PREPARING YOUNG CHILDREN FOR SUCCESS THROUGH EVERYDAY CONVERSATIONS

by

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ABSTRACT

Children's early language skills are foundational for their health, personal relationships, and academic outcomes (e.g., Adler et al., 1994; Pace et al., 2019). Given the importance of a strong language foundation, the overarching purpose of this three-study dissertation was to expand our understanding of how everyday adult-child conversations during infancy, toddlerhood, and the preschool years are associated with children's language development and subsequent academic success. Examining how components of caregiver talk may associate with children's language development clarifies how adults can help children prepare for school, providing children of all demographics an equal opportunity to succeed.

Infant-directed speech (IDS) refers to how people talk with young children in many societies. Compared to speaking with an adult (ADS), IDS includes a slower rate of speech, fewer words per utterance, higher-than-average pitch, and elongated vowels (Ma et al., 2011). Study 1 assessed parents' beliefs about IDS, whether their beliefs about IDS align with their speech register, and whether their beliefs about IDS were associated with children's expressive language skills (MCDI) or ability to learn a novel word. Over a one-time video chat session, 57 parents (four fathers) were asked to teach a novel word to their 15- to 21-month-old monolingual English-reared infants (M_{age}= 17.95, *SD* = 2.01, 25 males) and to complete the Parent Language Belief Questionnaire (PLBQ). Results showed that parents had mixed beliefs about their use of IDS. Additionally, there was a misalignment between parents' IDS beliefs and the speech register they used when interacting with their child. Lastly, parents' IDS

beliefs did not associate with children's performance on the MCDI or word learning at test. Given the benefits associated with using infant-directed speech with young children on their language development (e.g., Saint-Georges et al., 2013), identifying the barriers that may prevent adults from using IDS is essential.

Research has yet to explore how grandparents support their grandchildren's language development over video chat. For Study 2, 43 grandparents (10 males) and their grandchildren between the ages of 48- to 72-months (M_{age} = 60.19, *SD* = 6.49, 18 males) were asked to watch and discuss a video and a series of pictures over a one-time video chat session. Results revealed that grandparents drove conversations and primarily used statements and questions when interacting with their grandchildren. Additionally, grandparents facilitated dialogic interactions using distancing prompts and tended to open these bouts of distancing prompts through question-asking. Lastly, grandparents' education, distance, frequency of video chat, or perceptions of video chat did not contribute to their overall talk or use of distancing prompts. Findings suggest that families can use video chat to connect and support children's language learning by allowing them to engage with distant loved ones.

Study 3 examined how the topics 60 mothers discussed with their children at 24-months (M_{age} = 25.3, *SD* = 1.13) relate to language and school readiness at 36- and 54-months. We found that mothers mostly talked about visible referents—things they can see (e.g., animals, food, body parts). Children's gender did not influence the topics mothers discussed with them. We also found maternal education was associated with later language and SR measures even within this relatively homogenous sample in which all families were considered low socio-economic status. Additionally, talking about visible referents was positively related to children's later working memory at

54-months. However, discussing abstract and absent referents and behavior regulation was not associated with children's language skills and SR. Results enhance our understanding of how early language experiences prepare children for school.

The findings of these three studies investigate three novel ways that examine how adult-child everyday interactions may support children's later language and school readiness. Future directions should analyze children's language interactions with other family members, such as grandparents, fathers, and siblings, to obtain a fuller picture of early language environments. Findings have implications for building children's language development.

Chapter 1

INTRODUCTION

Early language skills are fundamental for later educational attainment, personal satisfaction, and health outcomes (Adler et al., 1994; Durham et al., 2007; Golinkoff & Hirsh-Pasek, 1999; Hammer et al., 2017; Kaiser et al., 2022; Owens, 2016; Pace et al., 2019). Language is necessary to build a community. For example, language is needed to communicate with members, build relationships with colleagues, connect with mentors, and schedule meeting times. Additionally, language is vital for personal relationships. Through language, individuals can communicate their needs and feelings to nurture successful relationships. Finally, language is important for good outcomes in healthcare. Healthcare providers must gather information from patients to provide the correct services, build rapport, offer treatment, and support decision-making. Additionally, patients must understand doctors' orders and address any questions they may have about the treatment. Language is even needed for everyday interactions such as reading the newspaper and understanding the plot of a movie.

Given the importance of language skills for everyday activities, this dissertation includes three separate studies that examine how adults (i.e., parents, mothers, and grandparents) help build children's language skills at various ages before children enter school. In the first study, I examined parents' beliefs about infant-directed speech, a special way of talking with infants that research suggests supports children's language development (Cristia, 2013; Ma et al., 2011; Ramirez-Esparza et al., 2014). We also considered how parental beliefs about infant-directed speech may

relate to children's word-learning abilities. The second study explored the nature of grandparent-grandchild conversations over video chat. Many families turned to video chat to connect children with their grandparents (Barr et al., 2020; Forghani & Neustaedter, 2014; McClure et al., 2015; Strouse et al., 2021; Zosh et al., 2022). Thus, it is imperative to investigate how we can use video chat to sustain relationships and support children's language development. Lastly, the third study investigated whether mother-child discussions about specific topics (e.g., animals, colors, math) at an early age may lay the foundation for building school readiness. Before diving into the three studies, I discuss the importance of supporting children's language development.

Significance of Constructing a Strong Language Foundation Early

The skills children bring to kindergarten are often associated with how well they succeed academically in the long term (Forget-Dubois et al., 2009). In a more recent study, Pace et al. (2018) found that children's language abilities at kindergarten entry was the only predictor of longitudinal gains both within (i.e., later vocabulary) and across domains (e.g., later math), even more than executive function skills.

Unsurprisingly, early language skills support later language development (Henrichs et al., 2011; Duff et al., 2015; Lee, 2010; Patrucco-Nanchen et al., 2019; Stolt et al., 2016; Reilly et al., 2010). Developmental cascades appear within language learning (Guo et al., in press). For example, children's lexical development at two years predicted grammatical development at least three years later (Moyle et al., 2007). In another study, Marchman and Fernald (2008) found that children who were more efficient in recognizing words at 24-months were more likely to have stronger language skills in elementary school than those who were less efficient in processing

language. These studies reveal how building skills is one language area rests upon achievements in another language area.

Developmental cascades in language learning can also occur across domains. For example, children's language skills may be a precursor for literacy, a secondary system that depends on language (Butler, 1999; Dickinson & Tabors, 2001; Gough & Tunmer, 1986; Larney, 2002). Indeed, past research has shown that children's language comprehension and word recognition are fundamental for literacy development (Hjetland et al., 2019). Language comprehension includes background knowledge of the subject, vocabulary, syntax, verbal reasoning (e.g., inference), and literacy knowledge (e.g., print concepts). Word recognition skills encompass phonological awareness, decoding, and sight recognition of familiar words. Scarborough et al. (2001) proposed that a skilled reader weaves these skills together like the strands in a rope. For example, children cannot comprehend text if they do not know the words (i.e., vocabulary) and do not have background knowledge of the subject from prior experiences to "read between the lines" and interpret the text successfully (Scarborough et al., 2001).

Children's early language abilities are also associated with later math skills (Slusser et al., 2019). For example, LeFevre et al. (2010) investigated how children's linguistic skills (i.e., phonological awareness and receptive vocabulary), quantitative ability, and spatial attention at 4.5 years relate to children's early numeracy skill, and in turn, their mathematical outcomes three years later. Children's linguistic ability was the only variable contributing to all the mathematical outcomes that was measured (e.g., numeration, geometry, calculation, and measurement).

Different aspects of language play a role in children's math skills (Viesel-Nordmeyer et al., 2022). For example, children's vocabulary is associated with acquiring number-words and number-word sequences (Geary, 2000). Vocabulary may be related to number-word sequences because number-word sequences are initially learned as a series of words (e.g., one, two, three, four) before the association between quantities and numbers is established. Additionally, grammar skills have been linked to children's ability to connect quantities and numbers (Purpura & Reid, 2016). Grammar is necessary to utilize prepositional phrases (e.g., *on*) or comparatives (e.g., *more*) that describe a relationship between quantities.

Lastly, children's language skills are crucial for social competence (Horwitz et al., 2003; Longobardi et al., 2015; McCabe & Meller, 2004) and self-regulation (Ayoub et al., 2011; Roben et al., 2013; Vallotton & Ayoub, 2011). Strong social competence includes knowledge of social standards of behavior, problem-solving abilities, social skills (such as listening, communicating, and turn-taking with peers), perspective-taking, and understanding of emotions (Longoria et al., 2009; McCabe & Meller, 2004). Language skills link to social competence because language is needed to understand parents, teachers, and peers. Self-regulation is the ability to consciously manage behavior rather than reflexively react (Kopp, 1982). A strong language foundation also allows children to regulate their behavior more easily because they can take a pause to process feelings, express their needs, and in turn, develop and sustain peer relationships (Baillargeon et al., 2007; Kochanska et al., 2001; Roben et al., 2013; Zeman et al., 2006).

In summary, these studies highlight the importance of building children's language development at an early age for later academic success (Adler et al., 1994;

Durham et al., 2007; Golinkoff & Hirsh-Pasek, 1999; Hammer et al., 2017; Kaiser et al., 2022; Morgan et al., 2015; Pace et al., 2019). The developmental cascades in language learning are evident within- and across-domains (Guo et al., in press). Therefore, understanding how adults can support children's language development at an early age is vital for later achievement.

How Adults Support Children's Language Development

Despite the clear importance of children's language abilities at school entry, there is considerable variability in children's language abilities at kindergarten entry (Claessens & Engels, 2013; Durham et al., 2007; Fenson et al., 1994). One environmental factor that may contribute to the variability in children's language abilities is the linguistic input their caregivers offer during interactions (Hoff, 2006). Research has aimed to identify which aspects of caregiver input can strengthen children's language abilities (e.g., Hirsh-Pasek et al., 2015; Rowe, 2012). One aspect is the number of words addressed to children, or language *quantity* (Rowe, 2008).

Prior research has found that the quantity of language addressed to the child can promote vocabulary in monolingual (e.g., Hart & Risley, 1995; Lieven, 2010) and bilingual families (e.g., Weisleder & Fernald, 2013). Increasing overall talk may be associated with lessening the 30-million-word gap. However, this message to adults is oversimplified (Masek et al., 2021). A large body of literature has found that the *quality* of caregiver input has a more substantial role in children's language trajectories than language quantity (Cartmill et al., 2013; Goldin-Meadow et al., 2014; Hindman & Wasik, 2015; Hirsh-Pasek et al., 2015; Huttenlocher et al., 2010; Masek et al., 2021; Rowe, 2012; Rowe et al., 2017). Therefore, research has turned toward exploring which components of the linguistic environment support children's language

development rather than focusing solely on the quantity of language input. Although language quantity is defined as the total number of words addressed to children, the *quality* of language does not have a set definition. Quality input is a multifaceted concept and has been measured in multiple ways (Cartmill, 2016; Lieven, 2019; Masek et al., 2021; Rowe & Snow, 2020).

One way to measure quality interactions is how adults talk with children. Compared to speaking to an adult, *infant-directed speech* (IDS) is characterized by a slower rate of speech using fewer words per utterance, speaking in a higher-than-average pitch, elongating vowels, and using a narrower set of vocabulary words when speaking to young children (Song et al., 2010). Adjusting one's speech register when interacting with infants has been shown to attract infants' attention (Saint-Georges et al., 2013), help the segmentation of words from fluent speech (Thiessen et al., 2005), assist with word mapping (Graf Estes et al., 2013; Ma et al., 2011; Singh et al., 2009), and support children's early language comprehension (Han et al., 2023; Herold et al., 2012; Porritt et al., 2014; Song et al., 2010). Although there are many benefits associated with using IDS, there is little information on how parents think about IDS. Parents' knowledge of child development is associated with parents' self-efficacy, child-rearing practices, variability in linguistic input, and children's language abilities (Albarran & Reich, 2014; Bornstein et al., 2003; Donahue et al., 1997). Therefore, understanding how parents conceptualize IDS may provide insight into the misconceptions and barriers to using infant-directed speech when interacting with young children.

Another way of measuring quality language is by examining the presence of *dialogic interactions* in adult-child conversations. When engaging in shared book

reading, dialogic interactions occur when adults provide feedback to children about the things they point to or talk about in the book, adapt according to the child's linguistic abilities by providing just enough information, and facilitate children's active participation on the part of the child (Arnold & Whitehurst, 1994; Hargrave & Sénéchal, 2000; Zevenbergen & Whitehurst, 2003). One way to measure dialogic interactions is by counting how many *distancing prompts* occurred (e.g., Parish-Morris et al., 2013). In shared book reading, distancing prompts appear when adults draw parallels from the storybook to children's lives (Purdy, 2008). For example, an adult may ask children if they have ever visited a zoo when reading a book about animals. When adults use distancing prompts, children are more likely to retain information and stay engaged (De Temple & Snow, 2001). Given the benefits associated with using distancing prompts (Beck & Mckeown, 2003, 2007), an avenue for research should investigate whether dialogic interactions can appear in contexts beyond shared book reading, such as when adults and children interact with media over video chat.

Question-asking is also a measure of language quality, and another component of dialogic interactions (Hargrave & Sénéchal, 2000). Question-asking can facilitate children's learning (Yu et al., 2019; Willard et al., 2019), likely because asking a question shifts children's attention toward a particular object or event, requires children to reflect on their current knowledge of the subject, and invites children to engage in retrieval to respond with their own words (Bonawitz et al., 2011; Oshima-Takane & Titova, 2021). Exposure to question-asking in preschool promotes children's language development (Blewit et al., 2009), literacy acquisition (Storch & Whitehurst, 2002), and content learning (Haden et al., 2015). Question-asking may be

especially interesting to examine over video chat because children are more likely to stay attentive over video chat when they are asked questions (Barr et al., 2018).

Past research has found that the quality of caregiver input was measured by coding for lexical diversity (e.g., Silvey et al., 2021) and conversational turns (Hirsh-Pasek et al., 2015). *Lexical diversity* is the number of different word types in the input (Demir-Vegter et al., 2014; Rowe et al., 2004; Tamis-LeMonda et al., 1998). All inflected forms of a word are considered a single word type. For example, jumped, jumps, and jumping have the same word stem (i.e., jump). Thus, these words are counted as a single word type. Alternatively, jump, run, and walk have three different word stems. Consequently, these words are counted as three different word types.

Conversational turns are defined as the number of times individuals converse back and forth without pauses lasting longer than five seconds (Gilkerson et al., 2018; Masek et al., 2021). A conversational turn occurs when a parent displays timely and relevant responses to the child's utterances. Lexical diversity (e.g., Jones & Rowland, 2017) and conversational turns (Romeo et al., 2018) have been linked to later language development beyond the quantity of language children hear from their caregivers. If quantity was the only variable that influenced language learning, children could learn language from simply watching television. However, many studies have found that this is not the case (Anderson & Pempek, 2005; Barr et al., 2010; Hudon et al., 2013; Zimmerman et al., 2009).

Although lexical diversity and conversational turns link to language learning, they may be insufficient for understanding how language input correlates with school readiness as they omit an examination of the *content* of parent-child speech. Little is known about what mothers discuss with their children before entering school. A new

line of research considers whether talking about specific categories (i.e., visible referents, abstract and absent referents, and behavioral directives) with children is another way to support children's school readiness.

Altogether this growing work highlights the many ways adult-child interactions have a significant role in children's language trajectories (e.g., Cartmill et al., 2013). Creating a strong language foundation is critical for children's academic success for many reasons, including understanding their teachers, communicating with peers, and learning to read. Therefore, this three-study dissertation probes the linguistic environment adults offer to help children's language grow.

The Three Studies

In the first study, titled "*How do Parents' Beliefs about Infant-directed Speech Align with their Interactions with their Infants When Teaching a Novel Word*," I explored parents' beliefs about the ways they adjust their speech register when interacting with their 15- to 21-month-old children. Although there are many benefits associated with IDS (Han et al., 2023; Herold et al., 2012; Porritt et al., 2014; Song et al., 2010), there is variability in parents' use of IDS. Therefore, identifying the barriers surrounding its use is essential. I asked parents about their beliefs about IDS using a new survey, the Parent Language Belief Questionnaire we created (Ramirez et al., in preparation). Then parents were asked to teach their child a new word to examine whether parents exhibit IDS in their speech and behavior. Afterward, I assessed whether parents' beliefs around IDS aligned with their speech. Lastly, I asked whether parents' beliefs relate to children's expressive language skills, ability to learn a novel label, and parents' change in speech register. Findings have implications for

addressing parents' misconceptions about IDS to support children's language development.

In the second study, "*Exploring Interactions Between Children and their Grandparents Over Video Chat,*" I analyzed conversations between 48- to 72-month-old children and their grandparents during video chat. In the past decade, many families used video chat to sustain relationships between children with other family members (Horgan & Poehlmann-Tynan, 2020), such as grandparents (Barr et al., 2020; Forghani & Neustaedter, 2014; McClure et al., 2017; Strouse et al., 2021; Zosh et al., 2022). With this number likely increasing due to the COVID-19 pandemic (Drouin et al., 2020), it is essential to investigate how we can utilize video chat to have children connect with others and support children in their language development. During a shared book reading context, children learn best when caregivers incorporate dialogic interactions (Hargrave & Sénéchal, 2000). For this study, I investigated whether dialogic interactions appeared in contexts beyond shared book reading by examining the quality of language grandparents and grandchildren used when they discussed a series of pictures and a short video about an uncommon animal over video chat. Additionally, I probed whether factors of the grandparent-grandchild relationship (e.g., education, distance, perceptions of video chat, and the frequency of video chat) contributed to grandparents' use of distancing prompts. I chose to examine children's conversations with their grandparents because this special relationship has many health and psychological benefits for both grandparents and grandchildren (e.g., Duflos et al., 2020; Griggs et al., 2010; Neugarten & Weinstein, 1964; Thiele & Whelan, 2006). Additionally, interacting with grandparents over video chat may serve as an alternative environment for children to experience meaningful, language-rich

interactions that contribute to language growth. Finding ways children can engage in quality interactions using a smart device is critical when in-person social interaction is acutely limited, as in the COVID-19 pandemic and in this modern, tech-saturated age.

Lastly, the third study, titled "*How the Content of Early Parent-Child Linguistic Interactions May Prepare Children for School*," considered how children's early language environments relate to their preparation for school. Conversations about numbers, shapes, and colors, among other categories, support children's school readiness (Pears et al., 2013). Using the NICHD Study of Early Child Care and Youth Development (NICHD, 2002) longitudinal data set, I examined whether the content that parents and children talk about with their children at 24-months related to children's school readiness at 54-months. I organized topics into three broad categories: visible referents (e.g., animals, properties, and body parts), abstract and absent referents (e.g., mental states, relationships, and events), and talk about children's behavior (i.e., directives and prohibitions). Revealing the topics that support school readiness may illuminate how adults help prepare children for school.

Together, the three studies address how everyday adult-child conversations may relate to children's language development and subsequent academic success. Examining how components of caregiver talk may associate with language learning across child development clarifies how adults can help children prepare for school, providing children of all demographics an equal opportunity to succeed. Findings have implications for building children's language development.

Chapter 2

HOW DO PARENTS' BELIEFS ABOUT INFANT-DIRECTED SPEECH ALIGN WITH THEIR INTERACTIONS WITH THEIR INFANTS WHEN TEACHING A NOVEL WORD

Abstract

Infant-directed speech (IDS) refers to how people talk with children in many societies. Compared to speaking with an adult (ADS), IDS includes a slower rate of speech, fewer words per utterance, higher-than-average pitch, and elongated vowels. Although many benefits are associated with using IDS (e.g., Cristia, 2013), there is little information on what parents think about IDS. The current study asks: 1) How do parents conceptualize IDS? 2) Do parents exhibit IDS tendencies in their speech and behavior? 3) Is there an alignment between parents' IDS beliefs and their speech register when they teach their child a new word? and 4) How do parents' IDS beliefs associate with children's expressive language and performance on a word learning task. Fifty-seven parents and their 15- to 21-month-old monolingual English-reared infants (M_{age}= 17.95, *SD* = 2.01, 25 males) participated. Parents were asked to teach their child a novel word and to complete the Parent Language Belief Questionnaire (PLBQ). Parents had mixed beliefs about their use of IDS. Nevertheless, parents exhibited IDS in their speech and behavior. Lastly, parents' IDS beliefs did not predict children's language or word learning at test. As research has demonstrated the positive benefits associated between IDS and children's language development, identifying the barriers surrounding why parents may not use IDS with their children is essential.

Introduction

Children who start out not understanding language nor speaking somehow learn to string words together to create meaningful sentences by the end of their second year of life. The same infant that could only make cooing sounds during the first 3-months of their life can articulate consonant-vowel vocalizations at around 6-months and form their first word at approximately 12-months (McCarthy, 1954). Although forming a word seems challenging, children's productive vocabulary grows substantially at around 18-months (Tamis-LeMonda et al., 1998). Children's language development is exciting to witness, and it is essential to foster. In fact, children's language ability at kindergarten entry has been associated with subsequent academic achievement (Pace et al., 2018). How can adults communicate with children to help them build a strong language foundation in infancy? Some ways include following and talking about children's interests (Gros-Louis et al., 2014) by establishing joint attention (Adamson et al., 2004), as well as responding promptly to children's needs (Ainsworth et al., 1974; Deans, 2020; Schroer & Yu, 2022) and their communicative attempts (Donnelly & Kidd, 2021; Romeo et al., 2018).

The current study focused on another way parents can help children develop early language skills: using *infant-directed speech* (IDS). The study has three components. First, I assessed parents' beliefs about IDS via a questionnaire. Second, I asked parents to teach their children a novel word to examine the alignment between parents' beliefs about IDS and their behavior when teaching a novel word to their children. Finally, I assessed whether children learned that word using the Intermodal Preferential Looking Paradigm (Golinkoff et al., 2013).

Infant-Directed Speech

Infant-directed speech (IDS) refers to how people in many societies talk with young children (Byers-Heinlein et al., 2021). IDS is *not* defined as mispronunciations and non-words (e.g., "wawa" for water) (Kaye, 1980). Instead, IDS includes a slower speech rate (Cooper & Aslin, 1990; Narayan & McDermott et al., 2016), fewer words per utterance (Martin et al., 2016), higher-than-average pitch (Fernald & Simon, 1984; Song et al., 2010), elongating vowels (Uther et al., 2007), and using a narrower set of vocabulary words (Henning et al., 2005) compared to speaking with an adult (adult-directed speech; ADS). Of the acoustic features that are adjusted when using IDS, the current study focuses on the change in the average fundamental frequency (*F*0; also referenced as pitch). The average *F*0, a commonly used measure in previous studies to explore pitch modification (Masataka, 2002), is the average number of oscillations per second of a speech sample, expressed in Hz. There is a significant increase in the average *F*0 when using IDS in comparison to ADS (Ma et al., 2011; Spinelli et al., 2017; see Figure 1). This increase in pitch occurs for expressive purposes, such as asking questions or stressed syllables (e.g., "DO-" emphasized in "doggy"; Eady & Cooper, 1986; Xu, 1999).

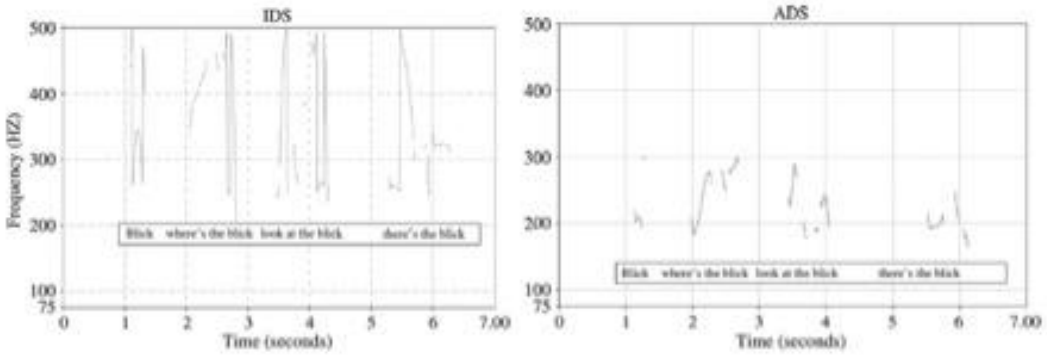


Figure 1 Spectrogram analysis of sentences presented in IDS (left) and ADS (right**),** originally from Ma et al. (2011).

The Advantages of Using IDS for Children's Language Development

Adults can support children's early language development when they adjust their speech register as they communicate with infants (Cristia, 2013; Ramirez-Esparza et al., 2014). For instance, infants are more likely to differentiate between speech and background noise when presented with IDS in comparison to ADS (Barker & Newman, 2004). IDS also attracts attention to speech because of its high and variable pitch (Fernald & Simon, 1984; Soderstrom, 2007). Indeed, infants have higher neural activity when they hear IDS rather than ADS (Háden et al., 2020; Naoi et al., 2012). For example, research using event-related potentials (ERPs) revealed increased neural activity when 6- and 13-month-old infants hear IDS, but not ADS (Zangl & Mills, 2007), aligning with more recent work with 9-month-olds (Peter et al., 2016). Interestingly, infants prefer listening to IDS when they hear IDS stimuli in their native language (Kaplan et al., 1995; ManyBabies Consortium, 2019) as well as foreign languages (Fernald & Morikawa, 1993; Werker et al., 1994), aiding bilingual development (Byers-Heinlein et al., 2021). The use of IDS can also assist in the segmentation of words from fluent speech (Golinkoff & Alioto, 1995; Kuhl, 2004;

Thiessen et al., 2005). Facilitating word segmentation is especially important during the first year of life, detecting regularities from the linguistic environment is one of the first steps to understand and ultimately produce meaningful units in their native language (Saffran, 2001). Additionally, a recent study found that IDS predicts children's language complexity five years later (Ferjan Ramírez et al., 2023). These studies collectively reflect how adjusting one's speech register in this special way supports early language comprehension (Han et al., 2023; Herold et al., 2012; Song et al., 2010) and production (Poritt et al., 2014).

Parental Beliefs About IDS

Although there are many benefits associated with IDS, there is little information on how parents think about IDS. There are numerous questionnaires designed to explore how parents' beliefs around general child-rearing practices relate to children's language development across cultures (e.g., Rodriguez & Olswang, 2003; Simmons & Johnston, 2007). However, these questionnaires only had a maximum of three questions that directly assessed what parents think about "baby talk," which some perceive as IDS. For example, Johnston and Wong (2002) designed a survey to explore differences between North American mothers (i.e., Canadian- or European-born, n = 44) and Chinese mothers (n = 42) in beliefs concerning talk with 24- to 48-month-old children. In this survey, baby talk was defined as mispronunciations and irregular words, using examples like "wawa for water, or jamis for pajamas." Results revealed mixed responses across cultures, with 74% of Chinese mothers and 57% of North American (i.e., Canadian- or European-born) mothers agreeing that baby talk will help children learn how to speak correctly (Johnston & Wong, 2002). Similarly, Mancilla-Martinez and Lesaux (2014) explored Latino, Spanish-speaking parents'

beliefs about their children's language development in the same age range (N = 200). When asked the same question about baby talk using the same definition, 26% percent of Latino Spanish-speaking parents agreed with the statement. Mancilla-Martinez and Lesaux (2014) interpreted these findings as a reflection of an "orientation to encourage children to use *adult-like* language." The design of these survey items suggests that the definition of baby talk does not align with the literature on infant-directed speech.

Despite the lack of clear alignment between baby talk and IDS, some studies do address specific components of IDS as defined by the literature. For example, items on the survey also assessed how parents evaluate the repetition of a target word or concept (e.g., "*Dog*! Do you see the *dog*? That's a *dog*"). Even so, the mixed responses on such items reveal a need for more research. For instance, 43% percent of Chinese mothers and 25% of North American mothers reported that they very often or almost always "repeat what their child says, adding new words" during parent-child interactions (Johnston & Wong, 2002). However, there is a lack of explanation for the range in response as well as limited data on why parents may not use IDS.

The current study addresses this gap and considers whether beliefs about IDS may align with behavior. An *alignment* between beliefs and speech register would be seen if parents who report they engaged in IDS behaviors on the questionnaire use a higher speech register when teaching a novel word to their child in real-time. In contrast, a *misalignment* would be seen if parents who report they do not engage in IDS behaviors adjust their speech register when teaching a novel word to their child. As research has demonstrated the positive benefits associated between IDS and children's learning in many communities (Golinkoff et al., 2015), understanding how parents evaluate IDS and whether they use it with their children is essential.

IDS is Often Accompanied by Other Behaviors That Support Children's Word Learning

The current study also considers whether selected behaviors (i.e., IDS-related behaviors) might be simultaneously present when an adult uses IDS. Studies have repeatedly shown that *infant-directed communication* may encompass features beyond acoustic adjustments (e.g., Kosie & Lew-Williams, 2022). Along with linguistic changes relative to adult-directed speech, adults tend to adjust their behavior when interacting with an infant (Golinkoff et al., 2015), especially when trying to teach their child a new word. These behavioral adjustments include pointing (Salo et al., 2019), repetition (Fernald & Simon, 1984), and question-asking (Melzi et al., 2011). In conjunction with IDS, these selected behaviors—pointing, repetition, and question-asking—may further support children's early language development.

Pointing may be another IDS-related behavior that is used in combination with linguistic adjustments to set the stage for word learning. Parents can use pointing alongside IDS as a tool to help direct children's attention (e.g., declarative pointing), clarify the referent, and ultimately help children learn about a new object or action (i.e., Tomasello et al., 2007). For example, parental use of declarative pointing at 12-months was related to children's concurrent and later vocabulary comprehension in both typically and atypically developing populations (Choi et al., 2021; Choi & Rowe, 2021).

Adults tend to *repeat* isolated words and phrases when interacting with infants (Newport et al., 1977), which can aid in infant language development. McRoberts et al. (2009) presented 6-month-old infants with natural recordings of mothers speaking with their 4- to 6-month-old child (i.e., younger IDS) or 12- to 14-month-old child (i.e., older IDS). Results revealed that 6-month-old infants preferred listening to the

younger IDS recordings made when the caregiver spoke to babies closer to their age. Interestingly, 6-month-old infants only preferred older IDS recordings when utterances contained repetition. This preference for repetition is meaningful, as children's exposure to repetition is positively associated with later language development (Newman et al., 2016). Repetition of a word in isolation may be beneficial because children do not need to segment a speech stream to identify the target word (Onnis et al., 2008). Caregivers' use of repetition seems to decline at approximately 24-months (Stern et al., 1983). One hypothesis suggests that repetition may be less effective as children build language skills (Schwab et al., 2018) and presumably need it less to guide their action.

Question-asking is another component that may be often used with IDS (Soderstrom et al., 2008). Children's exposure to question-asking can also be beneficial for their language (Blake et al., 2006; Blewit et al., 2009; Tompkins et al., 2017) and cognitive skills (Cristofaro & Tamis-LeMonda, 2012; Hubbs-Tait et al., 2002) across cultural contexts and at varied developmental stages. For example, Muhinyi and Rowe (2019) found that maternal questions during a shared book reading interaction as early as 10-months correlated with children's concurrent and later language abilities at 18-months. Similarly, Luo et al. (2022) revealed that Yes/No questions (e.g., "Is that a dog?") and referential questions (e.g., "What is it?") at 24-months predicted children's language comprehension a year later. Another study found that at 24-months, exposure to wh-questions (i.e., questions that start with who, what, when, where, why, or how) related to children's language and reasoning skills 12 months later, at 36-months (Rowe et al., 2017). Additionally, the frequency of maternal question-asking during a book-reading activity with multilingual 4- to 5-

year-olds was contemporaneously associated with vocabulary size in Spanish and English (Quiroz et al., 2010). Parents may ask questions when they use IDS to direct attention and engage the child when teaching a novel word (Robinson et al., 2009). Altogether, the simultaneous combination of the linguistic (i.e., change in speech register) and behavioral adjustments (i.e., high frequency of pointing, repetition, and question-asking) when using IDS may encourage infants to pay attention to language, promote social interaction between the infant and caregiver, and facilitate children's ability to associate words with novel entities and events (Golinkoff et al., 2015). The current study investigates whether IDS-behaviors co-exist with changes in speech register as part of infant-directed communication.

The Current Study

I ask the following questions: 1) How do parents conceptualize infant-directed speech (IDS) and its benefits or drawbacks? 2) Do parents exhibit IDS in their speech and behavior? 3) Is there an alignment between parents' beliefs about IDS and their speech register they use when they teach their child a new word? 4) How do parents' beliefs about IDS contribute to children's expressive language score (MCDI) and performance on a word learning task?

Hypotheses

1. I hypothesized that parents would underestimate their IDS usage, as suggested in extant limited research (Johnston & Wong, 2002; Mancilla-Martinez & Lesaux, 2014).

