

**Tutor Language Use During Interactive Book Reading Sessions**

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**Abstract**

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Understanding how children with autism spectrum disorders (ASD) improve oral language skills in relationship to tutor prompting has not yet been investigated. The study examined how variation in language prompt use by tutors during a storybook reading intervention influences growth in vocabulary and emergent literacy for young children with ASD. Participants included 9 tutors and 41 preschoolers with ASD enrolled in an interactive book reading intervention as part of a larger randomized control trial. These data were used to evaluate research questions focused on how variation in tutors' use of language prompts during interactive book reading relates to language and vocabulary growth for preschool children with ASD. Results indicate that tutor prompting fit a two-factor model, contextualized and decontextualized language. Furthermore that controlling for pretest, Completion prompts, a type of contextualized language prompting was uniquely predictive of child gains in phonological awareness from pre to immediately after intervention.



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## **DEDICATION**

To my wife, Sarah and daughter, Sadie. Thank you for taking this journey with me.

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## **CHAPTER 1: INTRODUCTION**

Reading ability often facilitates participation in civic life, job performance, and not least importantly, access to group membership and educational experiences in school (Blackorby et al., 2005; Booth et al., 2000; Wagner et al., 2005). Understanding how children with autism spectrum disorders (ASD) learn to read is important since reading is a foundational life skill (Davidson & Weismer, 2014; Lanter, Watson, Erickson, & Freeman, 2012; Westerveld et al., 2016) and predicts future school and life outcomes (Moats, 1999; National Early Literacy Panel, 2008; Snow, Burns, & Griffin, 1998). For children with ASD, reading ability can be a factor in determining the extent to which they either experience their education within the same context as their typically developing peers or, instead spend the majority of their time in exclusionary settings (Nation et al., 2006; Simpson et al., 2003).

Emergent literacy is the term used to describe the skills, knowledge, and attitudes that experiences with formal literacy build upon (Sulzby & Teale, 1991; Whitehurst & Lonigan, 1998; 2002). The period of emergent literacy begins at birth and continues into early schooling. During this time, children develop prerequisite abilities that build a foundation for pre-reading and formal literacy (Clay, 1993). Oral language is an important emergent literacy domain related to later reading comprehension achievement in typically developing children (NELP, 2008; Wasik & Bond, 2001).

The development of oral language skills in early childhood is an important foundational block for future reading development for both typically developing children and children with developmental disabilities (Scarborough & Dobrich, 1994; Tager-Flusberg, Joseph, & Folstein, 2001; Boudreau & Hedberg, 1999; Lonigan et al., 2008; Whitehurst & Lonigan, 1998). Proficient readers develop oral language early in life through guided practice with their

caregivers and interaction with their environment (Bishop & Adams, 1990; Scarborough, 1989). It is a malleable factor in development and children with ASD often experience exposure to it at differential levels.

Oral language can be viewed as existing on a continuum ranging from contextualized to decontextualized discourse (Snow, 1991). Contextualized discourse is talk concerned with concrete information that is immediately present such as pictures in a book. Decontextualized discourse, on the other hand, is concerned with abstract concepts that are not tangible or immediately present and require the use of higher order thinking to make inferences and predict what will happen such as reflecting on one's life experience as it relates to a story that is being read. Shared book reading is the most common way that children are introduced to these two types of language (Rosenquest, 2002).

Interactive Book Reading (IBR), a type of shared book reading, is an intervention implemented by teachers, parents, and other school personnel that promotes oral language development (Lonigan et al., 2008; Mol et al., 2009). In IBR, adult caregivers employ a set of language prompts during shared book reading. The purpose of IBR is to make book reading richer through eliciting greater amounts and quality of oral language. Using prompting procedures as a scaffold for adult caregivers during IBR, investigators have shown promising effects for developing the vocabulary and oral language of low-income students as well as students who are the children of immigrants (Chow & McBride, 2003; Storch & Whitehurst, 2002).

The application of IBR for children with ASD is a relatively new endeavor with a handful of studies having been completed in the last ten years (Fleury, Miramontez, Hudson, & Schwartz, 2014; Rahn, Coogle, & Storie, 2016; Tipton, Blacher, Eisenhower, 2017; Whalon,

Hanline, & Davis, 2016; Hudson et al. 2017). The aim of using IBR for young children with ASD follows the same logic as the initial studies with typically developing children, to increase exposure and practice to a greater amount and variety of oral language. Some children enter school with a deficit in the amount and quality of their language experiences (Hart & Risley, 1995). IBR is an intervention for bridging this gap. Intervening effectively in oral language development could hold promise for enhancing long-term reading development and future school outcomes for this group.

The use of IBR for children with ASD has shown promise as an intervention. Studies of IBR have shown a functional relationship between IBR and increased levels of engagement, spontaneous language, and increases in thematic vocabulary during IBR (Fleury, Miramontez, Hudson, & Schwartz, 2014; Rahn, Coogle, & Storie, 2016; Whalon, Hanline, & Davis, 2016). A need for a more nuanced understanding of how specific components of IBR work or don't work for children with ASD is now necessary. Research is needed to determine the active ingredients of IBR, specifically, which components of IBR facilitate skill development in the areas of vocabulary and emergent literacy.

### **Statement of The Problem**

This study builds and expands upon a recently completed randomized control trial (Hudson et al., 2017) that examined IBR and phonological awareness interventions for preschoolers with ASD. The current inquiry asks how variation in teacher's use of language prompts influences vocabulary and emergent literacy outcomes for young children with ASD. I will examine vocabulary and emergent literacy outcomes as a function of the rate and type of language prompts tutors implemented during IBR sessions.

## **CHAPTER 2: LITERATURE REVIEW**

This chapter reviews the existing literature pertaining to emergent literacy, joint attention, and vocabulary building activities for young children with autism spectrum disorder (ASD). Its aim is to inform the reader of the extant literature used to develop the research design for the present study on the relationship between tutor language use and emergent literacy outcomes during interactive book reading sessions. This review is designed to seat the study within the larger context of current thinking in the areas of emergent literacy and adult child interactions as well as its theoretical and conceptual underpinnings.

### **Characteristics of Children With Autism Spectrum Disorder (ASD)**

Autism Spectrum Disorder (ASD) is a pervasive neurological disorder with a wide range of impacts, outcomes, and varying levels of severity (5th ed.; DSM-5; American Psychiatric Association, 2013). Some children with ASD have symptoms that are observable from early on in life while others develop typically and then regress developmentally at 16 to 20 months. ASD is referred to as a pervasive disorder because it affects many aspects of behavior including sensory experiences, balance, physical awareness, and inner thought life (APA, 2013). The primary symptoms include a lack or delay in speech development, poor nonverbal communication, repetitive movements, minimal eye contact, little interest in friendships, lack of spontaneous or imaginative play, lack of social ability, and highly focused interests. Recent CDC statistics reveal that 1 in 68 children are identified with ASD, which is a ten-fold increase over the last 40 years (CDC, 2014; Newschaffer, Croen, Daniels, Giarelli, Grether, & Levy, 2007). Thus teachers must be prepared to meet the specific needs of the growing number of children with ASD (Christensen et al., 2016; Odom et al., 2010).

## **Emergent Literacy**

This section of the review describes the early literacy experiences of typically developing (TD) children from birth to age 5. The emergent literacy model proposes that the process of developing literacy begins at birth and continues until formal schooling begins in kindergarten (Clay, 1979; Mason & Allen, 1986; Sulzby & Teale, 1991; Whitehurst & Lonigan, 1998). Children learn skills that are the building blocks of formal literacy (Whitehurst & Lonigan 1998; Van Kleeck 1990). The development of these skills is largely dependent on the amount and quality of experiences a child has interacting with an adult using language (Mason & Allen, 1986; Scarborough et al., 1991; Snow, 1991; Sulzby, 1986; Teale & Sulzby, 1987).

Emergent literacy skills develop inter-connectedly within a social context (Whitehurst & Lonigan, 1998). The process of emergent literacy unfolds as adult caregivers expose children to experiences that are language and symbol rich both with the artifacts of reading and with the act and system of writing (Kent-Walsh & Light, 2003). Skills develop within the context of many common activities such as library visits, common household errands, and play (Anderson et al., 2010; Neuman, Newman, & Dwyer, 2011). These experiences are worthwhile with regard to language development to the extent that they foster adult child interactions and provide activities that require the scaffold of language, therefore demonstrating the need and utility of literacy (Ninio, 1983). Through these experiences language and novel vocabulary develop (Ninio & Bruner, 1978).

## **Emergent Literacy Development of Preschoolers With ASD**

The current understanding of the emergent literacy experience of young children with ASD is informed by the few studies that exist examining this population (Davidson & Ellis Weismer, 2014; Dynia, Brock, Logan, Justice, & Kaderavek, 2017; Dynia, Lawton, Logan, &

Justice, 2014; Lanter, Freeman, & Dove, 2013; Lanter, Watson, Erickson, & Freeman, 2012; Westerveld, 2017). Several conclusions can be drawn from these findings. First, children with ASD show relative strengths and equal performance compared to their TD peers in discrete skills, such as letter naming. Second, they show relative weakness in meaning related skills, as well as phonological awareness and vocabulary development (Dydia, Lawton, Logan, & Justice, 2014; Lanter, Freeman, & Dove, 2013). Third, children with ASD have been reported to have varying interest in print-related activities such as shared book reading as determined through parental report in these same studies (Lanter, Freeman, & Dove, 2013; Lanter, Watson, Erickson, & Freeman, 2012). Fourth, although there is some common profile among skills of children with ASD there appears to be some variance between low performers and high performers on emergent literacy skills within this group (Davidson & Ellis Weismer, 2014; Dydia, Lawton, Logan, & Justice, 2014). Last, children's performance on emergent literacy skills seems to be related to aspects of ASD such as language, social skills, and cognition (Davidson & Ellis Weismer, 2014; Dydia, Lawton, Logan, & Justice, 2014; Lanter, Watson, Erickson, & Freeman, 2012; Rosenberg, 2008; Westerveld, 2017). Taken together the findings from these studies indicate a clear need for inquiries focused on the emergent literacy experience of preschoolers with ASD.

### **Theoretical Framework**

A transactional model of language and vocabulary development guides the current study. Transactional theory proposes that the back and forth interactions between a child and adult build and account for variation in language and vocabulary development, cognition, and social skills development (Sameroff and Friesse, 2000). Existing literature on language development for young children with ASD has shown that parent sensitivity to child attention as well as

prompting that “follows-in” to the child's interest and attention is predictive of later communication outcomes (Haebig, McDuffie, Wiesmer, 2013). Given the nature of the present inquiry, to understand how adult language affects children’s emergent literacy development, a transactional theory is warranted.

Specific supports for oral language learning are important to vocabulary outcomes for children. Research on supporting vocabulary in children with ASD indicates that learning and understanding new words can be supported by acts of joint attention, intentional communication, and the types of language adults use with children during play and other pro-language activities (Toth et al. 2006, Perryman et al. 2013; Siller and Sigman, 2002; 2008; Van Kleeck et al, 1997). Children with high nonverbal cognition, receptive language, sound and word production, symbolic play schemes, and response to bids for joint attention have better language outcomes and thus a better chance of capitalizing on future opportunities to build formal literacy (Thurm et al., 2007; Wetherby et al., 2007).

**Joint attention.** Joint attention is the ability to coordinate attention between people and objects. It is an important milestone in language development (Bakeman & Adamson, 1984; Bruner, 1975). It occurs when an adult and child are focused on the same object or action while communicating with each other (Tomasello, 1995). Exchanges that require joint attention provide a predictable context and meaningful referential information that support children’s language learning (Bakeman & Adamson, 1984; Tomasello & Farrar, 1986). It is through these exchanges that children share achievement, interests, and enjoyment with others (Tomasello, 1995). The development of joint attention is a threshold for several aspects of social and cognitive development (Wetherby, Prizant, and Schuler, 2000). Joint Attention and language skills in preschool predict later vocabulary and reading skills (Sigman & McGovern, 2005).

