through the procedural sequence multiple times during the session using various types of support. Adequate pause time was provided throughout the implementation of these procedures. Therefore, during the intervention protocol, the participant was afforded repeated opportunities to retrieve the targeted vocabulary, an element that Soto and Dukhovny reported as important in the effectiveness of their shared reading protocol in promoting the word-learning gains of their participant.

During the dialogic book reading/scripting intervention, specific elicitation techniques were used to provide opportunities for the participant to engage in the activity at a level that was beyond his independent language skills. These techniques were consistent with those reported by Soto, Dukhovny, and Vestli (2006) to be effective with children who use AAC and included the use of either/or choices, cloze phrases, and open-ended questions. Although specific measures were not made to evaluate the effectiveness of each specific type of cuing, these elicitation techniques were an important element in the overall intervention protocol and, based on the overall performance of the participant, appeared to promote gains in his use of spoken words to relate simple procedural sequences.

The results of the current study provided further support for the effectiveness of the use of scripts in increasing the verbal output of children with expressive language problems. Scripts are thought to be effective because they provide the structure and vocabulary support for the child to promote the conversion and storage of the activities into a linguistic form, while also providing a framework that reduces the demands for planning and organization (Bliss and McCabe, 2006). However, as indicated by the participant’s performance in the two baseline phases as compared to the treatment phases,
a verbal script supported by the illustrations in the books was not sufficient support to increase the participant’s production of coherent procedural discourse. Previous research suggested that the use of a verbal script without any added input may be challenging for children with moderate to severe communication impairments (as discussed in Naremore et al., 2001). Therefore, the current study used objects, pictures, and picture/symbol strips to provide additional support to the child. These appeared to be effective in providing the child additional cues so that he could benefit from the structure provided by the script.

The books adapted with picture symbol strips appeared to be an important element in the success of the intervention in promoting coherent multiword utterances that conveyed the steps of the procedural sequences. These books provided both picture support from the illustrations in the books and sentence symbol strips (scripts) that were affixed to the pages in the book that explicitly cued the expected spoken words for each step. This combination of support appeared to provide the language structure necessary for the child to organize and then verbalize his thoughts. The picture cues probably served to decrease the cognitive load for the child as language formulation was not needed and cognitive resources could be employed for verbal production and memorization of the steps. Additional evidence for the effectiveness of the visual cues was indicated by the child’s behavior when this support was taken away and the child was prompted to retell the procedural sequence without support. Prior to beginning his retell, the child often closed his eyes as if to visualize the cues from the adapted books.

The child’s performance when provided the picture support from the adapted books is consistent with previous research that shows that individuals with DS improve their expressive language production when given facilitation from visual supports.
(Chapman, 2006). What is notable about the current intervention is that the participant with DS in this study had overall lower verbal skills than the adolescents who were participants in the earlier work demonstrating the effectiveness of the use of picture cues with adolescents with DS. The current study showed that picture cues that explicitly cue coherent multiword utterances can also be effective at increasing the verbal productions of a child with DS with moderate to severe cognitive impairment.

**Word Retrieval Benefits**

Previous research has indicated that individuals with DS often have poorly organized world knowledge, slower ability to produce responses, and/or inefficient word retrieval strategies that underlie their overall reduced expressive language skills (Nash & Snowling, 2008). A common evidence-based intervention practice for word retrieval problems is the use of highly related vocabulary that is already familiar to the child with repetitive practice in retrieval of the targeted vocabulary (German, 2012). The current intervention provided these same elements, which may have contributed to the increase in the child’s ability to produce coherent multiword utterances. The procedural sequences were specifically chosen to be ones with which the child was highly familiar and was related by its use to describe the sequence. Repetitive practice occurred because the child went through the entire intervention protocol two times each session (following along while the clinician read the book aloud, retelling the sequence with picture support, retelling with the sentence symbol strips, retelling with the props, and retelling the procedural sequence without support). Within each intervention protocol the child had four opportunities to retrieve and verbalize the targeted vocabulary. This repetitive practice may have been an important element for improving his word retrieval ability.
**Ecological Validity**