2. I hypothesized that the parents in the sample would exhibit IDS in both their speech register (e.g., elevate F0) and behavior (i.e., point, repeat the target word, and ask questions) when interacting with their infant.
3. For those parents who indicate that they do not use IDS, there would be a misalignment between parents' beliefs and speech register. In contrast, for those parents who do claim they use IDS, there would be an alignment between parents' beliefs and speech register.
4. I hypothesized that parents' beliefs about IDS would not relate to children's expressive language scores or ability to learn a novel word.

Methods

Participants

A power analysis was conducted for a proposed multiple regression analysis (MRA) with parent beliefs, behavior, and speech register as the independent variables, and word learning as the dependent variable using the GPower 3.0 program (Faul et al., 2007). Children's language ability and parental education were entered as control variables. Results from the power analysis (a = .05, b = .80) indicated that a sample of 30 parent-child dyads was needed to detect an effect (f^2= 0.55) for the current study. This effect size was expected based on previous study that had a similar design and topic of study (see Dilley et al., 2020).

Eighty-five parents and their monolingual English-learning infants between the ages of 15- to 21-months participated. However, 29 participants' word learning performance was excluded from analyses due to counterbalancing issues (n = 4), technological issues (n = 3), fussiness (n = 5), video quality (i.e., blurry or the infant

moved away from camera; n = 8), side bias (i.e., the infant looked towards one side of the screen 70% of the time; n = 4), or low attention (i.e., the infant looked at the screen for less than 50% of the time, n = 5). The final sample included 57 parent-child dyads (*25 males, M_{age}= 17.95, SD = 2.01)*. Four included fathers. On a background questionnaire, participants self-reported that they were White (n = 41, 71.9%), Asian (n = 3, 5.3%), Hispanic (n= 2, 3.5%), African American (n = 1, 1.8%), and of mixed race (n = 8, 14.3 %). One participant held only a high school degree (1.8%). Two had some college experience (3.6%). Sixteen held a bachelor's degree (28.1%). Twenty-five held a master's degree (43.9%). Thirteen received a doctorate (22.9%).

Participants were contacted through social media platforms, recruitment platforms (i.e., Children Helping Science), and a database from a research laboratory located in the mid-Atlantic. Potential subjects were excluded if they were deaf or had a hearing impairment because the task required participants to listen to auditory stimuli. Potential subjects were also excluded if they did not hear English at least 70% of the time. Parents indicated their child's hearing and language background when completing the demographic questionnaire. This project was approved by the University's Institutional Review Board (1548843-11).

I took advantage of video chat, via Zoom, during the COVID-19 pandemic and used it as a tool to address our questions with families in their own homes. I asked parents to use a laptop or desktop computer to ensure children could see the visual stimuli. Additionally, parents were asked to schedule a time for the parent-child dyad to be in a quiet room with limited distractions and to place children in a highchair or on their lap during the study. Lastly, I asked parents to adjust the video camera angle if the lightning was not bright enough to observe children's eye movements.

Importantly, Morini and Blair (2021) found no differences in performance on a word-learning task between children tested in person and those same children tested virtually, opening a new avenue toward utilizing a more accessible testing paradigm.

Visual and Auditory Stimuli

Visual stimuli included two novel household objects (see Figure 2) to ensure the child was unlikely to have seen either object before the study. *Object A* was blue and resembled a blue travel razor (i.e., glorp). *Object B* was a gray spaghetti measure with four holes (i.e., dax). Objects were labeled with nonsense words that followed English phonotactic constraints and used in previous research (Gaudreau et al., *in preparation*; Parish-Morris et al., 2007). The auditory stimuli were created by a female native monolingual speaker of American English who used infant-directed speech.

Object A: Glorp *Object B: Dax*

Figure 2 Novel objects

Procedure

Before the one-time video-chat appointment, parents were given a consent form and a socio-demographic information questionnaire via Qualtrics, an online platform for surveys.

The video-chat appointment included 5 blocks of trials: ADS elicitation (ADS), exploration, teaching (IDS), testing, and assessments (Table 1). The independent variables were parents' beliefs, change in speech register, and engagement with IDS-related behaviors. The dependent variable was children's word learning performance.

ADS Elicitation

To establish a baseline of parents' speech register, the experimenter asked the same two questions to every parent. The first question was, "What is a typical morning for you and your child like?" The second question was, "How do you read with your child?" These questions were designed to elicit at least 45 seconds of ADS. The content discussed between the parent and the experimenter was not relevant to the study. Therefore, the experimenter prompted conversation with the parent when necessary. If the parent gave a response that was longer than 45 seconds to the initial question, the experimenter skipped the second question. Parents were told they were being recorded, though not that our focus was their speech register.

Exploration of Novel Objects on Screen

Next, each novel toy was individually presented sequentially to the infant for 26 seconds. I added video exploration trials to ensure that the child had the opportunity to see both novel objects before test and assess whether the child had a preference for either novel object, potentially interfering with which object they chose

in later testing trials (Hollich et al., 2000; Pruden et al., 2006). In these videos, each novel toy appeared to float across the screen side to side, then up and down. Visual stimuli were accompanied with up-beat music that did not have any words. The order of presentation was counterbalanced, such that half of the participants saw Object A first and half of the participants saw Object B first.

Parent Teaches Child New Word

Before the IDS block, the experimenter told parents the label of that object and presented the label in writing. The object given to the parent was counterbalanced: half of the participants were taught that Object A is called a "glorp," while the other half were taught that Object B is called a "dax." The label associated with each object was not counterbalanced, as previous work that used the same stimuli found no differences in children's word learning performance related to the label of the toy (Gaudreau et al., in preparation). Parents and children were never given the label of the second object and only asked to teach a single name.

After the parent received the label, they were asked to teach their child the name of the labeled object for 45 seconds. This time was chosen to sustain infants' attention-span and provide parents the opportunity to exhibit IDS-related behaviors. During the IDS block, the child saw the novel object floating across the screen with the label written on the screen, left for the parent to reference. No audio accompanied the video. Parents were not explicitly told to use IDS or ADS.

Children's Ability to Learn New Word is Tested

Testing included four trials: one to introduce the format of the objects (two objects per slide instead of one) and three testing trials. Parents were instructed to

close their eyes to prevent influencing their infants' looking. Each trial was separated by a 2-sec intertrial interval during which a video of a laughing baby appeared in the middle of the screen with background music. Its purpose was to promote looking toward the center of the screen at the beginning of each trial.

Introduction Trial

The introduction trial was utilized to introduce children to the testing trial. During the introduction trial, the two novel objects were placed side-by-side on the screen for 9 seconds. The visual stimuli were accompanied with up-beat music without words.

Test Trial 1

During the first testing trial, children were tested to see if they mapped the novel label they were taught during the IDS block with the correct object. The auditory stimuli directed the child to look at the object they were taught during the IDS block. The object they were taught (e.g., glorp) was said four times (e.g., "Look! It's a glorp! That's a glorp! Wow! There's a glorp! It's a glorp!"). If children had correctly associated the label with the corresponding object, they should look longer at the object that the parent named during the IDS block than the object that was not named.

Test Trial 2

The second trial was a *rigorous* test to ensure that the child mapped the novel label to the correct object and not to both novel objects (Reed et al., 2017). This time, the auditory stimuli directed the child to look at the object that was *not* labeled during the IDS block. The object that was named during the IDS block (e.g., dax) was said

four times (e.g., “Look! It’s a dax! That’s a dax! Wow! There’s a dax! It’s a dax!”). If the child learned the label for the object that was named during the IDS block, they should associate this novel label (e.g., dax) with the object that was not labeled, possibly using mutual exclusivity (Markman & Wachtel, 1988). The child might not drastically switch their gaze towards the other object but hearing this novel label should disrupt their prior looking pattern.

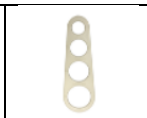
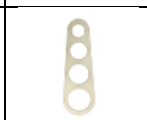
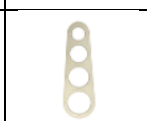
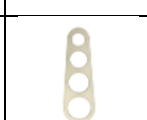
Test Trial 3

A *recovery* trial replicated the first testing trial, in which the auditory stimuli directed the child to look at the object that was named during the IDS block. Similar to the first testing trial, the label that was taught during the IDS block (e.g., glorp) was said four times (e.g., “Look! It’s a glorp! That’s a glorp! Wow! There’s a glorp! It’s a glorp!”). If the child successfully learned the label for the novel object, they should once again look at the object that the parent named during this testing trial.

After the testing block, the experimenter asked the parent to complete the Parent Language Belief Questionnaire and a vocabulary assessment.

Table 1 Visual and linguistic stimuli used over video chat

Trial	*Left Side*	*Right Side*	*Time*	*Audio*
Exploration of Novel Objects on Screen*				
Exploration Trials (Salience)			26s	Music (no words)
			26s	Music (no words)

Parent Teaches Child New Word			
		45s	*Parents were asked to teachc the child the label of the toy (e.g., Glorp)*
Child's Ability to Learn New Word is Tested			
Introduction			9s	Music (no words)
Test Trial #1			9s	Look! It's a glorp! That's a glorp! Wow! There's a glorp! It's a glorp!
Test Trial #2 Rigorous Test			9s	Look! It's a dax! That's a dax! Wow! There's a dax! It's a dax!
Test Trial #3 Recovery			9s	Look! It's a glorp! That's a glorp! Wow! There's a glorp! It's a glorp!

*Note. * = Order is counterbalanced.*

Materials

Background Questionnaire

Our lab's standard background questionnaire asked demographic questions such as socioeconomic status, race/ethnicity, history of ear infections and hearing problems, and language delays.

MacArthur Communicative Development Inventory (MCDI*)*

Parents completed the short version of the MacArthur Communicative Development Inventory (MCDI; Fenson et al., 2000), which included a 229-item vocabulary checklist appropriate for children between the ages of 16- and 30-months to assess children's productive language skills. Research has shown that it is predictive of children's language development as much as 4-years later (Deniz et al, 2013).

Parent Language Belief Questionnaire (PLBQ)

Parents were also given a 40-item the Parent Language Belief Questionnaire (PLBQ; Ramirez et al., in preparation) regarding their beliefs about their child's language, reading, and technology habits. A 4-point Likert scale, ranging from never to always, was used to determine the extent to which parents agreed with a statement. Of the 40-items, 12-items were designed to assess parents' beliefs about IDS. For example, "I use shorter words when I talk to my child than when I talk to my friends" and "I address my child and my adult friends with the same tone of voice" (see Appendix A). These 12-items items were constructed based on the characteristics identified as IDS (see Table 2; e.g., Cristia, 2013; Golinkoff et al., 2015; Johnston & Wong, 2002; Ma et al., 2011; Song et al., 2010). Responses to these IDS-related items were compared with their actual use of IDS, measured from the audio and video recordings.

Due to the recent pandemic, seven additional questions related to COVID-19 were added to the Parent Belief Questionnaire (PBQ) to help us understand how children's language development related to COVID-19. A 5-point frequency scale ranging from *much less often to much more often* was used to determine the differences in parent-child interactions before and during the COVID-19 pandemic.

Coding and Reliability

Speech Analysis with Praat Software

The average fundamental frequency and pitch range was extracted from the parents' speech samples during the ADS elicitation and IDS blocks using Praat software (Boersma & Weeninik, 2009). To evaluate whether caregivers switched to the use of IDS with their infants, the acoustic properties of their speech was compared to when they were speaking with the adult (ADS). For every participant, the average F0 and pitch range was extracted from the parents' speech samples during the ADS elicitation (Time 1) and IDS (Time 2) blocks.

The duration of the speech samples analyzed were matched to the duration of time the parent is given to teach the child a novel word during the IDS block (i.e., 45 seconds). A high degree of reliability was found between the two coders (Cronbach's $\alpha = .91$). Preliminary analyses explored whether parents talked the entire 45 seconds of the IDS block with 20% of the sample (n = 10). Results revealed that 80% of this sub-sample used the full 45 seconds to teach the label (n = 8). The other two used a minimum of 37 seconds.

Behavior Analysis of Parents Teaching Children a Novel Label

Parent behavior was coded during the IDS block to examine the alignment between parents' self-report of utilizing an IDS-related behavior (i.e., pointing, repetition, and question-asking) and their behavior when teaching a novel word to their child. Coding occurred offline and 20% of parents' behavior was re-coded. To assess reliability between four coders, 20% of the data was re-coded. Reliability was excellent for coding of pointing (ICC = .99), repetition (ICC = 1.00), and question-asking (ICC = 1.00).

Pointing

An extended finger was identified as pointing. The number of times the parent pointed at the screen was calculated during the 45-second trial.

Repetition

The number of times a target word was repeated was calculated individually for the parent and child. I coded whether the target word was used by itself or within a sentence or phrase.

Question-asking

Questions were defined in two ways: 1) as an utterance that requests verification, such as "That's blue, right?" (i.e., tag questions; Barr et al., 2008), and 2) utterances that started with who, what, where, why, or how, such as "What color is it?" (i.e., *Wh*-questions; Rowe et al., 2017).

Eye Gaze Coding

Lastly, infants' looking patterns were coded to measure word learning in the IPLP using Datavyu 1.3.7 (Datavyu Team, 2014). Looks were coded as left, right, center, or away on a frame-by-frame (30 frames per second) basis. To assess reliability of eye gaze coding, a second coder re-coded 20% of the videos. A high degree of reliability was found between raters, $r^2 = .99$.

For the exploration and IDS trials, infants' attention to the stimuli was calculated by dividing the time spent looking at the screen by the total trial length. If infants' attention was less than 50% of the total trial length, they were excluded from further analyses (Pruden et al., 2012). For testing trials, the dependent variable was

computed by dividing children's looking time towards the target object by their total looking time to both objects (i.e., percentage looking to target or PLT; Verdine et al., 2017). A PLT greater than 50% suggests that the infant associated the label with the correct object.

Table 2 IDS and non-IDS related items that promote language development as supported by sample papers from the research literature

Questions	Literature
IDS-items	
I change my words when my child does not understand me.	Henning et al. (2005) Hirsh-Pasek et al. (2006) Gros-Louis et al. (2014)
I use shorter sentences when I talk to my child than I do when talking to my friends.	Song et al. (2010)
I use shorter words when I talk to my child than when I talk to my friends.	Song et al. (2010)
During a typical conversation with my child, I ask lots of questions.	Blake et al. (2006) Blewit et al. (2009) Luo et al. (2022)
I use "baby talk" – my voice gets higher and more melodic when speaking to my child than when speaking to an adult.	Cristia (2013) Fernald et al. (1989) Grieser & Kuhl (1988)
I speak more slowly when I talk to my child than when I talk to my friends.	Cooper & Aslin (1990) Narayan & McDermott et al. (2016)
I repeat myself more when I talk to my child than when I talk to my friends.	McRoberts et al. (2009) Newman et al. (2016)

I repeat what my child says, adding new words.	McRoberts et al. (2009) Newman et al. (2016)
† I correct my child if s/he uses the wrong word.	Hirsh-Pasek et al. (2006) Gros-Louis et al. (2014)
† I address my child and my adult friends with the same tone of voice.	Ma et al. (2011)
† I speak to my child as I would speak to an adult; this is how they will learn to speak intelligently.	Ma et al. (2011)
† I speak to my child as I speak to adults to help him or her learn proper language.	Ma et al. (2011)
Non-IDS items that promote language development	
† I ask my child to repeat new words to help him or her learn to talk.	McRoberts et al. (2009) Newman et al. (2016)
† I choose what my child and I talk about.	Hirsh-Pasek et al. (2006) Gros-Louis et al. (2014)
My child chooses what we talk about.	Hirsh-Pasek et al. (2006) Gros-Louis et al. (2014)
I answer when my child tries to talk to me.	Hirsh-Pasek et al. (2006) Gros-Louis et al. (2014)
When I read a storybook, I try to see what my child is interested in and wants to hear about.	Adamson et al. (2004)
I allow my child to take a turn in conversations that include adults who are not family members.	Donnelly and Kidd (2021) Romeo et al. (2018)
† I ask my child to speak clearly.	Hirsh-Pasek et al. (2006) Gros-Louis et al. (2014)
I talk about what is happening when my child and I are playing or doing things	Adamson et al. (2004)

together.

Note. † = Items are reverse coded

Results

Results address each research question in turn. First, I assessed parents' beliefs about IDS via a questionnaire. Second, I examined whether parents exhibited IDS in their speech and the behaviors that accompany IDS. Third, I explored the alignment between parents' beliefs and the speech register they use when they teach their child a new word. Finally, I investigated whether parents' beliefs were associated with a change in their speech register compared to when they addressed an adult and whether this change appeared to impact word learning.

How do Parents Conceptualize Infant-Directed Speech (IDS)?

The twelve items of the Parent Belief Questionnaire that related to assessing parents' beliefs about IDS contained high item-reliability (Cronbach's $\alpha = .83$). A variable (i.e., referenced as IDS Beliefs) was created by summing each parent's responses to IDS-items and dividing by 12 (i.e., the number of IDS questions). Some items were reversed scored. Parents' scores ranged from 0 to 3. A higher score indicates that parents thought IDS was more valuable for their children's language learning while a lower score suggests that parents did not think IDS would be helpful. Results revealed mixed responses to the IDS Beliefs items. Table 3 shows the percentage of parents that *often* or *always* (scores 2 and 3) support the IDS item. Overall, parents were neutral toward their use of IDS when interacting with their infant ($M = 1.72$, $SD = .45$, *Range* = .67–2.75), falling if anything a bit in the negative range. Parents' beliefs did not differ according to the gender of the infant, t (53) =

.778, p = .44, d = .21. Nor did parents' beliefs relate to their children's age (r = -.18 p = .18) or language ability, as measured with the MCDI (r = -.18, p = .18).

Table 3 The percentage of parents that selected "often" or "always" on ids items. the scale was from 0 to 3 (never, sometimes, often, or always)

Parent beliefs about IDS usage	Mean (SD)	Percentage
I repeat myself more when I talk to my child than when I talk to my friends.	2.35 *(.65)*	90.9%
I change my words when my child does not understand me.	2.22 *(.71)*	83.6%
During a typical conversation with my child, I ask lots of questions	2.18 *(.80)*	83.6%
I repeat what my child says, adding new words.	2.15 *(.68)*	83.6%
*I address my child and my adult friends with the same tone of voice.	1.64 *(.68)*	60%
I use shorter sentences when I talk to my child than I do when talking to my friends.	1.69 *(.77)*	58.1%
I use "baby talk" – my voice gets higher and more melodic when speaking to my child than when speaking to an adult.	1.60 *(.87)*	52.7%
*I speak to my child as I would speak to an adult; this is how they will learn to speak intelligently.	1.55 *(.79)*	54.5%
*I correct my child if s/he uses the wrong word	1.42 *(.83)*	49.1%
*I speak to my child as I speak to adults to help him or her learn proper language.	1.29 *(.88)*	45.5%
I use shorter words when I talk to my child than when I talk to my friends.	1.33 *(.80)*	34.5%
I speak more slowly when I talk to my child than when I talk to my friends.	1.25 *(.82)*	38.1%

Note: * = Items are reverse coded; N = 55.

Do Parents Exhibit IDS in their Speech and Are There Behaviors That Accompany IDS?

To examine how parents acted in the infant-directed communication context, I investigated how parents' acoustic features change when speaking with an experimenter compared to speaking with their infant. Additionally, I explored behaviors that may co-occur when adults use infant-directed speech.

The Use of the IDS Speech Register

To explore changes related to speech register, I extracted the fundamental frequency, pitch minimum, and pitch maximum in both the ADS and IDS block using Praat software (Boersma & Weeninik, 2018). Both blocks were at least 45-seconds long. However, the time duration of the ADS (M = 39.72, SD = 2.99, *Range* = 24.68–45.48 seconds) and IDS (M = 38.03, SD = 5.34, *Range* = 15.00–45.84 seconds) blocks still significantly differed, t (56) = 2.224, p = .03, d = .30. This could be because both blocks were edited to ensure only the parents' voice was measured. Many videos were shorter in the IDS block than the ADS block. This could be because parents followed infants' vocalizations and behavior during the IDS block. In contrast, the experimenter encouraged parents to share as much as they were comfortable with during the ADS block.

Three one-way ANOVAs were separately conducted to compare the effect of the block (IDS vs. ADS) on the three dependent variables, parents' average fundamental frequency, maximum pitch, and minimum pitch. Results revealed a significant difference between parents' average fundamental frequency between the ADS and IDS blocks, F (1, 112) = 60.803, p < .001. There was also a significant difference between parents' maximum pitch between the ADS and IDS blocks, F (1, 112) = 4.669, p = .03. However, no significant difference emerged for minimum pitch

across the ADS and IDS blocks, F (1, 112) = .207, p =. 65. Altogether, results revealed that parents had a significantly higher average fundamental frequency and maximum pitch during the IDS block in comparison to the ADS block (Figure 3), suggesting that they spoke differently to their child when teaching a novel word than when they spoke to an adult.

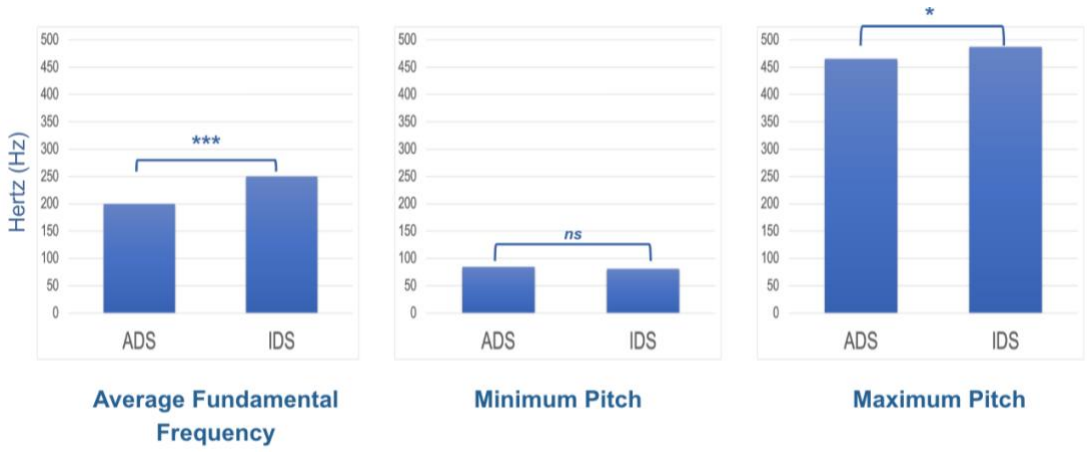


Figure 3 Results from three separate One-Way Anovas to assess whether parents adjusted their speech register between the ADS and IDS

For subsequent analyses, I created a difference score for each participant between Time 2 (IDS) and Time 1 (ADS) to examine parents' speech register adjustment. Specifically, parents' average fundamental frequency at Time 1 was subtracted from their average fundamental frequency at Time 2, yielding a difference score that allows us to control for individual differences. In subsequent analyses, only the average fundamental frequency was used because it is a commonly used measure to explore pitch modification (Masataka, 2002). A large speech register adjustment score signifies that a parent's average fundamental frequency was higher when

teaching a novel word to their child. A smaller score signifies less change when interacting with their child.

Behaviors

Exploratory descriptive analyses were run to examine which characteristics of IDS parents use when teaching a novel word to their child (Table 4). Results revealed that 51 out of 57 parents asked at least three questions (89.5%), 50 out of 57 parents pointed to the screen at least three times (87.7%), and 53 out of 57 participants repeated the target word at least three times (93%).

Table 4 Means and standard deviations of parent behaviors during the 45-second IDS block

Behavior	Mean (*SD*)	Range
Questions	5.28 *(3.23)*	0-14
Pointing	3.53 *(2.38)*	0-10
Repetition	11.19 *(3.63*)	5-20

Is IDS Accompanied by Child-directed Behaviors?

To assess whether change in speech register co-occurred with specific IDS-related behaviors, I ran a series of correlations between parents' speech register adjustment score and the behaviors they produced during the teaching session. A series of correlations were non-significant between IDS beliefs and question-asking (r = .12, p = .38), pointing (r = .20, p = .14), and repetition of the target word (r = .16, p = .25).

Another correlation between parents' speech register adjustment score and a behavior composite score was run. The behavior composite score summed the number of questions, points, and repetitions the parent produced during the IDS block (M = 20, SD = 5.96, *Range*= 10-33). Results revealed a correlation that was not significant (r = .24, p = .07). Figure 4 shows a scatterplot of parents' speech register adjustment score and their behavior when they taught their child a novel word.

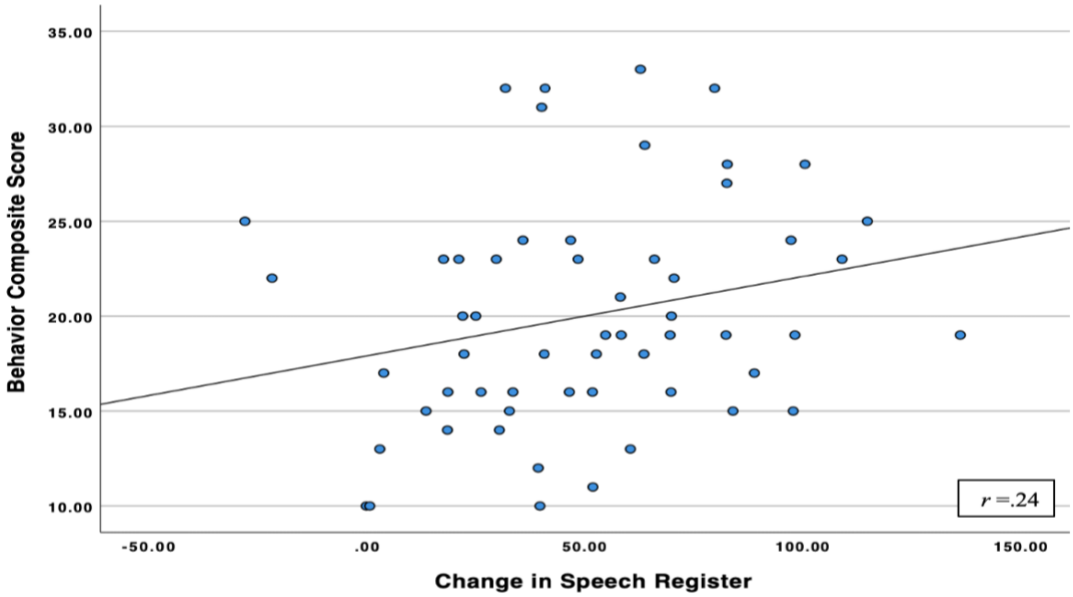


Figure 4 Relationship between change in behavior composite score and change in parents' average fundamental frequency for each participant between Time 2 (IDS) and Time 1 (ADS). Zero indicates that there was no change in parents' speech register and parents did not engage in IDS related behaviors (asking questions, pointing, and repeating the target word) during the teaching block

Is There Alignment Between Parents' Beliefs and the Speech Register They Use When They Teach Their Child a New Word?

A correlation between parents' IDS beliefs scores and their speech register adjustment scores (IDS – ADS) was not significant (r = .26, p = .06). Figure 5 presents the relationship between parents' beliefs about IDS and their speech register adjustment score during the IDS block.

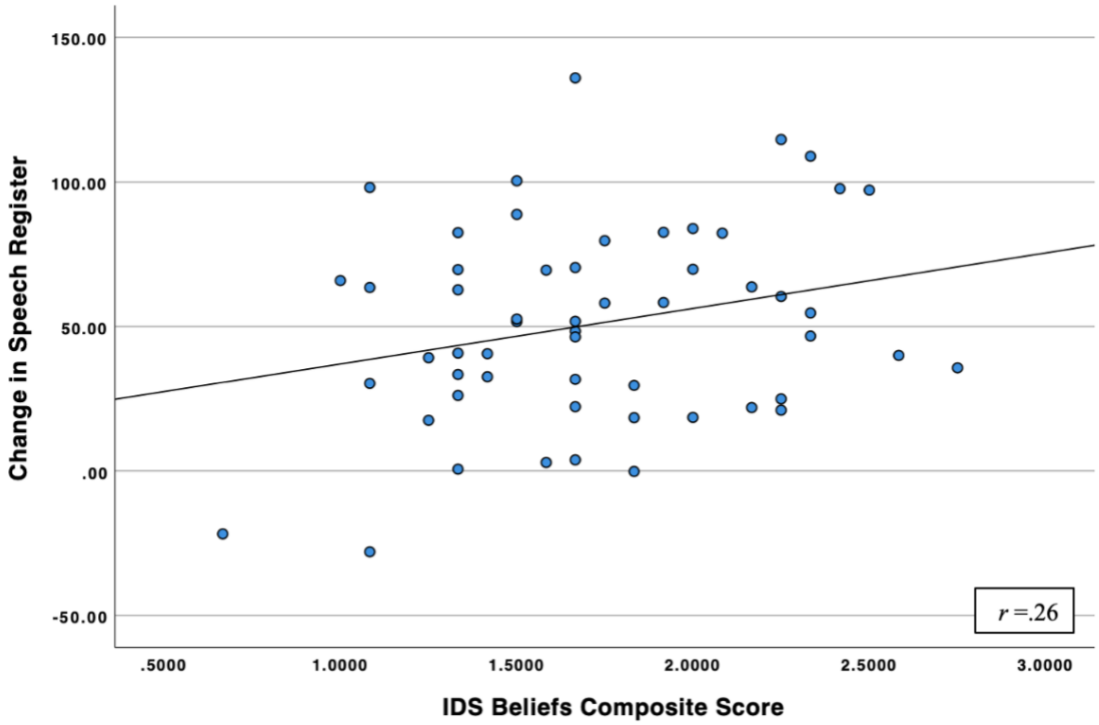


Figure 5 Relationship between IDS beliefs and change in parents' average fundamental frequency for each participant between Time 2 (IDS) and Time 1 (ADS)

To further examine those parents who may have a misalignment between beliefs and change in speech register, I conducted a split at the median of parents' beliefs about IDS, 1.66. *IDS supporters* were defined as parents who had a score higher than 1.66 (n = 32). *IDS non-supporters* were parents who had a lower score

than 1.66, (n = 23). An independent samples t-test was conducted to examine whether there were differences in parents' speech register adjustment score (average fundamental frequency during IDS block – average fundamental frequency during ADS block) between IDS supporters (M = 55.60 Hz, SD = 33.46 Hz) and IDS non-supporters (M = 44.33 Hz, SD = 34.92 Hz). There was not a significant difference between the speech register adjustment score between IDS supporters and non-supporters in the speech register they used to address infants versus adults was not significant, t (53) = 1.210, p = .23, d = .33.

A 93.19 Hz increase in fundamental frequency between the IDS and ADS blocks was used to define whether parents adopted the IDS register when addressing their children. This criterion was based on prior studies that subtracted the ADS average fundamental frequency value from the IDS average fundamental frequency value in past work (Ma et al., 2011; Singh et al., 2009; Thiessen et al., 2005). Therefore, I averaged participants' fundamental frequencies in each condition (IDS and ADS) to create these speech register adjustment scores. In the current study, I found that 27 out of the 32 IDS supporters (84.4%) increased their speech register above our criterion. On the other hand, 21 out of the 23 IDS non-supporters (91.3%) exceeded this criterion. Altogether, findings suggest that most parents adjusted their speech register when interacting with their child regardless of their beliefs as reflected on the questionnaire.

I then investigated how parents' speech register adjustment scores related to how they responded to specific items on the questionnaire. I examined parents' responses to three specific items that asked whether parents change their speech register when interacting with their children. Two items of the PLBQ were designed to

assess parents' responses about the use IDS (e.g., item 11: "I use baby talk–my voice gets higher and more melodic when speaking to my child than when speaking to an adult" and item 1: "I address my child and my adult friends with the same tone of voice"-scored in reverse). To assess the alignment between parents' speech register adjustment scores and their response to each of these items, I conducted two separate Pearson correlations. The relation between parents' response to item 11 and their speech register adjustment score was significant (r = .31, p = .02), suggesting that parents' change in speech register during the teaching block was aligned with their belief that they used a higher and more melodic voice when speaking with their child. However, there was a non-significant relation between parents' response to item 1 and their speech register adjustment score (r = .11, p = .43). Although these statements may be contradictory, it seems that parents report that they are aware that they adjust their pitch when interacting with their child. However, parents' responses to these items suggest that they might be less conscious of the extent to which their speech to their child differs from the way they talk with adults.

Another item of the PLBQ was designed to examine why parents report not using IDS (e.g., item 6: "I speak to my child as I would speak to an adult; this is how they will learn to speak intelligently"). To assess the alignment between parents' speech register adjustment score and their response to item 6, I conducted another Pearson correlation. I found a non-significant correlation between parents' response to the PLBQ item and their speech register adjustment score (r = .24, p = .08), suggesting that parents think that they should talk to their child in the same way that they speak to an adult.