Difficulty in joint attention is a core feature of ASD (Adamson and Chance, 1998; DSM-5; APA 2013; Wetherby, Prizant, and Schuler, 2000). Bottema-Beutel et al. (2014) divided supported joint attention into two types: higher order and lower order with higher order containing greater reciprocity in toy play and being predictive of expressive language. Only higher order supported joint attention predicted social communication and expressive language. Higher order supported joint attention plus follow-in comments predicted social communication and receptive language (Bottema-Beutel et al. 2014).

**Intentional communication.** Intentional communication during adult-child interactions can take the form of comments, questions, or directives. There is variation in exchanges between caregiver and child during language building activities and caregiver-child interaction style for children with ASD has been observed to vary widely (Siller and Sigman 2002: 2008). This variability is influenced by the parent's ability to direct and maintain a child's focus.

Adamson and colleagues (2009) observed two groups of children over the course of a year for differences in interactions with their caregivers, a group of children with ASD and a group with Down Syndrome with an average age of 30 months. They found differences in how the groups presented in situations that require symbol reinforced joint attention, attending to objects and symbols within a social interaction simultaneously, and those that require attending to an object and language, but not their caregiver. These differences predicted language uniquely over the course of a year. For children with ASD the frequency of symbol infused joint attention uniquely predicted receptive and expressive vocabulary (Adamson et al. 2009). In another study, Hudry and colleagues (2013) observed a group of children and their parents with an interest in parent-child synchrony, that is whether the parent's language supporting behavior was matched with the child's interest or sought to gain the child's interest first. The study was conducted with

151 parent-child dyads. Children were between two and five years old. They found that parents who had greater synchrony with their child's interest and were able to consistently provide prompting had different outcomes. An example of this type of activity from the study would be a mother reflecting her child's actions during unstructured play verbally such as, "You are putting the yellow block on top of the blue one!" Parents that used language that built on their child's interest had children with higher outcomes in receptive and expressive language (Hudry et al. 2013).

The difference in children's ability to respond to their caregivers' attempts for joint attention has long term outcomes for language development. Paul and colleagues (2007) found that children with ASD accepted fewer bids for attention from their mothers and appeared unaware more often than a comparison group of TD children when measuring commenting, requesting, and interacting. These outcomes predicted levels of functioning at age four when measured at age two. In a related study, Paul and colleagues (2008) found that receptive language and stereotypic behaviors (unusual finger and hand mannerisms, atypical sensory habits) made the largest contribution to the overall variance of early language outcomes. From 20 months to 36 months the occurrence of children ignoring attention bids from their parents went from 42% to 57%. Children with high nonverbal cognition, receptive language, sound and word production, symbolic play schemes, and response to bids for joint attention had better outcomes than children who did not. These outcomes predicted levels of functioning at age four when measured at age two (Paul et al. 2008).

**Adult language.** Adult commenting can have a differential effect on language and vocabulary development in activities of joint attention. Adult linguistic input, in particular input that follows a child's lead, is an important consideration when examining the effect adult-child

interactions may have on language acquisition and vocabulary. McCathren, Yoder, and Warren (1995) describe the relationship directives have in developing language in interventions. Three types of adult comments that support joint attention are: (1) those that pertain to a topic that the child is already engaged in, described as “follow-in” (2) those that pertain to a topic that requires the child to first shift their attention and then receive linguistic input, described as “redirectives” and (3) those that are given to an unengaged child or “introductions” (McCathren et al., 1995). They found that language that “follows-in” to children’s joint attention promotes language growth and that “redirectives” which serve the dual purpose of changing the child’s focus of interest and then providing language input on a new topic does not promote language growth or had no effect, and that “introductions”, directives that introduce a new topic, may be neutral in promoting language growth (McCathren et al., 1995).

Several studies have been conducted using this theoretical model as a basis. McDuffie and Yoder (2010) found that parent follow-in comments and follow-in directives uniquely predicted the variance in spoken vocabulary of 32 young children with ASD. Haebig, McDuffie, and Wiesmer (2013) found that language that follows-in to a child's attention has differential effects depending on the initial language level of the child. In a related study, the frequency of parent follow-in comments positively predicted later receptive language skills after considering joint attention and previous receptive language level (Perryman et al. 2013). This inquiry found that very young children (24 months) who were pre-linguistic benefitted from the intervention even after controlling for initial language level and joint attention skills (Perryman et al. 2013).

**Adult language differences.** The language that young children are exposed to can be divided into two large categories, contextualized and decontextualized language. Language that supports tasks immediately present, is termed contextualized language (Snow, 1991). An

example of a contextualized language transaction would be an adult reading a book with a child that displays an elephant drinking water from a stream. The adult prompts the child with the following cloze procedure:

**Adult:** “The elephant is drinking\_\_\_\_\_?”

**Child:** “Water.”

In this example the adults’ language supports the experience of the story within the immediate context being presented on the page. Contextualized language often takes place in settings where the participants can rely on unstated background knowledge and “nonlexical” communication techniques such as gestures (Dickinson & Smith, 1994). The early utterances of children can be linked to the context by the nature of their intent (“da da, mum muh”) and are therefore observable as contextualized by the child and any observer (Snow, 1983).

Decontextualized language refers to language that is not in reference to the immediate context. Decontextualized language has been defined in existing scholarly literature several ways. It has been characterized as abstract conversations of past or future events, semantically abstract conversations surrounding explanations about concepts or phenomena, and extended discourse concerning conversational topics concerned with the nonpresent (Dickinson & Tabors, 2001; Katz, 2001; Rowe, 2012, 2013; Snow, 1983, 1990).

For the purpose of the current study decontextualized language will be used to categorize IBR prompts that reference aspects of the story not present on the page (reference to previous parts of the story or text to life connections). The distinguishing characteristic of these types of prompts is that they require further cognitive processes to situate the child’s thinking in a realm not immediately present or represented on the page of a book or supported with a toy object.

An example of decontextualized language using the previous prop of a storybook depicting an elephant drinking water from a stream is as follows:

**Adult:** “They have elephants at the zoo. Have you ever been to the zoo?”

**Child:** “Yes! My grandmother took me to the zoo last summer”

Adult’s use of language has been shown to yield different outcomes for literacy measures across events that are typically language bolstering (Hart & Risley, 1995). A difference in the type of language used by adults with their preschool aged children has been linked to differential future literacy outcomes as well (Dickinson & Tabors 1991, Snow 1991). Decontextualized language represents a move towards a higher level of language sophistication because language has to rely more on itself and less on context (Ninio & Snow, 1996; Uccelli, Hemphill, Pan, & Snow, 2005). Children’s first experiences with decontextualized language typically commence at age 2 with the emergence of constructed narratives of events past and future as well as pretend play (Ninio & Snow, 1996; Uccelli, Hemphill, Pan, & Snow, 2005). Existing research shows that parents decontextualized discourse increases when children are 14-42 months of age (Rowe, 2012).

**Language and future literacy development.** Though language that is both contextualized and decontextualized is important for development, only decontextualized talk has been linked with future literacy development and school readiness (Dickinson & Tabors, 1991; Norris & Bruning, 1988; Reese, 1995; Snow, 1991). Existing studies suggest that adult caregivers, primarily parents, use a variety of commenting during language building activities (Haden, Reese, & Fivush, 1996; Reese, 1995; Shapiro, Anderson, & Anderson, 1997; Van Kleeck et al., 1997; Van Kleeck, Woude, & Hammett, 2006). Children who are exposed to more decontextualized language use more decontextualized language themselves (Dickinson & Tabors, 2001), and are found to have larger vocabulary, narrative, and syntactic skills between the ages of three and five (Demir et al., 2015; Rowe, 2012; Tabors, Roach, & Snow, 2001). Additionally, parent decontextualized language input is strongly associated with oral language at

kindergarten entry (Cunningham & Stanovich, 1997; Dickinson & Tabors, 2001; Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Durham, Farkas, Hammer, Tomblin, Catts, 2007; Rowe, Raudenbush, & Goldin-Meadow, 2012; Snow, Burns, & Griffin, 1998).

**Shared book reading.** Shared book reading is the most common activity that exposes children to decontextualized language. During shared book reading, understanding the narrative in the immediate context often requires checking information and details that occurred earlier in the story therefore giving way to questions that are targeting aspects of the narrative that are decontextualized (Rosenquest, 2002). Curen-ton and colleagues (2008) examined three different types of common emergent literacy activities, oral storytelling, emergent reading, and shared book reading. They found that shared book reading had the most instances of decontextualized talk from parents.

It is clear from existing research that children with different levels of joint attention capability experience language-building activities during the preschool years with varying outcomes (Kasari et al., 2008; Loveland & Landry, 1986; Mundy, Mundy, Sigman, & Kasari, 1990). These differences are further mediated by the language supports children are given in naturalistic and intervention settings, a child's ability to initiate and sustain joint attention, and the types of adult language children receive during vocabulary building activities. Summarily, these varying experiences result in differential outcomes in vocabulary. The translation of theoretical constructs into practices that adults implement with children is described in the next section. Children who do not have the same exposure to experiences that build their procedural knowledge of literacy and vocabulary through adult child interactions are at risk for language delay and subsequent reading failure. Exposure to these experiences is facilitated by activities of literacy.

## **Interactive Book Reading**

Several activities common to early childhood have shown vocabulary promoting capabilities within the context of back and forth interactions between children and adults. As mentioned previously, core among these activities is the act of sharing a picture book with a child. Children experience different levels of shared book reading during the preschool years. Adams (1990) estimated that some TD children enter school with 1,000 to 1,700 hours of one-on-one book reading while others enter school with many fewer. These differences are greater for children with disabilities who historically have little exposure to shared book reading (Light & Smith, 1993; Marvin, 1994; Marvin & Miranda, 1993). Differences have also been highlighted in the quality of book reading experiences (Scarborough & Dobrich, 1994). The shared book reading experiences of children with significant disabilities are often of lower quality and include less interaction (Koppenhaver, Erickson, & Skotko, 2001; Light, Binger, & Smith, 1994). These differing levels of engagement and interaction have been cited in explaining some of the variance in children's differential emergent literacy outcomes in early childhood (Odom & Wolery, 2003; Warren & Yoder, 1996, Tsybina & Eriks-Brophy, 2010).

**Prompting during IBR.** In previous studies of IBR with TD children, the rates that tutors used the different types of prompts varied (Briesch, Chafouleas, Lebel, & Blom-Hoffman, 2008; Blom-Hoffman, 2008; Wasik & Bond, 2001; Wasik & Hindman, 2013; Whitehurst et al., 1988). Though not all of these studies targeted children with developmental disabilities, they demonstrate that without explicit direction adult caregivers employ prompts at differential rates, which is consequential regarding the emergent literacy outcomes promoted by IBR.

Whitehurst and colleagues (1988) compared the general conversational style and prompting techniques of parents that were trained in IBR, which contained a variety of

questioning, and expansion techniques for use during book reading to increase episodes of oral language practice. They found that the experimental group increased Open-ended questions while decreasing Wh- questions, the former being related to decontextualized language and the later contextualized. The control group's use of Open-ended questioning remained consistent, while they also saw a smaller decrease in Wh- questions (Whitehurst et al. 1988). This change in language type is consistent with findings from previous studies, that adults begin to shift language prompting gradually from contextualized to decontextualized at age 2 (Ninio & Snow, 1996; Uccelli, Hemphill, Pan, & Snow, 2005).