Although the intervention took place in a standard therapy room, it was designed to have ecological validity to increase the possibility of generalization of the skills to the child’s home environment. The books used during the study were selected to include activities of daily living that were familiar to the child. Therefore, they depicted routines that could be practiced every day in his natural environment. In addition, the book format was one that was familiar to the child as it was reported that he had a variety of books at home that were easily accessible to him. One indication of the ecological validity of the format of the intervention for this child was provided by a report from the mother of the child’s behavior at home. She reported that, during the study, the child began to independently pick up books in his room and would talk aloud while looking at the pictures in the books. The child reportedly did this on numerous occasions without any prompting. The mother also reported that she noticed that the child had begun to use spoken words to describe what he was doing during sequenced tasks at home such as loading and unloading the dishwasher.

**Limitations**

The study’s single-subject design was a limitation of the study because the findings cannot be generalized to the larger population of all children with moderate to severe communication impairments. Further examination of this intervention with more children is warranted. Secondly, because the intervention included repeated exposures to the procedural sequences and verbal cuing by the clinician during the intervention phases, it is difficult to discern which element of the program was the most influential to improving the discourse skills in this child.
Potential threats to internal validity or the determination of a true cause-effect relationship between the intervention and the increased verbal performance of the child include: maturation and subject selection. Participant maturation was unable to be accounted for as the research study lasted approximately 2 months and only one subject was included in the study. However, the child’s age (adolescence) and causative condition (DS) would suggest that spontaneous improvement due solely to a maturational process was less likely to occur. The subject selection may also have been an internal threat because it was not random but was based on convenience sampling. One typical threat to internal validity, concurrent treatment, was not an issue for this study as the child received home-schooling and was not enrolled in any other speech-language therapy during the period of this study.

Potential threats to external validity or the ability to generalize the results of this study to a larger population are inherent in the nature of the single subject design, in this case, with a single subject. The results of this study may not be generalizable to the population of all children with moderate to severe communication impairments, especially due to the restrictions in the inclusion criteria. The participant’s specific historical, medical, and demographic background may be important factors, limiting the generalizability of the results. The study does provide initial, promising evidence of an effective intervention with a population, adolescents with DS with moderate to severe impairment, for whom the development of discourse skills has been difficult.

Future Directions

Before strong conclusions can be made about the efficacy of the combined dialogic reading and scripting intervention, the study needs to be replicated with
additional participants. This study was limited to the procedural sequences of daily living that include: getting dressed, morning routine, making a sandwich, going to bed, taking a bath, and getting ready for school. The maintenance of discourse skills to different contexts and activities could be explored in future research.

As discussed earlier, the use of props seemed to be distracting to the child at first; however, over time and practice the child’s verbal performance when using the props improved. Although the use of actual props seems to be intuitively important for carryover to actual activities of daily living, this assumption could be explicitly tested in future research.

Summary

Children with moderate to severe cognitive and functional limitations have difficulty learning to use spoken language to communicate, especially with moving from telegraphic speech to using discourse for conversations or narratives. However, these individuals can become successful communicators when provided with specialized instruction that focuses on their strengths and provides explicit cues and repetitive practice to reduce problems with language organization and word retrieval.

In conclusion, this single-subject study showed positive results in improving the discourse skills (specifically, the ability to produce coherent multiword utterances and longer verbal description) for a child with moderate to severe communication impairments. Replication studies are warranted to further validate the efficacy of the designed combined dialogic reading and scripting intervention for additional children with moderate to severe communication impairments. This study demonstrates the potential for even children with significant language impairments to develop the ability to
relate information beyond simple requesting or commenting. The use of procedural discourse is a first step toward the ability to relate events, an essential element of a more mature form of pragmatic language development, and one that can move the child toward true conversational engagement with others.
References


Appendix A.

Measure of Fidelity

All items are scored from 1-3.
1 – Did not implement the intervention procedure.
2 – Implemented the intervention procedure variably
3 – Consistently and appropriately carried out the intervention procedure.