How Do Parents' IDS Beliefs Predict to Children's Expressive Language Scores?

A multiple regression analysis (MRA) was run to assess the contribution of parents' beliefs about IDS and their speech register adjustment score on the dependent variable, children's expressive language skills measured as the number of words they produce on the MCDI. I inserted parents' speech register adjustment score first, as parents' speech register adjustment has been shown to be associated with children's language acquisition in past studies (Cristia, 2013; Ma et al., 2011; Thiessen et al., 2005). This model accounted for a non-significant 3.8% of the variance in children's expressive language skills, F (2, 52) = 1.019, MSE = .023, p = .37.

Assessing Whether Parents' IDS Beliefs are Associated with Children's Word Learning

Preliminary Analyses

To assess how parents' beliefs contribute to children's word learning performance, I first needed to probe which children learned the novel word. I calculated infants' percentage looking to the target (PLT; Verdine et al., 2017) by dividing infants' looking time towards the target during test trials by their total looking time to both objects on the screen. I conducted a series of preliminary analyses to assess whether children's PLT differed according to gender or condition. An independent-samples t-test between females (M = .60, SD = .18) and males (M = .57, SD = .16) indicated no gender difference on word learning, t (55) = .545, p = .59. I also examined whether there was an effect related to condition (whether the target word was *dax* or *glorp*) and the order in which the target word was presented during exploration trials (*glorp* appeared first for half the children). A one-way ANOVA with the four conditions as the between-subjects variable and infants' word learning

performance test average found no differences across conditions, F (3, 52) = .244, p = .87. Thus, the data were collapsed across gender and condition. To assess whether children preferred one toy or another, I conducted a paired-samples t-test between exploration trial 1 (M = .78 SD = .14) and exploration trial 2 (M = .78, SD = .19). I found no significant difference between the two exploration trials indicating that children did not prefer one toy over the other, t (56) = .087, p = .93.

Did Children Learn the Word that their Parent Taught them During the Teaching Block?

Test trial 1 examined whether the child mapped the novel label to the correct object. If the child had correctly associated the label with the corresponding object, they should look longer at the object that the parent named (i.e., the target) than object that the parent did not name (i.e., non-target). In contrast, in the second test trial (i.e., the *mutual exclusivity* trial), the auditory stimuli asked the child to look at the object the parent did not name during the teaching session, allowing us to examine whether the child mapped the novel label to the correct object and not to both novel objects (Reed et al., 2017). If the child learned the label for the target object, they should associate the new label with the object that was not named during the teaching block, possibly using mutual exclusivity (Markman & Wachtel, 1988). Lastly, a *recovery* trial replicated the first testing trial, in which the auditory stimuli directed the child to look at the target object after an intervening delay and hearing another new word. If the child successfully learned the label for the novel object, they should once again look at the target object, the one the parent named, during this testing trial.

Although test trials 1 and 3 (the recovery trial) were similar, test trial 2 (the mutual exclusivity trial) asked a different question. Success in the test trial 2 would be

evidenced by disruption of prior looking patterns in test trials 1 and 3. Therefore, each test trial was analyzed individually. A repeated-measures ANOVA with one factor (trial type) with three levels (test trial 1, mutual exclusivity trial, recovery trial) was run. The repeated-measures ANOVA with a Greenhouse-Geisser correction determined that the children's PLT differed significantly between the three test trials, F (1.581, 88.545) = 8.476, p = .001 (Figure 6). Post hoc analysis with Bonferroni adjustment revealed that children's PLT was statistically significant between test trials 1 (M = .59, SD = .16) and 2 (M = .44, SD = .20), p = .001. Additionally, there was a statistically significant difference between test trials 2 and 3 (recovery trial) (M = .58, SD = .25), p = .02. However, there was not a significant difference between trial 1 and 3, demonstrating robust learning of the novel word because children had to remember the novel word with an intervening trial and another new object-name pair offered.

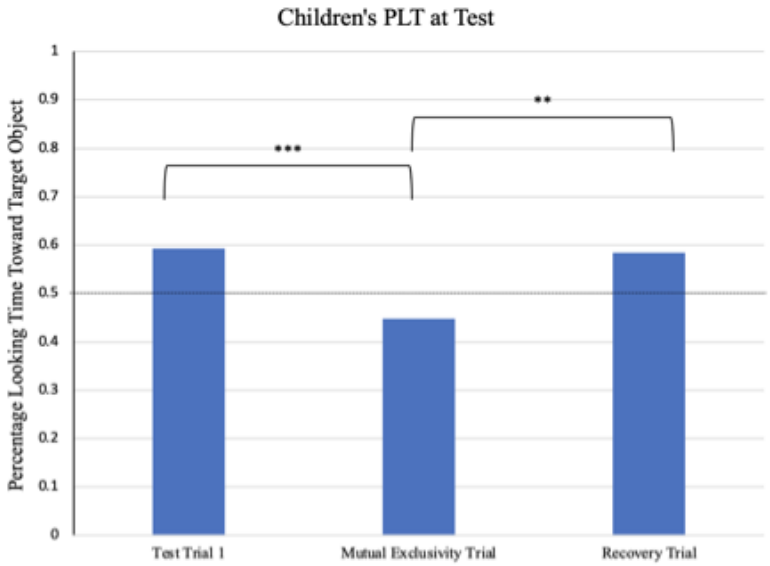


Figure 6 Children's percentage of looking time toward the target object during the three test trials

I next examined whether children's PLT score for each trial differed from chance. For test trial 1, children's PLT score (M = .59, SD = .16) was significantly greater than chance (50%), t (56) = 28.777, p < .001, d = .60. These findings suggest that infants demonstrated comprehension of the object name they were taught during test trial 1. When looking at children's PLT score, 42 out of 57 children (73.7%) looked longer at the object parents labeled during the teaching block at test trial 1.
For the mutual exclusivity trial, children's PLT score (M = .45, SD = .*20*) was significantly less than chance (50%), t (56) = 17.292, p < .001, d = -.23. These findings suggest that infants demonstrated mutual exclusivity, in which they switched their gaze to the object that was not named during the prior teaching session. However, only 25 out of 57 children (43.9%) looked longer at the object that was not named during the teaching block at test trial 2.
For the recovery trial, children's PLT score (M = .58, SD = .25) was significantly greater than chance (50%) as well, t (56) = 17.922, p < .001, d = 34. Specifically, 38 out of 57 children (66.7%) looked longer at the target word at test.

An MRA was run to assess the contribution of parents' IDS beliefs on the dependent variable, infants' word learning performance. Parents' IDS beliefs were inserted as the predictor variable. Test trial 1 and the recovery trial (test trial 3) were identical in that both asked the infant to find the target object while the mutual exclusivity trial (test trial 2) was predicted to diminish infants' attention to the target object. To increase the reliability of infants' responses (Roseberry et al., 2009), data from test trial 1 and the recovery trial were averaged and inserted as the outcome variable. Children's language skills (MCDI) and age were inserted as control

variables. Results revealed that parents' beliefs around IDS did *not* contribute to children's word learning performance, F (3, 51) = .990, MSE = .030, p = .41.

Discussion

This study sought to examine how parents conceptualize infant-directed speech (IDS), whether there is an alignment between parents' beliefs about IDS usage and their speech when interacting with their children, and how IDS beliefs may relate to children's language skills, word learning, or parents' change in speech register during a word learning session. Although IDS is not used in all societies (e.g., Broesch & Bryant, 2018), its widespread use has been shown to enhance children's language learning (Cristia, 2013; Nelson et al., 1989; Kuhl et al., 1997; Thiessen et al., 2005). Therefore, it is essential to understand parents' perspectives on IDS and whether they think it facilitates their children's language development. Results revealed that parents had mixed beliefs about their use of IDS. Nevertheless, parents exhibited IDS in their speech and behavior, suggesting a misalignment. Lastly, parents' beliefs about using IDS predicted neither children's performance on the MCDI nor children's word learning at test.

Parents have Mixed Beliefs about Infant-directed Speech

The Parent Language Belief Questionnaire (PLBQ; Ramirez et al., in preparation) is the first questionnaire designed to examine parents' beliefs about infant-directed speech. Past studies have examined parents' beliefs about "baby talk" and defined baby talk as mispronunciations and irregular words (Rodriguez & Olswang, 2003; Simmons & Johnston, 2007). However, this definition does not align with what research defines as infant-directed speech. To address these flaws, I

designed 12- items on the PLBQ to assess parents' beliefs about IDS. These items were constructed based on findings from previous studies that defined IDS. Specifically, I asked parents to report how frequently they use simpler vocabulary (Henning et al., 2005; Hirsh-Pasek et al., 2006; Gros-Louis et al., 2014), shorter sentences (Song et al., 2010), a slower speech rate (Cooper & Aslin, 1990; Narayan & McDermott et al., 2016), and a higher pitch (Cristia, 2013; Fernald et al., 1989; Grieser & Kuhl, 1988) when interacting with their child. Additionally, I asked if parents were likely to ask more questions (Blake et al., 2006; Blewit et al., 2009; Luo et al., 2022) and use more repetition (McRoberts et al. 2009; Newman et al., 2016) when speaking with children compared to adults. Querying the various aspects of IDS allowed us to identify what parents think about them. Another benefit of the PLBQ is that it is a quick online questionnaire. On average, parents completed the PLBQ in about 6.5 minutes (Range = 3 to 14 minutes). Lastly, designing the questionnaire on Qualtrics allowed parents to respond to questions on their laptops or mobile devices, making it readily accessible.

Our first research question probed parents' beliefs about infant-directed speech. I hypothesized that parents would underestimate their IDS usage based on parents' responses in past studies (Rodriguez & Olswang, 2003; Simmons & Johnston, 2007). I defined infant-directed speech as using a slower speech rate (Cooper & Aslin, 1990; Narayan & McDermott et al., 2016), fewer words per utterance (Martin et al., 2016), higher-than-average pitch (Fernald & Simon, 1984; Song et al., 2010), elongating vowels (Uther et al., 2007), and a narrower set of vocabulary words (Henning et al., 2005) when speaking with a child compared to speaking with an adult (adult-directed speech; ADS). I omitted mispronunciations and shortened words (e.g.,

"wawa" for water) in our definition and did not include these aspects in any of the items. I found that parents had mixed responses to the IDS items. For example, 52.7% of parents reported that they often or always "use baby talk–their voice gets higher and more melodic when speaking to their child than when speaking to an adult." It seems that parents might be unaware that they naturally adjust their speech register when interacting with children.

When further exploring parents' perceptions of how they adjust their speech with their child, I found that parents were more receptive to IDS-items that did not focus on speech registers per se. For example, 83.6% of parents reported that they often or always "change their words when their child does not understand them," and 90% reported that they often or always "repeat themselves more when they talk to their child than when they talk to their friends." One possibility could be because parents may not be conscious that they adjust their speech register. Therefore, they are less likely to admit to adjusting their speech register in comparison to other behaviors such as simplifying vocabulary and repetition.

In past studies, parents' knowledge of child development was associated with parents' self-efficacy, child-rearing practices, variability in linguistic input, and children's language abilities (Albarran & Reich, 2014; Bornstein et al., 2003; Donahue et al., 1997). For example, Rowe (2008) explored the factors contributing to parental language input variability. Exposure to child-directed speech at 24-months was correlated with children's language skills one year later. Differences in the proportion of parents' child-directed speech were related to parents' SES, as measured by income and education. Importantly, parents' knowledge of child development mediated the relationship between parents' use of child-directed speech and SES. This suggests that

parents with more knowledge about children's development, as measured by parents' performance on the KIDI (MacPhee, 2002), were more likely to use child-directed speech with their children. These findings highlight how parent cognition is often connected with parent behavior (Belsky et al., 1984; Huang et al., 2005) and, in turn, children's development (Bornstein et al., 2018; McKee et al., 2021). Therefore, understanding how parents conceptualize IDS may provide insight into the barriers to using infant-directed speech when interacting with their children.

Parents Exhibit IDS in their Speech

A second aim investigated whether parents modified their speech register when interacting with their child compared to interacting with an adult. I hypothesized that parents' speech would have a higher pitch when interacting with their infant versus another adult. There was a significant difference in parents' average fundamental frequency between the ADS and IDS blocks. To further explore the extent of this difference, I created a speech register adjustment score for each participant by subtracting the average fundamental frequency during Time 1 (ADS) from Time 2 (IDS). An average difference of 50 Hz was found between the IDS and ADS block. These findings suggest that parents adjusted their speech register depending on their communicative partner. Specifically, parents had a significantly higher average fundamental frequency when teaching a label to their infant than when parents talked with the experimenter. This aligns with our hypothesis and past work in which parents elevated their pitch when speaking with infants (Fernald & Simon, 1984; Golinkoff et al., 2015; Masataka, 2002; Song et al., 2010; Spinelli et al., 2017).

Why do many parents use infant-directed speech with their young children? First, parents may use IDS to *elicit and maintain children's attention* (Cooper et al

1997; Fernald, 1992; Fernald & Simon, 1984; Werker & McLeod, 1992). Indeed, Dunst et al. (2012) found that infants tend to prefer listening to IDS over ADS speech in their meta-analysis with 34 studies. These results hold regardless of the gender of the voice (Werker & McLeod, 1989). This could be because the high and varied pitch found in IDS make the auditory stimuli more salient than ADS (Soderstrom, 2007). Parents may notice that infants pay more attention to them when they use IDS.

The second possibility is that parents might use IDS to *reassure their children* when their physical proximity decreases (Katz et al., 1996). Adults tend to display exaggerated positive affect by smiling, widening their eyes, and raising their eyebrows when interacting with infants (Fernald & Kuhl, 1987; Scherer et al., 1991; Swerts & Krahmer, 2010; Werker & McLeod, 1989). These exaggerated facial expressions often accompany infant-directed speech (Chong et al., 2003). However, there are times when infants cannot access their parents' facial signals. For example, a parent might clean dishes or run a load of laundry while their infant plays in the next room. Infants are more likely to decipher the affectionate intention of caregivers' messages when parents use IDS than ADS (Fernald, 1989; Moore et al., 1997; Spence et al., 2003). This can be seen when a child relaxes as they hear their parent's voice from a different room.

Third, parents may use IDS to *encourage infants to participate* in the conversation. The slower tempo in IDS may create the opportunity for infants to process the auditory stimuli and respond, either through gestures, babbling, or talking (Ferjan Ramírez et al., 2020). Inviting children to engage in conversational turn-taking is a key component for building language, social skills, and cognitive development (Donnelly & Kidd, 2021). For example, Hirsh-Pasek et al. (2015) examined the

contributions of the quantity and quality of input in 60 parent-child dyads on children's later language development. Results revealed that the turn-taking between the mother-child dyad (i.e., "fluency and connectedness") at 24-months correlated with children's expressive language abilities a year later. Through turn-taking, parents can encourage children to take an active role in conversations, which is associated with stronger language skills (Romeo et al., 2018; Tamis-LeMonda et al., 2014).

The fourth possibility is that parents may use IDS with their children with an eye to *facilitating language development* (Saint-Georges et al., 2013). Given parents' mixed responses to the IDS items, this possibility is likely to be an unconscious behavior. Parents may modify their behavior to adjust according to children's current language skills (Bruner et al., 1984). For example, Bergelson et al. (2019) observed children's linguistic environments between the ages of 3- to 20-months. In their study, results revealed that the proportion of child-directed speech increased with age because of a decrease in adult-directed speech (ADS) increased. One hypothesis for this decrease in ADS could be that children produce more vocalizations as they age. Consequently, parents may tune into children's vocalizations instead of participating in adult-to-adult conversations. Indeed, parents talk more to infants who have begun to talk than infants who are not talking yet (Dailey & Bergelson, 2022).

Findings from our study are consistent with several of these possibilities. Specifically, parents used IDS to direct infants' attention toward the screen (Reason 1). They also invited infants to engage in conversation by encouraging them to point and pronounce the target word (Reason 3). Lastly, I gave parents the goal of teaching their child a novel word, allowing parents to facilitate word learning in whatever way felt natural to them. Many parents adjusted their speech register to teach their children

the novel word (Reason 4). Importantly, I did not directly ask parents why they used IDS when they taught their children a novel word. An avenue for future work should include interviewing parents to better understand whether they have any idea about why they adjust their speech register when talking with their child.

There is Misalignment Between Parents' Beliefs about IDS with their Change in Speech Register

The third research question probed whether parents' beliefs would align with their use of IDS when interacting with their child. I hypothesized that there would be a *misalignment* between parents' beliefs about IDS and their speech registers, especially for those parents who indicated that they did not use IDS. I created a criterion to further explore which parents "switched" to IDS. First, participants' fundamental frequencies were averaged for each condition (IDS and ADS) as in past studies (Ma et al., 2011; Singh et al., 2009; Thiessen et al., 2005). By subtracting the ADS average fundamental frequency value from the IDS average fundamental frequency, a speech adjustment score was created (e.g., IDS: 330 - ADS: 219, see Ma et al., 2011). The averaged speech register adjustment scores resulted in a 93 Hz average difference. Consistent with our hypothesis, results revealed that 87.7% parents elevated their speech register when interacting with their children according to our criterion.

I then split parents' beliefs about IDS according to median (1.66) into two categories: IDS-supporters and non-supporters. Interestingly, no significant difference in the speech register adjustment score emerged between the two groups. Findings suggest that most parents adjusted their speech register when interacting with children regardless of their beliefs about IDS. Although the literature often observes a correlation between parental knowledge about child development and parenting

practices (Belsky, 1984; Huang et al., 2005), I do not see this pattern when analyzing the relation between IDS beliefs and behavior. In contrast, our findings revealed that parents' beliefs about IDS do not correlate with their speech register adjustment.

Next, I broke down the IDS composite score to investigate whether parents' speech register adjustment scores were aligned with specific items on the questionnaire. Notably, parents who had a higher speech register adjustment score were more likely to report that they "use "baby talk–their voice gets higher and more melodic when speaking to my child than when speaking to an adult" on the questionnaire (p = .02). However, there was no relationship between parents' speech register adjustment score and their response to "I address my child and my adult friends with the same tone of voice" (scored in reverse) (p = .43). Additionally, there was no relationship between parents' speech register adjustment score and their response to "I speak to my child as I would speak to an adult; this is how they will learn to speak intelligently." There are two possibilities for why parents responded differently to each item.

The first possibility could be that parents believe that they should talk to children in the same way that they speak to adults. Alternatively, it could be that parents are aware that they adjust their pitch when interacting with their child. However, they might be less conscious of the *extent* to which their speech to their child differs from the way they talk with adults, thinking the difference small. Altogether, it seems that parents have misconceptions about IDS. This could be due to inconsistent messaging about the use of baby talk with their children. A quick Google search of "should parents use baby talk with kids" on March 20, 2023, yields 882,000,000 results with conflicting article titles, such as "Why baby talk is good and

bad for kids," "Why should one avoid using baby talk," or "Using baby talk isn't just cute: it could help them learn to make words." Additionally, early writers framed baby talk as harmful (McCarthy, 1954), potentially creating a stigma around its use. Parents are more likely to turn towards Google for their source of information than research articles. Therefore, defining infant-directed speech and clarifying that it is beneficial for babies may be an initial step toward addressing parents' misconceptions about baby talk.

Infant-Directed Communication Extends Beyond Speech

This study also examined whether there are reliable behaviors that accompany IDS. I hypothesized that parents would exhibit such behavior when interacting with their infant. I found that parents' change in speech register co-occurred with specific behaviors such as question-asking, pointing, and repetition. During the 45-second IDS block, 89.5% of parents asked at least three questions, 87.7% pointed to the screen at least three times, and 93% repeated the target word at least 3 times when teaching their child a novel label. This is consistent with past research, as question-asking (Robinson et al., 2009), pointing (Tomasello et al., 2007), and repetition (Newport et al., 1977) are all methods to help direct and sustain children's attention. However, these behaviors did not correlate with children's word learning in the present study ($p = .60$).

Interestingly, parents' beliefs about IDS were *not* correlated to their question-asking, pointing, or use of repetition during the IDS block. Additionally, the relationship between parents' speech register adjustment and a composite behavior score of these three behaviors was positively, but *not* significantly correlated ($p = .07$). This suggests that parents who elevated their speech register were more likely to

engage in child-directed behaviors, such as question-asking, pointing, or using repetition, during the IDS block. Parents' beliefs may not be associated with their behavior because they may be aware of their behavior. On the other hand, speech register and behavior may co-occur when parents engage with their children, consistent with recent work exploring *infant-directed communication* (Kosie & Lew-Williams, 2022). In their work, Kosie and Lew-Williams (2022) found that parents' speech, action, gesture, emotion, and touch can jointly co-occur in different combinations at any point during a play session.

IDS Beliefs Do Not Associate with Children's Expressive Language Scores nor Children's Performance on a Word Learning Task

Our final question assessed whether parents' beliefs about IDS are associated with children's expressive language scores (MCDI) or children's performance on a word learning task. I hypothesized that parents' beliefs about IDS would *not* relate to any of these outcome variables. Results were in alignment with our hypothesis, in that parents' beliefs around IDS did not associate with children's expressive language scores nor children's performance on a word learning task. Apparently, parents' beliefs about IDS do not reflect what they do in real-time. In real-time, parents engage in child-directed behaviors and elevate their speech register when talking with their child.

How the Present Findings Can Impact Parent-Child Linguistic Interactions

I acknowledge that infant-directed speech is rare in some communities (see Broesch & Bryant, 2018; Cristia et al., 2019; Ochs & Schieffelin, 1984). Thus, I cannot claim that IDS is necessary for children's language learning (Ma et al., 2011). Indeed, children in these communities develop language at the same rate as children

from the United States (Casillas et al., 2020, 2021), a country that commonly uses IDS when interacting with infants (The ManyBabies Consortium, 2020). Floor and Akhtar (2006) found that 18-month-old children could learn a novel word when stimuli were presented indirectly (i.e., overheard speech). However, exposure to IDS, in particular, has many benefits for language acquisition, such as facilitating word segmentation (Thiessen et al., 2005), word recognition (Singh et al., 2009), speech discrimination (Liu et al., 2003), and phoneme categorization (Werker et al., 2007). Additionally, infant-directed speech can be beneficial in communities where interactions with children are rare. For example, Shneidman and Goldin-Meadow (2012) explored sources of children's language input in a Mayan community and with families in the United States. Though interactions occurred far less in the Mayan community than in the U.S. sample, children's exposure to direct input by adults at 24-months was the most robust predictor of children's later vocabulary skills in the Mayan sample. Nearly all children become competent speakers in their respective communities. Therefore, although IDS is not *necessary* for word learning, I argue that IDS, among other aspects of the linguistic environment (e.g., eye-gaze, perceptual salience, turn-taking; Hollich et al., 2000), is a valuable tool to facilitate language development.

These findings may be useful in future interventions that address how parents interact with their language-learning children. For example, Ferjan Ramírez et al. (2018) examined whether coaching parents at 6- and 10-months would improve children's language skills at 14-months. Coaching included providing feedback on how parents interacted with their infant by sharing written reports and listening to recordings. Additionally, coaches discussed the benefits of using IDS, turn-taking exchanges, and overall talk on children's language development with parents. Results

revealed that parents who received coaching were more likely to increase their use of infant-directed speech than those who did not receive coaching. Furthermore, children whose parents received coaching had higher language gains than children whose parents did not receive coaching. Our findings suggest that coaches also address potential misconceptions about infant-directed speech. Addressing misconceptions may contribute to clarifying the messaging about baby talk and remove any stigma around its use.

Limitations

Although these findings have implications for adding to current interventions that build children's language skills, there are several limitations to consider. First, these interactions occurred over Zoom and might not reflect everyday interactions. Additionally, the context in which parents interacted with another adult differed from how they were asked to interact with their child. To receive a sample of parents' adult-directed speech, I used a recording from parents' responses to the experimenter's questions (e.g., "Can you share a little bit about what a morning looks like for you and your child?"). To receive a sample of parents' infant-directed speech, I asked parents to teach their child the label of that new toy and explained that I would assess children's knowledge of the label. Parents may exhibit more IDS than they would in an everyday context because the task was goal oriented. In sum, the context may have played a role in how parents adjusted their speech register. To control for differences related to the context, future work should ask parents to complete a similar task when interacting with infants and another adult. However, there is little reason to believe that parents would use IDS when teaching a new word to an adult, as past work has found significant differences between parents' IDS and ADS in studies with more

naturalistic designs (e.g., Englund & Behne, 2005; Kalashnikova & Burnham, 2018; Narayan & McDermott, 2016).

Another weakness of the study is that our sample was largely homogeneous. First, 71.9% of families identified as White. As beliefs about child-rearing practices differ across cultures (Johnston & Wong, 2002; Mancilla-Martinez & Lesaux, 2014; Simmons & Johnston, 2007) and the use of IDS is not present in all societies (e.g. Broesch & Bryant, 2018), a more diverse sample might differ in their beliefs about IDS. Additionally, 87.7% of parents held at least a bachelor's degree. Given that children in homes with higher maternal education hear more child-directed speech than those in lower-maternal education homes (Bergelson et al., 2019), IDS beliefs may differ in a sample with lower-maternal education.

Another limitation is that 92.9% of the sample were mothers. Although many studies have focused on maternal infant-directed speech, fewer studies have examined paternal infant-directed speech (Benders et al., 2021; Ferjan Ramírez, 2021; Golinkoff & Ames, 1979; Shapiro et al., 2021). In past work, Kennison and Byrd-Craven (2015) reported gender-differences in child-rearing beliefs. Specifically, they found that men were less likely than women to view the benefits of talking to infants. Thus, future work should examine whether fathers have a misalignment between their beliefs about IDS and their behavior, similar to how mothers participated in our study.

Lastly, the sample size was small. A power analyses was conducted to examine a large effect based on a prior study that had a similar design and topic of study (Dilley et al., 2020). Therefore, a small effect may go undetected.

Conclusion

The current study is the first to explore parents' beliefs about using infant-directed speech. These findings highlight the mixed beliefs about using IDS with their child, even though research has demonstrated positive benefits associated with using IDS. For example, some parents reported that they adjusted their speech register when interacting with their infant, while others did not. Interestingly, these beliefs do not affect children's language skills or their ability to learn a novel word. During current interventions, researchers define IDS to parents and discuss its benefits for language learning (see Ferjan Ramírez et al., 2018). Addressing parents' misconceptions about IDS might strengthen these interventions.

Chapter 3

EXPLORING DIALOGIC INTERACTIONS IN GRANDPARENT-GRANDCHILD CONVERSATIONS OVER VIDEO CHAT

Abstract

Many families use video chat to sustain relationships between children with distant family members, such as grandparents (e.g., Zosh et al., 2022). Research has yet to examine how grandparents support young children's language development over video chat in real time. The current study asks: 1) Do grandparents and grandchildren produce high-quality language talk (e.g., questions and statements) with each other as they engage with the media through video chat? 2) Do grandparents engage in dialogic interactions with their grandchildren? 3) What factors of the grandparent-grandchild relationship contribute to the nature of the interaction? Forty-three grandparents (10 males) and their grandchildren between the ages of 48- to 72-months (Mage = 60.19, SD = 6.49, 18 males) participated in a one-time video chat session with two activities: discussing a video and series of child-appropriate pictures. Results revealed that grandparents drove conversations and primarily used statements and questions when interacting with their grandchildren. Grandparents facilitated dialogic interactions using distancing prompts Lastly, grandparents' education, distance, frequency of video chat, or perceptions of video chat did not contribute to their overall talk or use of distancing prompts. Findings suggest that video chat interactions can be used to connect and support children's language development by allowing them to hear language and engage with distant loved ones.

Introduction

There are growing concerns about children's access to screens (e.g., Monteiro et al., 2022). At least 98% of children under eight have access to a device in their home and, on average, use about two and a half hours of screen media (Rideout, 2017). This number likely rose during the COVID-19 pandemic (Drouin et al., 2020). The American Academy of Pediatrics (AAP) generally recommends only one hour of screen time for children up to 5 years of age (AAP, 2011) because children's access to screens can be detrimental to their mental health, sleep, and language development (Christakis et al., 2009; Lam et al., 2003). However, not all screen time is equal (Brown et al., 2015). A large body of research suggests that video chat may be the exception to media restrictions (AAP, 2011; McClure et al., 2015). Many families utilize video chat to sustain and support relationships between children and distant relatives (Ballagas et al., 2009).

Research has yet to investigate the nature of conversations over video chat between adults and children. Given that children's language ability is the single best predictor of their school readiness and academic achievement (Burchinal et al., 2020; Duncan et al., 2007; Fiorentino & Howe, 2004; Hoff, 2013; Pace et al., 2018), and language input shapes children's language skills (Huttenlocher et al., 2002; Snow & Ferguson, 1977), it is essential to investigate how I can utilize smart devices as a tool for not only connection but also to support children's language development.

The present study examined the nature of conversations between grandparents and grandchildren as they engaged with media through video chat, whether dialogic interactions occurred during these conversations, and the factors that may have contributed to the nature of the conversations. I chose to examine children's conversations with their grandparents because this special relationship has many

health and psychological benefits for both participants (e.g., Duflos et al., 2020; Griggs et al., 2010; Neugarten & Weinstein, 1964; Thiele & Whelan, 2006). Additionally, a common reason parents use video chat with children is to support their child's relationship with their grandparents (Barr et al., 2020; Forghani & Neustaedter, 2014; McClure et al., 2015; Strouse et al., 2021; Zosh et al., 2022). Understanding the nature of conversations between grandparents and grandchildren as they interact through video chat may illuminate ways to promote children's language development over video chat.

Benefits of Video Chat

The use of video chat has opened doors for connection (Ames et al., 2010; Goldschmidt, 2020; McClure & Barr, 2017). In the past decade, video chat has been used to sustain relationships between children with other distanced family members due to deployment (Yeary et al., 2012), work (Yarosh & Abowd, 2011), divorce (Yarosh et al., 2009) or incarceration (Horgan & Poehlmann-Tynan, 2020). Video chat is also used to support relationships between children and their grandparents (McClure & Barr, 2017).

Compared to other forms of communication, young children stay attentive for a longer time when communicating over video chat (Tarasuik et al., 2013). In fact, Yadav and Chakraborty (2022) found that children aged 4-to 6-years 32.8% were more engaged when talking through video chat in comparison to phone calls. In another study, children under five were more likely to play with toys in an unfamiliar room for a longer duration when they were video chatting with their parents than when they were left alone or left with only an audio connection to their parents (Tarasuik et al., 2011, 2013). Past work has examined why video chat holds children's attention

more so than other mediums. One possibility could be because video chat allows participants to be visually present with each other in real-time (Ames et al., 2010; Ballagas et al., 2009; Roseberry et al., 2014). Having access to see a person may be an attentional draw. Another reason why video chat holds children's attention could be that video chat allows caregivers to observe children's nonverbal cues, such as facial expressions and gestures (McClure & Barr, 2017). These additional cues may be critical to maintaining children's attention.

The visual aspect of video chat gives participants access to the surrounding physical context, which grants multiple family members the opportunity to "pop in" if they are within earshot of the call (McClure & Barr, 2017). Families have taken advantage of the larger shared environment in the video chat by conducting family activities such as story reading or parties over video chat, creating a sense of belonging (Ames et al., 2010; Judge et al., 2010). Using video chat, adults can also establish joint attention in real-time by showing objects to children in their environment (Kelly, 2021; McClure et al., 2018). Access to the surrounding physical context and joint attention creates an atmosphere similar to in-person interactions (McClure et al., 2015).

Overall, prior research has found that video chat offers another way to connect with others because participants have access to virtually see each other in real-time (McClure & Barr, 2017). Research has yet to examine adult-child *language input specifically* during video chat interactions. Investigating the linguistic environment over video chat may offer insight on how adults support children's language development over video chat.

How Can Adults Support Children's Language Development Over Video Chat?

There is limited literature that has examined how adults support children's language development over video chat. On the contrary, much more research has examined how adults build children's language skills during in-person interactions. Here, I use what I have learned from in-person adult-child interactions to define what high-quality language interactions look like over video chat.

Delivery of Communication

One way to define high-quality language is by examining how adults deliver their language input (Masek et al., 2021; Tamis-LeMonda et al., 2012; Tompkins et al., 2017). Past work has found that asking children *questions* can build their language acquisition (Blake et al., 2006; Blewitt et al., 2009; Fletcher et al., 2008; Cristofaro & Tamis-Lemonda, 2011). For example, Bojczyk et al. (2016) examined the relationship between maternal beliefs about shared reading strategies, mothers' shared book-reading behaviors in real-time, and their preschoolers' language skills. In their study, question-asking and expansions (i.e., utterances that build upon children's utterances) were defined as strategies that encourage high-level child participation. Results revealed that exposure to question-asking and expansions positively predicted children's expressive vocabulary. Question-asking may facilitate language development because asking children questions fosters engagement and encourages children to participate in conversations, allowing them to practice producing language (Justice et al., 2002; McGinty et al., 2012).