Types of decontextualized prompts have been the focus of several recent studies. In particular, Open-ended questions which generally require a multi-word answer and don't seek simple binary responses (Wasik & Hindman, 2013). These questions initiate episodes that insist children use language in more sophisticated and meaningful ways using more varied and elaborate sentence structures (Tompkins, Zucker, Justice, & Binici, 2013; Wasik & Hindman, 2013). As previously discussed, Open-ended prompts initiate decontextualized language episodes providing an opportunity for developing advanced language (e.g., Dickinson & Smith, 1994; Hindman et al., 2008; Wasik & Bond, 2001).

Several studies of IBR have been completed with the primary purpose of establishing the efficacy of video based training as a practice. These studies are some of the few that report differential levels of prompting techniques utilized by adults and therefore they are discussed in the following section.

Several studies of video training parents in IBR have found that, once trained, parents seem to favor particular prompts over others in independent practice. Crane-Thoresen & Dale (1999) found that when training parents with video they are more likely to use Open-ended and

Wh- prompts. In a comparison of in-person versus video based distance training using The Read Together Talk Together materials, Briesch and colleagues (2008) found that Wh- prompts were used overwhelmingly more, (.76 times per minute) than “Open-ended” questions (.10 times per minute).

Similar to Briesch et al., Blom-Hoffman (2006) compared video training to in-person training and found differences in the prompting used during subsequent IBR sessions. Both groups favored contextualized prompts (the author’s refer to these as “page” prompts) and employed relatively few decontextualized prompts (Recall, Distancing). Each of these inquiries documented a positive effect for language outcomes for the children that were the target of the shared book reading experience. Considering the impact of the specific prompts contained in the intervention package was called for in future inquiry.

### **Adult Prompting and Child Literacy Outcomes**

In a review of existing studies of IBR for children with disabilities, Towson & Gallagher (2016) call for a greater understanding of which prompts affect children with disabilities in which ways. Additionally, they point out that a need exists to determine which aspects of the intervention are suited best to children of varying initial language levels.

Tipton, Blacher, & Eisenhower (2017) performed a factor analysis of parent behaviors during shared book reading and found that parents of children with ASD employ a variety of strategies during shared book reading. They found that absent of direct instruction in strategy use, parents used Wh- questions more than open ended or simple yes/no questions (Tipton, Blacher, & Eisenhower, 2017). Haden, Reese, & Fivush (1996) found that different mothers commented in different ways across different types of books when reading to their typically developing preschool age children. Children who were engaged in more decontextualized

language episodes performed better on vocabulary and language measures than did children who focused primarily on contextualized aspects of the book such as describing a page or answering binary questions (Haden, Reese, & Fivush, 1996). These differences were significant for reading outcomes assessed in children at 70 months.

In an effort to address these important issues and extend our understanding of the active ingredients of IBR and how they mediate child response to the intervention, I have developed two models of how the different prompts relate to growth in child oral language. In Figure 1, I propose that the five types of adult prompting will be related to growth in child oral language with more prompting leading to higher rates of growth. This is supported by previous research on the differential levels of prompting present in various presentations of the IBR intervention. It has been established that emergent literacy skills are modular and often increase when specifically targeted (Blom-Hoffman et al., 2006; Briesch, Chafouleas, Lebel, & Blom-Hoffman, 2008; Crane-Thoresen & Dale 1999; Haden, Reese, & Fivush 1996; Lonigan, Purpura, Wilson, Walker, & Clancy-Menchetti, 2013; Tipton, Blacher, & Eisenhower, 2017; Whitehurst et al. 1988).

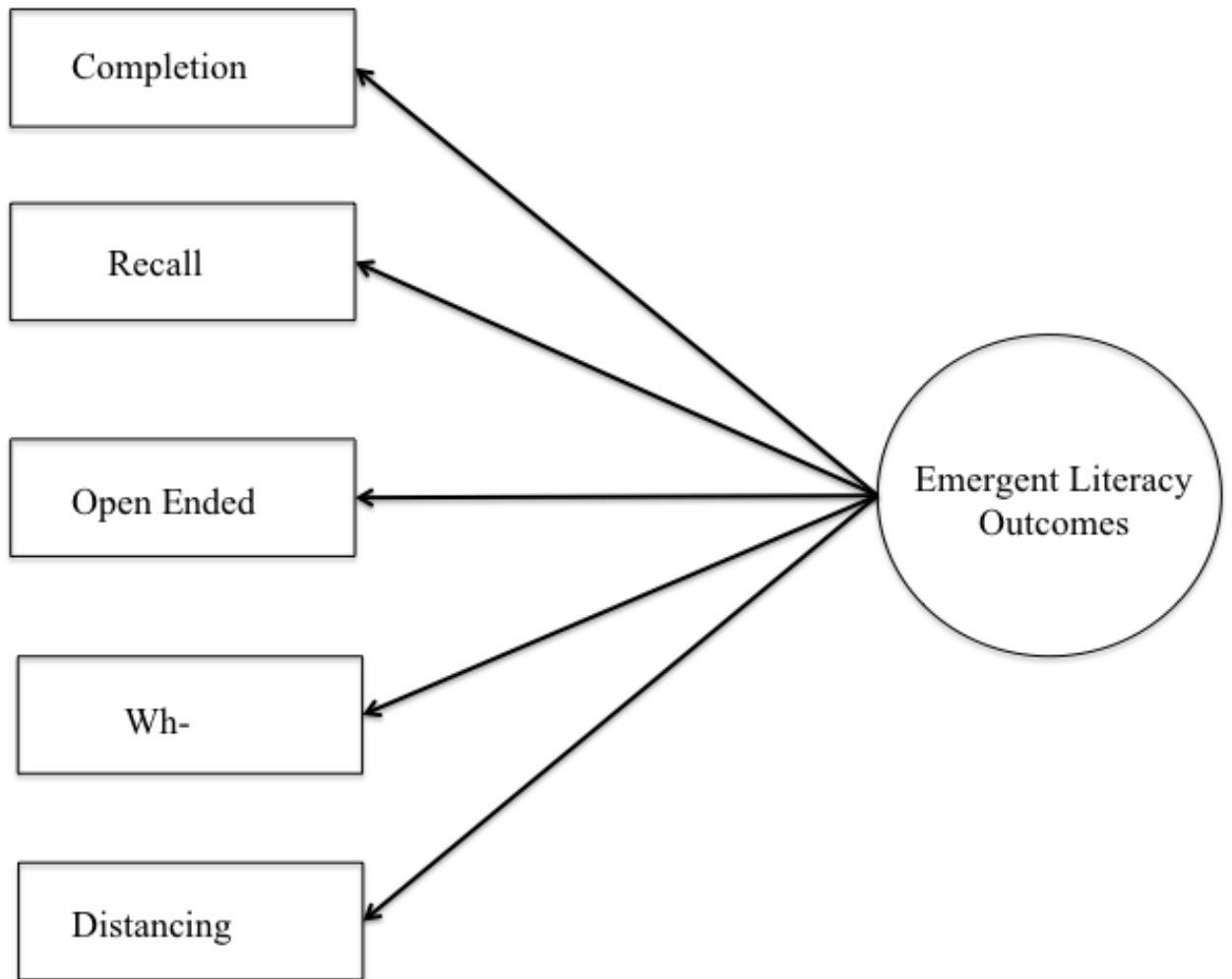


Figure 1. Proposed Relationship Between Adult Prompts and Emergent Literacy Outcomes.

As seen in Figure 2, I further propose that both contextualized and decontextualized prompts will be related to growth in child oral language though perhaps in different ways. Reese (1995) found that the degree of decontextualized language mothers used during shared book reading may vary as a function of the type of comments and questions; for example, comments that ask the child to recall events in his or her life are more decontextualized than comments that ask the child to locate pictures in a book. In Fleury (2014) children responded to all prompts, but less to open ended questions. The response rate varied for children based on their initial level of functioning at the study's initiation. For instance, “Alan” who had borderline adaptive

functioning responded more to Distancing and Recall questions. Whereas, “Nick” who spoke in complete sentences, responded to all prompt types. Frances, who had the most limited level of verbal functioning at the study's outset, responded most readily to Completion prompts and had limited responses to all other types of prompts (0% response to Distancing prompts). Leading one to believe that initial language level may indicate a child’s ability to make use of certain kinds of prompts in the intervention.

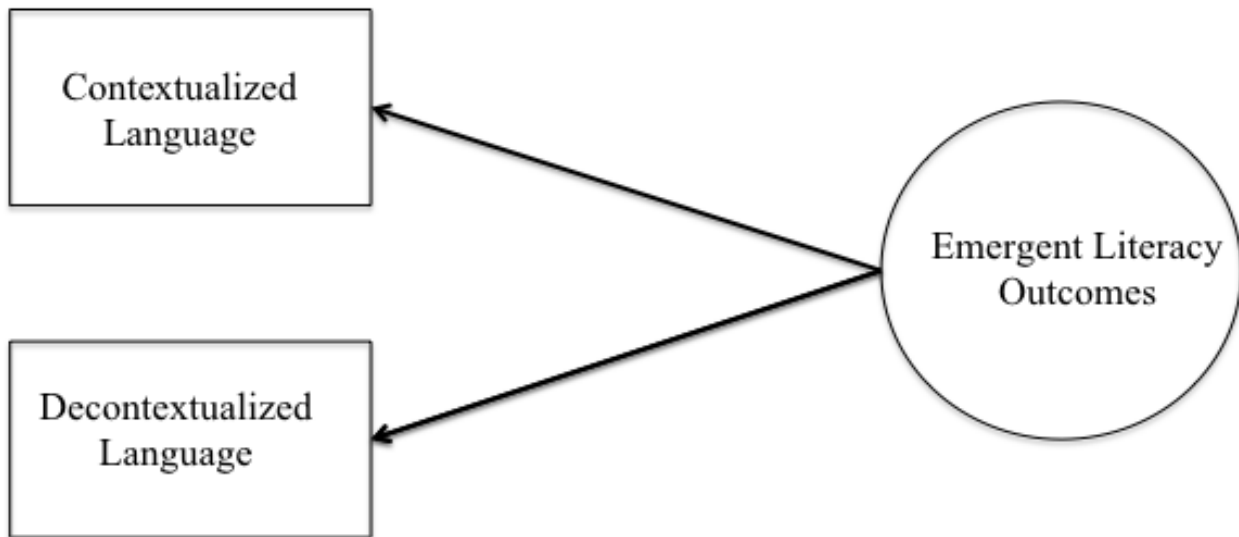


Figure 2. Proposed Relationship Between Adult Language Type and Emergent Literacy Outcomes.

### **Purpose of Study**

The purpose of the present study is to describe and evaluate ways adults affect various aspects of language development during the IBR intervention for a cohort of young children with ASD. Determining the active ingredients of IBR for young children with ASD could have several benefits. It could lead to the development of stronger interventions in reading for young children with ASD and create a clearer path to word reading and comprehension. It could also provide a means for strengthening interventionists’ implementation. Specifically, the following research questions were examined:

1. Within the context of IBR for children with ASD, do tutors have significant variation in prompts per minute (a) across all types of prompting (total prompts per session), and (b) different types of prompting?
  - a. There will be significant variation in total prompts per minute (total prompts per session) because past studies of IBR have demonstrated differential per session total prompt use by adults.
  - b. There will be significant variation in prompts per minute for different types of prompting because past studies of IBR have demonstrated differential use of prompts by adults.
2. Is there a significant change from the beginning to the end of intervention in the number of prompts per minute (a) across all types of prompting, and (b) the two different composites of types of prompting?
  - a. Tutors' prompt use per minute across all types of prompting will show a significant change from beginning to the end of the intervention because past studies have shown adults adjust their use of prompting based on the child's level of engagement during interactive book reading.
  - b. Tutors' prompt use will show significant change for certain types of prompts because children will be more or less responsive to certain kinds of prompts.
3. In the same context, can a two-factor model of language (contextualized and decontextualized prompting) previously used with TD children be replicated in IBR sessions with tutors and children with ASD?
  - a. I predict that particular types of prompting will uniquely predict student emergent literacy outcomes pretest to posttest better than overall prompting because

extant literature demonstrates that certain types of particular language predicts outcomes over and above total language prompts.