B1- Session 2: November 5 (*My Bathtime Book*)

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<tr>
<td>Prompted child to retell sequence using picture symbol strips</td>
<td>3</td>
</tr>
<tr>
<td>Prompted child to act out sequence while using props to act out</td>
<td>3</td>
</tr>
<tr>
<td>Asked child to retell while looking at pictures in unadapted book</td>
<td>3</td>
</tr>
<tr>
<td>Asked child to retell sequence independently</td>
<td>3</td>
</tr>
<tr>
<td>Appropriate verbal praise and encouragement</td>
<td>3</td>
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B1- Session 4: November 9 (*How to Make a Sandwich*)

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<td>Prompted child to retell sequence using picture symbol strips</td>
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<td>Asked child to retell while looking at pictures in unadapted book</td>
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</tr>
<tr>
<td>Asked child to retell sequence independently</td>
<td>3</td>
</tr>
<tr>
<td>Appropriate verbal praise and encouragement</td>
<td>3</td>
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</tbody>
</table>

B2- Session 3: December 10 (*My Bedtime Book*)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinician read through book making sure the child followed along</td>
<td>3</td>
</tr>
<tr>
<td>Prompted child to retell sequence using picture symbol strips</td>
<td>3</td>
</tr>
<tr>
<td>Prompted child to act out sequence while using props to act out</td>
<td>3</td>
</tr>
<tr>
<td>Asked child to retell while looking at pictures in unadapted book</td>
<td>3</td>
</tr>
<tr>
<td>Asked child to retell sequence independently</td>
<td>3</td>
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<tr>
<td>Appropriate verbal praise and encouragement</td>
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<td>Activity</td>
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Appendix B. Parent Interview

**Introduction**
I’m interested in talking with you today about a few things related to your child’s participation in the study, specifically his changes following the combined dialogic reading and scripting intervention. I’m interested in talking with you about any differences that you have noticed in your child’s communication and discourse skills.

I would like to tape record this interview. Later, I’ll transcribe the interview and analyze the information. To insure confidentiality, I will not use your name or any other (child, staff member, parent, etc.) names in the transcription, but I might use quotations from this interview when I type up the results. The interview should take about 30 to 45 minutes. If you are willing to continue, I have a consent form that we will now review together.

**Interview**
Do you have any questions before we begin?

1. **Now that we’ve finished the intervention with your child, what are your impressions of it?** – I am very encouraged to see the progress that he has made. It was definitely worth coming down. He is communicating more with others and producing more spontaneous speech. The intervention has stimulated him to speak more. I even hear just more scripted phrases which are “neat to hear.”

   **Follow-up questions:**
   - **Do you think this intervention was beneficial for your child? If so, in what way?** – Yes it was beneficial. It does make sense that he has more in his mind now that he wants to talk about. I think it has helped him be able to retrieve information better and also helped attention wise too. He has increased his ability to sit and pay attention to a task for a period of time, which is huge for him.
   - **Do you think that your child enjoyed the intervention?** – Yes, he really had a good time; he looked forward to coming down each session.

2. **Have you noticed any differences in your child’s spoken language? If so, can you tell me about that?** – It does seem like when he is engaged in an activity, he’s more verbal with it now and producing more spontaneous language.

   **Follow-up questions:**
   - **Have you noticed your child improving his or her ability to talk about experiences? If so, can you provide any examples?** – Yes I have. Even when we are emptying the dishwasher, he will talk about what he is doing and what he is putting away. The whole practice of doing it during the study has helped. He also loves to sit on his bed and look through his books now. He seems to more readily want to interact in conversation. He will interrupt conversations and ask “what”; so that he can be filled in
on the conversation. He has more appropriate responses as well now and can pick up on other’s emotions.

○ Has anyone else mentioned differences in your child’s spoken language skills? – The Sunday school teacher has made comments that she thinks that he is clearer, and she can understand him better. His older brother has said that he has noticed the different language abilities and was really impressed. It was a good experience for us to observe and see him learning and succeeding.

3. I’d like some feedback regarding the intervention length and content.

Follow-up questions:

○ What other types of activities could we have used that you think your child would have enjoyed? - Putting away dishes or any other hands-on activity. I think that you targeted good activities that were helpful for him. Going through the steps and breaking it down was beneficial. His father has realized throughout this experience that there is a lot happening in our son’s mind that he wants to talk about, but just takes him longer to formulate.

○ Do you think the sessions were too long for your child? - Not too long. It was good to quit while he was still interested instead of making it too long. I felt that it was an appropriate length for him.