However, questions only appear in some utterances of conversations. Two-thirds of preschool teachers' utterances in the classroom are statements and commands (de Rivera et al., 2005; Massey et al., 2008). *Statements* may be beneficial to build

children's language development because statements include descriptions and labeling. Providing labels and descriptions of objects have been shown to facilitate word learning for young children (Baldwin & Markman, 1989; Wu & Gros-Louis, 2015). When adults offer a label or description for an object, children can use this information to distinguish between lexical categories by noting which category the object falls into (Hadley et al., 2016).

Commands are used to regulate children's behavior or attention (Kuchirko et al., 2020). Interestingly, parents use more behavioral-related talk, referenced as commands, when children engage with media than in contexts in which media is not present (Parish-Morris et al., 2013). Therefore, there is a possibility that adults may use more commands as they engage with children over video chat, a form of media. However, commands typically use more pronouns, contain low lexical diversity, and are repetitive (Tamis-LeMonda et al., 2013). As a result, the use of commands is often associated with ineffective or negative relates to children's language development (Baumwell et al., 1997; Hoff & Naigles, 2002; Masur et al., 2005; Paavola et al., 2005).

In sum, previous research suggests that asking children questions and statements is more beneficial for children's language development than commands (Justice et al., 2002; Olsen-Fulero & Conforti, 1983; Yoder & Davies, 1990). Therefore, evidence of high-quality language over video chat would include a high proportion of questions and statements and low proportion of commands.

Content of Communication

Another way to identify high-quality language input is to examine the content of adult-child interactions over video chat. The content of communication during

adult-child interactions is often related to children's language development (Masek et al., 2021). In a shared book reading context, children learn best when caregivers incorporate *dialogic interactions* (Hargrave & Sénéchal, 2000). Dialogic interactions include three broad principles: offer feedback to the child on things they point to or talk about in the book, adapt according to the child's linguistic abilities by providing just enough information, and facilitate active participation on the part of the child (Arnold & Whitehurst, 1994; Parish-Morris et al., 2013; Zevenbergen & Whitehurst, 2003). During shared reading experiences, adults use dialogic interactions to aid children's understanding of the book by asking questions, labeling objects, correcting misunderstandings, providing additional prompts and explanations, and connecting the book to children's lives (Whitehurst et al., 1988).

There are many benefits to utilizing dialogic interactions, as they contribute to children's language and literacy development (Blom-Hoffman et al., 2006; De Temple & Snow, 2003; Fletcher et al., 2008; Mol et al., 2008) and, in turn, academic success (Demir-Lira et al., 2019; Luo et al., 2014). Additionally, dialogic interactions can encourage bonding (Ganotice et al., 2017; Huebner, 2000b) and excitement (Avelar et al., 2022) between caregivers and their children. Shared-reading experiences can lower parental stress (Huebner, 2000a) and increase caregivers' confidence (La Cour et al., 2013). Given the many benefits associated with using dialogic interactions with children, it is crucial to investigate whether dialogic interactions can appear in contexts beyond shared-book reading.

One context that dialogic interactions may appear in is when adults and children interact with media over video chat. For example, adults can encourage active participation with the media by using *distancing prompts*, which appear when adults

draw parallels from the storybook to children's lives (Purdy, 2008). Distancing prompts includes extending from the "here and now," with the topic of the discussion not in the immediate environment. To illustrate this, an adult may ask "Did you remember when I took you to the zoo?" when engaging with media that includes animals. When adults use distancing prompts during shared-book reading, children are more likely to retain information, stay engaged with the material, understand the storybook plot, and engage in distancing as well (Beck & McKeown 2007; DeTemple, 2001; Mckeown & Beck, 2003). Thus, engaging with media through video chat may invite the use of distancing prompts, a key component of dialogic interactions (Whitehurst, 1994; Hargrave & Sénéchal, 2000; Zevenbergen & Whitehurst, 2003).

Video Chatting with Grandparents

Many families use video chat to support the relationship between children and their grandparents (Barr et al., 2020; Forghani & Neustaedter, 2014; McClure et al., 2015; Strouse et al., 2021; Zosh et al., 2022). Indeed, when families were asked to list their motivation for using video chat with their child, the most frequently used words were variations of "family," "relatives," and "grandparents" (McClure et al., 2015). Yet, there is limited research that offers insight on what interactions between grandparents and grandchildren discuss over video chat. Some researchers have attempted to study video chat interactions between grandparents and grandchildren using questionnaires. Grandparents reported that they often let children take the lead and discuss recent events, things they learned, and shared experiences (Forghani & Neustaedter, 2014). In a more recent study, Strouse et al. (2021) also used a survey to examine how grandparents engaged with their grandchildren over video chat. Grandparents' responses varied. Most grandparents reported that they smiled (98%),

waved (88%), and showed children images or objects in their environment (64%). Fewer grandparents reported that they sang with their grandchild (48%), read to their grandchild (31%), and imitated the parent when the parent was in the same room as the child (10%). Additionally, results revealed that a greater *variety* of how grandparents engaged with their grandchildren contributed to the closeness of the grandparent-grandchild relationship (Strouse et al., 2021). This could be because engaging in a variety of ways may increase children's participation during video chat (Share et al., 2018).

Research has yet to explore the linguistic input during grandparent-grandchild interactions over video chat in *real-time*. Given that many families are already utilizing video chat to connect with grandparents (McClure & Barr, 2017), examining how grandparents and grandchildren converse over video chat is the next step. I do so by examining the nature of conversations between grandparents and grandchildren as they engage with the media through video chat. I also consider which factors of the grandparent-grandchild dyad play a role in grandparent-grandchild conversations.

Factors that Contribute to the Grandparent-grandchild Relationship

Prior research has identified several factors that strengthen the bond between children and their grandparents. These factors may also contribute to the quality of language input during conversations between grandparents and grandchildren. The relationship between children and their grandparents is a function of the individual characteristics of both children and their grandparents. These factors include participant characteristics, perceptions of family dynamics, distance, and frequency of video chat.

Participant characteristics related to the grandparent-grandchild relationship include grandparents' age and education (Davey et al., 2009; Hakoyama & MaloneBeach, 2013). Specifically, younger grandparents are more likely to have a stronger relationship with their grandchild than older grandparents (Davey et al., 2009). Additionally, grandparents with fewer years of education tend to have a closer relationship than grandparents with higher education (Silverstein & Marenco, 2001; Strouse et al., 2021).

Parents' perceptions of family relationships are also associated with the grandparent-grandchild relationship (Block et al., 2000; Strouse et al., 2021). One hypothesis suggests that parents are the "gatekeeper" to the closeness between children and their grandparents (Mueller & Elder, 2003). If parents are not close with their children's grandparents, children are less likely to engage with them. Moreover, children are less likely to maintain the grandparent-grandchild relationship as they age if they do not have a close relationship with their grandparents when they are young (Hakoyama & MaloneBeach, 2013).

The geographical distance between children and their grandparents is also associated with the closeness between the grandparent-grandchild dyad (Davey et al., 2009). Children who live closer to their grandparents tend to have a closer relationship due to the frequency of in-person visits. These factors are again often mediated by parental choices. Notably, the frequency of video chat mediates the relationship between distance and the closeness between grandparents and their grandchildren (Davey et al., 2009). One reason may be that each interaction over video chat gives grandparents insight into their grandchildren's lives and permits children to become more familiar with their grandparents (Ames et al., 2010). Continued interactions over

video chat between the grandparent-grandchild dyad may lessen the issue of children's tendency to become shy after long absences. Indeed, video chat is a common method to nurse bonds with grandparents who live at a distance (McClure & Barr, 2017).

Notably, most of these studies focused on relationships of grandparents with older grandchildren (Dunifon & Bajracharya, 2012; Monserud, 2010; Silverstein & Marenco, 2001). Although there is limited research surrounding the relationship between grandparents and their grandchildren under five years of age, past work has hypothesized that the grandparent-grandchild relationship may strengthen as children become better communication partners over their first five years of life (Strouse et al., 2021). With stronger social and linguistic skills, children are more likely to engage in turn-taking communication (Casillas, 2014; Donnelly & Kidd, 2021). Therefore, the impact of these factors on the grandparent-grandchild relationship may still hold when exploring relationships with preschool-aged children.

The Current Study

As families continue to take advantage of video chat during COVID-19 and beyond, it is critical to explore how we can utilize video chat to stimulate emotional connections with distant loved ones and foster child language development. The current study examined the nature of conversations between grandparents and their grandchildren as they engaged with media through video chat. I also considered the factors of the grandparent-grandchild relationship that may contribute to the nature of the conversation. Our specific research questions were:

1. Do grandparents and grandchildren produce high-quality language talk (e.g., questions and statements) with each other as they engage with the media through video chat?

2. Do grandparents engage in dialogic interactions with their grandchildren?
3. What factors (i.e., individual differences in characteristics of the dyads or grandparent/parent perceptions of video chat) contribute to the nature of the video chat interaction with media?

For the first research question, I hypothesized that grandparents would mostly use questions and statements to facilitate active participation over video chat. I also hypothesized that grandparents would drive the conversation. Therefore, children would mostly use statements. To address the second research question, I hypothesized that grandparents would utilize dialogic practices in the form of distancing prompts throughout the interaction, saying things like, "Remember when you saw a horse at the farm?" and "Did you have a pinata at your birthday?" For the third research question, I hypothesized that differences in use of distancing prompts will appear according to individual characteristics of the grandparent-grandchild dyad. Specifically, I hypothesized that grandparents who have fewer years of education, live closer, have positive perceptions of video chat, and use video chat more frequently with their grandchildren would use more distancing prompts when interacting with their grandchild over video chat, as these characteristics tend to facilitate a close relationship between children and their grandparents (Silverstein & Marenco, 2001; Strouse et al., 2021).

Although data for this study were primarily collected during the worst of the COVID-19 pandemic, the significant rise in children's access to smart devices (see Common Sense Media, 2019) renders this study relevant beyond the context of the COVID-19 pandemic. Interacting with a grandparent through video chat may serve as

an opportunity for children to experience meaningful, language-rich interactions that contribute to language growth.

Method

Participants

Forty-three children between the ages of 48- to 72-months (*M = 60.19, SD = 6.49, Range* = 49 to 70-months, 18 *males)* and their grandparents (*10 males*) participated in this study. Participants were recruited from social media platforms and the University of Delaware's Child's Play Lab database to participate in a one-time video chat session. Altogether, participants were excluded due to technical difficulties with Zoom (n = 1), a developmental delay (n = 1), the child was over the age range (n = 2), and the grandparent lived with the child's parents (n = 2). On a background questionnaire, 39 participants reported that children were White (90.7%). Two reported children were African American (4.7%). Lastly, two reported that children were of mixed race (4.7%).

Education

In our sample, two parents reported that they had some college experience (4.7%). Twelve parents held a bachelor's degree (27.9%) and 17 held a master's degree (39.5%). Twelve parents received a doctorate (27.9%). Three grandparents held a high school diploma and only had some college experience (6.9%) Six grandparents received an associate degree or certification (13.9%). Sixteen grandparents held a bachelor's degree (37.2%) and 11 held a master's degree (25.6%). Lastly, four grandparents received a doctorate or law degree (9.3%). Three grandparents did not report their education (6.9%).

Distance

The distance that the grandparent-grandchild dyad lives from each other is another factor in the relationship between the two (Davey et al., 2009) (Figure 1). Thirteen families lived less than 15 minutes away from each other (30.2%). Ten families reported that they live 30 minutes to an hour away from each other (23.2%). Seven families lived one to two hours away from each other (16.3%). One grandparent lived three to five hours away from their grandchild (2.3%). Lastly, twelve families lived over 6 hours away from each other (27.9%).

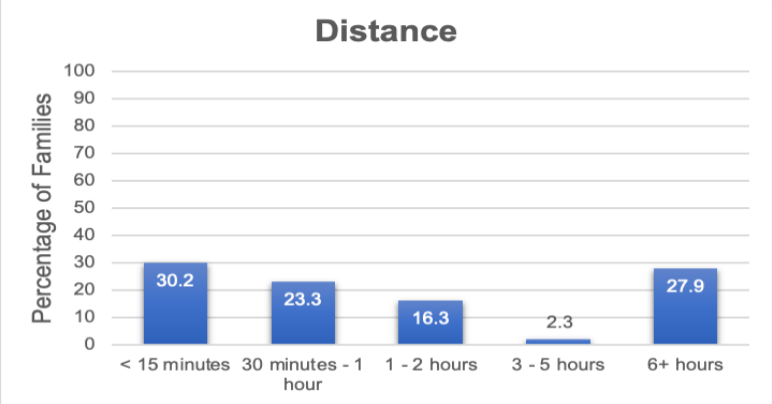


Figure 7 The distance that grandparents live from their grandchildren in minutes and hours

Frequency of Video Chat

How often grandparents video chat with their grandchildren also contributes to the grandparent-grandchild relationship (Strouse et al., 2021). Figure 2 represents the frequency of video chatting that occurred between grandparents and their

grandchildren since COVID-19. Five grandparents video chatted with their grandchildren every day (11.6%). Eleven grandparents video chatted with their grandchildren a couple times a week (25.6%). Four grandparents video chatted with their grandchildren once a week (9.3%). Twelve grandparents video chatted with their grandchildren about once a month (27.9%) and ten grandparents video chatted several times a month (23.3%). One grandparent reported that they never used video chat with their grandchild.

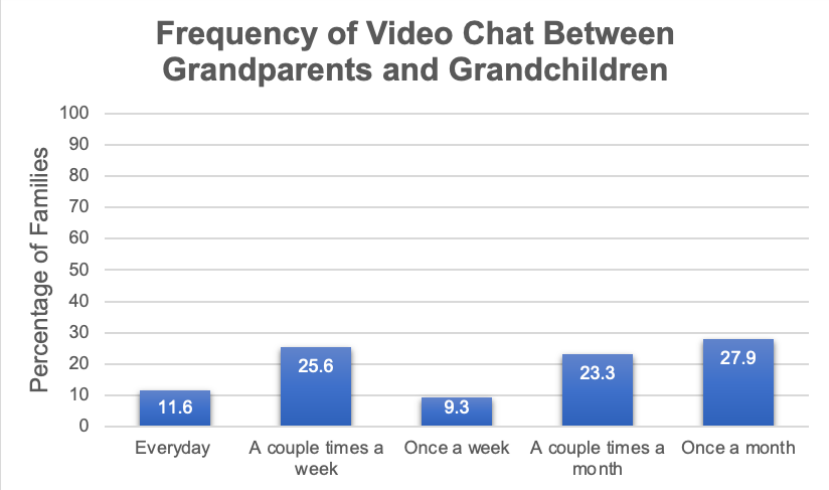


Figure 8 Frequency of video chat between grandparents and grandchildren

Procedure

Over Zoom, the grandparent-grandchild dyad was asked to watch a short video about an uncommon animal (see https://www.youtube.com/watch?v=n2F2LjKLYF8). This video was chosen to encourage an informal conversation where neither party knew much about this animal. Next, the grandparent and grandchild saw three sets of pictures showing birthday parties, playgrounds, and household pets. The series of

images were presented sequentially to promote further conversation between the grandparent-grandchild dyad. The video and picture activities were counterbalanced across participants. After the picture and video activities, grandchildren were asked to complete the Quick Interactive Language Screener (QUILS; Levine et al., 2020)—though this data was not used for this project. Lastly, the grandparent and the grandchild's parent were asked to complete the Relationship Survey separately.

Measures

Standard Lab Background Questionnaire

Before the appointment, parents completed a socio-demographic questionnaire for SES, gender, and age information. This questionnaire included background questions regarding children's due date, birth weight, birth order, health, and language exposure.

Video Chat Survey

Parents were also asked to complete a Video Chat Survey before the appointment. The Video Chat Survey (Avelar et al., 2021) was originally created to explore children's exposure to media use and how video chat interactions have changed since the sheltering-in-place order due to COVID-19. I adapted this questionnaire to control for children's familiarity with video chat and how often they use video chat to interact with their grandparents.

Quick Interactive Language Screener (QUILS)

To control for children's language abilities, children completed the Quick Interactive Language Screener (QUILS; Golinkoff et al., 2017). The QUILS is a

game-like screener that assesses children's language skills between 3- to 5-years-old. The QUILS has high convergent validity, as it correlates with other common measures of language such as the PLS-5AC and PPVT-4 ($r = 0.65$, $p < 0.001$ and $r = 0.67$, $p < 0.001$ respectively) (Zimmerman et al., 2011). Additionally, the QUILS has a high internal consistency reliability (Cronbach's $\alpha = 0.93$) and high test-retest reliability ($r = 0.83$).

Relationship Survey

Both grandparents and parents independently completed the Relationship Survey, which assessed participants' perception of the relationship between grandparents and their grandchildren. Questions were constructed based on the factors associated with fostering a close-knit relationship between the child and grandparent: distance, communication patterns, activities, and family dynamics (Strouse et al., 2021). To assess *distance*, questions revolved around the number of hours of travel to visit each other and the frequency of in-person visits, regardless of how they traveled (i.e., train, plane, or car). *Communication patterns* examined the frequency of using video chat and the type of devices used to video chat. *Activities* included the types of activities the child and grandparent typically engaged in in-person and over video chat. *Family dynamics* included questions regarding the relationship between the grandparent and parent, as well as the grandparent and child.

To assess parents' attitude towards video chat, I calculated a composite score of the six questions that explored parents' perceptions of their children video chatting with their grandparents (e.g., "My child enjoys using video chat to talk to their grandparent"). These six items contained an acceptable item-reliability (Cronbach's $\alpha = .73$). A composite variable (i.e., referenced as Parent Video Chat Perceptions) was

created by summing parents' responses to the Parent Video Chat Perception-items and dividing by 6 (i.e., the number of items) for each parent. Some items were reversed-scored. Parents' scores ranged from 0 to 4. A higher score indicates that parents thought that video chatting with a grandparent was a good thing.

Similarly, to assess grandparents' attitude towards video chat, I calculated a composite score of the six questions that explored grandparents' perceptions of video chatting with their grandchildren (e.g., "I enjoy using video chat to talk with my grandchild"). These six items contained an acceptable item-reliability (Cronbach's α = .72). A composite variable (i.e., referenced as GP Video Chat Perceptions) was created by summing grandparents' responses to the Video Chat Perception-items and dividing by 6 (i.e., the number of items) for each grandparent. Some items were reversed scored. Grandparents' scores ranged from 0 to 4. A higher score indicates that grandparents enjoyed video chat.

Coding

To explore the presence of dialogic interactions during the video and picture activities, I adapted the Villanova Preschool Project maternal utterance coding system (Blewitt, 2008; Parish-Morris et al., 2013; Table 1). I first coded the form of each utterance as a question, statement, or command. Next, the content of the utterance is categorized as one of the following utterance types: behavior-related, media-related, or distancing prompts. *Behavior-related utterances* redirected the participant to engage with the media (e.g., "Can you put the necklace down?" or "Move closer!"). *Media-related utterances* referred to the media provided as part of the picture and video activities (e.g., "How many candles can you see?" or "Look at the blue slide!"). Lastly, *distancing prompts* included utterances that drew parallels about what is seen in the

media to the child's life outside of the media source (Zevenbergen et al., 2003). ''Would you be happy if you had a tapir?'' or ''Did you see a tapir at the zoo?'' are examples of distancing prompts. All codes for Tiers 1 and 2 were mutually exclusive, in which each utterance had only one code for Tier 1 and 2. To assess reliability between three coders, a two-way mixed-model intra correlation coefficient (ICC) was run with 20% of the data. Reliability was "good" for coding of behavior-related utterances (ICC = .86) and "excellent" for media-related utterances (ICC = .99) and distancing prompts (ICC = .95) (Liljequist et al., 2019).

Table 5 Examples of the three different types of utterances for children and their grandparents

Behavior-related	*Media-related*	*Distancing prompts*
G: Stop moving around.	G: What did you think about the tapir?	G: Remember when you'd see the horse at the farm?
G: Can you turn the slide?	G: Can you see how many candles there are?	G: What is your favorite thing to do on one of those gym sets?
	G: Look at the blue slide.	G: Was there anything in the pinata besides candy at your birthday?
	C: They're singing happy birthday	C: It was kinda like when you go walk around at halloween in the night
	G: Which cat or dog do you like the best? C: I like the doggy	G: Our dog used to like to sleep with me.

Note: This coding scheme was originally developed by the Villanova Preschool Project maternal utterance coding system (Blewitt, 2008; Parish-Morris et al., 2013).

Results

In this section, I addressed our first research question, which examined whether grandparents and grandchildren produced high-quality language talk with each other as they engage with the media through video chat. Then, I discussed how *children* interacted with their grandparents during video chat. Next, I investigated whether grandparents engaged in dialogic interactions with their grandchildren. Lastly, I examined whether individual differences in the characteristics of the grandparent-grandchild dyad contributed to the nature of the interaction when they engaged with media.

Do Grandparents and Grandchildren Produce High-quality Language With Each Other as They Engage with the Media through Video Chat?

How Grandparents Used Language When Engaging with Grandchildren

I hypothesized that grandparents would use more questions and statements than commands to facilitate grandchildren's active participation over video chat. I calculated the means and standard deviations of the proportions of questions, statements, and commands grandparents used while video chatting. Overall, grandparents varied in the number of utterances they produced (*Range* = 46-172). To control for the variation, I used proportions with our variables of interest (statements, questions, or commands), divided by the number of utterances grandparents produced (Table 2). A one-way ANOVA revealed differences between the proportion of statements, questions, and commands grandparents used, F (2, 126) = 452.47, $p <$ .001. Post hoc analysis with the Bonferroni adjustment revealed that grandparents produced more statements (M = .58, SD = .11) than questions (M = .41, SD = .11) and

commands (M = .02, SD = .02), all ps <.001. Grandparents also asked more questions than commands, p <.001.

Table 6 Descriptive statistics for proportion of statements, questions, and commands used by grandparents across video and picture activities

	Mean	SD	Range
Grandparents			
Statements	.58	.11	.38 - .96
Questions	.41	.11	.04 - .61
Commands	.02	.02	.00 - .10

There were two activities: watching a video and looking at pictures. Altogether, grandparents used more questions, statements, and commands, during the picture activity than the video activity (all ps < .05). To further explore how talk differed by activity, I first examined the proportion of questions, statements, and commands grandparents produced for each activity. Inspection of the data indicated that commands were used vanishingly rarely, less than 2% of the time for each activity. Therefore, commands were omitted from subsequent analyses.

A one-way ANOVA was conducted to compare the effect of the activity (video vs. picture) on the dependent variables: statements and questions. The proportion of statements grandparents used during the video and picture activities did not differ, F (1, 84) = .26, p = .65. Nor did they differ in the proportion of questions they produced, F (1, 84) = .65, p = .42. Thus, the data were collapsed across the two activities.

Children's Role in the Interactions

Grandparents produced more utterances than their grandchildren ($p < .001$). The correlation between how many utterances grandparents produced and how many utterances grandchildren produced was not significant ($r = .11$, $p = .48$). These results suggest that grandparents may be driving the conversations when interacting with their grandchildren. However, I acknowledge that grandparents are not acting in a vacuum. Grandchildren's responses also play a role in determining the course of the conversation (Parish-Morris et al., 2013).

Overall, children varied in the number of utterances they produced (*Range* = 16-93). To control for the variation, I used proportions with our variables of interest (statements, questions, or commands), divided by the number of utterances children produced (Table 3). A one-way ANOVA revealed that differences were found between the proportion of sentence types (statements, questions, commands) children used, F (2, 126) = 5599.08, $p < .001$. Like grandparents, post hoc analysis using the Bonferroni adjustment revealed that grandchildren produced far more statements (M = .93, SD = .06) than questions (M = .06, SD = .07) and commands (M = .01, SD = .02), all ps <.001. Additionally, children asked more questions than they produced commands, p <.001.

Table 7 Descriptive statistics for proportion of statements, questions, and commands used by grandchildren across both activities (video and pictures)

	Mean	SD	Range
Grandchildren			
Statements	.93	.06	.69 -

			1.00
Questions	.06	.07	.00 - .42
Commands	.01	.02	.00 - .13

A further question was whether the form of children's utterance differed by activity. Like grandparents, children rarely produced commands (M = .01). Therefore, commands were omitted from subsequent analyses. A one-way ANOVA was conducted to compare the effect of the activity (video vs. picture) on the dependent variables of statements and questions. The proportion of statements children used during the video and picture activities did not significantly differ, F (1, 84) = .03, p = .86. Nor did they differ in the proportion of questions they produced, F (1, 84) = 2.24, p = .14.

Do Grandparents Engage in Dialogic Interactions with their Grandchildren?

Exploring how grandparents engaged in dialogic interactions with their grandchildren was another aim of the study. I calculated the means and standard deviations of the proportions of media-related utterances and distancing prompts. Proportions were used when examining how grandparents encourage their grandchildren to engage with media to control for the variation in the number of utterances grandparents produced (Table 4). Grandparents used more media-related utterances (M = .68, SD = .18) than distancing prompts (M = .26, SD = .16), t (42) = 8.63, p <.001.

Table 8 Descriptive statistics for the proportion of media-related utterances and distancing prompts used by grandparents across both activities (video and pictures)

	Mean	SD	Range
Media-related utterances	.68	.18	.25 - 1.00
Distancing prompts	.26	.16	.00 - .75
Behavioral-related utterances	.03	.04	.00 - .23

Differences emerged in the way grandparents engaged in dialogic interactions between the two activities (video and pictures) (Table 5). Specifically, grandparents used more distancing prompts during the picture activity (M = .28, SD = .19) than the video activity showing an unusual animal (M = .20, SD = .17), F (1, 84) = 4.40, p = .04.

In contrast, the proportion of grandparents' utterances describing the media they were seeing did not differ *during* the video activity (M = .73, SD = .20) and the picture activity (M = .66, SD = .20), F (1, 84) = 2.611, p = .11.

Table 9 Descriptive statistics for the proportion of behavior-related utterances, media-related utterances, and distancing prompts used by grandparents for the video and picture activity

	Video Activity			**Picture Activity**		
	Mean	SD	Range	Mean	SD	Range
Media-related utterances	.73	.20	.33 - 1.00	.66	.20	.19 - 1.00
Distancing prompts	.20	17	.00 - .64	.28	.19	.00 - .81

How do Grandparents Open Bouts of Distancing Prompts?

Often it is the case that grandparents' opening utterance was a question prompting the child's memory of an event, as in "Do you remember the time…?". By definition, discussing a past event is a distancing prompt as it moves away from the specific content of the media shown. These opening questions often resulted in a bout of distancing prompts or distancing *sequences* from the grandparent who continued to describe the prior event. As expected, the proportion of questions and distancing prompts were correlated (r = .36, p = .02). To show that distancing sequences often began with questions, I coded the first utterance that opened such bouts. To assess reliability of coding, 20% of the data was re-coded. Reliability between the two-coders was excellent (Cronbach's α = .99). Distancing sequences occurred an average of 5 times throughout each dyad's interactions (*Range* = 0-13). Grandparents opened with questions 61.9% of the time and with statements and 33.3% of the time. Table 6 shows descriptive statistics about how grandparents opened bouts of distancing prompts.

Table 10 Descriptive statistics for proportion of questions, statements, and commands used by grandparents to open bouts of distancing prompts across both activities (video and pictures)

	Mean	SD	Range
Grandparents			
Statements	.62	.29	.00 – 1.00
Questions	.33	.27	.00 – 1.00

Preliminary Analyses

Before I examined whether grandparents' education, distance, frequency of video chat, and perceptions about video chat relate to grandparents' overall talk (i.e., the number of utterances they produced when interacting with their grandchild) and use of dialogic interactions, defined by questions and distancing prompts, I assessed grandparents' and parents' perceptions of video chatting with children. Table 7 shows the percentage of parents that agree or strongly agree with each item that comprised the Parent Video Chat Perception composite. Parents perceived that their children had positive experiences when they video chat with their grandparents (M = 3.15, SD = .55, *Range* = 1.83 – 4.00).

Table 11 The percentage of parents that selected "agree" or "strongly agree" on their perceptions of how their child experiences video chatting with their grandparent. The scale was from 0 to 4 (strongly disagree, disagree, neutral, agree, strongly agree)

Perceptions about their children video chatting with grandparents	Mean (SD)	Percentage
Items		
My child's grandparent enjoys using video chat to talk to my child	3.43 *(.77)*	86%
Video chat is a good alternative for my child to spend time with their grandparent when face-to-face interaction is not possible	3.24 *(.76)*	88.4%

My child enjoys using video chat to talk to their grandparent	2.98 *(.79)*	72.1%
Reverse Coded Items		
I worry that my child's grandparent does not have anything to talk about with my child when we video chat	3.26 *(.80)*	2.3%
I believe that video chatting with my child's grandparent is a big time commitment	3.10 *(.82)*	4.6%
I feel pressured/obligated to connect my child's grandparent with my child over video chat	2.88 *(1.06)*	14%

Table 8 shows the percentage of grandparents that agree or strongly agree with each item that comprised the GP Video Chat Perception composite. Overall, grandparents also had positive experiences when video chatting with their grandchild (*M* = 3.13, *SD* = .53, *Range* = 1.50 – 4.00).

Table 12 How grandparents evaluate video chat: percentage selecting "agree" or "strongly agree" on the six items used to create the composite score (scale ranged from 0 to 4: strongly disagree, disagree, neutral, agree, strongly agree, respectively)

Perceptions about video chatting with grandparents	Mean (SD)	Percentage
Items		
Video chat is a good alternative to spend time with my grandchild when face-to-face interaction is not possible	3.30 *(.81)*	95.3%
I enjoy using video chat to talk to my grandchild	3.14 *(.89)*	79.1%

My grandchild enjoys using video chat to talk to me	2.86 *(.74)*	69.8%
Reverse Coded Items		
I feel pressured/obligated to connect with my grandchild over video chat	3.49 *(.67)*	2.3%
I believe that video chatting with my grandchild is a big time commitment	3.14 *(.77)*	2.3%
I worry that I don't have anything to talk about with my grandchild when we video chat	2.86 *(1.04)*	16.3%

Next, a series of additionally preliminary analyses were conducted to assess whether there were any differences in grandparents' overall talk and proportion of distancing prompts related to whether the first activity was the picture or video activity (i.e., condition) or children's gender. A one-way MANOVA with the two conditions as the fixed factor and grandparents' overall talk and proportion of distancing prompts as the two dependent variables was conducted. There were no differences across conditions, F (2, 40) = 1.667, Wilk's λ = .92; p = .20. Thus, data across the two conditions were collapsed for subsequent analyses.

Next, a one-way MANOVA with children's gender as the fixed factor and grandparents' overall talk and proportion of distancing prompts as the two dependent variables was conducted. There were no differences related to children's gender, F (2, 40) = 1.741, Wilk's λ = .92; p = .19. Therefore, children's gender was not inserted as a control in subsequent analyses.

I also examined whether children's overall talk (i.e., the number of utterances children produced) was associated with their grandparents' overall talk and their use of distancing prompts. A one-way MANOVA with children's overall talk as the fixed factor and grandparents' overall talk and proportion of distancing prompts as the two dependent variables was conducted. Results revealed no differences related to

children's overall talk, F (2, 40) = .46, Wilk's λ = .97; p = .63. Findings suggest that the number of utterances children produced during the interaction did not relate to grandparents' language quantity or use of distancing prompts. Therefore, children's overall talk was also not included as a control in subsequent analyses.

Lastly, I conducted a Pearson correlation to assess whether grandparent and parents' perceptions about video chat were related. This correlation was positive but not significant (r = .27, p = .09). To avoid multicollinearity, I only included grandparents' perceptions in subsequent analyses.

Grandparents' Overall Talk

To examine which factors contributed to grandparents' overall talk, a linear regression with grandparents' education, distance, the frequency of video chat, and grandparents' perceptions about video chat as the predictor variables and grandparents' overall talk as the outcome variable was run. This model was not significant, F (4, 35) = 2.04, MSE = 511.90, p = .11.

Grandparents' use of Distancing Prompts

Next, I examined which factors contributed to the proportion of distancing prompts grandparents used. A linear regression with grandparents' education, distance, and the frequency of video chat as the predictor variables and grandparents' proportion of distancing prompts as the outcome variable was run. This model was not significant, F (4, 35) = 2.27, MSE = .03, p = .08 (Table 9).