4. To what extent do language and emergent literacy skills of children with ASD relate to tutor prompting strategies during an interactive book reading task?

a. I predict that both types of prompting will uniquely predict student emergent literacy outcomes pretest to posttest because extant literature demonstrates that type of language predicts outcomes over and above total language.

## **CHAPTER 3: METHOD**

The purpose of this chapter is to describe the methods and procedures used to conduct the present study. This chapter details: (a) the criteria for selecting participants; (b) a description of the participants based on descriptive and norm based assessments; (c) the setting for the intervention and the materials used; (d) the research design; (e) the independent variables; (f) the dependent variables and observational coding definitions; (g) the research procedures; and (h) the data collection and analysis procedures (i.e., coding, graphing, analyzing intervention data; interobserver agreement).

### **Participants**

Participants for this study are a subset from the Preschool Autism Literacy Study (PALS), a randomized control trial examining the effects of two emergent literacy interventions implemented in early learning classrooms located in a metropolitan area in the Pacific Northwest (Hudson, et al., 2017). The participants in the PALS study were drawn from 32 schools across eight school districts in the Pacific Northwest. PALS investigated the immediate and long-term treatment effects of two early literacy interventions for preschool children with ASD. This study's participants were from the subset of PALS participants who received the Interactive Book Reading (IBR) intervention in years 1 and 3.

In 2013, 2014, and 2015, 151 students with ASD were recruited and their parents consented to their participation in the PALS project. Participants were randomly assigned to conditions across districts. After attrition, the final PALS dataset included 47 students who received the IBR treatment, 42 who received the Phonological Awareness (PA) treatment, and 44 who were assigned to the Business As Usual (BAU) control condition. For detailed information about the procedures for the randomized control trial, refer to Appendix A. For this study, data

from 41 participants in the IBR treatment condition were used in the analysis. Due to attrition six IBR participants were dropped from the final data set.

**Participant inclusion criteria.** Children were included if they met the following criteria: (a) have either a medical diagnosis of autism or an educational identification, (b) have an active IEP and receive services for ASD, (c) be enrolled in their last year of preschool, (d) have no known co-occurring neurological or genetic disorders (e.g., Down syndrome, Fragile X), (e) exhibit functional communication such as the ability to make requests, use 2-3 word phrases, and be able to follow simple directions, and (f) a minimum standard score of 55 on the *One Word Expressive Picture Vocabulary Test*. Additionally, classroom teachers for each child participant were asked to complete the Gilliam Autism Rating Scale -2<sup>nd</sup> ed. (GARS-2) for each of the participating students. Children are rated on three scales stereotyped behaviors, communication, and social interactions.

**Participant demographics.** The demographic characteristics and child language skills of the tutors and children participating in this study were similar to the teachers and children participating in the other two conditions of the RCT. Demographic information for the 41 children used in the present study are presented in Table 1.

Table 1.

*Demographic Data for Child Participants*

Characteristic	N	%
Male	30	75
Asian	8	20
African American	2	5
Hispanic	3	8
Multiracial	8	20
Mean Age at Pretest	55 mo.	

*Note.* N = 41 children across 9 tutors.

Ten tutors served as interactive book reading interventionists (tutors), but only nine had data for use in the present study. All tutors were female and the majority (92%) were Caucasian. All tutors had a 4-year college degree or graduate degree and had previous experience working with children with ASD.

## **Measures**

**Tutor prompting behaviors during sessions.** Data from 82 IBR sessions with 10 tutors and 41 children were collected. All sessions were conducted between the 2012-13 and 2014-15 academic school years. IBR sessions were video recorded two times weekly, during the session that the book was introduced and during the final session for that week. Because tutors varied in how they conducted the book reading sessions, a standardized beginning and end of session was defined. The beginning of the session was defined as when a teacher presented the book or began asking questions about the book and the session was considered over when book related talk had concluded. Average session length was 11.9 minutes with a range of 8 minutes on the low end and 17 minutes being the longest session.

For each video, the researcher or trained assistant coded the number of prompts given by each tutor and the type of prompt (Completion, Recall, Open-ended, Wh-questions, and Distancing). The form used for this data collection was the fidelity checklist developed to measure the fidelity of the intervention for the RCT. The researcher or trained assistant coded: (1) The type of adult language prompt and (2) Student engagement during the back-and-forth interaction for the course of the book. Because the reading sessions varied in length, rate of teacher prompts was calculated by dividing the number of prompts by the number of minutes in the session. An example of this form is found in Appendix B.

**Receptive and expressive vocabulary.** Language was assessed using two measures. Receptive vocabulary was measured using the *Peabody Picture Vocabulary Test-IV* (PPVT-IV

Dunn, & Dunn, 2007). In this test, children point to a picture that best illustrates the meaning of an orally presented stimulus word. The raw score is converted to a norm-referenced standard score although raw scores will be used in this study. Internal consistencies (Cronbach's alpha) computed using our sample's first cohort were 0.98 at pretest and 0.96 at posttest. Expressive vocabulary was assessed using The *Expressive One-Word Picture Vocabulary Test-IV* (EOWPVT-IV; Brownell, 2011). For this test, children are presented with pictures and are asked to orally provide the names of the pictures. The raw score is converted to a norm-referenced standard score which will be used in this study. Sample-based internal consistencies using Cohort 1 were 0.95 for pretest and 0.96 for posttest.

**Phonological awareness.** Phonological Awareness (PA) was measured using the *Test of Preschool Early Literacy-TOPEL* (Lonigan et al., 2007), which is a standardized assessment designed to identify preschoolers who are at risk for literacy problems that affect reading and writing. The TOPEL was administered to participants prior to intervention and again after intervention. According to the test manual (Lonigan et al., 2007) internal consistency reliability measures for the three subtests ranged from .86 to .96 for their sample of 3 to 5-year-olds. Test-retest reliability for a one to two-week period ranged from .81 to .89. Concurrent validity for the subtests ranged from .59 to .77. The composite Emergent Literacy index produced an internal consistency reliability of .96.

**Child engagement during sessions.** Each video session was also coded for child engagement during the session by the researcher or the researcher's assistant using partial interval recording. Within each 15-second period, it was noted whether the student was actively engaged or not. Active engagement was defined as behaviors such as looking at the object of importance, pointing, speaking about a topic related to the story, or looking at the tutor.

Nonengagement was defined as behavior such as looking away from the activity or tutor, speaking about an unrelated topic, pushing the book away, or playing with an object unrelated to the story being read.

***Interobserver agreement.*** Two coders used the tutor prompting and child engagement coding definitions to code videotapes using a coding checklist adapted from Whitehurst (1988) and Fleury (2014) until they reached a minimum of 80% agreement on three out of five consecutive videos. Once reliable, a randomly selected 30% of sessions were coded a second time by to establish interrater reliability. Reliability was calculated by dividing the number of agreements by the number of agreements plus the number of disagreements multiplied by 100. Interobserver agreement was calculated for each participant, and averages were 95% to 97% (range = 80%–100%) for responses, 95% to 98% (range = 75%–100%) for verbal initiations, and 89% to 96% (range = 75%–100%) for nonverbal initiations.

### **Interactive Book Reading Intervention**

**Procedures.** Tutors were trained in the IBR interventions in two small group didactic trainings over consecutive days. In addition, graduate research assistants provided additional trainings to clarify individual questions. Coaching and feedback were provided bi-weekly during the intervention period. A research team member met with each tutor at the intervention site to troubleshoot and observe that the intervention was being delivered with fidelity in the manner intended. The team member reviewed the specific IBR techniques and coached tutors in accurate prompting, appropriate wait time, and matching the intervention to the individual child to maximize engagement and ensure consistent implementation. Issues of engagement and challenging behavior were the most common issues that arose. In addition to standard activities that were part of the child's daily routine, novel materials were provided to keep children

engaged in the intervention procedures.

Tutors worked with an average of three children and worked with the same children throughout the year of the intervention implementation. IBR sessions were scheduled to occur four times per week during a time determined by the preschool teacher to be the least disruptive to the child's existing school programming. Each session lasted 7-15 minutes. Each child received an average of 56 sessions of the IBR intervention. Tutors were instructed to prompt children at least once every 2-3 pages.

**Setting.** All intervention sessions took place in inclusive preschool classrooms across schools located within or near and large Metropolitan City in the Pacific Northwest. The composition of the classrooms varied widely ranging from those that had equal numbers of typically developing children with children with developmental disabilities two classrooms that had only children who were receiving early intervention services. The majority of children also attended a half-day program designed to meet the needs of young children with ASD.

**Prompting strategies.** Two acronyms encompass the prompting strategies governing adult directives in the original RCT. They are adapted from Whitehurst (1988) and are similar to the procedures from Fleury (2014). They are PEER, CROWD, and a third group referred to as CROWD + prompts. The PEER acronym stands for prompt, evaluate, expand, and repeat. They refer to the steps of the prompting hierarchy. The CROWD acronym stands for Completion, Recall, Open-ended, Wh-, and Distancing. These terms refer to the different types of adult prompting in the IBR intervention. Completion prompts aim to increase the child's attention during reading. An example would be an adult providing the prompt, "He ran through the \_\_\_\_\_?" and the expected response from the child would be, "woods". Recall prompts facilitate text to self-connections. An example would be the adult asking a question such as, "Do

you remember the boy’s name?” The expected response from the child would be the name of the male character being referred to, which is not available specifically on the page being read, but requires that the child “Recall” a detail from the story previously read. An Open-ended prompt is, as its name indicates, a broad inquiry raised by the adult reading partner referring to events or story action currently in the dyads realm of focus. An example would be an adult asking, “what’s going on here on this page?” immediately after she has turned the page of the book. A Wh-prompt elicits details from the page being viewed and provides the opportunity for oral language practice and vocabulary building. The adult may ask, “What is the boy doing?” A Distancing prompt is an opportunity for a text to life or text to self connection. In a book that has action that takes place in a zoo the adult may ask, “Have you ever been to the zoo?”

An example of CROWD prompting in an authentic context is presented in Figure 3: (1) The adult ensures the child's interest is fixated on the book through eye gaze. (2) She reads the words on the page, “Goodnight gorilla.” (3) she prompts the child, “ what is the gorilla doing?” (4) She pauses and waits for the child to respond (“He is reaching for the man’s keys”) (5) She evaluates, expands, and repeats the child's response, “that's right he is reaching for the man’s keys. He wants to get out of the cage.”

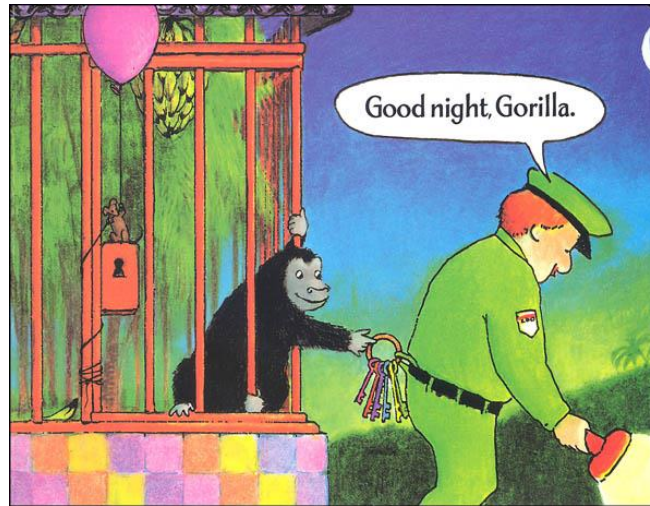
Figure 3.