4. I’d like your impressions of the usefulness of this intervention in the home environment.

Follow-up questions:

○ Have you already used it at home? Can you give me some examples? – I need to make sure I’m more intentional with it. However, we practice during shower time. I will ask “what do we need, what do we do first?” I feel like I’ve been trained some during this experience. Things that other kids just get, I need to make more explicit for my son to learn

○ What would make it difficult to use at home? - It’s like learning a new discipline. I need to make sure to do a thorough job with him because sometimes I just go on auto-pilot and need reminded to support him more.

We have had the opportunity to talk about many ideas about combined dialogic reading and scripting intervention and I have asked you many questions. In closing, is there anything else you’d like to tell me about?

○ The experience was excellent. I couldn’t be more thrilled with what he has learned and what a great opportunity this has been for him. Hopefully it will be helpful for some other folks too. We couldn’t be happier.
Appendix C. Visual Analysis for Number of Steps

Level. The level is the mean of all data points within a phase and is indicated by a solid horizontal line for each phase in Figure 21. For the participant’s verbal production of number of steps in the procedural sequence without support, the mean percent correct for number of steps was 66.7% at Baseline Phase 1, 95.5% at Treatment Phase 1, 70% within Baseline Phase 2, and 99.6% during Treatment Phase 2.

Figure 21. Level or mean of all data points within a phase for number of steps.

Variability. The variability refers to “the fluctuation of the data (as reflected by the data’s range or standard deviation) around the mean” (Kratchowill et al., 2010, p. 5). Plus and minus one standard deviation around the mean as indicated by the dotted lines in Figure 21. The mean of the percent correct for number of steps at the first baseline was 66.7% with a standard deviation of 11.6; mean for the first treatment phase was 95.5% with a standard deviation of 4.9; mean for the second baseline phase was 70% with a standard deviation of 17.3; and, the mean for the second treatment phase was 99.6% with a standard deviation of 1.02. For verbal retell without support or review of the book, the least variability in performance occurred at the last intervention phase, which indicates that his improvements and gains were stabilizing.
**Trend.** The trend within baseline and the first treatment phase as well as the trend within the second baseline and the second treatment phase demonstrated an acceleration and improvement. However, the trend line of treatment phase 1 and the second baseline demonstrate a decelerating trend. The change in trend between adjacent conditions were “accelerating to decelerating” and then “decelerating to accelerating.” The solid line in Figure 22 displays the trend line within each phase. There was a change between each baseline to intervention phase; the change was improving each time the intervention was applied and overtime the behavior became more stable.

**Figure 22.** Trend or best fitting straight line and variability for number of steps.

**Immediacy of Effect.** As shown in Figure 23, the last three data points of one phase and the first three data points of the next phase were visually compared using shapes to indicate which data points are being compared (i.e., ovals, rectangles, and triangles). Comparison revealed that there was some effect on number of steps produced visualized between the first baseline and first intervention phase, the first intervention phase and second baseline, and the second baseline and second intervention phase.
Figure 23. Visual analysis of immediacy of effect for number of steps. Similar shapes are used to indicate which data points should be compared to each other.

Degree of Overlap. Overlap is the proportion or percentage of data points from one phase that overlaps with the data points from the comparison phase [with the desired outcome being a small percentage of overlap]. As depicted in Figure 24, verbal retell of the procedural sequence without picture support had 0 overlapping data points (0%) between the first baseline and the first treatment phase, 0 between the first treatment phase and the second baseline (0%), and 0 between the second baseline and the second treatment phase (0%).

Figure 24. Visual analysis of degree of overlap for number of steps when comparing adjacent phases.
Consistency Across Phases. Consistency is a comparison of the data from similar phases (baseline to baseline; treatment to treatment) to determine the extent to which these phases resemble each other and is shown to Figure 25 by the linked ovals. The data patterns of similar phases indicated a consistent pattern between the two treatment phases and the two baseline phases. There is also a consistent pattern between the first baseline and the first intervention, and a consistent pattern is also demonstrated between the second baseline and the second intervention phase.

Figure 25. Visual analysis of comparison of the consistency for number of steps across similar phases.