Table 13 Regression analysis summary for variables predicting the proportion of distancing prompts grandparents produced

Variable	*B*	SE *B*	β

Grandparent Education	-.065	.037	-.293†
Distance	-.032	.034	-.146
Frequency of Video Chat	.022	.035	.107
Grandparent Perceptions	.110	.050	.355*
Constant	-.001	.163	

Note: R^2 = .11 (n = 39, p = .08); † = <.10, * = <.05, ** = < .01, *** = <.001

Discussion

A large number of families are turning towards video chat to develop and maintain relationships between children and their grandparents (Barr et al., 2020; Forghani & Neustaedter, 2014; McClure et al., 2016; Strouse et al., 2021; Zosh et al., 2022) especially when in-person interactions are limited, such as in COVID-19 (Lam-Cassettari et al., 2020). Video chat offers an opportunity for connection (Goldschmidt, 2020; McClure & Barr, 2017). Prior work has explored how grandparents and grandchildren utilize video chat to sustain a close relationship between the grandparent-grandchild dyad using questionnaires (Strouse et al., 2021). I expand on this line of research in three ways. First, I explored whether grandparents and grandchildren produced high-quality language talk with each other as they engaged with the media through video chat in real time. Second, I considered how grandparents supported their grandchildren's language skills using video chat by examining whether dialogic interactions occurred in these conversations. Third, I considered how characteristics of the grandparent-grandchild dyad might relate to the nature of the conversation.

Offline, I coded interactions in which grandparent-grandchild dyads discussed two activities: watching a video and looking at a series of pictures. Results revealed

that grandparents and grandchildren are more likely to use statements and questions when engaging with the media over video chat. Additionally, grandparents facilitated dialogic interactions by using distancing prompts to encourage grandchildren to participate in the activity. Lastly, I found that grandparents' education, distance, frequency of video chat, or perceptions of video chat did not contribute to their overall talk or use of distancing prompts.

How Grandparents used Language When Engaging with Grandchildren

Our first question examined whether grandparents produced high-quality language talk with each other as they engaged with the media (e.g., questions and statements) through video chat. Results revealed that grandparents mostly produced statements and questions, but very few commands. These findings were consistent across both activities. These results signify that grandparents naturally engage in high-quality language talk with their grandchildren as they interact over video chat. In the following sections, I discuss why grandparents may have been more likely to use questions and statements as they engaged with the media instead of commands.

Grandparents Mostly used Statements and Questions

Grandparents used statements about 58% of the time. Statements often include descriptions and labels. Grandparents may have used statements more often than questions and commands to ground the conversation by describing or labeling what they see. For example, a grandparent shared their interpretation of a photo by stating, "the cat and dog look like they're sleeping or hugging." Other times, grandparents used statements to explain an unfamiliar concept to the grandchild. One grandparent stated that "sometimes they put a blindfold on, and they spin you in a circle and you

get all dizzy" when describing why a child was blindfolded near a pinata in one of the photos. Using descriptions to establish joint attention may be especially important during video chat, as participants are not physically in the same room together.

I also found that grandparents asked their grandchildren many questions (41% of the time) as they engaged with the media over video chat. There are several possibilities for why question-asking occurred. One hypothesis is to facilitate active participation and promote responses (Shatz, 1978). During shared-book reading, the use of question-asking has been shown to foster children's engagement and invite children to participate in the conversation (e.g., Justice et al., 2002; McGinty et al., 2012). The grandparents in our study may have used question-asking to invite grandchildren into the conversation and practice their language skills. Many grandparents opened with questions when I changed the stimulus to new photos (e.g., "Oh, what do you see?" or "Does that look like fun?"). Therefore, grandparents may have asked questions to facilitate grandchildren's active participation with the media and contribute to the conversation.

Grandparents may have asked grandchildren questions with an intent to teach. Questions constitute approximately one-third of preschool teachers' utterances in the classroom (de Rivera et al., 2005; Massey et al., 2008). Of the questions teachers ask their students, approximately 80% are used with the intention of teaching (Gall, 1970). These types of questions are called "pedagogical questions" and occur when the speaker asks a question to facilitate learning (e.g., "How do you spell *bus*?"; Yu et al., 2019). Exposure to pedagogical questions has been shown to promote preschool-aged children's casual learning (Daubert et al., 2020) and further topic exploration (Jean et

al., 2019). Grandparents may have used questions to probe their grandchildren's understanding of a concept and support learning (e.g., "Where do tapirs live?").

Lastly, grandparents may have asked questions to draw upon children's memories. For example, one grandparent asked their grandchild about a recent birthday party to explain why there was a pinata in one of the images. Co-constructing memories may be helpful for grandchildren to make connections to the media. In past work, adults have utilized questions to co-construct memories (Fivush & Fromhoff, 1988). Boland et al. (2003) explored how maternal input and preschool-aged children's language skills contributed to children's memory. Half of the mothers in the sample were exposed to maternal-style training in which they were instructed to enhance children's memory by asking wh- questions, making associations, follow-ins, and positive evaluations. Results revealed that children's memory was boosted by trained mothers. As exposure to talk about events has been found to support children's memory, grandparents may have utilized questions to tap into shared experiences.

Grandparents Rarely used Commands

Commands were used only 2% of the time. The lack of commands suggests that grandparents and grandchildren experienced "guided play" during video chat interaction. To illustrate guided play, I must define free play and direct instruction first. Free play occurs when play is flexible and child-directed (Lillard et al., 2013). In contrast, direct instruction is structured and adult-led (Klahr & Nigam, 2004). Guided play is in the middle of the spectrum between free play and direct instruction, as it is a learning experience that combines child-agency and adult guidance (Weisberg et al., 2013; Weisberg et al., 2016; Zosh et al., 2017). Guided play aligns with the principles of how children learn best as it allows them to be actively engaged, socially interactive

with adults and peers and builds meaningful connections to their lives (Hirsh-Pasek et al., 2015). Prior work has hinted that the grandparent-grandchild dyad experienced guided play during video chat interactions, but these results were derived from questionnaires (Forghani & Neustaedter, 2014; Strouse et al., 2021). Guided play is beneficial for children's language acquisition, fostering spatial skills, and building cognitive development (Hassinger-Das et al., 2017; Toub et al., 2016). Thus, our findings suggest that video chat interactions with grandparents may be another opportunity for children to learn.

Our results were not consistent with past work. Prior research exploring parent-child interactions found that parents use more behavioral-related talk (i.e., commands) when children engage with media than in contexts in which media is not present (Chiong et al., 2012; Krcmar & Cingel, 2014; Parish-Morris et al., 2013). There are several reasons why grandparents may have rarely used commands in the present study.

One reason could be that the media the dyad used did *not* include electronic features as those found in e-books. E-books often include features such as buttons that trigger the sounds of letters, words, and music (e.g., Leapfrog). These additional features are often available before, after, and even *during* the oral narration (de Jong & Bus, 2003). Consequently, access to additional features may be distracting (de Jong & Bus, 2002). The grandparent-grandchild dyads here did not have access to additional features that included filters. For example, they could not set their background at the beach, add silly glasses to their face on the screen, or access sound effects. Instead, grandparents and grandchildren were only given the opportunity to converse about the activities when a static image appeared. It is likely that the lack of filters or sound

effects may allow grandparents and grandchildren to solely focus on the stimulus on their screens. Therefore, limiting potential distractions, such as filters or sound effects, may be a way to encourage high-quality interactions over video chat.

Grandparents may have rarely used commands because children might be familiar with using video chat, especially as this study occurred during the COVID-19 pandemic. Although many families were already accustomed to using video chat to connect with distanced family members (Horgan & Poehlmann-Tynan, 2020; McClure, 2015; McClure & Barr, 2017; Yarosh et al., 2009; Yeary et al., 2012), many more adopted this new way of communicating (Brown & Greenfield, 2021). Thus, children in our study may have needed less guidance on how to interact through video chat because they are already experienced with using this form of communication.

Lastly, grandparents may have rarely used commands because of their relationship with their grandchild. Grandparents tend to perceive themselves to be more relaxed, involved, and wiser when parenting the second generation of children (Dolbin-MacNab, 2006). Indeed, grandparents tend to "spoil" grandchildren to differentiate themselves from their grandchild's parents and other family members (Pankhurst et al., 2019). Grandparents' role in their grandchildren's life might contribute to whether grandparents regulate children's behavior. Some grandparents might feel comfortable directing grandchildren. Others might be more passive because they do not want to overstep boundaries.

Children's Role in the Video Chat Interaction with Grandparents

Children's input can shape what grandparents talk about. Therefore, I also considered how children contributed to the conversation. I found that children mainly produced statements (93%) and far fewer questions (6%) and commands (1%). This

could be because grandparents are driving the conversation. Consistent with past work with parents and children (McGinty et al., 2012; Parish-Morris et al., 2013), grandparents (M = 108.91) produced far more utterances than grandchildren (M = 55.84), $p < .001$.

Grandchildren's age and the video chat context may have played a role in children's limited input. At around three years of age, children's perspective-taking skills emerge, and children slowly become cognizant of others' feelings, wants, and perceptions (Astington & Barriault, 2001). It is possible that children's perspective-taking skills may worsen in a video chat setting because participants' social cues must be interpreted through the screen. Therefore, grandparents might be driving the conversation, so grandchildren do not have to engage as much in perspective-taking. Exposure to conversational turn-taking is powerful for later language development (Hirsh-Pasek et al., 2015; Masek et al., 2021; Romeo et al., 2018), socio-emotional development (Gómez & Strasser, 2021), and executive function skills (Masek et al., 2022). Therefore, future research should explore how the roles may shift as grandchildren age and become more involved in conversations.

Grandparents engage in dialogic interactions with their grandchildren

One aim of the study was to investigate whether dialogic interactions appeared when grandparents and grandchildren engaged with media over video chat. Distancing prompts occurred 26% of the time, with grandparents saying things such as "do you remember your birthday party?" or "doesn't that cat look like grandma's cat?" When adults use distancing prompts during a shared-reading context, children are more likely to have higher engagement and more profound comprehension of the storybook plot (Beck & Mckeown, 2003, 2007; De Temple & Snow, 2001). Our results suggest

that distancing prompts can occur in a context beyond shared reading. I discuss several reasons that may have contributed to grandparents' use of distancing prompts.

One possibility for why grandparents used distancing prompts could be because of the communication format. Forghani and Neustaedter (2014) examined factors contributing to how grandparents and grandchildren interacted over the phone and video chat using diary entries and interviews. They found that grandparents and grandchildren typically talked about recent and shared experiences. Therefore, grandparents and grandchildren may bring this established reliance on discussing recent and shared experiences to this digital way of interacting, promoting distancing prompts.

Another reason grandparents may have used distancing prompts could be the structure of the study. Although I encouraged grandparents and grandchildren to talk about whatever came to mind, I offered them a topic of discussion by showing static pictures. For example, the dyad saw a static image of the video after it was played. It showed four images from the video: the tapir's toes, the tapir swimming, the tapir eating, and the tapir next to a rhinoceros. Grandparents often began discussions with their grandchildren by describing the static image examples. Then, grandparents built upon these static images to connect the material to children's lives. In past work, grandparents have reported being hesitant to inquire about their grandchild's lives over chat because they do not want to be overbearing (Forghani & Neustaedter, 2014). Thus, the format of the study may have allowed grandparents and grandchildren to "warm up" before using distancing prompts.

Next, I examined how grandparents began bouts of distancing prompts. Results revealed that the proportion of questions and distancing prompts were correlated (r =

.36, p = .02). Grandparents begin bouts of distancing prompts with questions to invite children to draw upon children's memory (e.g., "Have you seen a tapir at your zoo? or "Did I have a pinata for your birthday?"). Prior research identified two ways adults often talk about past events with children. One way is "elaborative talk" in which adults ask children frequent questions about past experiences to cue children's memory (e.g., Fivush & Fromhoff, 1988; McCabe & Peterson, 1991; Reese et al., 1993). Asking children questions about past experiences may assist children's memory because question-asking can facilitate retrieval of information (Fazio & Marsh, 2019). In contrast, "repetitive talk" occurs when adults provide little descriptive information about the past and tend to repeat the same questions. The finding that grandparents used distancing prompts 61% of the time indicates that they were more heavily focused on elaborative, rather than repetitive talk. This suggests that even in this new medium of connection, the dyads are engaging in high quality interactions. Talking elaborately about memories supports children's immediate and long-term memory (Haden et al., 1997; Reese et al., 1993), as well as narrative talk (McCabe & Peterson, 1991; Harley & Reese, 1999). Therefore, grandparents may be talking elaborately to draw children's memories and encourage children to make connections with the media.

Differences in Language Content Across Activities

Notably, I found differences across grandparents' use of distancing prompts across the video and picture activity. Specifically, grandparents used more distancing prompts during the picture activity (M = .28) than the video activity showing an unusual animal (M = .20), p = .04. During the video activity, grandparents and grandchildren watched a video together about a tapir and then discussed it. One reason

for differences in language content may be because the dynamic nature of the video may encourage participants to describe what they see rather than relate the material to their lives (e.g., reminiscing about going to the zoo). When events change as they play in real time, there may not be time to link them to children's lives. On the other hand, grandparents and grandchildren discussed a series of static photos with three themes (i.e., birthday parties, parks, and pets) during the picture activity, giving them time to link the contents to children's lives. To hold children's attention, grandparents may have had to go beyond describing the photos and use distancing prompts.

Another reason for differences in language content may be due to familiarity. The picture activity prompted the grandparent-grandchild dyad to talk about pictures that were everyday activities. In contrast, the video activity prompted the grandparent-grandchild dyad to talk about an uncommon animal. The child was likely unfamiliar with the animal and, thus, did not have any previous experiences with the animal to draw upon. Therefore, familiarity with the content may have allowed grandparents to move beyond the content and relate the material to grandparents' and grandchildren's personal experiences.

Characteristics of the Grandparent-Grandchild Dyad Did Not Relate to the Nature of Conversation

The last objective of the study was to investigate what factors (i.e., individual differences in characteristics of the dyads or grandparent/parent perceptions of video chat) contribute to the nature of the video chat interaction with media. Strouse et al. (2021) found that individual factors (i.e., education, distance, frequency of video chat, and perceptions of video chat) of the grandparent-grandchild contributed to the closeness of the relationship between grandparents and grandchildren. Therefore, I

was interested in which of these factors also contributed to the quality of language used during the video chat interaction. Results revealed that grandparents' education, distance, perceptions, or frequency of video chat did *not* contribute to grandparents' quantity of language.

Given that exposure to distancing prompts has many benefits (Whitehurst, 1994; Hargrave & Sénéchal, 2000; Zevenbergen & Whitehurst, 2003), I ran an additional model to examine whether individual factors of the grandparent-grandchild relationship would contribute to distancing prompts. I found that grandparents' education, the distance the dyad lived from each other, perceptions of video chat, and frequency of video chat was also not related to their distancing prompts.

Grandparents' Perceptions about Video Chat Differ from Parents' Perceptions

Based on responses to a questionnaire, I also assessed grandparents and parents' perceptions about their experiences with video chat. Both parties indicated that they had positive experiences when children used video chat to communicate with their grandparents. For example, at least 88.4% of parents and grandparents reported that they agreed or strongly agreed that "Video chat is a good alternative for grandparents to spend time with their grandchild when face-to-face interaction is not possible." Additionally, 79.1% of parents and grandparents reported that their "grandparent enjoys using video chat to talk with their grandchild." This is consistent with prior research, in which Strouse et al. (2021) also found that grandparents and grandchildren enjoy using video chat to connect. In other work, grandparents have reported that video chat is another way for grandparents to watch their grandchildren grow and participate in family activities with them from a distance (Ames et al., 2010; Forghani & Neustaedter, 2014).

Both parents and grandparents reported few concerns with maintaining children's enjoyment and attention over video chat. For example, 72.1% of parents and 69.8% of grandparents reported that they agreed or strongly agreed that "children enjoyed using video chat with their grandparents." Responses to this item align with grandparents' language input during the video chat interaction with their grandchildren. Grandparents rarely used commands, which suggests adults did not struggle to maintain grandchildren's attention, nor did they need to redirect grandchildren to media often.

Interestingly, I found that grandparents in our sample reported that they could be hesitant to interact with grandchildren through video chat because they were unsure of what to discuss with them. Specifically, 16% of grandparents reported worrying that they "do not have anything to talk about with their grandchild." These results are consistent with prior work (Kakulla, 2021). For example, Forghani and Neustaedter (2014) reported that grandparents worry about asking adult grandchildren about their lives because they do not want to be "annoying." I found that grandparents may have similar reservations when talking with younger grandchildren. The present study also considered parents' perceptions and found that only 2.3% of parents worried that grandparents did not have anything to discuss with their grandchildren. It seems that parents are confident in their children's grandparents' capabilities to connect with their children.

Implications for Grandparent-Grandchild Video Chat Interactions

In the last decade, children's access to mobile devices has substantially increased (Rideout, 2017). Many families have concerns about excessive exposure to mobile devices on children's development (Rideout, 2015). Others have taken

advantage of this access to sustain relationships between children with family members using video chat (Horgan & Poehlmann-Tynan, 2020; Yarosh & Abowd, 2011; Yeary et al., 2012), especially during the COVID-19 pandemic (Brown & Greenfield, 2021). Although there are concerns about children's screen time, allowing time for video chat is an exception (AAP, 2016; McClure et al., 2015). The present study supports this claim, as I found that video chat can be utilized to not only connect, but video chat can also help support children's language skills by affording them the opportunity to hear language and engage with separated loved ones.

Altogether, results have implications for supporting children's language learning over video chat. This work revealed that grandparents and grandchildren use high-quality language over video chat by asking questions and engaging in distancing prompts. Research has found that question-asking and distancing prompts can promote language acquisition (e.g., Cristofaro & Tamis-LeMonda, 2011 and Beck & McKeown, 2007, respectively). Therefore, findings suggest that video chat interactions with grandparents may be another way to support children's language development.

Limitations

The present study has several limitations. First, our sample was highly homogenous, so one should be cautious generalizing findings. Specifically, our sample was predominately White (90.7%) and 95.3% held at least a bachelor's degree. Given that there is typically great variability in adult language input related to individual characteristics (Rowe & Weisleder, 2020; Snow & Ferguson, 1977), an avenue for future work should consider whether grandparent-grandchild interactions may look different with a more diverse sample. For example, prior research suggests that adults

with higher education tend to engage in more distancing prompts than those with lower education (Mol et al., 2008). Therefore, understanding how grandparents with diverse educational experiences interact with grandchildren over video chat is a critical future direction.

Second, I only explored how grandparents and grandchildren interact through video chat. I did not compare how these interactions differed from face-to-face interactions for each dyad. Grandparents and grandchildren might have facilitated more dialogic interactions if the dyad was in the same room. However, given that many families turned to video chat to connect with grandparents during the COVID-19 pandemic (Brown & Greenfield, 2021), our priority was to shine a light on the conversations grandparents and grandchildren have during video chat.

Third, I structured the video chat interaction with two activities: watch and discuss a video and a series of pictures. I selected stimuli that could potentially capture children's attention by using animals, parks, and a birthday party scene. Past work has found that the context in which adults and children interact alters their language input (Goldenberg et al., 2022; Rowe & Weisleder, 2020; Tamis-LeMonda et al., 2017; Tamis-LeMonda et al., 2019). These activities may have altered the way grandparents and grandchildren conversed over video chat. Therefore, I cannot claim that these findings reflect video chat interactions that are solely free talk.

Conclusion

The present study builds upon prior research by examining grandparent-grandchild interactions through video chat in real-time. Findings show that grandparents and grandchildren engaged in rich dialogic interactions, using question-asking and distancing prompts—similar to strategies parents would use during shared-

reading interactions. Lastly, I found that grandparents' perceptions about their video chat experiences with grandchildren related to their use of distancing prompts. Results suggests that video chat interactions can be used to connect and support children's language development by affording them the opportunity to hear language and engage with distant loved ones.

Chapter 4

How the Content of Early Parent-Child Linguistic Interactions May Prepare Children for School

Abstract

Children are expected to enter school with some degree of school readiness (SR), including knowledge of some letters and numbers, social-emotional competence, math abilities, executive functions, and knowledge about categories (Snow, 2006). SR at kindergarten entry predicts later academic success (Duncan et al., 2007). To explore one potential source of the variability in SR (Rowe, 2008), we examined how the topics 60 mothers discussed with their children at 24-months was associated with measures of language and SR at 36- and 54-months using the NICHD SECCYD data set. The current study asks: 1) What topics do mothers discuss with their children at 24-months? 2) How does the content mothers discuss at 24-months relate to children's language and SR at 36- and 54-months? 3) Do mothers talk about different topics to boys and girls? Results revealed that mothers mostly talked about animals, children's behavior, and the properties of objects (e.g., shapes) with their children at 24-months. Maternal education level was associated with children's later language and SR measures. Talking about visible referents was positively related to children's later working memory at 54-months. In contrast, talking about abstract and absent referents and behavior regulation was not associated with children's language and SR. Lastly, children's gender did not influence the topics mothers discussed with them. Results enhance our understanding of how early language experiences contribute to SR.

Introduction

As the transition from toddlerhood to early preschool years is pivotal for children's language development (Clark, 2018), it is essential to examine what parent-child communication looks like during toddlerhood and how these conversations might impact later development. Here, I examined whether the topics mothers discuss at 24-months was associated with children's school readiness at 54-months. Exploring children's early language experiences may provide insight into how conversations in the home prepare children for school.

School Readiness

Children are expected to enter school with some degree of knowledge and skills that point them toward academic success (Snow, 2006). This *school readiness* is complex and multifaceted (Ladd et al., 2006). Indeed, school readiness encompasses some knowledge about domain-specific skills such as early language, literacy, and math (Snow, 2006). School readiness comprises cognitive abilities, such as general knowledge about the world (e.g., colors, shapes, or animals; Soltis et al., 2015) and executive functioning skills (Blair & Peters, 2003). Executive functioning skills (cognitive flexibility, working memory, and inhibition) are a set of processes necessary to perform a purposeful, goal-directed behavior (Best et al., 2011). Additionally, school readiness includes social-emotional competence (Denham, 2006).

Many studies have utilized the Bracken Basic Concepts Scales (BBCS-R; Bracken, 2002) and Woodcock-Johnson Revised (WJ-R; Woodcock & Mather, 1990) to assess children's performance on measures of school readiness (e.g., Duncan et al., 2007; Keys et al., 2013; Lombardi & Dearing, 2020; Mudrick et al., 2020). These measures include a range of subtests to capture the complexity of school readiness

skills. The present study focuses on the language and cognitive aspects of school readiness. Therefore, I utilized a composite score from the BBCS-R and four subtests from the WJ-R to assess school readiness: Applied Problems, Incomplete Words, Letter-Identification, and Memory for Sentences.

The Role of Children's Language Ability on School Readiness

School readiness at kindergarten entry predicts later academic success (Duncan et al., 2007). Children's language abilities may be one factor associated with school readiness discrepancies (Burchinal et al., 2020; Claessens & Engels, 2013; Pace et al., 2019). The association between children's language skills before they enter school and school readiness is well documented in the literature (Fiorentino & Howe, 2004; Forget-Dubois et al., 2009). This could be because children's language skills are often a precursor of success in other domains. For example, Pace et al. (2019) examined whether school readiness in kindergarten—including executive function, math, literacy, social and emotional skills, and language development—was associated with children's academic trajectories. Results revealed that children's language ability at kindergarten entry was the only predictor of longitudinal gains both within (i.e., later vocabulary) and across domains (i.e., later math or social-emotional skills). Indeed, language has been found to relate to later literacy (Dickinson et al., 2010; Griffin et al., 2004; Snow et al., 2014) and mathematical abilities (Rudd et al., 2008; Susperreguy & Davis-Kean, 2016), two of the many components of school readiness (Justice et al., 2009; Kurdek & Sinclair, 2001).

In a more recent study, Burchinal et al. (2020) examined which school-entry skills predict later academic achievement. School-entry abilities were categorized as academic (i.e., math and reading skills), cognitive (i.e., language and executive

functioning), and social-emotional skills (i.e., externalizing and internalizing problems). Along with executive functioning, children's language skills at school entry predicted academic achievement during the first four years of elementary school.

Altogether, these findings highlight the importance of building a strong language foundation for academic success before entering school. Given that children's school readiness assessments tend to be conducted at around the age of 4, it is essential to assess children's language skills at 36-months. Examining the components that drive children's language abilities at 36-months is one step toward understanding the discrepancies that lie within children's school readiness skills (Cristofaro & Tamis-LeMonda, 2011).

Parents' Linguistic Input

Great variability in children's language abilities is present at kindergarten entry (Claessens & Engels, 2013; Durham et al., 2007; Fenson et al., 1994) and often related to the linguistic input that children receive before they enter school (Rowe, 2008). The relationship between linguistic input and children's language abilities has led to exploration about which aspects of the linguistic environment can strengthen children's language abilities.

One environmental factor that may explain the variability in children's language abilities is the number of words addressed to children during early childhood (Rowe, 2008). Although the quantity of talk has been correlated with children's language development (e.g., Hart & Risley, 1995), subsequent research has found that the *quality* of the linguistic environment has a more influential role in children's language trajectories (Cartmill et al., 2013; Goldin-Meadow et al., 2014; Romeo et al., 2018; Rowe, 2012).

Unlike language quantity, the quality of language does not have a set definition. This could be because quality input is a multifaceted concept, and research is still establishing which components of language quality are most facilitative for children's learning. Consequently, the quality of language input has been measured in multiple ways. For example, Rowe (2012) explored the quantity and quality of parental input when communicating with their child at 18-, 30-, and 42-months in participants' homes. Vocabulary comprehension was also assessed at 30-, 42-, and 54-months. Results revealed that parents who used a more sophisticated vocabulary—one that contains *rare words* and is varied—compared to vocabulary composed of common words at 30-months, influenced children's language abilities positively, resulting in a more extensive vocabulary size a year later (Rowe, 2012). Parents' use of rare words appear in everyday contexts in the home like mealtimes (e.g., Weizman & Snow, 2001) and shared-book reading (Tompkins et al., 2021). Rare words appear in adult-child interactions outside of the home as well. For example, Dickinson and Porche (2011) found that preschool teachers' use of rare words during free play predicted children's reading comprehension and word recognition in fourth grade.

Other studies have associated quality language with *conversational turns*, the number of times individuals converse back and forth without any pauses lasting longer than five seconds (Gilkerson et al. 2018; Masek et al., 2021). A conversational turn occurs when a parent displays contingent responses to the child's utterances but also allows the child to have the opportunity to lead the conversation. This temporal connection has been shown to facilitate children's word learning over video chat as well (Kuhl et al., 2003; Roseberry et al., 2014). Conversational turns have been linked to later language development beyond the sheer number of words a child is exposed to

(Romeo et al., 2018) and preschool executive function skills (Masek et al., 2022). For example, Hirsh-Pasek et al. (2015) explored the contribution of language quantity and the quality of dialogue between children and their caregivers in low-income families. At 24-months, the quality of parental linguistic input was coded for different features of parental communication, including symbol-infused joint attention, routines and rituals, and fluency and connectedness. "Fluency and connectedness," similar to conversational turns, can best be defined as the flow and relationship between the mother and child's conversations. Findings reported that fluency and connectedness correlated with children's expressive vocabulary ability at 36-months.

Exploring the *lexical diversity* of parental input is also a way to measure quality language. Lexical diversity is defined as the number of different word types in the input (e.g., jump, run, walk; Bornstein et al., 1998; Demir-Vegter et al., 2014; Rowe et al., 2004). Exposure to input that contains various word types is positively related to children's language abilities (Huttenlocher et al., 2010; Pan et al., 2005). For example, Rowe (2012) analyzed conversations between parents and their 30-month-old children in the home for 90 minutes. Results revealed that exposure to lexically diverse talk was associated with a more extensive vocabulary in children a year later.

Another way to measure the quality of language is by examining the pragmatic devices used, which is the *function* of the linguistic input. Parents can use language to teach children about objects and events, guide attention and actions, and encourage participation (Bruner, 1984). The function of language is often categorized into three broad categories: referential, regulatory, or vocalization prompts (Kuchirko et al., 2020; Tamis-LeMonda et al., 2013; Wu & Gros-Louis, 2015).

A majority of research has focused on *referential language* (Olson & Masur, 2015; West & Iverson, 2017), defined as utterances that provide information about objects and events (Masur et al., 2005; Tamis-LeMonda et al., 2012). Referential language is typically used when parents and children engage in joint attention (Tomasello & Farrar, 1986) or to respond to children's actions (Messer, 1978; Tamis-LeMonda et al., 2014). Following children's lead has been shown to support their word learning (Akhtar et al., 1991; Bornstein & Tamis-LeMonda, 1989; Hampson & Nelson, 1993; Tamis-LeMonda et al., 2001; Hoff & Naigles, 2002). Additionally, language input tends to be lexically diverse when adults use labels (e.g., "That is a cat!") and descriptors (e.g., "You are so silly"). As a result, referential language contributes to language development and, in turn, later cognitive and language outcomes (Bornstein et al., 1998; Fernald et al., 2006; Hoff, 2006; Hoff & Naigles, 2002; Hurtado et al., 2008; Huttenlocher et al., 2010; Marchman & Fernald, 2008; Rowe, 2012; Tamis-LeMonda et al., 2012).

Regulatory language includes utterances that direct, regulate, or prohibit children's behavior and attention (Masur et al., 2005). Compared to referential language, regulatory language often includes low lexical diversity due to short utterances (e.g., "Stop" or "Put that down") and frequent repetitions (Tamis-LeMonda et al., 2013). Exposure to low lexical diversity may be one explanation that regulatory language is often unrelated or negatively related to children's language skills (Kuchirko et al., 2020; Marfo, 1992; Mahoney & Neville-Smith, 1996; Hoff & Naigles, 2002; Paavola et al., 2005). Additionally, when adults use regulatory language with children, adults are determining how the child approaches the task. Redirecting children requires them to stop what they are attending to and shift their

attention, demanding greater processing (Tomasello & Farrar, 1986; Akhtar et al., 1991).

Lastly, prior work has looked at *vocalization prompt*s, utterances that encourage children to vocalize including question-asking (e.g., "What do you think?) and eliciting vocalizations (e.g., "Can you say mommy?"). Question-asking and eliciting vocalizations encourages children to participate in interactions (Hoff & Naigles, 2002), and in turn, positively relates to children's language skills (Cristofaro & Tamis-LeMonda, 2012; Rowe et al., 2017) as questions elicit information from the addressee. When children participate in interactions, it allows them to practice their speech processing and producing words aloud (Bonawitz et al., 2011; Oshima-Takane & Titova, 2021).

Exploring the Content Discussed in Parent-Child Interactions

Although these common measures (i.e., rare words, conversational turns, lexical diversity, and referential language) of quality language tend to foster word learning, they may not be sufficient for understanding how aspects of language input correlate with school readiness. *These measures do not consider what parents discuss with their children before entering school.* Research has not assessed whether talking about specific topics better supports children's school readiness. To obtain a fuller picture of how quality interactions relate to children's language skills, I identified the topics caregivers discuss with their children at 24-months and organized them in three broad categories: visible referents, abstract and absent referents, and behavior regulation.

Visible Referents

One category that parents often discuss with their children refers to things they can see, or *visible referents*. When parents and children jointly engage with an object, parents might use multiple strategies to establish joint attention (Baldwin, 1995; Tomasello & Farrar, 1986). For example, parents might point to a novel object. Along with pointing, parents often use referential language, in which they label or describe the object's properties (i.e., the shape, color, texture, or function). Providing labels and descriptions of objects can facilitate children's word learning and a deeper understanding of an object (Baldwin & Markman, 1989; Wu & Gros-Louis, 2015).

Past work found that preschoolers learned concrete nouns more readily than other word types, such as verbs, adjectives, and abstract nouns (Hadley et al., 2016). Concrete nouns–objects that are tangible–may be easier to learn because they are more likely to perceptually accessible (Bird et al., 2001; Gillette et al., 1999; Hollich et al., 2000; Forbes & Farrar, 1993; Maguire et al., 2006; Smiley & Huttenlocher, 1995; Yu & Smith, 2012). For example, the word "truck" might be easier to learn than the word "hope" because children can see and actively engage with a toy truck in their immediate environment. Therefore, it is possible that talk about visible referents may be related to school readiness because children must understand concrete topics (e.g., literacy, animals, body parts, food, and properties) before processing more abstract domains that are absent from the immediate environment (e.g., math, relationships, past and future events, and mental states).