*Tutor Prompting Types*

Category	Support	Definition	Example
Contextualized	Completion	Adult prompts child to fill in omitted word	“The Gorilla is reaching for the___?”
Contextualized	Open-ended	Adult prompts the child generally to some aspect of the narrative on the current page	“What do you see on this page?”
Contextualized	Wh-	Adult prompts the child to a specific vocabulary concept on the current page	“What is the gorilla reaching for?”
Decontextualized	Recall	Adult prompts the child to a event that occurred in	“How did the gorilla get

		the story previously	out of the cage?"
Decontextualized	Distancing	Adult prompts the child to make a connection from the story to their own life	"Have you ever been to the zoo at night?"

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*Taken from Rathmann, P. (1994). Good Night, Gorilla. New York: G. P. Putnam's Sons.*

The proposition this study makes is that these prompts can be divided into two categories: prompts that lead to contextualized discourse and prompts that lead to decontextualized discourse. The contextualized prompts consisting of the Completion, Open-ended, and wh-prompts in the CROWD hierarchy and the decontextualized prompts consisting of Recall and Distancing prompts. The division between the two types of prompts delineates between intervention-specific language that have to do with elements of the book that are in the immediate context being discussed ("What does the Gorilla do with the keys in the picture?) and that follow-in to the child's current focus contrasting with language that asks the child to focus on an alternate sphere of focus and thus requiring more abstract higher order thinking. In the case of the intervention specific prompts within The IBR intervention, the Recall and Distancing prompts ask the child to remember a previous episode in the narrative ("Why is the gorilla in the cage?") and to make a text-to-life connection ("Have you ever been to the zoo at night?").

## **Data Analysis Plan**

**Missing data.** For brevity, participants who were missing data for the IBR intervention or who were missing the majority of data across IBR sessions were treated as “missing at random,” and subsequently excluded from analyses. Recall that the final data used in analysis included nine tutors and their 41 children; all children received a uniform IBR intervention, but tutors were free to employ whatever tutor prompts they chose in interacting with the children.

**Research question 1.** To answer the question, “Do tutors have significant variation in prompts per minute (a) across all types of prompting (total prompts per time), and (b) different types of prompting?”, a series of one-way random effects analysis of variance with tutor as the random factor (9 tutors) was employed on prompt use per minute (rate) for each of the five types of prompts as well as combined to test whether there was significant non-zero between-tutor variation across 41 tutor-student pairs.

**Research question 2.** Data was then aggregated (i.e., average across each tutors’ students) at the tutor level (9 tutors) to conduct three 1-group hypothesis *t*-tests comparing change from session 1 to session 2 on total prompt use (averaged across all prompt types) as well as each of the two composite prompt types (contextualized and decontextualized derived from the literature on language development). The focus was to evaluate evidence of nonzero change from session 1 to session 2.

**Research question 3: Validity of language composites.** Recall that the intervention employed five language prompts that tutors employed during the intervention sessions, with a hypothesized effect on two different dimensions of language categories (see again Figure 3 for prompt definitions and examples). For example, within the Contextualized construct, the Completion prompt engages the child in a cloze procedure when the tutor presents a prompt to

the child: “He ran through the \_\_\_\_\_?” and the expected response from the child would be: “woods”. The focus of research question 3, “To what extent do language and emergent literacy skills of children with ASD relate to tutor prompting strategies during an interactive book reading task?”, was thus evaluated using exploratory factor analytic methods. Specifically, the aim of this research question was to determine if the CROWD prompts were best described by a 2-factor model (evidence to support the language development literature that Contextualized and Decontextualized factors were present in the prompt types used during the IBR intervention) or whether a single factor was a more appropriate representation of the data.

Generally speaking, an exploratory factor analysis (EFA) analyzes patterns of correlations among many variables (in this case, the five CROWD prompts) that are thought to reflect a smaller set of distinct, underlying processes (also known as “factors”; in this case, the two underlying language composites) (cf., Tabachnick & Fidell, 2007). General rules of thumb for EFA sample size ratios vary from 20 subjects per variable to 2 subjects per variable. Although the present analysis was limited to a sample size of 41 child-tutor pairs, with 5 items ( $N:p$  ratio of approximately 8:1) for the EFA, the impact of having fewer subjects than would be desired for psychometric measure development simply limits generalization of EFA results (i.e., the EFA’s results are prone to be sample-specific).

Several choices also exist among EFA estimation and rotation algorithms. The EFA analyses in the present study used maximum likelihood estimation (i.e., maximizing the probability that the observed item correlations are sampled from the model-implied parameters; cf., Tabachnick & Fidell, 2007) and a Varimax orthogonal rotation. All orthogonal rotations for EFAs have the advantage of preserving estimated item-item relationships while aiding in the

interpretation of results by geometrically shifting axes simultaneously in space so that factor item relationships are as close as possible to respective factor axes; however, Varimax is the recommended orthogonal rotation because it minimizes the complexity of factors by maximizing the variance of the item-factor relationships for each factor (Tabachnick & Fidell, 2007).

For the present study, I modeled the data using a 1- and 2-factor EFA with Varimax rotation. A model fit test, in concert with descriptive statistics from item communalities and factor loadings, was used to determine the best fitting EFA model. In addition, results from these analyses were used to determine which prompt type or prompt composite to include in testing the links between prompt use and child outcomes.

**Research question 4: Modeling tutor prompt use.** To answer research question 4 which focuses on how prompt use during intervention related to child literacy outcomes, two-level multilevel linear modeling (also known as “hierarchical linear modeling”) was used. Specifically, multilevel modeling can take into account the dependencies of children’s outcomes (Level 1,  $n = 41$ ) within their tutors (Level 2,  $n = 9$ ). Not addressing the potential nesting (non-independence) can lead to severely inflated Type I error rates when testing the relationships among variables, particularly when the variables are at different levels of a hierarchy such as in the current data (e.g., Raudenbush & Bryk, 2001).

Prior to analysis, intraclass correlations (ICC) were obtained using intercept-only model results for each outcome (ICC = variance between tutors divided by total variance). Next, a series of three models were conducted for each of the four child-level outcomes (outcomes were pretest-posttest change on receptive and expressive vocabulary, as well as pretest-posttest change on print knowledge and phonological awareness). (I note here that the results of the EFAs that will be shown shortly revealed that two of the prompt types – completion and distancing – were

marked contributors in the factor model and thus became the focal predictors for research question 4).

The first model (Model 1) tested mean tutor completion prompt per minute's effect, controlling for child pretest, on child pretest-posttest gains. Next, the second model (Model 2) tested tutor distancing prompt per minute's effect, controlling for child pretest, on child gains. Finally, Model 3 tested the effect of both completion and distancing prompt use, again controlling for child pretest, on child gains. In each of these models, the two prompt type per minute variables were standardized (z-scored) and tested at the tutor level, and student pretest was standardized (z-scored) and tested at the student level. All model parameters were estimated with full maximum likelihood. Models were specifically as follows:

$$\text{Model 1: } \textit{Pre-Post Gain}_{ij} = \gamma_{00} + \gamma_{10} * \textit{Pretest}_{ij} + \gamma_{01} * \textit{Completion}_j + U_{0j} + r_{ij}$$

$$\text{Model 2: } \textit{Pre-Post Gain}_{ij} = \gamma_{00} + \gamma_{10} * \textit{Pretest}_{ij} + \gamma_{01} * \textit{Distancing}_j + U_{0j} + r_{ij}$$

$$\text{Model 3: } \textit{Pre-Post Gain}_{ij} = \gamma_{00} + \gamma_{10} * \textit{Pretest}_{ij} + \gamma_{01} * \textit{Completion}_j + \gamma_{02} * \textit{Distancing}_j + U_{0j} + r_{ij}$$

## **Statistical Software**

*IBM SPSS 19* was used to analyze data for research questions 1 through 3; *HLM 7* (Raudenbush, Bryk, & Congdon, 2004) was used to analyze data for research question 4.

## CHAPTER 4: RESULTS

### Descriptive Statistics

Since tutors were not given direct instruction on how to read with the child, it is important to see the means and variance of each prompt type that was naturally observed in the setting. These results, disaggregated as child-tutor pairs, are provided in Table 2 for each of the two sessions that tutors were observed.

Table 2.

*Tutor Prompt Per Minute (Rate) by Type and Total across Session 1 and 2*

Tutor	No. Children	Completion Rate		Recall Rate		Open-ended Rate		Wh- Rate		Distancing Rate	
		<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>
1	8	0.21	(0.19)	0.13	(0.07)	0.14	(0.05)	0.84	(0.45)	0.23	(0.17)
2	7	0.74	(0.45)	0.18	(0.06)	0.18	(0.12)	0.91	(0.39)	0.38	(0.17)
3	3	0.36	(0.34)	0.00	(0.00)	0.00	(0.00)	1.89	(1.62)	0.13	(0.13)
4	3	1.15	(0.63)	0.03	(0.06)	0.32	(0.20)	1.05	(0.28)	0.12	(0.10)
5	1	0.23	NA	0.18	NA	0.05	NA	1.62	NA	0.17	NA
6	3	0.24	(0.24)	0.18	(0.13)	0.00	(0.20)	1.28	(0.28)	0.12	(0.10)
7	5	0.45	(0.19)	0.07	(0.10)	0.15	(0.12)	1.32	(0.64)	0.21	(0.34)
8	6	1.61	(0.74)	0.21	(0.21)	0.21	(0.25)	2.06	(0.49)	0.30	(0.20)
9	5	0.54	(0.52)	0.14	(0.07)	0.07	(0.07)	1.12	(0.77)	0.16	(0.08)
Total	41	0.61	(0.41)	0.13	(0.09)	0.12	(0.13)	1.34	(0.61)	0.20	(0.16)

*Note.*  $N = 41$  children across 9 tutors.

**Question 1: Do Tutors Vary in their Prompt Per Minute Use Rates when providing IBR Intervention to Preschoolers with ASD?**

In order to answer this question, I conducted one-way, between-subjects, random effects analyses of variance on the averages across sessions on tutor prompt use per minute for each of the five prompt types as well as across all prompts (total), and found significant tutor variation on completion prompt use per minute,  $F(8, 32) = 5.04, p < .001$ , and total prompt use per minute,  $F(8,32) = 2.96, p = .010$ . In other words, tutors varied substantially on completion and total prompt use rate with some using them more often and some using them less often.

**Question 2: Do Tutors Change their Prompt Type per Minute Use Rates across Sessions 1 and 2 when providing IBR Intervention to Preschoolers with ASD?**

**Tutor prompting across sessions.** A series of 1-group *t*-tests on total prompt use (across all types as well as the two composites) for the nine tutors was conducted to test whether the change in average prompts per minute was significantly greater than a no change from session 1 to session 2. Results are displayed in Table 3. As can be seen, there were no significant differences between sessions. This supports that the mean prompt use per minute across session can be used, rather than as separate time points data for subsequent modeling.

Table 3.