Abstract and Absent Referents

Abstract and absent referents include intangible concepts (see Table 1 for definitions of these topics). Our definition of abstract and absent referents differs from

how others have defined abstract language because past research has focused only on how parents convey information (i.e., the function of input) rather than the topic of discussion. For example, studies have referenced abstract talk as decontextualized language—talk that extends the conversation beyond the "here" and "now" (Demir et al., 2015; Morgan & Goldstein, 2004; Rowe, 2012; Rowe, 2013). Decontextualized talk encompasses explanations, pretending, and discussing the past and future. Exposure to decontextualized talk has been shown to support later literacy development (Dickinson & Tabors 2001; Peterson & McCabe, 1994), narrative competency (Demir et al., 2015), and vocabulary skills (Rowe, 2013). However, Rowe (2012) found that exposure to decontextualized talk was not predictive of children's vocabulary until 42-months. Therefore, it is possible that talking about abstract and absent referents at 24-months may not support children's school readiness.

Behavior Regulation

Lastly, I considered how mothers' talk about the child's behavior would relate to children's school readiness. Parents often talk about what they would like their children to do, offering directions for restricting or regulating children's behavior (e.g., "Come here") and attention through imperatives or indirectly (e.g., "Let's see what's in the other box") (Kuchirko et al., 2020). There is mixed research examining how talk about children's behavior relates to children's language development. Some research suggests that directing children's attention scaffolds children's cognitive and social development (Landry et al., 1996; Neitzel & Stright, 2003). However, more research has found that when parents attempt to regulate children's behavior, it has negatively contributed to children's language trajectories (Baumwell et al., 1997; Hoff & Naigles, 2002; Masur et al., 2005; Paavola et al., 2005). Talk about behavior is

often repetitive (e.g., “Look, look, look!”), contains low lexical diversity (e.g., “Turn around”), and uses more pronouns (Tamis-LeMonda et al., 2013). Thus, it is likely that talk directing children’s behavior may not support children’s school readiness.

Maternal Talk about Topics at 24-Months

Mothers adjust how they talk with children according to their language levels and age (Rowe, 2012). For example, Bornstein et al. (2008) found that mothers are more likely to promote play, describe objects in the environment, and provide affirmations when children are toddlers, the age in which children often experience a vocabulary spurt—a time in which language usage is suddenly increasing for the child (Tamis-LeMonda et al., 2014).

Children might not reap the benefits of referential language if parents do not lexicalize the topic and use only indirect phrases to refer to the topic. Table 1 shows examples from three different mother-child dyads playing with toys during a laboratory visit. In Example A, mothers predominately used referential language that lexicalized topics (e.g., “That’s a *tractor*” or “That’s a big *rooster*”). Example B shows a mother who mostly used referential language although she did not explicitly label the topic of discussion (e.g., “You wanna see what’s in here?” or “It’s like yours.”). Lastly, Example C shows an instance in which a mother predominantly used regulatory language (e.g., “Look here”). Therefore, the focus was not on the topic but on children’s behavior. Although examples A and B both contain referential language, Example A might be more beneficial for children’s learning because the mothers identify the topics of discussion. Offering children labels may be less cognitively demanding than requiring children to make inferences about what the mother is referring to.

Table 14 Examples of mothers' referential language that lexicalizes topics, referential language that does not lexicalize topics, and language about behavior regulation

Example A		Example B		Example C	
Referential language that lexicalizes topics		Referential language that does *not* lexicalize topics		Language about behavior regulation	
Mother:	That's a tractor.	**Mother:**	You wanna see what's in here?	**Mother:**	Here.
Mother:	I bet there's animals in this book.	**Mother:**	What's that?	**Mother:**	Let's sit up here like this.
Mother:	It's called cock-a-doodle-doo.	**Mother:**	It's like yours.	**Mother:**	Let's play with this.
Mother:	There's a big rooster.	**Mother:**	Huh?	**Mother:**	Look.
Mother:	How big he is.	**Mother:**	What's in there?	**Mother:**	Look here.
		Mother:	Mhm.	**Mother:**	[Child's name] there.
		Mother:	Yes	**Mother:**	Oh boy.
				Mother:	Put it in this one.

Gender Differences

Generally speaking, the way parents talk with their children during everyday day experiences tend to reflect their beliefs about gender roles (Friedman et al., 2007; Gelman et al., 2004). For example, past research has shown that parents are also more likely to talk with boys than with girls about math (Eccles & Vida., 2003). In other work, parents are more likely to talk about literacy (Anderson et al., 2004; Curenton & Craig, 2011), mental states (Fivush et al., 2000), and events (Haden et al., 1997; Reese et al., 1993) with girls than boys. Here, I also consider whether gender-differences in mother-child conversations exist as early as 24-months when exploring the topics mothers discuss with their children.

The Current Study

The sample consisted of low-income mother-child dyads who took part in the NICHD Study of Early Child Care and Youth Development. Although the achievement gap has been found to relate to SES-disparities (Hanushek et al., 2019), it is critical to acknowledge the variance that is also present *within* SES groups (Hirsh-Pasek et al., 2015). I examine the variability in language input within families experiencing poverty using a strength-based approach (Kuchirko, 2019) to uncover the factors that strengthen children's school readiness. The specific research questions are:

1. What topics do mothers discuss with their children at 24-months?
2. How does the content mothers discuss at 24-months relate to children's language and school readiness at 36- and 54-months?
3. Do mothers talk about different topics to boys and girls?

To address the first research question, I hypothesized that in general, mothers discuss a range of topics with their toddlers. I also hypothesized that mothers will

mostly talk about visible referents because they may be easiest for children to learn (Bird et al., 2001; Gillette et al., 1999; Hollich et al., 2000; Forbes & Farrar, 1993; Maguire et al., 2006; Smiley & Huttenlocher, 1995). Second, I hypothesized that children's language school readiness at 36- and 54-months will relate to the topics mothers talked about with their children at 24-months. Specifically, I hypothesized that exposure to maternal talk about visible referents at 24-months would be associated with higher language skills and school readiness at 36- and 54-months. However, exposure to maternal talk about abstract and absent referents and behavior regulation at 24-months may not support language and school readiness at 36- and 54-months. Lastly, I hypothesized that mothers talk differently to their children according to children's gender (Anderson et al., 2004; Curenton & Craig, 2011; Eccles & Vida, 2003; Fivush et al., 2000; Haden et al., 1997; Reese et al., 1993). Specifically, mothers will be more likely to talk about abstract and absent referents with girls than boys, consistent with some past research (e.g., Anderson et al., 2004; Curenton & Craig, 2011; Fivush et al., 2000; Haden et al., 1997; Reese et al., 1993). Given that education is often associated with variability in input (Schwab et al., 2018; Sultana et al., 2020; Rowe et al., 2005; Vernon-Feagans et al., 2020), education will be included as a control for analyses.

Method

Participants

The current study had a longitudinal design and used a subset of 60 low-SES mother-child dyads from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development

(SECCYD) (Early Child Care Research Network, 2006). Participants came from five original study sites: Pittsburgh, Pennsylvania; Morganton, North Carolina; Charlottesville, Virginia; Philadelphia, Pennsylvania; and Madison, Wisconsin. The dataset was archived from a former study that utilized the NICHD dataset (Hirsh-Pasek et al., 2015). In the former study, 60 participants were selected to represent the full range of children's expressive language scores on the Reynell Developmental Scale (Reynell, 1990) at 36-months. Children's expressive language outcomes were split into three tiers (low = 20, mid = 20, high = 20). In each group, there were 10 females and 10 males. Children with higher expressive-language scales were oversampled to ensure there were an equal number of females and males.

Children's language skills at 36-months were analyzed because language tends to be a precursor of other domains (e.g., literacy, math; Pace et al., 2019). Along with the language outcomes at 36-months, the current study also obtained mother-child interactions at 24-months and children's school readiness at 54-months. Analyzing maternal input when infants were 24-months was especially interesting because language usage is suddenly increasing for the child (i.e., referenced as the *vocabulary spurt*; Tamis-LeMonda et al., 2014). I analyzed children's school readiness at 54 months because this is the age children typically enter school.

Across the 60 participants, 37% children were Black non-Hispanic (n = 22) and 63% White non-Hispanic (n = 22). All families were experiencing poverty, in which income-to-needs ratio was reported to be less than 1.8 Maternal education was also coded because it is a better representation than income of family SES (Hoff, 2013; Roberts et al., 1999). Thirteen did not complete high school. Twenty-two graduated high school but did not pursue further education. Twenty completed some

secondary education (some college, vocational school, or associate degree). Lastly, five mothers had received a Bachelor of Arts.

A power analysis was conducted to indicate the number of participants needed to run a linear regression to examine whether the number of times a topic was discussed at 24-months predicted children's performance on measures of language (Reynell Verbal Comprehension Scale) and school readiness (Bracken Basic Concepts Scale and the Woodcock-Johnson Revised, WJ-R) at 36- and 54-months, controlling for maternal education at 24-months. The expected effect size was set at .25, to reflect the effect size detected in prior studies of parent/child variables on school readiness (Janus et al., 2007). The power analysis from the multiple regression ($\alpha = .05$, $\beta = .80$) required 53 parent-child dyads, suggesting that the current subset ($n = 60$) met the sample size requirement.

Procedure

At 24-months, participants visited the lab at one of the study sites all over the United States to assess mother-child interactions with a semi-structured procedure, *the Three-Box Task.* Container one held a picture storybook called *Barnyard Track*. This book showed many farm-animals and their footprints. Container two held a miniature kitchen set with toy stove top, oven, microwave, and cabinet storage with cooking essentials. Lastly, container three had a small dollhouse with figurines and a miniature toy scooter. Mothers were instructed to play with the three numbered containers sequentially. There were no time constraints for how long they played with the contents of each container though the overall session had a time limit of 15 minutes (*M* =15.1 minutes, *SD* = 0.91, *Range* = 10.7 - 16.6). Children's school readiness was measured using the Bracken Basic Concept Scales (BBCS-R; Bracken, 2002) at 36-

months. Children's verbal comprehension skills were also measured at 36-months using the Reynell Verbal Comprehension Scale (Reynell; 1991). Lastly, children's school readiness was measured at 54-months using the Woodcock-Johnson Psycho-Educational Battery-Revised (WJ-R; Woodcock & Mather, 1990).

Measures

Reynell Language Scales

Children's language skills were assessed using the Reynell Developmental Language Scales (Reynell; 1991), a measure that has excellent validity and is normed for children between the ages of 1 to 7. Using two 67-item scales, the Reynell Developmental Language examines children's verbal comprehension and expressive language skills. There was a strong correlation between children's verbal comprehension and expressive language scores ($r = .52$, $p < .001$). Therefore, I only used one of the scales. I decided to use children's verbal comprehension because children often know more words than they can produce at this age (Bloom, 1974; Hirsh-Pasek & Golinkoff, 1996).

Children's School Readiness

The *Bracken Basic Concept Scale* assessed children's general knowledge about the world used in conversations with peers, teacher directions, or the curriculum. With 88-items and 11 subscales, the Bracken Basic Concept Scale measured children's knowledge around colors, letters, numbers/counting, size, self/social awareness (e.g., affective feeling, familial relationships, age), comparisons, and shapes. It has been standardized with a nationally representative sample and has excellent reliability and validity (Bracken, 2006; Breen, 1985; Rhyner et al., 1988). Knowledge of basic

concepts is correlated with language skills (Zucker & Riordan, 1988) and later academic success (Panter & Bracken, 2009), suggesting that conceptual knowledge is important for school readiness (Bracken & Crawford, 2003). Low performance is often related to limited conceptual knowledge or receptive language skills because children need to process questions to answer them correctly.

The Woodcock-Johnson Psycho-Educational Battery-Revised was also used to assess children's school readiness. Data for the following four subtests were obtained: Applied Problems, Incomplete Words, Letter-Identification, and Memory for Sentences.

Applied Problems measured children's ability to analyze and solve practical mathematical problems. For example, an experimenter may show images of shapes and ask, "How many circles are there?" or an experimenter may show images of children with balloons and ask, "There are five children here. There are three balloons. How many children do not have balloons?" Low performance may be related to children's low math abilities or language comprehension difficulties because children need strong language to understand the relationship between one quantity to another (Purpura & Reid, 2016). Assessing children's mathematics as a component of school readiness is essential because math is related to later success in school and post-secondary education (Davis-Kean et al., 2021; Jordan et al., 2009; Sadler & Tai, 2007).

Incomplete Words measured of phonological awareness, the ability to recognize and manipulate the sounds of units within a particular language (Smagorinsky & Mayer, 2014). Incomplete words asked children to identify and pronounce words with one or more missing phonemes, such as "C _ T" or "C_R".

Children would need to say “Cat” or “Car” to answer correctly. Low performance on this subtest may be related to limited awareness of phonemes. Phonological awareness relates to children’s decoding abilities (Lonigan et al., 2000; Sénéshal et al., 2001), reading success (Lonigan et al., 2011; Milankov et al., 2021), and language ability (Olofsson & Niedersøe, 1999), making it critical to assess phonological awareness as a predictor of readiness for learning to read.

Letter-Identification was used to measure children’s ability to identify isolated letters and words. Early items ask children to point to a specific letter. Sometimes the experimenter may point to a letter and ask children to name the letter. As children continue, an experimenter may show them a list of words and ask, “Point to the word *car*.” More advanced items ask children to read increasingly difficult lists of words aloud. Low performance may be due to limited reading skill. Reading individual words are vital for building vocabulary (Marchman & Fernald, 2008) and reading comprehension (Scarborough & Neuman, 2009).

Lastly, *Memory for Sentences* explored children’s ability to repeat words in the same sequence presented, assessing children’s verbal working memory (a component of executive functioning). For example, an experimenter or tape recorder might ask the child to say, “I feed the cat.” To answer correctly, children must repeat the utterance precisely as presented. *Working memory* is the ability to update, monitor, and manipulate relevant information actively (Alloway et al., 2006; Diamond, 2013; Miyake et al., 2000). For example, a child uses their working memory when following a recipe to make cookies. Children are adapting to what the next steps will be while also holding the end goal in mind—making cookies. In a school setting, working memory is necessary for problem-solving, following instructions, and impulse control

(Riggs et al., 2003; Vernon-Feagans et al., 2016). Low performance on this subtest may be related to limited executive functioning skills or language comprehension because children must be able to listen and follow verbal instructions to perform well on this subtest (Masek, 2022). Additionally, children with larger vocabularies may perform better on this subtest because they are more familiar with the words presented. Much research has found EF linked to educational outcomes (Burchinal et al., 2020; McClelland et al., 2014; Verdine et al., 2014; Ziegler et al., 2012).

For each subtest, items were presented in order of increasing difficulty. An incorrect response was scored as zero and a correct response was scored as one. Raw scores were standardized with a mean of 100 and a standard deviation of 15. The WJ-R battery of tests has been standardized on a nationally representative sample with a high internal-consistency (.94 to .98) and test–retest reliability (.80 to .87).

Maternal Input

Maternal input was coded in two ways. First, research assistants coded the *function* of the utterance. Then, they coded the *topics* that the mother-child discussed (e.g., animals, literacy, and relationships; see Table 2). Coding of topics were not mutually exclusive. The present study only presents the work with topics as few studies have taken this task on while many studies have coded for function. After research assistants coded the topics, they were categorized in three broad categories: visible referents, abstract and absent referents, and behavior regulation. Figure 1 shows the coding process and how topics were categorized.

Topics were generated based on two common school readiness assessments: the Bracken School Readiness Assessment (BSRA; Bracken, 2002) and Woodcock-Johnson Psycho-Educational Battery-Revised (WJ-R; Woodcock & Mather, 1990).

First, I identified the concepts measured with the WJ-R (e.g., math and literacy) and the Bracken Basic Concepts Scale—Revised (BBCS-R; Bracken, 2002) (e.g., self-awareness, properties, relationships). I also included topics that parents may discuss with their children at this age (e.g., animals, food, body parts).

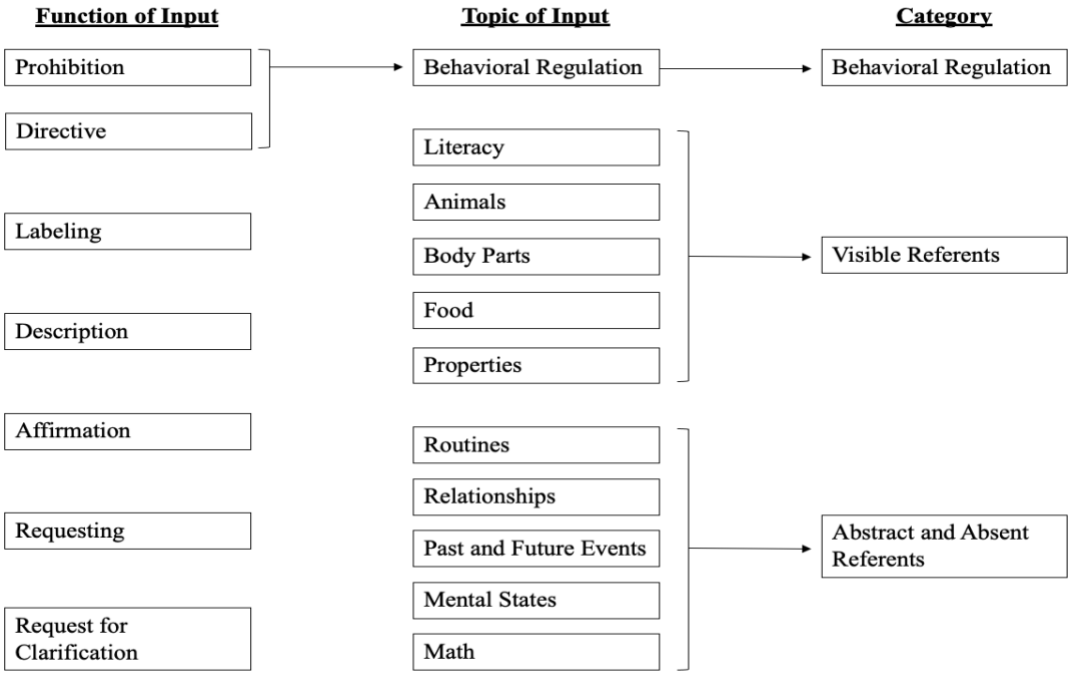


Figure 9 Flow chart showing the coding process and how topics were categorized

Table 15 Topics mothers discuss with their child at 24-months

Topics	Descriptions and Examples
Visible Referents	

Storybook Reading and Emergent Literacy	Talk that includes sounding out words, rhyming, identifying letters, book, and print conventions (e.g., cover, page, line), or encouraging the child to read *"What letter is that? It's an S!"* *"Look, do you see the animals on this page?"*
Animals	Talk that explicitly labels or describes an animal *"What animal is that?"* *"What sound does a cow make?*
Body Parts	Talk that includes the body *"Touch your toes."* *"Can you point to their head?"*
Food	Talk that explicitly labels a food item *"That's a pie!"* *"Pass me the butter."*
Properties	Talk that includes colors, shapes, textures, temperature, speed, direction, or size *"What color is that?"* *"That's a small toy!"*
Abstract and Absent Referents	
Relationships	Talk that includes familial and peer relationships *"Is that your best friend?"* *"That animal might be taller than your brother."*
Events: Evoking Memories, Predicting Future;	Talk that includes reminiscing on past events, predicting future events, or daily routines *"Remember when we went to the zoo and saw an animal like that?"* *"We will cook when we go to grandma's next weekend."*
Routines and Traditions	*"Brush your teeth!"* *"It's time for bed."*
Self-awareness and Mental	Talk that includes internal states or self-regulation

States	*"Does that make you happy?"* *"Oh, he might have a headache huh?"*
Math	Talk that includes labeling numbers, identifying the quantity, counting, or math concepts (e.g., adding or subtracting) *"Let's count how many animals there are!"* *"1...2...3!"*
Behavior Regulation	
Directive	Attempt to get the child's attention or get the child to perform an action; command expressed through imperative, or indirectly as a suggestion. *"Give me the toy."* *"Look at the pig."*
Prohibitions	Restricting, limiting, or forbidding child's actions. *"No."* *"Be careful."*

Note: Requests for information, descriptions, affirmations, and requesting for clarifications were not included here if topics were not mentioned explicitly

Results

What Topics do Mothers Discuss with Their Children at 24-Months?

To examine this question, the overall means and standard deviations of utterances related to a specific topic were calculated. The number of utterances mothers produced varied (Range = 71 - 418 utterances). Therefore, I calculated the proportion of talk about each topic divided by total number of utterances. On average, codes that identified the topic of the utterance appeared in 62% of the utterances across transcripts (Range = 27-91%). Although mothers did not discuss a topic for every utterance (e.g., "Huh?" or "What's in there?"), I hypothesized that conversations about certain topics might still contribute to school readiness. Results revealed that mothers were most likely to talk about animals, children's behavior, and properties of

objects (e.g., shapes, color, texture). In contrast, numbers and events (e.g., going to the zoo) were less likely to be talked about. Table 3 shows descriptive statistics for the proportion of talk about each topic. These topics were discussed in less than 1% of the interaction, and therefore not included subsequent analyses.

As Table 1 showed, only data like those found under Example A (lexicalized topic) and Example C (behavior regulation) were included for analysis in this study. Referential language that does not lexicalize the topic, even if it appears to ask the child to lexicalize the topic (e.g., "What is that?"), was not coded because it was not possible to tell if the mother was asking the child to respond or speaking rhetorically. By omitting topics that were not lexicalized, the number of utterances entering the data set was much reduced. Therefore, entries into Tables 3 and 4 appear to have very small numbers. Those data were the proportions of utterances about individual topics divided by the total number of utterances in each dyad.

Another way to do this would be to divide each individual topic by the number of utterances that included talk about topics for each dyad. This would suggest that the proportions for topics were much greater than in the data set, possibly misleading readers into thinking that topics were highly prevalent in parents' utterances. Therefore, I did not choose this type of calculation for our topics. However, I could take individual differences into account by dividing by the number of topical utterances in each dyad. That calculation would show how much each parent talks about the topics. A mother who talks about topics 50% of the time she speaks to the child differs from a mother who mentions topics only 10% of the time. Future analyses will explore this possibility.

Table 16 Descriptive statistics for proportion of talk about a topic at 24-months

	Mean	SD	Range
Animals	.11	.07	.00-.28
Behavior Regulation (Directives and Prohibitive)	.08	.05	.01-.28
Properties	.07	.05	.00-.21
Emergent Literacy	.03	.02	.00-.10
Food	.03	.03	.00-.14
Routines and Traditions	.02	.02	.00-.11
Mental States	.02	.02	.00-.11
Relationships	.01	.02	.00-.09
Body Parts	.01	.01	.00-.04

How Does the Proportion of Talk about Each Topic Differ by Activity?

I calculated the overall means and standard deviations of talk about each topic for each activity (Table 4). The first box included a storybook about barn animals. Mothers primarily talked about animals, properties, and literacy during the storybook activity. The second box included a toy kitchen set. Mothers mostly talked about food, routines and traditions, and behavior regulation when engaging with the kitchen set. The last box included a toy house with figurines. During the house activity, mothers mostly conversed about animals, behavior regulation, and properties.

Table 17 Descriptive statistics for proportion of talk about each topic used by mothers during each activity (storybook, toy kitchen, and toy house)

	Mean	SD	Range
Storybook			
Animals	.09	.07	.00-.28
Properties	.05	.04	.00-.17
Emergent Literacy	.03	.02	.00-.10
Behavior Regulation	.02	.02	.00-.10
Relationships	.00	.01	.00-.04
Mental States	.00	.01	.00-.03
Body Parts	.00	.01	.00-.04
Food	.00	.00	.00-.01
Routines and Traditions	.00	.00	.00-.01
Kitchen			
Food	.03	.03	.00-.13
Routines and Traditions	.02	.02	.00-.11
Behavior Regulation	.02	.02	.00-.11
Properties	.01	.01	.00-.07
Mental States	.01	.01	.00-.03
Relationships	.00	.01	.00-.05
Body Parts	.00	.00	.00-.02
Animals	.00	.01	.00-.06
Emergent Literacy	.00	.00	.00-.02
House			
Animals	.02	.02	.00-.06

Behavior Regulation	.01	.01	.00-.10
Properties	.01	.01	.00-.04
Routines and Traditions	.00	.01	.00-.04
Mental States	.00	.01	.00-.02
Relationships	.00	.01	.00-.03
Body Parts	.00	.01	.00-.02
Food	.00	.01	.00-.04
Emergent Literacy	.00	.00	.00-.01

For subsequent analyses, I combined topics into three broad categories: Behavior Regulation, Visible Referents, and Abstract and Absent Referents. Visible Referents included animals, body parts, food, emergent literacy, and properties. Abstract and Absent referents included mental states, relationships, events, and routines. Behavior Regulation included prohibitions and directives. Table 5 provides the overall means and standard deviations of utterances related to the three categories. Results revealed that mothers most likely talked about things they and their children could see.

Table 18 Descriptive statistics for proportion of mothers' talk within a category (visible referents, behavior regulation, and abstract and absent referents) at 24-months

	Mean	SD	Range
Visible Referents	.25	.12	.03-.54
Behavior Regulation (Directives and Prohibitive)	.08	.05	.01-.28
Abstract and Absent Referents	.05	.03	.00-.14

How Does the Proportion of Talk about Specific Topics at 24-Months Relate to Children's Language Development and School Readiness at 36- and 54-months?

Table 6 includes a correlation matrix between the proportion of talk about a specific category (visible referents, abstract and absent referents, and behavior regulation) at 24-months and children's performance on language and school readiness assessments at 36- and 54-months, when controlling for maternal education.

There was a correlation between children's exposure to talk about visible referents and their performance on the memory for sentences WJ-R subtest at 54-months (r = .31, p = .03). The correlation between proportion of talk about abstract and absent referents and children's performance on the Bracken Basic Concept Scales was not significant (r = -.23, p = .10). Additionally, the correlation between proportion of talk about behavior direction at 24-months and children's performance on the memory for sentence WJ-R was not significant (r = -.27, p = .06).

Table 19 Correlations between the proportion of maternal talk by category during the three-box task and children's performance on language and school readiness tasks at 36- and 54-months, when controlling for maternal education

	Visible Referents	Abstract and Absent Referents	Behavioral Regulation
36-months			
Reynell Verbal Comprehension	r = .18	r = -.08	r =-.13
Bracken Basic Concept Scales	r = .12	***r* = -.23**†	r = -.18
54-months			
Memory for Sentences	***r* = .31***	r = -.23	***r* = -.27**†
Applied Problems	r = .21	r = -.15	r = -.07
Incomplete Words	r = .16	r = .06	r = -.05
Letter-word Identification	r = .19	r = -.21	r = -.08

Note. † = <.10, * = <.05, ** = < .01, *** = <.001

I examined how the visible referents related with later school readiness when controlling for maternal education (Table 7). There was a correlation between parents' talk about animals at 24-months and their children's performance on the memory for sentences WJ-R subtest at 54-months (r = .34, p = .01). There was also a correlation between talk about properties at 24-months and their performance on the memory for sentences WJ-R subtest at 54-months (r = .32, p = .02).

Table 20 Correlations between the proportion of maternal talk about visible referents at 24-months during the three-box task and children's performance on language and school readiness tasks at 36- and 54-months, when controlling for maternal education

	Animals	Properties	Literacy	Food	Body Parts
36-months					
Reynell	*r* = .17	*r* = .21	*r* = -.13	*r* = .10	*r* = -.02
Bracken	*r* = .11	*r* = .08	*r* = .10	*r* = -.03	*r* = .05
54-months					
Memory for Sentences	***r* = .34***	***r* = .32***	*r* = .04	*r* = -.10	*r* = -.13
Applied problems	*r* = .12	*r* = .13	*r* = .08	*r* = .20	*r* = .17
Incomplete Words	*r* = .16	*r* = .06	*r* = -.06	*r* = .21	*r* = -.03
Letter-word identification	*r* = .17	*r* = .11	*r* = .02	*r* = .09	*r* = .15

† = <.10, * = <.05, ** = < .01, *** = <.001

Next, I conducted a series of linear regressions to examine whether the proportion of talk about visible referents, abstract and absent referents, or behavior regulation at 24-months predicted children's performance on language and school readiness assessments at 36- and 54-months, controlling for maternal education.

To assess which categories contributed to children's verbal comprehension skills at 36-months, I ran a linear regression with the proportion of visible referents, abstract and absent referents, and behavior regulation at 24-months as the predictor variables, and children's performance on the Reynell Verbal Comprehension Scale at 36-months as the outcome variable. I controlled for maternal education. This model was significant and accounted for 24.9% of the variance, F (4, 55) = 4.547, MSE = 189.049, p =.003 (Table 8). Maternal education was the only significant predictor (β = .448, SE = .925, p < .001).

Table 21 Regression analysis summary for variables predicting children's performance on the Reynell Verbal Comprehension Scale at 36-months

Variable	*B*	SE *B*	β
Step 1			
Maternal Education	3.532	.925	**.448****
Step 2			
Visible Referents	25.250	16.069	.195
Abstract and Absent Referents	-7.979	58.226	-.017
Behavior Regulation	-42.124	38.461	-.140
Constant	54.173	12.174	

Note. R^2 = .249 (N = 59, p = .003); † = <.10, * p = < .05, ** p = < .01, *** p = < .001.

To assess which categories contributed to children's performance on the Bracken Basic Concept Scale at 36-months, I ran a linear regression with the proportion of visible referents, abstract and absent referents, and behavior direction at 24-months as the predictor variables, and children's performance on the Bracken

Basic Concepts Scale at 36-months as the outcome variable. I controlled for maternal education. This model was significant and accounted for 17.7% of the variance, F (4, 55) = 2.904, MSE = 64.984, p =.03 (Table 9). Maternal education was the only significant predictor (β = .342, SE = .552, p = .008).

Table 22 Regression analysis summary for variables predicting children's performance on the Bracken Basic Concept Scale at 36-months

Variable	*B*	SE *B*	β
Step 1			
Maternal Education	3.532	.925	**.448****
Step 2			
Visible Referents	6.654	9.478	.091
Abstract Referents	-40.604	34.419	-.157
Behavioral Direction	-22.025	22.652	-.130
Constant	-3.418	7.334	

Note. R^2 = .177 (N = 58, p = .03); † = <.10, * p = < .05, ** p = < .01, *** p = < .001.

To assess which categories contributed to children's working memory skills at 36-months, I ran a linear regression with the proportion of talk about visible referents, abstract and absent referents, and behavior direction at 24-months as the predictor variables, and children's performance on the memory for sentences WJ-R subtest at 54-months as the outcome variable, controlling for maternal education. This model was also significant and accounted for 30.4% of the variance, F (4, 50) = 5.393, MSE

= 246.566, p =.001 (Table 10). Proportion of talk about visible referents had the highest predictive value of the three predictors (β = .343, *SE* = 19.01, p = .008).

Table 23 Regression analysis summary for variables predicting children's performance on the Memory for Sentences WJ-R subtest at 54-months

Variable	*B*	SE *B*	β
Step 1			
Maternal Education	3.552	1.187	**.380****
Step 2			
Visible Referents	52.259	19.007	.343**
Abstract Referents	-47.757	67.254	-.091
Behavioral Direction	-75.072	44.225	-.218†
Constant	55.953	14.845	

Note. R^2 = .304 (N = 54, p = .001); † = <.10, * p = < .05, ** p = < .01, *** p = < .001.

To assess which categories contributed to children's performance on applied problems at 54-months, a linear regression with the proportion of talk about visible referents, abstract and absent referents, and behavior direction at 24-months as the predictor variables, and children's performance on the applied problems WJ-R subtest at 54-months as the outcome variable, controlling for maternal education was run. This model was significant and accounted for 16.7% of the variance, F (4, 50) = 2.506, MSE = 310.251, p =.05 (Table 11). However, maternal education was the only significant predictor (β = .334, *SE* = 1.24, p = .01).

Table 24 Regression analysis summary for variables predicting children's performance on the Applied Problems WJ-R subtest at 54-months

Variable	*B*	SE *B*	β
Step 1			
Maternal Education	3.204	1.243	**.334***
Step 2			
Visible Referents	37.639	21.321	.241†
Abstract Referents	-28.486	75.441	-.053
Behavioral Direction	-2.962	49.608	-.008
Constant	58.158	16.652	

Note. R^2 = .167 (N = 54, p = .05); † = <.10, * p = < .05, ** p = < .01, *** p = < .001.

To assess which categories contributed to children's performance on the incomplete-word WJR subtest at 54-months, a linear regression with the proportion of talk about visible referents, abstract and absent referents, and behavior direction at 24-months as the predictor variables, and children's performance on the incomplete-words WJ-R subtest at 54-months as the outcome variable, controlling for maternal education was run. This model was non-significant, F (4, 50) = 1.921, MSE = 217.42, p =.12.

Lastly, to assess which categories contributed to children's performance on the letter-word identification at 54-months, I ran a linear regression with the proportion of talk about visible referents, abstract and absent referents, and behavior direction at 24-months as the predictor variables, and children's performance on the letter-word identification WJ-R subtest at 54-months as the outcome variable. I controlled for maternal education. This model was significant and accounted for 21.5% of the

variance, F (4, 50) = 3.42, MSE = 137.32, p =.02 (Table 12). Maternal education was the only significant predictor (β = .342, *SE* = .552, p = .008).