*Mean Tutor Prompting Rates by Session and Change over Time*

Prompt	Session 1		Session 2		Session 1-2 Change			
	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>t</i> (8)	<i>p</i>
Completion	0.62	(0.43)	0.61	(0.61)	-0.02	(0.45)	-0.13	0.897
Recall	0.16	(0.12)	0.09	(0.07)	-0.07	(0.12)	-1.83	0.104
Open-Ended	0.09	(0.10)	0.16	(0.14)	0.07	(0.11)	1.95	0.087
Wh-	1.51	(0.71)	1.18	(0.50)	-0.33	(0.88)	-1.13	0.293
Distancing	0.20	(0.10)	0.20	(0.13)	-0.01	(0.15)	-0.12	0.911
Contextualized	0.74	(0.29)	0.65	(0.33)	-0.09	(0.33)	-0.84	0.423

Decontextualized	0.18	(0.08)	0.14	(0.09)	-0.04	(0.08)	-1.53	0.166
Total	2.60	(0.88)	2.23	(1.03)	-0.36	(1.00)	-1.08	0.314

Note.  $N = 9$  tutors; aggregate prompt per use for each tutor shown for each session..

### Question 3: Does a Two-Factor Language Development Model Fit the Tutor Prompt Type per Minute Use with Preschoolers with ASD?

Recall that this analysis employed exploratory factor modeling to determine the number and nature of factors underlying the five types of tutor CROWD prompts. Given that research question 2 showed no evidence of differences between session 1 and session 2, I used the average across sessions for this analysis. Additionally, I used the child-tutor pairs in the analysis (rather than the tutor-level aggregates) due to the small tutor-level sample size. Specifically, for this analysis the interest was in whether a two-factor model of language (contextualized and decontextualized prompting) that was previously used with typically developing children would be replicated in a context in which tutors were using interactive book reading (IBR) with young children with ASD.

Results, displayed in Table 4, showed that a 2-factor model fit the prompt items well,  $\chi^2(1) = 3.57, p = 0.06$  (i.e., the reproduced correlations among the give prompt types did not differ significantly from the original correlations); in comparison, a 1-factor model did not fit the data well,  $\chi^2(5) = 13.89, p < 0.02$ .

Table 4.

#### *Exploratory Factor Analysis Results of Prompt Type Per Minute Rates*

Prompt Type	Communalities	Factor 1 Contextualized	Factor 2 Decontextualized
1 Completion	>0.99	<b>0.99</b>	0.15
2 Recall	0.24	0.12	<b>0.47</b>
3 Open-Ended	0.47	<b>0.64</b>	0.24

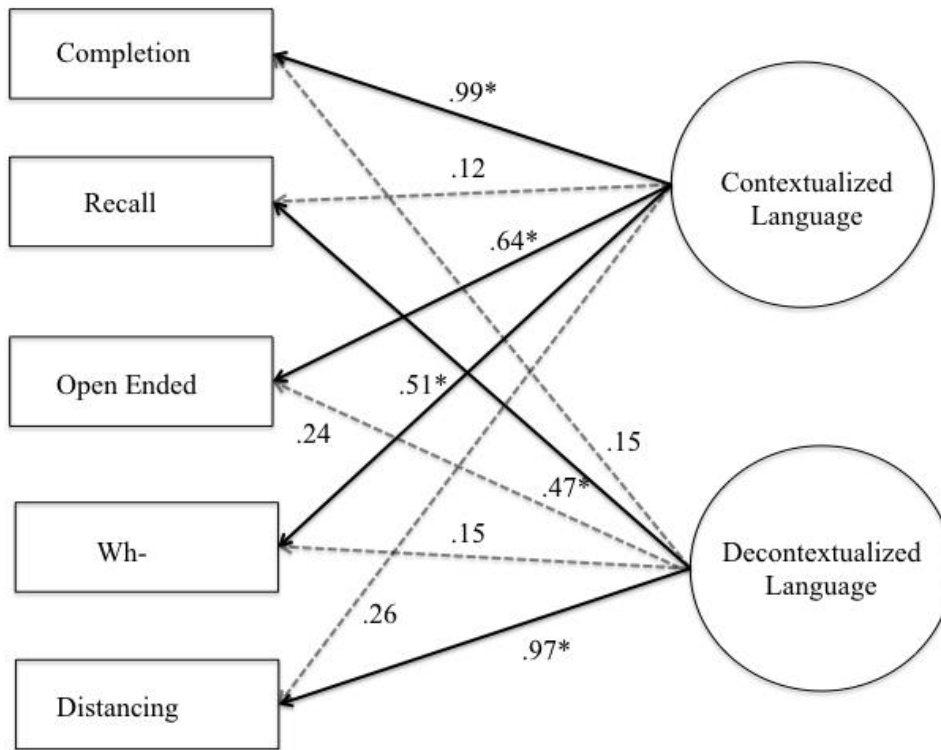
4	Wh-	0.28	<b>0.51</b>	0.15
5	Distancing	>0.99	0.26	<b>0.97</b>
<i>Unrotated Variance Accounted For</i>			44%	16%
<i>Varimax Rotated Variance Accounted For</i>			34%	25%

*Note.*  $N = 41$  child-tutor pairs across 9 tutors; estimates derived using maximum likelihood with Varimax rotation; statistically significant loadings at .05 level in bold.

Importantly, as can be seen in Table 4, the three prompt types anticipated to load onto the Contextualize factor did so (completion, open-ended, and wh- prompts), and the two hypothesized to contribute to Decontextualized language prompts matched onto that factor well (recall and distancing). (See Figure 4 for path diagram representation of the factor loadings.) This said, as can also be seen in Table 4, only one item was truly the “driver” behind each factor (with near-perfect correlations above 0.90): for the Contextualization factor, the completion prompt loaded heavily; for the Decontextualization factor, the distancing factor loaded heavily. Given this striking result, coupled with the reality of my small sample size (41 children and 9 tutors), I used the two individual prompts (representing the two language factors, respectively), rather than composites based on the prompts that loaded significantly onto each factor, to maximize power in the subsequent multilevel models (research question 4.).

Figure 4.

*Rotated Loading Values for each Prompt Type by Language Factor*



**Question 4: What is the Relationship between Rates of Tutor Prompt Use Per Minute and Emergent Literacy and Language Skill Growth for Preschoolers with ASD?**

**Descriptive Analyses**

To determine the extent to which rates of use of the two key tutor prompting strategies (during interactive book reading) identified in my prior analyses (completion and distancing) were associated with growth in language and emergent literacy skills of preschoolers with ASD, I conducted a series of multilevel linear regression models.

**Child Outcome Means and Standard Deviations.** Child pretest-posttest observed means and standard deviations for each testing period are provided in Table 5 below. Recall that all children received interactive book reading (IBR) intervention.

Table 5.

*Descriptive Statistics for Child Measures across IBR Intervention Period*

Measure	Pretest (Fall)		Posttest (Spring)		Pre-Post Gain	
	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>
EOWVT	86.85	21.72	93.12	21.40	4.54	10.34
PPVT	81.32	17.93	89.76	17.93	8.44	11.94
TOPEL PK	98.46	26.70	103.39	20.07	1.37	10.42
TOPEL PA	71.10	22.80	81.73	25.88	10.15	13.81

*Note.*  $N = 41$  children across 9 tutors. . EOWVT = *Expressive One Word Vocabulary Test IV*; PPVT = *Peabody Picture Vocabulary Test IV*; TOPEL PK = *The Test of Preschool Emergent Literacy Print Knowledge*; TOPEL PA = *The Test of Preschool Emergent Literacy Phonological Awareness*; Gain = pretest-posttest standard score gain. Correlations in bold are significant at the .05 level.

**Intraclass correlation coefficients.** In addition to computing the descriptive statistics, I also computed intraclass correlations (ICC) for both tutor prompt type rates and child pretest-posttest scores using estimates from intercept-only two-level random effects models with  $n = 41$  child-tutor pairs and  $n = 9$  tutors. As can be seen in Table 6, ICCs ranged from .08 to .45 for the five prompting types and composites (mean ICC = .20). Across child outcomes, ICCs ranged from .00 to .16, and averaged .07 (see Table 7).

Table 6.

*Tutor ICCs for Prompt Types across Children*

Prompt Type	Between Tutors	Within Tutors	Total Variance	ICC
Completion	0.17	0.20	0.37	0.46
Recall	0.00	0.01	0.01	0.00
Open-ended	0.00	0.02	0.02	0.00
Wh-	0.10	0.40	0.50	0.20
Distancing	0.00	0.02	0.02	0.00
Contextualized Composite	0.05	0.11	0.16	0.31
Decontextualized Composite	0.00	0.02	0.02	0.00

*Note.*  $N = 41$  children across 9 tutors.

Table 7.

*Tutor ICCs for Child Pre-Post Gains*

Measure	Between Tutors	Within Tutors	Total Variance	ICC
EOWVT	0.16	106.25	106.41	0.00
PPVT	0.05	139.16	139.21	0.00
TOPEL PK	18.82	96.26	115.08	0.16
TOPEL PA	18.76	173.71	192.47	0.10

*Note.*  $N = 41$  children across 9 tutors. EOWVT = *Expressive One Word Vocabulary Test IV*; PPVT = *Peabody Picture Vocabulary Test IV*; TOPEL PK = *The Test of Preschool Emergent Literacy Print Knowledge*; TOPEL PA = *The Test of Preschool Emergent Literacy Phonological Awareness*; Gain = pretest-posttest standard score gain. Correlations in bold are significant at the .05 level.

**Correlations.** Finally, I also computed zero-order correlations among the 10 variables that I used in the forthcoming multilevel models. These variables included the mean tutor prompt per minute rate of the completion and distancing prompts, as well as children’s fall pretest scores and children’s fall-spring pretest-posttest gains. As can be seen in Table 8, the correlations between tutor completion prompting was significantly positively related to three of the four child gains (receptive language, print knowledge, and phonological awareness), whereas distancing prompting was not significantly related to any of the four child gains. As would be expected, for three of the four measures, higher levels of pretest correlated negatively with growth in their respective measures (i.e., the higher children started, the less room for growth). The exception to this was for expressive language, which had a small, nonsignificant positive correlation between pretest and growth. Finally, it is also noteworthy that the two prompt types themselves had a small positive (albeit nonsignificant) correlation of  $r = 0.18$ .

Table 8.

*Disaggregated Correlations across Variables used in Multilevel Models*

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Tutor Mean Completion Prompt Rate	--								
2. Tutor Mean Distancing Prompt Rate	.18	--							
3. EOWVT Pretest	.13	<b>.50</b>	--						
4. PPVT Pretest	.00	<b>.46</b>	<b>.76</b>	--					
5. TOPEL PK Pretest	.01	.02	<b>.49</b>	<b>.35</b>	--				
6. TOPEL PA Pretest	.21	<b>.58</b>	<b>.74</b>	<b>.76</b>	<b>.47</b>	--			
7. EOWVT Pretest-Posttest Gain	-.09	.02	.18	.29	.21	.29	--		
8. PPVT Pretest-Posttest Gain	<b>.32</b>	.09	.09	-.33	.07	-.02	.29	--	
9. TOPEL PK Pretest-Posttest Gain	<b>.41</b>	.19	-.18	.01	<b>-.57</b>	-.15	.05	.00	--
10. TOPEL PA Pretest-Posttest Gain	<b>.37</b>	-.13	-.08	-.25	-.06	-.29	.18	<b>.53</b>	.24

Note.  $N = 41$  children across 9 tutors. Prompt Variables are averages across two observation sessions and are in prompt per minute rates; EOWVT = *Expressive One Word Vocabulary Test IV*; PPVT = *Peabody Picture Vocabulary Test IV*; TOPEL PK = *The Test of Preschool Emergent Literacy Print Knowledge*; TOPEL PA = *The Test of Preschool Emergent Literacy Phonological Awareness*; Gain = pretest-posttest standard score gain. Correlations in bold are significant at the .05 level.

**Multilevel Model Results.** Multilevel modeling results are provided in Tables 9-12 by child outcome, including expressive language (EOWVT), receptive language (PPVT), print knowledge (TOPEL PK), and phonological awareness (TOPEL PA), respectively. Recall that, for each outcome, I employed three models: Model 1 tested the relationship between tutor completion prompting rate and child gains, controlling for child pretest; Model 2 tested the relationship between distancing prompting rate and child gains, controlling for child pretest, and Model 3 combined Models 1 and 2 to test the unique relationships of the two prompt types on child outcomes, controlling for pretest. After showing the tables I explain the model results..

Table 9.

*Multilevel Modeling Results for Child EOWVT Pre-Post Gain*

<i>Fixed Effects</i>	Model 1					Model 2					Model 3				
	<i>Coeff</i>	<i>SE</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>Coeff</i>	<i>SE</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>Coeff</i>	<i>SE</i>	<i>t</i>	<i>df</i>	<i>p</i>
Intercept (Mean)	4.87	2.59	1.88	7	.102	4.91	2.59	1.90	7	.099	5.03	3.07	1.64	6	.152
Completion	-0.94	2.68	-0.35	7	.737						-0.76	3.42	-0.22	6	.831
Distancing						-0.83	2.75	-0.30	7	.772	-0.51	3.50	-0.15	6	.890
Student Pre	2.56	1.77	1.45	30	.158	2.70	1.87	1.45	30	.158	2.72	1.86	1.46	30	.155
<i>Random Effects</i>	<i>Var</i>	<i>Chi-Sq</i>	<i>df</i>	<i>p</i>	<i>Var</i>	<i>Chi-Sq</i>	<i>df</i>	<i>p</i>	<i>Var</i>	<i>Chi-Sq</i>	<i>df</i>	<i>p</i>			
Tutors	35.28	17.34	7	.015	33.58	17.51	7	.014	58.20	17.81	6	.007			
Students	91.15				91.78				88.32						
No. Param	2				2				2						
Deviance (-2LL)	287				287				285						

*Note.*  $N = 41$  students across 9 tutors. EOWVT = *Expressive One Word Vocabulary Test IV*; Gain = pretest-posttest standard score gain.

Table 10.

*Multilevel Modeling Results for Child PPVT Pre-Post Gain*

<i>Fixed Effects</i>	Model 1					Model 2					Model 3				
	<i>Coeff</i>	<i>SE</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>Coeff</i>	<i>SE</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>Coeff</i>	<i>SE</i>	<i>t</i>	<i>df</i>	<i>p</i>
Intercept (Mean)	8.09	1.70	4.75	7	.002	7.28	1.84	3.97	7	.005	7.46	1.80	4.14	6	.006
Completion	3.90	1.73	2.26	7	.059						3.05	1.91	1.60	6	.161
Distancing						3.70	1.97	1.88	7	.103	2.25	2.13	1.05	6	.333
Student Pre	1.94	1.72	-2.32	31	.027	-5.67	1.97	-2.88	31	.007	-5.01	1.97	-2.54	31	.016
<i>Random Effects</i>	<i>Var</i>	<i>Chi-Sq</i>	<i>df</i>	<i>p</i>	<i>Var</i>	<i>Chi-Sq</i>	<i>df</i>	<i>p</i>	<i>Var</i>	<i>Chi-Sq</i>	<i>df</i>	<i>p</i>			
Tutors	0.03	1.64	7.00	>.500	0.07	4	7	>.500	0.03	1.11	6	>.500			
Students	117.74				122.19				117.41						
No. Param	2				2				2						
Deviance (-2LL)	300				301				294						

*Note.*  $N = 41$  students across 9 tutors. PPVT = *Peabody Picture Vocabulary Test IV*; Gain = pretest-posttest standard score gain.

Table 11.

*Multilevel Modeling Results for Child TOPEL PK Pre-Post Gain*

<i>Fixed Effects</i>	Model 1					Model 2					Model 3							
	<i>Coeff</i>	<i>SE</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>Coeff</i>	<i>SE</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>Coeff</i>	<i>SE</i>	<i>t</i>	<i>df</i>	<i>p</i>			
Intercept (Mean)	1.17	1.83	0.64	7	.545	1.19	2.37	0.51	7	.629	1.02	1.68	0.61	6	.567			
Completion	4.69	1.87	2.51	7	.040						4.08	1.15	3.54	6	.106			
Distancing						3.18	2.42	1.31	7	.231	1.61	1.43	1.13	6	.478			
Student Pre	-6.68	1.30	-5.13	28	<.001	-6.87	1.30	-5.28	28	<.001	-6.77	0.92	-7.38	28	<.001			
<i>Random Effects</i>	<i>Var</i>		<i>Chi-Sq</i>		<i>df</i>	<i>p</i>	<i>Var</i>		<i>Chi-Sq</i>		<i>df</i>	<i>p</i>	<i>Var</i>		<i>Chi-Sq</i>		<i>df</i>	<i>p</i>
Tutors	16.02		15.26		7	.032	35.44		24.34		7	.001	19.49		14.11		6	.028
Students	51.53						50.16						51.07					
No. Param	2						2						2					
Deviance (-2LL)	252						254						249					

*Note.*  $N = 41$  students' across 9 tutors. TOPEL PK = *Test of Preschool Emergent Literacy Print Knowledge*; Gain = pretest-posttest standard score gain.

Table 12.

*Multilevel Modeling Results for Child TOPEL PA Pre-Post Gain*

<i>Fixed Effects</i>	Model 1					Model 2					Model 3				
	<i>Coeff</i>	<i>SE</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>Coeff</i>	<i>SE</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>Coeff</i>	<i>SE</i>	<i>t</i>	<i>df</i>	<i>p</i>
Intercept (Mean)	10.70	1.96	5.45	7	.001	11.41	2.62	4.35	7	.003	11.12	2.09	5.33	6	.002
Completion	6.05	1.95	3.11	7	.017						6.43	2.05	3.14	6	.020
Distancing						0.95	3.02	0.32	7	.761	-1.51	2.63	-0.57	6	.587
Student Pre	-5.26	2.00	-2.63	27	.014	-4.65	2.66	-1.75	27	.092	-4.45	2.44	-1.83	27	.079
<i>Random Effects</i>	<i>Var</i>	<i>Chi-Sq</i>	<i>df</i>	<i>p</i>	<i>Var</i>	<i>Chi-Sq</i>	<i>df</i>	<i>p</i>	<i>Var</i>	<i>Chi-Sq</i>	<i>df</i>	<i>p</i>			
Tutors	0.02	2.94	7	>.500	15.36	11	7.00	.139	0.02	3	6.00	>.500			
Students	140.51				159.73				139.27						
No. Param	5				5				6						
Deviance (-2LL)	286				294				286						

*Note.*  $N = 41$  students' across 9 tutors. TOPEL PA = *Test of Preschool Emergent Literacy Phonological Awareness*; Gain = pretest-posttest standard score gain.

**Expressive one word vocabulary test (EOWVT).** Results from this model (see Table 9) indicated that there was not a significant pretest to posttest gain on the expressive one word vocabulary test (EOWVT) (which is represented by the intercept); nevertheless there was a trend for growth of about 5 points and significant variation in student gains among tutors (see random effects). More importantly, as can be seen in Models 1 and 2, completion prompts did not predict significant gains, nor did distancing prompts ( $p < .05$ ). Not surprisingly, when the two prompt types were combined, there were no significant effects observed either. Last but not least, it was noteworthy that pretest did not significantly predict growth; this matches what we observed in the correlations.

**Peabody picture vocabulary test (PPVT).** For this measure (see Table 10), children did exhibit significant growth from pretest to posttest, by approximately 7-8 points depending on what is being controlled for (see intercept across Models 1-3), but there was no evidence of differences in child gains among tutors (see random effects). Not surprisingly, pretest was a significant negative predictor of child gains (the higher they started, the less room for growth over the year). More importantly, there was a substantial trend for completion to predict gains, albeit not statistically significant (Model 1,  $p = 0.059$ ). In other words, students whose tutors used 1 *SD* more completion prompting had students who were predicted to have a 3.90-point boost in gains compared to the average gain, controlling for student pretest. This said, the effect was dampened once distancing was entered into the model (likely due to the two prompt types' intercorrelation observed in the descriptive analyses). In addition, a similar trend was observed with distancing predicting PPVT gains ( $p = 0.103$ ). Students who had tutors using 1 *SD* more distancing prompting were predicted to gain 3.70 more points on PPVT than the average gain.

**Test of preschool emergent literacy print knowledge (TOPEL PK).** On print knowledge (see Table 11), although children did not exhibit significant systematic gains (average estimate was approximately 1 point gain across all models), there was significant variation in student gains across tutors (see random effects). Not surprisingly, pretest negatively predicted gains (i.e., the more children knew at the beginning of intervention, the less growth expected).

More interestingly, completion prompting had a significant effect on child gains ( $p = .040$ ). Specifically, controlling for pretest, tutors who used 1 *SD* more completion prompting were predicted to have children who gained 4.69 points more than average (i.e., nearly a third of a standard deviation in growth if we recall that the measure's norm-referenced  $SD = 15$ ). Similar to the pattern on the PPVT, the completion effect on gains was dampened when distancing prompting was controlled for; again this is likely due to the intercorrelation among the prompt types.

**Test of preschool emergent literacy print knowledge (TOPEL PA).** Last but not least, Table 12 displays the model results for children's phonological awareness gains. For this measure, children gained approximately 11 points from pretest to posttest (see intercept estimates), and there was no significant tutor differences in the gains (see random effects). Additionally, as we saw in the last three measures, pretest was negatively predictive of gains, which simply indicates that children who had higher phonological awareness at pretest had lower overall gains in phonological awareness by posttest. More importantly, completion prompting again was significantly predictive of gains, but this time both in isolation ( $p = .017$ ) and when in combination with distancing prompting ( $p = .020$ ). Examining Model 1, tutors that used 1 *SD* more in completion prompting were predicted to have children make 6.05 points more in gains compared to the average gain, holding pretest constant. This represents over a third of a standard

deviation of growth if we recall that the measure is norm-referenced with a  $M = 100$  and  $SD = 15$ .

## CHAPTER 5: DISCUSSION

The present study sought to examine how tutor prompting affected gains in vocabulary and emergent literacy for children with autism spectrum disorder (ASD). Past research has shown that vocabulary development for young children with ASD is dependent on adult sensitivity to a child's attention as well as prompting that “follows in” to the child's interest and attention (McCathren et al., 1995; Haebig, McDuffie, Wiesmer, 2013). New words are learned through supported acts of joint attention most commonly taking place during play and other language promoting activities (Toth et al. 2006, Perryman et al. 2013; Siller and Sigman, 2002; 2008; Van Kleeck et al, 1997). Different prompts are employed during shared book reading and other language building activities (Haden, Reese, & Fivush, 1996; Reese, 1995; Shapiro, Anderson, & Anderson, 1997; Van Kleeck et al., 1997; Van Kleeck, Woude, & Hammett, 2006). Past research on interactive book reading shows that adults employ prompting techniques differently (Blom-Hoffman, 2008; Wasik & Bond, 2001; Wasik & Hindman, 2013; Whitehurst et al., 1988). Research on IBR for children with ASD has shown that it is effective for increasing engagement for children with ASD, but questions remain as to understanding its effects on emergent literacy outcomes (Fleury, 2014; Tipton, Blacher, & Eisenhower, 2017).

### **Characteristics of Tutor Prompting**

**Tutor prompt use.** Across both measurement occasions, all tutors used all prompt types. However, consistent with previous studies, Wh prompts were used the most by all tutors (Crane-Thoresen & Dale 1999; Tipton et al., 2017; Rowe, Leech, Carbera, 2017). I had hypothesized that tutor prompting would differ because past research demonstrates that adults, when given no other explicit direction, employ prompts at different rates in total and by type during book reading activities both with typically developing children and when reading with

children with disabilities (Blom-Hoffman et al., 2006; Briesch, Chafouleas, Lebel, & Blom-Hoffman, 2008; Crane-Thoresen & Dale 1999; Haden, Reese, & Fivush 1996; Lonigan, Purpura, Wilson, Walker, & Clancy-Menchetti, 2013; Tipton, Blacher, & Eisenhower, 2017; Whitehurst et al. 1988). The present study echoed these findings for some of the prompts. I found significant differences in tutor prompting for two types of prompts: Completion and Wh prompts. This finding confirms the hypothesis that adults, in this case tutors, employ different kinds of prompting during book reading.