Table 25 Regression analysis summary for variables predicting children's performance on the Letter-Word Identification WJ-R subtest at 54-months

Variable	*B*	SE *B*	β
Step 1			
Maternal Education	2.540	.833	**.386****
Step 2			
Visible Referents	20.049	14.185	.187
Abstract Referents	-65.137	50.189	-.175
Behavioral Direction	-7.723	33.003	-.032
Constant	65.513	11.078	

Note. R^2 = .215 (N = 54, p = .02); † = <.10, * p = < .05, ** p = < .01, *** p = < .001.

Do Mothers Speak Differently to their Male and Female Children at 24-Months?

A one-way MANOVA with child gender as the fixed factor and the proportion of talk about each topic as the dependent variables was conducted to explore whether the topics mothers discussed with their children differed by gender. Results revealed no differences related to children's gender, F (3, 56) = .756, p = .52; Wilk's λ = .961, partial η^2 = .04.

Discussion

Children's early language experiences are associated with children's later language development (Cartmill et al., 2013; Goldin-Meadow et al., 2014; Romeo et al., 2018; Rowe, 2012) and school readiness (Fiorentino & Howe, 2004; Forget-Dubois et al., 2009). Previously, the quality of caregiver input was measured by lexical diversity (e.g., Silvey et al., 2021), conversational turns (Hirsh-Pasek et al., 2015; Romeo et al., 2018), and the function of the input (e.g., Kuchirko et al., 2020). Although these measures link to language learning, they may be insufficient for understanding how language input correlates with school readiness as they omit an examination of the *content* of parent-child speech. Little is known about *what* mothers discuss with their children during the preschool years. To obtain a fuller picture of how quality interactions relate to children's language skills, I identified the *topics* mothers discussed with their children at 24-months and how these topics relate to later school readiness.

Results revealed that mothers mostly talked about animals, children's behavior, and the properties of objects (e.g., shapes, color, texture, etc.) with their children at 24-months. In contrast, talk about numbers and events (e.g., going to the zoo) rarely occurred. I found that maternal talk about visible referents was positively related to children's later working memory at 54-months. In contrast, maternal talk about abstract and absent referents and behavior regulation was not associated with children's language and school readiness skills at 36- and 54-months. Lastly, I found that children's gender did not influence the topics mothers discussed with them.

Mothers Mostly Talk about Visible Referents and Children's Behavior at 24-Months

I found that mothers mostly talked about animals, children's behavior, and properties. In contrast, mothers were less likely to talk about numbers and events. For subsequent analyses, I combined the topics into three categories: visible referents, abstract and absent referents, and behavior regulation.

Mothers may have mostly talked about visible referents because of the semi-structured procedure of the task at hand. Language input is often shaped by the context in which the interaction occurs (Goldenberg et al., 2022; Hoff, 2006; Kuchirko & Tamis-LeMonda, 2019; Rowe & Weisleder, 2020; Tamis-LeMonda et al., 2017; Tamis-LeMonda et al., 2019). Indeed, Tamis-LeMonda et al. (2019) found that the amount, diversity, pragmatic functions, and semantic content of speech directed to infants differed according to the activities (e.g., feeding, book sharing, and object play) the dyads experienced.

In the present study, mothers and their children engaged with the Three-Box Task. The fact that the topics of conversation were about animals, properties, and literacy appears to be a direct function of the activities invited by the three boxes task. Specifically, I found that mothers primarily talked about animals, properties, and literacy during the first box, which included a storybook about barnyard animals. For example, mothers produced utterances such as "Does the cow make a moo?" and "Let's look at the book." Mothers mostly talked about food, routines and traditions, and children's behavior regulation when engaging with the second box, a kitchen set, saying things such as "Put them in the oven." or "Get the toast." Lastly, mothers mostly conversed about animals, suggesting or directing children's behavior, and properties when interacting with the third box, a toy house with figurines. Mothers produced utterances such as, "Don't break it" or "Tuck him in." These findings

suggest that the toys in the boxes influenced the topics mothers discussed with their children. Future work should consider *how* mothers discuss topics in different ways across activities. Mothers may adjust their speech, such as using more directives or asking more questions, when engaging with specific activities. Identifying which activities are associated with talk that is more likely to promote school readiness, such as promoting vocalizations or encouraging play, may illuminate other ways parents can help children learn before they enter school.

Research has identified symbolic, fine motor/adaptive, art, language, and life-size toys as age-appropriate for toddlers (Dreyer et al., 1996; Malhi et al., 2018; Rodriguez et al., 2009). *Symbolic toys* encourage the development of representational skills (e.g., dolls, action figures, small cars, small housekeeping toys, toy pots, and toy food). Two of the containers in the three-box task included symbolic toys (i.e., the small kitchen set and house with figurines), suggesting that these types of conversations may mirror the conversations mothers and children typically have at home. Tomopoulos et al. (2006) reported that access to symbolic toys and fine-motor and adaptive toys at 18-months was related to children's receptive language at 21-months (Tomopoulos et al., 2006). Here, I found that interactions with symbolic toys at 24-months were related to later working memory at 54-months. Thus, access to symbolic toys may facilitate rich interactions between children and caregivers that support later language skills and working memory.

The Role of Maternal Education

A large body of research has found that children of mothers with higher education levels tend to perform better academically than children of mothers with lower education levels (e.g., Hair et al., 2006; Konold et al., 2005; McWayne et al., 2012; Ramey & Ramey, 2004). Here, I also found an association between maternal education and measures of children's language and school readiness. There are several possibilities for why maternal education is often linked with child outcomes. First, maternal education tends to be correlated with accessibility to resources, such as books, that support children's academic achievement (Tomopoulos et al., 2006; Rodriguez et al., 2009). Second, some research has found that maternal education may impact style of communication with children, resulting in a greater amount and complexity of language when interacting with children (Schwab et al., 2018; Sultana et al., 2020; Rowe et al., 2005; Vernon-Feagans et al., 2020). Hearing more complex language is associated with children's later language development (Pan et al., 2005; Rowe, 2012; Rowe et al., 2017), a key component of children's school readiness (Durham et al., 2007; Golinkoff & Hirsh-Pasek, 1999; Hammer et al., 2018; Kaiser et al., 2022; Pace et al., 2019). Third, maternal education may be related to their knowledge of child development. Mothers who know the importance of talking with children may be more likely to engage in richer interactions with children (Rowe, 2008).

Maternal Input about Visible Referents Links to Children's Working Memory

Next, I examined how talk about visible referents may relate to children's school readiness. I found that maternal talk about visible referents was the highest

predictor that contributed to children's working memory, as measured by the WJ-R Memory for Sentences subtest. To investigate this relation further, I examined how each individual topic that was a part of the visible referents category related with later school readiness. Results revealed that maternal talk about animals and properties were related to children's working memory (as a part of executive functioning skills) at 54-months.

At this age, talking about visible referents might benefit young children because of perceptual accessibility (Bird et al., 2001; Gillette et al., 1999; Hollich et al., 2000; Forbes & Farrar, 1993; Maguire et al., 2006; Smiley & Huttenlocher, 1995; Yu & Smith, 2012). When parents and children see an object in front of them, they can use referential language to label the object or describe its properties (e.g., shape, color, texture, or function) to establish joint attention and support children's understanding of the object (Baldwin, 1995; Tomasello & Farrar, 1986). For example, some families labeled objects by saying things like "It's a stove," while others described what they saw, "That's a little one." Results suggest that offering children *labels*, in particular, throughout conversations may be more beneficial for children's working memory. This could be because children are more likely to encode new information when mothers label the topic.

Children's vocabulary skills may be why I found that talking about visible referents supports children's working memory skills. Children with greater language skills tend to perform better on this subtest than children with lower language skills because the task requires listening and following verbal instructions (Masek et al., 2022).

I ran a correlation between children's language and working memory skills at 54-months to see if our measure of working memory was tapping into children's language skills, controlling for maternal education. This correlation was significant ($r = .61$, $p < .001$). This result is consistent with past work that shows children's working memory and language abilities are related (Archibald, 2017; Archibald & Gathercole, 2006; Baddeley, 2003; Gathercole, 2006; Gathercole & Baddeley, 2014; Marcovitch & Zelazo, 2009; Masek et al., 2022; Stokes & Klee, 2009). A line of research has investigated the direction of this relationship, finding that children's vocabulary is a precursor of later executive function skills (Kuhn et al., 2014; Fuhs & Day, 2011; Vygostky, 1962; Zelazo, 2015). That is, children must have language skills to mentally represent categories before updating information using working memory (Marcovitch & Zelazo, 2009; Zelazo et al., 2003). For example, children have to learn the labels for the words "red" and "blue" before updating their understanding that these words both fall into the category of colors (Hall & Waxman, 1993; Kuhn et al., 2014).

One factor that may contribute to the relationship between children's language and executive function skills is language input (Hughes & Ensor, 2009; Ursache & Noble, 2016). Daneri et al. (2019) found that children's language skills mediate the relationship between language input and children's executive functioning skills. Specifically, children whose mothers used more lexically diverse language at 24-months and longer utterances at 36 months, had larger vocabularies at 36-months, and in turn, stronger executive functioning skills at 48-months. Therefore, in the present study, maternal input about visible referents may support children's working memory by building children's vocabularies. I hypothesize that when mothers discuss visible

referents using labels and descriptions, they potentially boost children's vocabularies and indirectly support executive function development. However, I did not examine the direction of the relationship, so I cannot determine whether maternal language input is driving children's vocabularies, and in turn, executive function skills.

Notably, I did not find an association between maternal talk about visible referents at 24-months and children's performance on the Bracken Basic Concept Scales at 36-months. Our measure from the Bracken Basic Concept Scale was a composite variable of subtests. Given that the Bracken Basic Concept Scale has 11 subtests (e.g., colors, letters, self/social awareness), there is potential that talk about visible referents may relate to individual subtests rather than a composite score.

Maternal Input about Abstract and Absent Referents Does Not Relate to School Readiness

I found that maternal talk about abstract and absent referents was negatively, but not significantly, associated with children's cognitive and language skills as well as general early childhood academic achievement, as measured by the Bracken Basic Concept Scale (r = -.23, p = .10). Exposure to abstract language might not have related to children's school readiness because of the low occurrence of abstract language in our data. Rowe (2013) found that only 2.2% of parent utterances were coded as abstract talk at 18-months, and 9.4% were coded as abstract talk at 42-months. In this study, 5% of talk was coded as abstract. These findings highlight that parents likely use more abstract language with older children. This could be because children typically do not participate in decontextualized discourse until the third year of their life (Rowe, 2012; Sachs, 1983). Additionally, past research has shown that exposure to decontextualized talk does not support language outcomes until after 42-months

(Rowe, 2012). Therefore, maternal input about abstract and absent referents at 24-months may be insufficient for making a large impact on children's school readiness.

Maternal Input about Behavior Regulation

Lastly, I explored how mothers' directions to children about their behavior related to children's school readiness. Parents tend to use behavior regulation when directing children's behavior or attention (Kuchirko et al., 2020). In the present study, many families regulated children's behavior by saying things such as "Sit down and read" or "Come over here." A large body of research has found that parental talk about children's behavior is often negatively associated with children's language trajectories (Baumwell et al., 1997; Hoff & Naigles, 2002; Masur et al., 2005; Paavola et al., 2005). In contrast, there is some literature that suggests that directing children's attention was positively associated with children's later cognitive and social skills at school entry (Landry, 2002; Landry et al., 2000). Here, I found that maternal talk about behavior regulation at 24-months was negatively, but not significantly related to children's working memory, as measured by the WJ-R Memory for Sentences subtest (β = -.218, p = .10).

These findings suggest that talking about behavior at 24-months was potentially ineffective for working memory. Prior work has found that talking about behavior regulation does not support children's language skills because it is often repetitive, contains low lexical diversity, and uses more pronouns (Tamis-LeMonda et al., 2013; see Example C in Table 1). Parent sensitivity is associated with children's self-regulation (Fay-Stammback et al., 2014; Pinquart, 2017). Some research suggests that this relationship is mediated through language (Matte-Gagné & Bernier, 2011). For example, Matte-Gagné and Bernier (2011) found that children whose mothers

exhibited greater autonomy support at 15-months had greater vocabularies at 24-months and, in turn, better self-regulation skills at 36-months. Therefore, one hypothesis suggests that using language to direct children's behavior may not support children's language. In turn, these weaker language skills are associated with lower executive functioning. However, our data cannot decipher the direction of the relationship. Altogether, these findings suggest that exposure to talk about behavior regulation at 24-months may not be an ideal way to support children's language or school readiness.

Mothers Did Not Speak Differently to Their Male and Female Children at 24-Months

The way parents engage with children often reflects their beliefs about gender roles (Friedman et al., 2007; Gelman et al., 2004). I did not find any gender differences in mother-child interactions. Similarly, Kuchirko et al. (2020) also found no gender differences in mothers' use of referential language and vocalization prompts at 24-months in a sample of Mexican, Dominican, and African American families. However, they found that mothers of sons used more action directives (i.e., regulate behavior) and attention directives (i.e., direct gaze) than mothers of daughters. In another study, Paavola et al. (2005) found that mothers spoke differently to their children according to their gender at 10-months. Specifically, mothers asked girls more questions for clarification or confirmation but used more commands and warnings with sons (Paavola et al., 2005).

One reason why I may not have found gender differences in mother-child interactions is that each dyad participated in the same activities in the Three-Box Task. Children did not have access to a wide variety of toys. If more options were available,

I might have children play with toys based on their interests rather than what was accessible. Depending on the toys children interact with, I might see gender differences in parents' input.

Implications

Though the effect of the quality of language input on children's development has been studied in various ways (Pan et al., 2005; Rowe, 2012; Rowe et al., 2017), research has yet to ask how the *content* mothers discuss with their children might help prepare them for school. The results from this study begin to enhance our understanding of how early language experiences improve school readiness in a sample of families from under-resourced backgrounds. Understanding how early language in the home relates to school readiness is a first step toward understanding the variability in school readiness. Findings also have implications for parent education. Future interventions should encourage parents to focus conversations on visible referents, rather than abstract and absent referents and behavior regulation, at 24-months of age to build children's school readiness at school entry.

Limitations

There are several limitations of this research. First, the structure of the Three-Box Task clearly impacted the conversations between mothers and their children, both in terms of how and what was discussed. Tamis-LeMonda et al. (2017) found that language to infants differs according to the approach to studying children's language environments. For example, language was denser during structured laboratory tasks. However, during naturalistic routines, language occurred in fluctuations interspersed with silence. Therefore, fifteen minutes may not capture the naturalistic input that

children hear in their homes. Another limitation was that our sample only included mothers. Given that mothers' and fathers' conversations with children differ (Rowe et al., 2004; Pancsofar & Vernon-Feagans, 2006) and independently predict children's outcomes (Cabrera et al., 2018; Tamis-LeMonda et al., 2004). Therefore, it is possible that parents may talk about different topics with their children.

Conclusions

The present study highlights the language input that strengthens children's school readiness in a sample of families experiencing poverty. This work is the first to examine how the topics mothers discuss with their children at 24-months relate to children's school readiness at 54-months. The parameters of the maternal talk were narrowed due to the Three-Box Task. Nevertheless, there was still variability in the topics that mothers discussed with their children at 24-months, and this variability related to children's working memory, a measure of school readiness. Specifically, our results suggest that talking about visible referents at 24-months was associated with children's verbal comprehension at 36-months and working memory skills at 54-months. In contrast, at 24-months, talk about abstract and absent referents and children's behavior regulation may be ineffective for language and school readiness at 36- and 54-months. These findings allow us to better understand which topics of maternal talk support children's school readiness.

Chapter 5

DISCUSSION

There is an abundance of research demonstrating the significance of early language skills for school readiness (Kaiser et al., 2022; Pace et al., 2019). Children's early language skills set the stage for later language (Ghassabian et al., 2014; Kemp et al., 2017; Moyle et al., 2007), literacy (Duff et al., 2015; Hjetland et al., 2019; Larney, 2002; Lee, 2011), math (Lefevre et al., 2010; Slusser et al., 2019), and socio-emotional skills (Bretherton et al., 2014; Longobardi et al., 2015; Matte-Gagné & Bernier, 2011; Roben et al., 2013). Given the importance of a strong language foundation, the overarching goal of the three studies in this dissertation was to expand our understanding of how everyday adult-child conversations before school-entry impact children's language development and subsequent academic success. Study 1 found that adults exhibit infant-directed speech in their speech and behavior when interacting with their infants, though adults were not conscious of it. Study 2 found that rich interactions that include distancing prompts and question-asking occur during video chat between grandparents and grandchildren. Lastly, Study 3 found that talking about specific topics during toddlerhood is associated with language development at 36-months and school readiness at 54-months.

Measuring Quality Input in Child-Directed Speech Across Development

Past work has found that the amount of speech children hear can promote children's language skills (Hart & Risley, 1995; Lieven, 2010; Weisleder & Fernald,

2013). However, this message is misleading (Masek et al., 2021). Children cannot build their language development by passively watching television (Anderson & Pempek, 2005; Barr et al., 2010; Hudon et al., 2013; Zimmerman et al., 2009). Indeed, the *quality* of caregiver input has a more substantial role in children's language trajectories than language quantity (Cartmill et al., 2013; Goldin-Meadow et al., 2014; Hirsh-Pasek et al., 2015; Huttenlocher et al., 2010; Masek et al., 2021; Rowe, 2012; Rowe et al., 2017; Hindman & Wasik, 2015).

Some studies have measured both the quantity and quality of linguistic input during infancy, toddlerhood, and preschool years. Past work has found, for instance, that parents' language input differs according to children's language levels (Bergelson et al., 2018). For example, Rowe (2012) examined the role of quantity and quality child-directed speech at 18-, 30-, and 42-months on children's vocabulary skills measured a year later (e.g., 30-, 42-, and 54-months, respectively). Results revealed that at 18-months, the quantity of input was the most important predictor of children's vocabulary. Rowe (2012) suggested measures that bring attention to language, such as gestures (Rowe & Goldin-Meadow, 2009), might be suitable quality measures when children's language skills are limited. At 30-months, parents' use of lexically diverse and sophisticated language (e.g., the use of rare words; Weizman & Snow, 2001) was most related to children's vocabulary. Lastly, at 42-months, parents' use of decontextualized language–talk beyond the here and now–was most related to children's vocabulary. The three studies in my dissertation also examined language input across infancy, toddlerhood, and preschool years. Our findings may offer insight into the potential implications of language input on children's language and academic skills.

Language During Infancy

At around the first birthday, children begin to produce their first words (McCarthy, 1954). Around six months later, children's productive vocabulary grows substantially (Tamis-LeMonda et al., 1998). What are ways that adults communicate with children that assists meeting these milestones during infancy? One way is through infant-directed speech. Study 1 examined parents' use of infant-directed speech as they taught their child a novel word. I found evidence of the use of infant-directed speech (IDS), in which parents adjusted their speech register on average, 50 hz higher when interacting with their infants versus the experimenter. Along with the linguistic adjustment, many parents asked at least three questions (89.5%) and repeated the target word at least three times (93%) when teaching children a novel label.

Even though Rowe (2012) found that language quantity was more effective than language quality at 18-months for later vocabulary, infant-directed speech, question-asking, and repetition might be the exception. Using infant-directed speech, question-asking, and repetition draws attention to language, making these behaviors suitable for building children's language during infancy. For example, many studies have found that infants have higher neural activity when they hear IDS than the speech that is directed to adults (Háden et al., 2020; Naoi et al., 2012; Peter et al., 2016; Zangl & Mills, 2007). Attracting infants' attention to language may be one reason infant-directed speech supports word learning. Past research has also found that infants prefer listening to utterances that contain repetition (McRoberts et al., 2009). This preference for repetition is meaningful, as children's exposure to repetition is positively associated with later language development (Newman et al., 2016). Lastly, asking children questions invites them to the conversation and encourages them to vocalize,

supporting their language development (Hoff & Naigles, 2002). For example, Muhinyi and Rowe (2019) found that asking children questions during a shared book reading at 10-months was associated with children's concurrent and later language abilities at 18-months.

Language During Toddlerhood

During toddlerhood, children experience a vocabulary spurt, in which language usage suddenly increases for both the child and caretaker (Tamis-LeMonda et al., 2014). Additionally, many studies have found that children's language skills during the second year of life are associated with later language (e.g., Hirsh-Pasek et al., 2015) and cognitive development (e.g., Rowe et al., 2017). Therefore, many studies have examined which aspects of caregiver language drive the vocabulary spurt during the second year of life (Adamson et al., 2021; Pancsofar & Vernon-Feagan, 2006; Tamis-LeMonda & Bornstein, 1994; Tamis-LeMonda et al., 2001). The vocabulary spurt is time in which language usage is suddenly increasing for both the child and caretaker (Tamis-LeMonda et al., 2014).

Study 3 examined mother-child interactions during a semi-structured procedure at 24-months. I found that 25% of mothers' utterances were about visible referents at 24-months. Visible referents included talking about tangible things you can see, such as animals, body parts, food, properties, and components of literacy (e.g., "Turn the *page*" or "Bring the *book*"). I also found that mothers talked about children's behavior using directives and prohibitions about 8% of the time. Lastly, only 5% of utterances were related to abstract and absent referents, such as relationships, past and future events, routines, mental states, and math. Only maternal talk about visible referents was related to longitudinal gains in children's verbal

comprehension at 36-months and working memory at 54-months. Past research suggests that children are more likely to learn the label for an object that is visible to them than an object that is not present (Yu & Smith, 2012). Given that children's language ability is still limited during toddlerhood (Tamis-LeMonda et al., 2014), talking about visible referents with children may be more appropriate than talking about abstract and absent referents at this age.

Language During the Preschool Years

During the third and fourth year of life, children's language becomes more complex (McCarthy, 1943). For example, children are more likely to use decontextualized talk such as explanations, talk about past and future events, and narratives (Curenton & Justice, 2004). Past research has suggested that talk beyond the "here and now" is especially important for children's later literacy development (Dickinson & Tabors 2001; Peterson & McCabe, 1994), narrative competency (Demir et al., 2015), vocabulary skills (Rowe, 2012, 2013) and academic language (Ucceli et al., 2019).

In Study 2, I examined whether grandparents engaged in dialogic interactions with their preschool- and school-aged grandchildren over video chat as they looked at media that I provided for them. I measured dialogic interactions by counting how many distancing prompts occurred (e.g., Parish-Morris et al., 2013). *Distancing prompts* appear when adults draw parallels from the learning material to children's lives (Purdy, 2008), often using decontextualized language. For example, adults may ask "What did you wear for Halloween?" when discussing a book about Halloween. On average, grandparents used distancing prompts 26% of the time. Given that exposure to decontextualized talk is associated with children's use of it (Leech et al.,

2018), these findings suggest that grandparent-grandchild interactions over video chat may support children's language skills.

Study 2 also examined how grandparents talked with the grandchildren. I found that, on average, 41% of grandparents' utterances were questions. Grandparents may have asked grandchildren questions over video chat to engage their participation, teach, or draw upon children's memories. Asking children questions during the preschool years is linked to a variety of learning outcomes, such as language (e.g., Blewitt et al., 2009; Cristofaro & Tamis-LeMonda, 2011), literacy acquisition (e.g., Storch & Whitehurst, 2002), and content learning (e.g., Haden et al., 2015). Additionally, asking children about past events is another way to engage in decontextualized talk (e.g., Wei et al., 2020). Therefore, video chatting with grandparents may be another way to reap the benefits of question-asking.

Factors that Might Contribute to Quality

Previous research and the current dissertation suggest that early the way adults talk with children sculpts children's language skills. Therefore, it is vital to examine the different factors that characterize the quality of the linguistic input. The three studies also shine light on how the linguistic environments differ according to adult beliefs about child development and the context of the interaction.

Beliefs

Parents' knowledge of child development is often related to the variability in linguistic input (Bornstein et al., 2003; Donahue et al., 1997; Rowe, 2008). Interestingly, I saw that this was not the case in Studies 1 and 2. Specifically, I found that parents' beliefs about infant-directed speech were not aligned with their behavior

in Study 1. For example, only 52.7% of parents reported that they often or always "use baby talk – their voice gets higher and more melodic when speaking to their child than when speaking to an adult." Yet, 87.7% of parents elevated their speech register when interacting with their children according to our criterion. These findings suggest that parents adjusted their speech register when interacting with their children, regardless of their beliefs.

For Study 2, 16% of grandparents reported worrying that they "do not have anything to talk about with their grandchild." Although this is a low percentage, only 2.3% of parents reported that they were worried that their children's grandparents did not have anything to discuss with their children. These findings suggest that some grandparents in our sample might be hesitant to interact with grandchildren through video chat because they were unsure of what to discuss with them. Notably, this was not reflected during the actual grandparent-grandchildren interactions. I found that 93% of grandparents' utterances described what they saw or engaged in distancing prompts.

Altogether, studies 1 and 2 reflect that beliefs do not always align with behavior. These responses were reported through self-report questionnaires. This could be because adults are not conscious of their behavior, as shown in Study 1. This is an interesting finding in itself because parents' behavior contradicted their beliefs.

Context

Language input differs according to the methodology used to examine children's language environments (Tamis-LeMonda et al., 2017). This was evident across all three studies. Specifically, Study 1 found that parents did not use the same speech register when interacting with infants and adults. I hypothesized that a factor

contributing to this difference may be because parents were asked to engage in a goal-oriented task with infants, but not with adults. However, numerous studies have documented that adults talk differently to babies than to other adults in many studies (e.g., Cox et al., 2022; Cristia, 2013; Fernald, 1992; Menn et al., 2022). Study 2 found differences across grandparents' use of distancing prompts across the video activity that showed information about an uncommon animal and the picture activity that included photos about a birthday party, playground, and pets. Lastly, Study 3 found that the topics mothers discussed with children differed according to the activity (storybook, toy kitchen set, toy house with figurines). These findings highlight the power of context on interactions.

Novel Ways to Analyze Quality Interactions

Lastly, the three studies in my dissertation add to the literature by examining language input in three novel ways: a questionnaire, coding of language input (e.g., distancing prompts and question-asking) during grandparent-grandchild videochat interactions, and coding of topics at 24-months. For Study 1, I designed the first questionnaire directly assessing parents' beliefs about infant-directed speech. Study 2 is the first to code the quality of language (i.e., distancing prompts and question-asking) grandparents and grandchildren use when they video chat. Study 3 designed a new coding scheme that identified and categorized the topics (i.e., visible referents, abstract referents, and behavioral regulation) mothers discuss with their children at 24-months. Finding novel ways to examine children's linguistic environment offers new insights into the aspects of language that drive children's language trajectories.

Implications of These Findings for Children's Language Development

Early language skills are necessary for connection, learning, health, and personal relationships (Adler et al., 1994; Durham et al., 2007; Hammer et al., 2017; Kaiser et al., 2022; Pace et al., 2019). Given that children's language skills before school entry set the stage for later development (Pace et al., 2019; Forget-Dubois et al., 2009; Guo et al., in press), it is critical to support children's language skills at an early age. In this dissertation, I examined new ways to measure language input during adult-child interactions across infancy, toddlerhood, and the preschool years. These findings have implications for building children's language development through everyday interactions such as using infant-directed speech during infancy (Study 1), talking about visible referents during toddlerhood (Study 3), and video chatting with grandparents for exposure to distancing prompts and question-asking during the preschool years (Study 2). Although infant-directed speech, talking about visible referents, distancing prompts, and question-asking is not necessary for word learning per se, many studies suggest that these measures of quality are valuable ways to facilitate children's language development (Han et al., 2023; Hargrave & Sénéchal, 2000; Herold et al., 2012; Porritt et al., 2014; Purdy, 2008; Song et al., 2010; Yu & Smith, 2012). Therefore, encouraging infant-directed speech during infancy, talking about visible referents during toddlerhood, and using distancing prompts and question-asking during preschool may be influential for language acquisition.

Future Directions

Findings from the three studies in the dissertation raise questions that should be addressed through future research. Future work should investigate children's language interactions with other family members, such as grandparents. Although a

growing body of literature has identified the factors that contribute to the closeness of grandparent-grandchild relationships (Duflos et al., 2022; Stelle et al., 2010), much less is known about what these interactions look like over in-person and over video chat with young children. Study 2 was the first study to explore the linguistic input that occurs during grandparent-grandchild interactions over video chat in *real-time*. However, the study did not examine whether these video chat interactions were contingent.

A socially contingent interaction occurs when adults provide responses that are *relevant* and are given in a *timely manner* to children's utterances (Troseth et al., 2006). Research suggests that young children can learn over video chat when the responses from the adult present are socially *contingent* (Gaudreau et al., 2020; Kirkorian et al., 2016; Roseberry et al., 2014; Myers et al., 2017; Strouse et al., 2018). For example, Roseberry et al. (2014) taught toddlers between the ages of 24- to 30-months novel verbs in one of three conditions: live interaction, socially contingent video chat, or a yoked video. The yoked video included a non-contingent pre-recorded interaction in which the experimenter was interacting with another child. Toddlers only learned novel verbs when training included contingent interactions, regardless of format (live vs. video chat). Similarly, in a more recent study, Gaudreau et al. (2020) explored how book-reading format relates to 4- to 5-year-old children's story comprehension and vocabulary learning. Children were read a book in person, over video chat, or through a prerecorded video. The prerecorded video was similar to *Blue's Clues* or *Dora the Explorer*. During the prerecorded video condition, the experimenter posed questions and waited a set amount of time for the child to respond, not contingent on the child's actions or responses. Results revealed that 4-year-olds

learned equally well when read to in person, with a prerecorded video, and over video chat (Gaudreau et al., 2020). Given that interactions over video chat are socially contingent, it is possible that video chatting with grandparents (or other family members) may be another way to support children's learning.

Future work should also examine father-child interactions. Studies 1 and 3 predominantly focused on mother-child interactions. Although Study 1 did not exclude fathers from participating, only 8.1% of the sample were fathers. Past research has found that mothers' and fathers' conversations with children differ (Ferjan Ramírez, 2022; Kwon et al., 2013; Leaper et al., 1998; Rowe et al., 2004; Warren-Leubecker et al., 1984). For example, fathers used less wh- questions and lexically diverse language than mothers when interacting with children (Pancsofar & Vernon-Feagans, 2006). One avenue for future work for Study 1 might consider whether fathers' beliefs about infant-directed speech differ from mothers' beliefs. For Study 3, future work might consider whether the topics parents discuss with their children differ depending on parents' gender.

Like maternal input, many studies show that paternal language input is also associated with children's language development (Cabrera et al., 2018; Leech et al., 2013). For example, Rowe et al. (2017) found that fathers' wh- questions were associated with children's expressive vocabulary and reasoning skills. In another study, Conica et al. (2020) reported that fathers' repetition of children's utterances, but not mothers' repetition, at 24-months was associated with children's vocabulary two years later. Additionally, other work has found that mothers' and fathers' input individually contribute to children's language learning (Pancsofar & Vernon-Feagans, 2006; Tamis-LeMonda et al., 2004). Without including fathers' input, results may not

provide a full picture of how input builds children's language skills and later academic achievement.

Another avenue of future research should consider the role of siblings' input on children's language development. In North America, older siblings often have a role in caretaking during younger siblings' daily routines (Fouts et al., 2012; Stewart & Marvin, 1984). In a rural community in southern Africa, other children's child-directed speech was more prevalent than mothers' or other adults' child-directed speech (Loukatou et al., 2022).

Lastly, Studies 1 and 2 were conducted with predominately White families with at least a bachelor's degree. Past research has found variability in language input related to parent education level (Schwab et al., 2018; Sultana et al., 2020; Rowe et al., 2005; Vernon-Feagans et al., 2020). Therefore, an avenue for future work is to assess whether the findings of the three studies differ with a more diverse sample.

There is much left to explore in children's early language environments. The three studies in this dissertation addressed gaps regarding parents' beliefs about infant-directed speech, the language grandparents use with grandchildren when interacting with media over chat, and whether the topics mothers discuss at 24-months appear to have longitudinal effects on children's development. For example, Study 1 found parents have mixed beliefs about IDS. Study 2 found that grandparents use high-quality language, including question-asking and distancing prompts, over video chat with grandchildren when engaging with media. Lastly, Study 3 found that talking about visible referents was related to children working memory. Altogether, the three studies contribute to understanding how everyday adult-child conversations support children's language development and subsequent academic success. Examining how

caregiver talk facilitates language learning across child development clarifies how adults help children prepare for school and has potential implications for interventions.