**Change in tutor prompt use.** Change in the rate of prompt use from the beginning of the intervention to the end of the intervention was examined. It was hypothesized that there would be a significant change from time 1 to time 2 since past research demonstrated prompting changes pre and post intervention (Fleury et al., 2014; Tipton et al., 2017). For instance, in studies that considered maternal reading styles, it was found that mothers tailored their input to their child as the observation period unfolded (Haden, Reese, & Fivush, 1996). In contrast to these findings, no significant differences were found in average per minute prompt use from the beginning of the intervention and by the end of the intervention. Tutors decreased their use of Wh prompting and increased their use of Open-ended prompting when examined at the student level, but this finding was not significant when variables were examined as a function of the mean rate of prompting at the tutor level.

A potential explanation is that as tutors and children work together during the course of the intervention, tutors placed a premium on consistent student engagement above using a variety of prompting techniques to vary the literacy experience. Another potential explanation is that adults develop a book reading “style” that doesn’t vary across time (Blom-Hoffman et al., 2006; Briesch, Chafouleas, Lebel, & Blom-Hoffman, 2008; Haden, Reese, & Fivush 1996; Tipton,

Blacher, & Eisenhower, 2017). It is plausible, though not part of the design of this study that during the course of any given shared book reading session a tutor could base their choice of prompting in the moment on adherence to fidelity of the intervention more than the feedback on engagement they are observing from the child. With this stated the opposite could also be true, that tutors employed certain prompts at a higher rate based on immediate engagement feedback from the child that was observable in the moment as well as developing their own “model” of what works best for the child over the course of the intervention. In the present study tutors were aware that the shared book reading sessions were part of an intervention and therefore their behavior was subject to outside review in the form of fidelity checks.

A recent pilot study by Fleury & Lease (2018) found indications of a relationship between parental attitudes and emergent literacy indices for a group of children with ASD. A modest relationship was found between parent’s overall literacy beliefs and measures of children’s overall communication and cognitive skills. Additionally, parent expectations specific to reading were moderately correlated to both the children’s communication and cognitive skills. The authors provide the example, “I ask my child a lot of questions when we read”. This combined with the findings from this question highlight a need to better understand the relationship between adult literacy focused behavior during shared book reading and whether it is driven by child engagement needs, adult reading “styles”, perceived literacy focus or some combination.

**Factor model of CROWD prompts.** Also consistent with previous studies of adult language-building interactions, tutor prompting fit a two-factor model and those two factors represented language prompting that was contextualized and decontextualized (e.g., Rowe, Raudenbush, & Goldin-Meadow, 2012; Snow, Burns, & Griffin, 1998; Tipton et al., 2017). I

had hypothesized that three prompts would load onto what I called contextualized prompts and two onto what I call decontextualized prompts. This hypothesis was confirmed and the five prompting types fit a two-factor model in the directions I had hypothesized. While the hypothesis was confirmed, one prompting type, completion for contextualized and distancing for decontextualized accounted for a majority of the loadings for each factor. Considering this finding in the context of existing literature of ASD highlights the caution that should be exercised when interpreting these results since no previous study has examine these language types for children with ASD and the majority of variance of the types of language were accounted for by one prompt type for each category (Davidson & Weismer, 2014; Lanter, Watson, Erickson, & Freeman, 2012; Hudson et al. 2017; Westerveld et al., 2016). Completion prompts are the most facilitative present-focused prompting type of the five considered for this study, whereas distancing prompts can be seen as an almost polar opposite. The former encourages the child to focus on the current context and what is happening in the immediate book, arguably indirectly forcing out distractions, while the later essentially introduces them with what could be considered unclear guidance.

### **Emergent Literacy Skills Of Children With ASD**

The main goal of this study was to examine types of adult language during interactive book reading and its unique association with gains in emergent literacy and language outcomes. It was hypothesized that different tutor prompts would explain gains in the child outcomes, with some prompts leading to gains in different outcomes across the intervention. Language type has demonstrated differential outcomes in previous studies (Demir et al., 2015; Rowe, 2012; Tabors, Roach, & Snow, 2001). This hypothesis was confirmed but only for the emergent literacy measure of phonological awareness (PA) and a particular type of

contextualized prompt, Completion prompts. As stated above, the nuance contained in the categorical difference of the completion prompt may not be accurately described in categorizing it by language type. While not explicitly concerned with cloze prompts in all cases, previous research of literacy activities for young children with ASD has indicated that the intended purpose of the activity is achieved most successfully in intervention approaches with an explicit focus and high level of scaffolding (Fleury et al., 2014; Rahn, Coogle, & Storie, 2016; Whalon, Hanline, & Davis, 2016).

The conceptual model explained in Chapter 2 posits that experiences that are facilitated by an adult who uses verbal prompting that “follows-in” to the child's interest, a type of IBR prompting that was categorized as contextualized, explained a significant amount of the variance in our emergent literacy outcome for PA skills. This finding, along with the trend toward significance for one of the vocabulary measures aimed at receptive vocabulary suggests that there may be something unique about Completion prompts.

Completion prompts are a type of contextualized prompt. They may hold a unique potential for children with ASD. If we can assume that the child's interest is being held by the action of the story, Completion prompts facilitate a short transactional social interaction to occur that's addressing emergent literacy and features of ASD synergistically. Bottema- Beutel et al. (2014) showed that, for children with ASD, supported joint engagement that includes reciprocity from the child increases the strength of relationships between adult-child interaction and language outcomes.

While the results of the multilevel models indicate a significant association between the use of Completion prompts over the course of the intervention and the measure of PA, interpreting these findings presents a challenge. To date there is only one intervention study that

examines the effect of emergent literacy interventions and PA skills of preschool age children with ASD (Hudson et al., 2017). They found that the IBR intervention did not result in significant gains in PA from pre to immediately post-intervention in comparison to the sample mean, but a 1:1 PA intervention did. Since the children in the IBR group of Hudson et al. are the same children in the current study, it is curious that use of one of the prompts had an effect on PA.

### **Limitations**

There are several limitations to this study. Due to the small sample size, any effects should be regarded as preliminary and taken with caution. Replicating this study with a similar population is needed to confirm the findings. It should also be noted that this was a secondary analysis of data collected to establish a causal relationship between two preschool interventions and emergent literacy outcomes. This secondary analysis was conducted to determine mediational effects of just the IBR condition and thus the sample size is smaller than one would expect for a mediational analysis.

However, this analysis points out that tutor language is a malleable factor in the IBR intervention and thus intentional training in language types as well as further refinement of the intervention to promote greater child specific engagement could potentially produce an effect on child emergent literacy outcomes. A last note is that the assessments used to measure emergent literacy for this study were developed and normed with a population that included few if any children that made up the current sample therefore a further level of caution should be considered. Previous research on the reading development and skills of children with ASD highlight the point that ASD is diagnosed on a spectrum it is difficult to generalize the results (Gabig, 2010). Further insight is needed into the appropriateness and accuracy of the employment

of these measures as indicators of emergent literacy for young children with ASD.

### **Future Directions**

The findings of the current study provide one step in understanding what elements of a common emergent literacy activity, IBR, works for the population of interest in this study, young children with ASD. Based on the findings, several implications for research emerge. The results of this study indicate that tutors employ different types of prompting at different rates and this variability affect emergent literacy outcomes. A primary aim of future research should be to consider if the findings of the present study are consistent with other samples of children with ASD on outcome measures and if adult prompting varies in the same way. A second aim of future research should be to consider whether a more structured paired-down prompting approach is more effective for this population. Since it was found that particular prompts affect outcome measures in particular ways, future studies should consider how and why tutor language changes over the course of the intervention. Furthermore, since the population is heterogeneous in terms of behavioral and language development, considering whether an adapted intervention that specifically targets one of the language types is more effective for children at lower levels of expressive and receptive language. Lastly, further research is needed to understand how PA skills in young children with ASD develop and function. Interpreting the findings from the current study accurately is challenging because of the lack of evidence and understanding about PA in the population in the investigation. It is notable that the research that does exist is inconsistent in its measurement of ASD severity and PA skills. That is ASD severity is measured using a different instrument in each study and the same is true of the measurement of PA skills (Heimann et al., 1995; Newman et al., 2007).

Recent research of dialogic reading for children in early childhood settings points out that

fidelity of intervention has not clearly been established. Towson and colleagues (2017) found that fidelity of implementation for IBR for children with disabilities varied considerably. Taking an implementation science lens when viewing IBR for young children with ASD and joining the findings of the current study with this idea about fidelity, future research should continue to examine what fidelity might look. One approach to this would be clearly communicating the core aspects of the intervention to those that will carry it out. The current study demonstrates that particular intervention features are associated with significant unique variance in outcomes.

Casting the findings of the present study in a larger context, two considerations emerge. The first is, are the findings about language building interactions between adults and children true across different participants and contexts? The current study examines aspects of language building episodes facilitated by a tutor, a relative stranger, in the school context. One can speculate whether we would see the same levels of prompting with different groups of adults and in what ways those differential levels would affect emergent literacy outcomes.

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## Appendix A

### Procedures For The Preschool Autism Literacy Study (PALS)

#### Study Procedures

The Preschool Autism Literacy Study (PALS) involved the comparison of two emergent literacy interventions, IBR (Whitehurst, 1988; Hudson et al. 2017) and phonological awareness training (Blachman, Ball, Black, & Tangel, 2000), for children with ASD in their last year of preschool. Children were recruited for participation across three cohorts to increase sample size. Recruitment, enrollment, measurement, fidelity, and intervention procedures were identical across the three cohorts.

Children were from 57 different preschool classrooms in 21 schools across 8 school districts in one state located in the Pacific Northwest. In order to be selected for the study children had to be in their last year of preschool and have either a medical or education diagnosis of ASD, have an active IEP, have no known co-occurring neurological or genetic disorders (e.g., Down syndrome, Fragile X), be able to follow simple direction, and have a minimum score of 55 on the *One Word Expressive Picture Vocabulary Test* (EOWPVT-IV; Brownell, 2011).

## Appendix B

### Procedural Fidelity Form: CROWD Prompts

Student ID: \_\_\_\_\_ Tutor: \_\_\_\_\_ Observer \_\_\_\_\_  
 Date: \_\_\_\_\_ Book/ Session: \_\_\_\_\_

A. CROWD Prompts		
<b>C</b>	# of times the adult asks the child to <b>complete</b> a repetitive sentence or phrase (e.g., "I'll huff, and I'll puff and ..." or complete a sentence)	
<b>R</b>	# of times the adult asks the child to <b>Recall information</b> about the events or characters in the story (e.g., "what was the boy looking for?") (at least one page removed)	
<b>O</b>	# of times the adult asks <b>Open-ended questions</b> (e.g., "what do you see? What's happening?")	
<b>W</b>	# of times the adult asks <b>Wh-questions</b> (e.g., what, who, when, where)	
<b>D</b>	# of times the adult asks <b>Distancing questions</b> that requires the child to relate parts of the story to his/her life (e.g., "have you ever made a snowman?") or predictions ("what do you think will happen?") or inferences	

	On	Off	On	Off	On	Off	On	Off
1								
2								
3								
4								
5								

%on task \_\_\_\_\_  
 %off task \_\_\_\_\_