REFERENCES

Adamson, L. B., Bakeman, R., & Deckner, D. F. (2004). The development of symbol-infused joint engagement. *Child Development, 75*(4), 1171–1187. https://doi.org/10.1111/j.1467-8624.2004.00732.x

Adamson, L. B., Caughy, M. O. B., Bakeman, R., Rojas, R., Owen, M. T., Tamis-LeMonda, C. S., ... & Suma, K. (2021). The quality of mother-toddler communication predicts language and early literacy in Mexican American children from low-income households. *Early Childhood Research Quarterly*, *56*, 167-179. https://doi.org/10.1016/j.ecresq.2021.03.006

Adler, N. E., Boyce, T., Chesney, M. A., Cohen, S., Folkman, S., Kahn, R. L., & Syme, S. L. (1994). Socioeconomic status and health: the challenge of the gradient. *American Psychologist*, *49*(1), 15. https://doi.org/10.1037/0003-066X.49.1.15

Ainsworth, M. D. S., Bell, S. M., & Stayton, D. J. (1974). Infant-mother attachment and social development: Socialization as a product of reciprocal responsiveness to signals. In J. M. Richards (Ed.), *The integration of a child into a social world* (pp. 99–135). London: Cambridge University Press.

Akhtar, N., Dunham, F., & Dunham, P. J. (1991). Directive interactions and early vocabulary development: The role of joint attentional focus. *Journal of Child Language*, *18*(1), 41-49. https://doi.org/10.1017/S0305000900013283

Albarran, A. S., & Reich, S. M. (2014). Using baby books to increase new mothers' self-efficacy and improve toddler language development. *Infant and Child Development*, *23*(4), 374-387. https://doi.org/10.1002/icd.1832

Alloway, T. P., Gathercole, S. E., & Pickering, S. J. (2006). Verbal and visuospatial short-term and working memory in children: Are they separable? *Child Development*, *77*(6), 1698-1716.

American Academy of Pediatrics (2011). Media use by children younger than 2 years. *Pediatrics*, *128*, 1040-1045.

Ames, M. G., Go, J., Kaye, J. J. & Spasojevic, M. (2010). Making love in the network closet: The benefits and work of family videochat. *Proceedings of the 2010 ACM Conference on Computer Supported Cooperative Work*, 145–154. https://doi.org/10.1145/1718918.1718946

Anderson, D. R., & Pempek, T. A. (2005). Television and very young children. *American Behavioral Scientist*, *48*(5), 505-522. https://doi.org/10.1177/0002764204271506

Anderson, J., Anderson, A., Lynch, J., & Shapiro, J. (2004). Examining the effects of gender and genre on interactions in shared book reading. *Literacy Research and Instruction*, *43*(4), 1-20. https://doi.org/10.1080/19388070409558414

Archibald, L. M. (2017). Working memory and language learning: A review. *Child Language Teaching and Therapy*, *33*(1), 5-17. https://doi.org/10.1177/0265659016654206

Archibald, L. M., & Gathercole, S. E. (2006). Short-term and working memory in specific language impairment. *International Journal of Language & Communication Disorders*, *41*(6), 675-693.

Arnold, D. S., & Whitehurst, G. J. (1994). Accelerating language development through picture book reading: A summary of dialogic reading and its effect. In D. K. Dickinson (Ed.), Bridges to literacy: Children, families, and schools (pp. 103–128). Blackwell Publishing.

Astington, J. W., & Barriault, T. (2001). Children's theory of mind: How young children come to understand that people have thoughts and feelings. *Infants & Young Children*, *13*(3), 1-12. https://doi.org/10.1111/1467-8624.00305

Avelar, D., Dore, R. A., Schwichtenberg, A. J., Roben, C. K., Hirsh-Pasek, K., & Golinkoff, R. M. (2022). Children and parents' physiological arousal and emotions during shared and independent e-book reading: A preliminary study. *International Journal of Child-Computer Interaction*, *33*, 100507. https://doi.org/10.1016/j.ijcci.2022.10050

Ayoub, C., Vallotton, C. D., & Mastergeorge, A. M. (2011). Developmental pathways to integrated social skills: The roles of parenting and early intervention. *Child Development*, *82*(2), 583-600. https://doi.org/10.1111/j.1467-8624.2010.01549.x

Baddeley, A. (2003). Working memory and language: An overview. *Journal of communication disorders*, *36*(3), 189-208. https://doi.org/10.1016/S0021-9924(03)00019-4

Baillargeon, R. H., Zoccolillo, M., Keenan, K., Côté, S., Pérusse, D., Wu, H. X., ... & Tremblay, R. E. (2007). Gender differences in physical aggression: A prospective population-based survey of children before and after 2 years of age. *Developmental Psychology*, *43*(1), 13-26. https://doi.org/10.1037/0012-1649.43.1.13

Baldwin DA. (1995) Understanding the link between joint attention and language. In: Moore C, Dunham PJ, editors. *Joint attention: Its origins and role in development.* (pp. 131–158). Hillsdale, NJ: Erlbaum.

Baldwin, D. A., & Markman, E. M. (1989). Establishing word-object relations: A first step. *Child Development*, *60*, 381-398.

Ballagas, R., Kaye, J. J., Ames, M., Go, J., & Raffle, H. (2009). Family communication: Phone conversations with children. *Proceedings of the 8th International Conference on Interaction Design and Children*, 321-324. https://doi.org/10.1145/1551788.1551874

Barker, B. A., & Newman, R. S. (2004). Listen to your mother! The role of talker familiarity in infant streaming. *Cognition*, *94*(2), B45-B53. https://doi.org/10.1016/j.cognition.2004.06.001

Barr, R., Blanchfield, O., McClure, E., Roche, E., Zosh, J. M., Strouse, G. A., ... & Myers, L. J. (2020). Virtual Family Time: How Families Connect via Video Chat. *Zero to Three*, *41*(2), 21-29.

Barr, R., Danziger, C., Hilliard, M. E., Andolina, C., & Ruskis, J. (2010). Amount, content and context of infant media exposure: a parental questionnaire and diary analysis. *International Journal of Early Years Education*, *18*(2), 107-122. https://doi.org/10.1080/09669760.2010.494431

Barr, R., McClure, E., & Parlakian, R. (2019). Maximizing the Potential for Learning from Screen Experiences in Early Childhood: What the Research Says. *Zero to Three*, *40*(2), 29-36.

Barr, R., Zack, E., Garcia, A., & Muentener, P. (2008). Infants' attention and responsiveness to television increases with prior exposure and parental interaction. *Infancy*, *13*(1), 30-56. https://doi.org/10.1080/15250000701779378

Baumwell, L., Tamis-LeMonda, C. S., & Bornstein, M. H. (1997). Maternal verbal sensitivity and child language comprehension. *Infant Behavior and Development*, *20*(2), 247-258. https://doi.org/10.1016/S0163-6383(97)90026-6

Beck, I. L., & McKeown, M. G. (2007). Increasing young low-income children's oral vocabulary repertoires through rich and focused instruction. *The Elementary School Journal*, *107*(3), 251-271.

Belsky, J., Robins, E., & Gamble, W. (1984). The determinants of parental competence: Toward a contextual theory. *Beyond the Dyad*, *55*(1), 251-279.

Benders, T., StGeorge, J., & Fletcher, R. (2021). Infant-directed speech by Dutch fathers: Increased pitch variability within and across utterances. *Language Learning and Development*, *17*(3), 292-325. https://doi.org/10.1080/15475441.2021.1876698

Bergelson, E., Casillas, M., Soderstrom, M., Seidl, A., Warlaumont, A. S., & Amatuni, A. (2019). What do North American babies hear? A large-scale cross-corpus analysis. *Developmental Science*, *22*(1), e12724. https://doi.org/10.1111/desc.12724

Best, J. R., Miller, P. H., & Naglieri, J. A. (2011). Relations between executive function and academic achievement from ages 5 to 17 in a large, representative national sample. *Learning and Individual Differences*, *21*(4), 327-336. https://doi.org/10.1016/j.lindif.2011.01.007

Bird, H., Howard, D., & Franklin, S. (2001). Noun–verb differences? A question of semantics: A response to Shapiro and Caramazza. *Brain and Language*, *76*(2), 213-222. https://doi.org/10.1006/brln.2000.2432

Blake, J., Macdonald, S., Bayrami, L., Agosta, V., & Milian, A. (2006). Book reading styles in dual-parent and single-mother families. *British Journal of Educational Psychology*, *76*(3), 501–515. https://doi.org/10.1348/000709905x49719

Blewitt, P., Rump, K. M., Shealy, S. E., & Cook, S. A. (2009). Shared book reading: When and how questions affect young children's word learning. *Journal of Educational Psychology*, *101*(2), 294–304. https://doi.org/10.1037/a0013844

Block, C. E. (2000). Dyadic and gender differences in perceptions of the grandparent-grandchild relationship. *The International Journal of Aging and Human Development*, *51*(2), 85-104.

Blom-Hoffman, J., O'Neil-Pirozzi, T. M., & Cutting, J. (2006). Read together, talk together: The acceptability of teaching parents to use dialogic reading strategies via videotaped instruction. *Psychology in the Schools*, *43*(1), 71-78. https://doi.org/10.1002/pits.20130

Bloom, B.S. (1974) Time and learning, *American Psychologist*, 29, 682–688.

Boersma, P., & Weenink, D. (2018). Praat: Doing phonetics by computer [Computer program]. Version 6.0.37. http://www.praat.org/

Bojczyk, K. E., Davis, A. E., & Rana, V. (2016). Mother–child interaction quality in shared book reading: Relation to child vocabulary and readiness to read. *Early childhood research quarterly*, *36*(3), 404-414. https://doi.org/10.1016/j.ecresq.2016.01.006

Boland, A. M., Haden, C. A., & Ornstein, P. A. (2003). Boosting children's memory by training mothers in the use of an elaborative conversational style as an event unfolds. *Journal of Cognition and Development*, *4*(1), 39-65.

Bonawitz, E., Shafto, P., Gweon, H., Goodman, N. D., Spelke, E., & Schulz, L. (2011). The double-edged sword of pedagogy: Instruction limits spontaneous exploration and discovery. *Cognition*, *120*(3), 322-330. https://doi.org/10.1016/j.cognition.2010.10.001

Bornstein, M. H. (2012). Cultural approaches to parenting. *Parenting*, *12*(2-3), 212-221. https://doi.org/10.1080/15295192.2012.683359

Bornstein, M. H., & Cote, L. R. (2003). Cultural and parenting cognitions in acculturating cultures: 2. Patterns of prediction and structural coherence. *Journal of Cross-Cultural Psychology*, *34*(3), 350-373. https://doi.org/10.1177/0022022103253186

Bornstein, M. H., & Tamis-LeMonda, C. S. (1989). Maternal responsiveness and cognitive development in children. *New Directions for Child and Adolescent Development*, 43, 49-61. https://doi.org/10.1002/cd.23219894306

Bornstein, M. H., Haynes, M. O., & Painter, K. M. (1998). Sources of child vocabulary competence: A multivariate model. *Journal of Child Language*, *25*(2), 367-393. https://doi.org/10.1017/S0305000998003456

Bornstein, M. H., Putnick, D. L., & Suwalsky, J. T. (2018). Parenting cognitions→ parenting practices→ child adjustment? The standard model. *Development and Psychopathology*, *30*(2), 399-416. https://doi.org/10.1017/S0954579417000931

Bornstein, M. H., Tamis-LeMonda, C. S., Hahn, C. S., & Haynes, O. M. (2008). Maternal responsiveness to young children at three ages: longitudinal analysis of a multidimensional, modular, and specific parenting construct. *Developmental Psychology*, *44*(3), 867-874.

Bracken, B. A. (2002). *Bracken school readiness assessment*. San Antonio, TX: The Psychological Corporation.

Bracken, B. A., & Crawford, E. (2010). Basic concepts in early childhood educational standards: A 50-state review. *Early Childhood Education Journal*, *37*, 421-430. https://doi.org/10.1007/s10643-009-0363-7

Breen, M. J. (1985). Concurrent validity of the Bracken basic concept scale. *Journal of Psychoeducational Assessment*, *3*(1), 37-44.

Bretherton, L., Prior, M., Bavin, E., Cini, E., Eadie, P., & Reilly, S. (2014). Developing relationships between language and behaviour in preschool children from the Early Language in Victoria Study: Implications for intervention. *Emotional and Behavioural Difficulties*, *19*(1), 7-27. https://doi.org/10.1080/13632752.2013.854956

Brewer, M. B., & Chen, Y. R. (2007). Where (who) are collectives in collectivism? Toward conceptual clarification of individualism and collectivism. *Psychological Review*, *114*(1), 133-151. https://doi.org/10.1037/0033-295X.114.1.133.

Broesch, T., & Bryant, G. A. (2018). Fathers' infant-directed speech in a small-scale society. *Child Development*, *89*(2), e29-e41. https://doi.org/10.1111/cdev.12768

Brown, A., Shifrin, D.L., Hill, D.L. (2015). Beyond 'turn it off': How to advise families on media use. Retrieved from http://www.aappublications.org/content/36/10/54.full

Brown, G., & Greenfield, P. M. (2021). Staying connected during stay-at-home: Communication with family and friends and its association with well-being. *Human Behavior and Emerging Technologies*, *3*(1), 147-156. https://doi.org/10.1002/hbe2.246

Brownell, C. A., Svetlova, M., Anderson, R., Nichols, S. R., & Drummond, J. (2013). Socialization of early prosocial behavior: Parents' talk about emotions is associated with sharing and helping in toddlers. *Infancy*, *18*(1), 91-119. https://doi.org/10.1111/j.1532-7078.2012.00125.x

Bruner, J. S. (1984). Vygotsky's zone of proximal development: The hidden agenda. In B. Rogoff & J. V. Wertsch (Eds.), *Children's learning in the "zone of proximal development"* (pp. 93–98). San Francisco, CA: Jossey-Bass.

Burchinal, M., Foster, T. J., Bezdek, K. G., Bratsch-Hines, M., Blair, C., Vernon-Feagans, L., & Family Life Project Investigators. (2020). School-entry skills predicting school-age academic and social–emotional trajectories. *Early Childhood Research Quarterly*, *51*(2), 67-80. https://doi.org/10.1016/j.ecresq.2019.08.004

Butler, K. G. (1999). From oracy to literacy: Changing clinical perceptions. *Topics in Language Disorders*, *20*(1), 14-32.

Byers-Heinlein, K., Tsui, A. S. M., Bergmann, C., Black, A. K., Brown, A., Carbajal, M. J., ... & Wermelinger, S. (2021). A multilab study of bilingual infants: Exploring the preference for infant-directed speech. *Advances in Methods and Practices in Psychological Science*, *4*(1), 2515245920974622. https://doi.org/10.1177/2515245920974622

Cabrera, N. J., Volling, B. L., & Barr, R. (2018). Fathers are parents, too! Widening the lens on parenting for children's development. *Child Development Perspectives*, *12*(3), 152-157. https://doi.org/10.1111/cdep.12275

Can, D. D., Ginsburg-Block, M., Golinkoff, R. M., & Hirsh-Pasek, K. (2013). A long-term predictive validity study: Can the CDI Short Form be used to predict language and early literacy skills four years later? *Journal of Child Language*, *40*(4), 821-835. https://doi.org/10.1017/S030500091200030X

Cartmill, E. A., Armstrong, B. F., Gleitman, L. R., Goldin-Meadow, S., Medina, T. N., & Trueswell, J. C. (2013). Quality of early parent input predicts child vocabulary 3 years later. *Proceedings of the National Academy of Sciences of the United States of America*, *110*(28), 11278-11283. https://doi.org/10.1073/pnas.1309518110

Casillas, M. (2014). Turn-taking. In D. Matthews (Ed.). *Pragmatic development in first language acquisition (Trends in Language Acquisition Research No. 10)* (pp. 53–70). Philadelphia: John Benjamins.

Casillas, M., Brown, P., & Levinson, S. C. (2020). Early language experience in a Tseltal Mayan village. *Child Development*, *91*(5), 1819-1835. https://doi.org/10.1111/cdev.13349

Casillas, M., Brown, P., & Levinson, S. C. (2021). Early language experience in a Papuan community. *Journal of Child Language*, *48*(4), 792-814. https://doi.org/10.1017/S0305000920000549

Chen-Bouck, L., Patterson, M. M., & Chen, J. (2019). Relations of collectivism socialization goals and training beliefs to Chinese parenting. *Journal of Cross-Cultural Psychology*, *50*(3), 396-418. https://doi.org/10.1177/0022022118822046

Chiong, C., Ree, J., Takeuchi, L., & Erickson, I. (2012). *Print books vs e-books. Comparing parent-child co-reading on print, basic and enhanced e-book platforms*. New York, NY: The Joan Ganz Cooney Center at Sesame Workshop. Retrieved from http://www.joanganzcooneycenter.org/wp-content/uploads/2012/07/jgcc_ebooks_ quickreport.pdf

Choi, B., & Rowe, M. L. (2021). A parent gesture intervention as a means to increase parent declarative pointing and child vocabulary. *Infancy*, *26*(5), 735-744. https://doi.org/10.1111/infa.12418

Chong, S. C. F., Werker, J. F., Russell, J. A., & Carroll, J. M. (2003). Three facial expressions mothers direct to their infants. *Infant and Child Development: An International Journal of Research and Practice*, *12*(3), 211-232. https://doi.org/10.1002/icd.286

Christakis, D. A., Gilkerson, J., Richards, J. A., Zimmerman, F. J., Garrison, M. M., Xu, D., ... & Yapanel, U. (2009). Audible television and decreased adult words, infant vocalizations, and conversational turns: a population-based study. *Archives of Pediatrics & Adolescent Medicine*, *163*(6), 554-558. https://doi.org/10.1001/archpediatrics.2009.61

Claessens, A., & Engel, M. (2013). How important is where you start? Early mathematics knowledge and later school success. *Teachers College Record*, *115*(6), 1-29.

Clark, E. V. (2018). Conversation and language acquisition: A pragmatic approach. *Language Learning and Development*, *14*(3), 170-185. https://doi.org/10.1080/15475441.2017.1340843

Conica, M., Nixon, E., & Quigley, J. (2020). Fathers' but not mothers' repetition of children's utterances at age two is associated with child vocabulary at age four. *Journal of Experimental Child Psychology*, *191*, 104738. https://doi.org/10.1016/j.jecp.2019.104738

Cooper, R. P., & Aslin, R. N. (1990). Preference for infant-directed speech in the first month after birth. *Child Development*, *61*(5), 1584-1595. https://doi.org/10.1111/j.1467-8624.1990.tb02885.x

Cowan, N. (2008). What are the differences between long-term, short-term, and working memory? *Progress in Brain Research, 169,* 323-338. https://doi.org/10.1016/S0079-6123(07)00020-9

Cox, C., Bergmann, C., Fowler, E., Keren-Portnoy, T., Roepstorff, A., Bryant, G., & Fusaroli, R. (2022). A systematic review and Bayesian meta-analysis of the acoustic features of infant-directed speech. *Nature Human Behaviour, 7*, 114-133. https://doi.org/10.1038/s41562-022-01452-1

Cristia, A. (2013). Input to language: The phonetics and perception of infant-directed speech. *Language and Linguistics Compass*, *7*(3), 157-170. https://doi.org/10.1111/lnc3.12015

Cristofaro, T. N., & Tamis-LeMonda, C. S. (2012). Mother-child conversations at 36 months and at pre-kindergarten: Relations to children's school readiness. *Journal of Early Childhood Literacy, 12*(1), 68–97. https://doi.org/10.1177/1468798411416879

Curenton, S. M., & Craig, M. J. (2011). Shared-reading versus oral storytelling: Associations with preschoolers' prosocial skills and problem behaviours. *Early Child Development and Care, 181*(1), 123-146. https://doi.org/10.1080/03004430903292208

Curenton, S. M., & Justic, L. M. (2004). African American and Caucasian preschoolers' use of decontextualized language: literate language features in oral narratives. *Language Speech Hearing Services in Schools, 35*(3), 240–253.

Dailey, S., & Bergelson, E. (2022). Talking to talkers: Infants' talk status, but not their gender, is related to language input. *Child Development*. 00, 1-19. https://doi.org/10.1111/cdev.13872

Daneri, M. P., Blair, C., Kuhn, L. J., FLP Key Investigators, Vernon-Feagans, L., Greenberg, M., ... & Mills-Koonce, R. (2019). Maternal language and child vocabulary mediate relations between socioeconomic status and executive function during early childhood. *Child Development, 90*(6), 2001-2018. https://doi.org/10.1111/cdev.13065

Datavyu Team. (2014). *Datavyu: A video coding tool (Version 1.3.4).* Databrary Project, New York University. http://datavyu.org

Daubert, E. N., Yu, Y., Grados, M., Shafto, P., & Bonawitz, E. (2020). Pedagogical questions promote causal learning in preschoolers. *Scientific Reports, 10*(1), 20700. https://doi.org/10.1038/s41598-020-77883-5

Davey, A., Savla, J., Janke, M., & Anderson, S. (2009). Grandparent- grandchild relationships: From families in contexts to families as con- texts. *The International Journal of Aging and Human Development*, *69*(4), 311–325. https://doi.org/10.2190/AG.69.4.d

Davis-Kean, P. E., Domina, T., Kuhfeld, M., Ellis, A., & Gershoff, E. T. (2022). It matters how you start: Early numeracy mastery predicts high school math course-taking and college attendance. *Infant and Child Development*, *31*(2), e2281. https://doi.org/10.1002/icd.2281

De Jong, M. T., & Bus, A. G. (2002). Quality of book-reading matters for emergent readers: An experiment with the same book in a regular or electronic format. *Journal of Educational* Psychology, 94, 145–155. https://doi.org/10.1037//0022-0663.94.1.145

De Jong, M. T., & Bus, A. G. (2003). How well suited are electronic books to supporting literacy? *Journal of Early Childhood Literacy*, *3*(2), 147-164. https://doi.org/10.1177/14687984030032002

De Rivera, C., Girolametto, L., Greenberg, J., & Weitzman, E. (2005). Children's responses to educators' questions in day care play groups. American Journal of Speech Language Pathology, *14*(1), 14–26. https://doi.org/10.1044/1058-0360(2005/004)

De Temple, J., & Snow, C. E. (2003). Learning words from books. In A. van Kleeck, S. A. Stahl, & E. B. Bauer (Eds.), *On reading books to children: Parents and teachers* (pp. 16–36). Mahwah, NJ: Lawrence Erlbaum Associates.

Deans, C. L. (2020). Maternal sensitivity, its relationship with child outcomes, and interventions that address it: a systematic literature review. *Early Child Development and Care*, *190*(2), 252-275. https://doi.org/10.1080/03004430.2018.1465415

Demir-Vegter, S., Aarts, R., & Kurvers, J. (2014). Lexical richness in maternal input and vocabulary development of Turkish preschoolers in the Netherlands. *Journal of Psycholinguistic Research*, *43*(2), 149-165. https://doi.org/10.1007/s10936-013-9245-7

Demir-Lira, Ö., Applebaum, L. R., Goldin-Meadow, S., & Levine, S. C. (2019). Parents' early book reading to children: Relation to children's later language and literacy outcomes controlling for other parent language input. *Developmental Science*, *22*(3), e12764. https://doi.org/10.1111/desc.12764

Demir, Ö. E., Rowe, M. L., Heller, G., Goldin-Meadow, S., & Levine, S. C. (2015). Vocabulary, syntax, and narrative development in typically developing children and children with early unilateral brain injury: Early parental talk about the "there-and-then" matters. *Developmental Psychology*, *51*(2), 161-175. https://doi.org/10.1037/a0038476

Denham, S. A. (2006). Social-emotional competence as support for school readiness: What is it and how do we assess it? *Early Education and Development*, *17*(1), 57-89. https://doi.org/10.1207/s15566935eed1701_4

Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, *64*, 135-168. https://doi.org/10.1146/annurev-psych-113011-143750

Dickinson D, K., & Tabors P. O. (2001). *Beginning Literacy with Language: Young Children Learning at Home and School.* Baltimore, MD: Brookes.

Dickinson, D. K., Golinkoff, R. M., & Hirsh-Pasek, K. (2010). Speaking out for language: Why language is central to reading development. *Educational Researcher*, *39*(4), 305-310. https://doi.org/10.3102/0013189X10370204

Dilley, L., Lehet, M., Wieland, E. A., Arjmandi, M. K., Kondaurova, M., Wang, Y., ... & Bergeson, T. (2020). Individual differences in mothers' spontaneous infant-directed speech predict language attainment in children with cochlear implants. *Journal of Speech, Language, and Hearing Research*, *63*(7), 2453-2467. https://doi.org/10.1044/2020_JSLHR-19-00229

Doan, S. N., & Wang, Q. (2010). Maternal discussions of mental states and behaviors: Relations to emotion situation knowledge in European American and immigrant Chinese children. *Child Development*, *81*(5), 1490-1503.

Dolbin-MacNab, M. L. (2006). Just like raising your own? Grandmothers' perceptions of parenting a second time around. *Family Relations*, *55*(5), 564-575. https://doi.org/10.1111/j.1741-3729.2006.00426.x

Donahue, M. L., Pearl, R., & Herzog, A. (1997). Mothers' referential communication with preschoolers: Effects of children's syntax and mothers' beliefs. *Journal of Applied Developmental Psychology*, *18*(1), 133-147. https://doi.org/10.1016/S0193-3973(97)90019-8

Donnelly, S., & Kidd, E. (2021). The longitudinal relationship between conversational turn-taking and vocabulary growth in early language development. *Child Development*, *92*(2), 609-625. https://doi.org/10.1111/cdev.13511

Dreyer, B., P., Mendelsohn, A., L., Tamis-Lemonda, C., S. (2009) *StimQ-The Cognitive Home Environment.* Available at: http:// pediatrics.med.nyu.edu/patient-care/for-healthcare-providers/ stimq-cognitive-home-environment

Drouin, M., McDaniel, B. T., Pater, J., & Toscos, T. (2020). How parents and their children used social media and technology at the beginning of the COVID-19 pandemic and associations with anxiety. *Cyberpsychology, Behavior, and Social Networking*, *23*(11), 727-736. https://doi.org/10.1089/cyber.2020.0284

Drummond, J., Paul, E. F., Waugh, W. E., Hammond, S. I., & Brownell, C. A. (2014). Here, there and everywhere: Emotion and mental state talk in different social contexts predicts empathic helping in toddlers. *Frontiers in Psychology*, *5*, 361. https://doi.org/10.3389/fpsyg.2014.00361

Duff, F. J., Reen, G., Plunkett, K., & Nation, K. (2015). Do infant vocabulary skills predict school-age language and literacy outcomes? *Journal of Child Psychology and Psychiatry*, *56*(8), 848-856. https://doi.org/10.1111/jcpp.12378

Duflos, M., Giraudeau, C., & Ferrand, C. (2020). What is emotional closeness between grandparents and their adolescent grandchildren? A systematic review. *Journal of Family Studies*, 1-23. https://doi.org/10.1080/13229400.2020.1752771

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, *43*(6), 1428–1446. https://doi.org/10.1037/0012-1649.44.1.217

Dunifon, R., & Bajracharya, A. (2012). The role of grandparents in the lives of youth. *Journal of Family Issues*, *33*(9), 1168-1194. https://doi.org/10.1177/0192513X12444271

Dunst, C., Gorman, E., & Hamby, D. (2012). Preference for infant-directed speech in preverbal young children. *Center for Early Literacy Learning*, *5*(1), 1-13.

Durham, R. E., Farkas, G., Hammer, C. S., Tomblin, J. B., & Catts, H. W. (2007). Kindergarten oral language skill: A key variable in the intergenerational transmission of socioeconomic status. *Research in Social Stratification and Mobility*, *25*(4), 294-305. https://doi.org/10.1016/j.rssm.2007.03.001

Eady, S. J., & Cooper, W. E. (1986). Speech intonation and focus location in matched statements and questions. *The Journal of the Acoustical Society of America*, *80*(2), 402-415. https://doi.org/10.1121/1.394091

Eccles, J. S. (2005). Influences of parents' education on their children's educational attainments: The role of parent and child perceptions. *London Review of Education*, *3*(3), 191-204.

Edwards, S. (2014). Finding a place for story: looking beyond reflective practice. *International Practice Development Journal*, *4*(2), 1-14.

Eisenberg, N., Wolchik, S. A., Hernandez, R., & Pasternack, J. F. (1985). Parental socialization of young children's play: A short-term longitudinal study. *Child Development*, *56*(6), 1506-1513. https://doi.org/10.2307/1130469

Englund, K. T., & Behne, D. M. (2005). Infant directed speech in natural interaction—Norwegian vowel quantity and quality. *Journal of Psycholinguistic Research*, *34*(1), 259-280. https://doi.org/10.1007/s10936-005-3640-7

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(1), 175-191. https://doi.org/10.3758/BF03193146

Fay-Stammbach, T., Hawes, D. J., & Meredith, P. (2014). Parenting influences on executive function in early childhood: A review. *Child Development Perspectives*, *8*(4), 258-264. https://doi.org/10.1111/cdep.12095

Fazio, L. K., & Marsh, E. J. (2019). Retrieval-based learning in children. *Current Directions in Psychological Science*, *28*(2), 111-116. https://doi.org/10.1177/0963721418806673

Fenson, L., Dale, P. S., Reznick, J. S., Bates, E., Thal, D. J., Pethick, S. J., . . . Stiles, J. (1994). Variability in early communicative development. *Monographs of the Society for Research in Child Development*, *59*(5), v-173.

Fenson, L., Pethick, S., Renda, C., & Cox, J. L. (2000). Short-form versions of the MacArthur communicative development inventories. *Applied Psycholinguistics*, *21*(1), 95-116. https://psycnet.apa.org/doi/10.1017/S0142716400001053

Ferjan Ramírez, N. (2022). Fathers' infant-directed speech and its effects on child language development. *Language and Linguistics Compass*, *16*(1), e12448. https://doi.org/10.1111/lnc3.12448

Ferjan Ramírez, N., Lytle, S. R., Fish, M., & Kuhl, P. K. (2019). Parent coaching at 6 and 10 months improves language outcomes at 14 months: A randomized controlled trial. *Developmental Science*, *22*(3), e12762. https://doi.org/10.1111/desc.12762

Fernald, A. (1992). "Meaningful melodies in mothers' speech to infants," in Nonverbal Vocal Communication: Comparative and Developmental Approaches, (eds H. Papoušek, U. Jürgens), pp. 262–282. New York, NY: Cambridge University Press.

Fernald, A., & Morikawa, H. (1993). Common themes and cultural variations in Japanese and American mothers' speech to infants. *Child Development*, *64*(3), 637-656. https://doi.org/10.1111/j.1467-8624.1993.tb02933.x

Fernald, A., & Simon, T. (1984). Expanded intonation contours in mothers' speech to newborns. *Developmental Psychology*, *20*(1), 104-113. https://doi.org/10.1037/0012-1649.20.1.104

Fiorentino, L., & Howe, N. (2004). Language Competence, Narrative Ability, and School Readiness in Low-Income Preschool Children. *Canadian Journal of Behavioural Science*, *36*(4), 280-294. https://doi.org/10.1037/h0087237

Fivush, R., & Fromhoff, F. A. (1988). Style and structure in mother-child conversations about the past. *Discourse Processes*, *11*(3), 337-355. https://doi.org/10.1080/01638538809544707

Fivush, R., Brotman, M. A., Buckner, J. P., & Goodman, S. H. (2000). Gender differences in parent–child emotion narratives. *Sex Roles*, *42*(3), 233-253. https://doi.org/10.1023/A:1007091207068

Fletcher, K. L., Cross, J. R., Tanney, A. L., Schneider, M., & Finch, W. H. (2008). Predicting language development in children at risk: The effects of quality and frequency of caregiver reading. *Early Education and Development*, *19*(1), 89–111. https://doi.org/10.1080/10409280701839106

Floor, P., & Akhtar, N. (2006). Can 18-month-old infants learn words by listening in on conversations? *Infancy*, *9*(3), 327-339.

Forbes, J. N., & Farrar, M. J. (1993). Children's initial assumptions about the meaning of novel motion verbs: Biased and conservative? *Cognitive Development*, *8*(3), 273-290. https://doi.org/10.1016/S0885-2014(93)80002-B

Forget-Dubois, N., Dionne, G., Lemelin, J. P., Pérusse, D., Tremblay, R. E., & Boivin, M. (2009). Early child language mediates the relation between home environment and school readiness. *Child Development*, *80*(3), 736-749. https://doi.org/10.1111/j.1467-8624.2009.01294.x

Forghani, A., & Neustaedter, C. (2014). The routines and needs of grandparents and parents for grandparent-grandchild conversations over distance. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 4177–4186. https://doi.org/10.1145/2556288.2557255

Fouts, H. N., Roopnarine, J. L., Lamb, M. E., & Evans, M. (2012). Infant social interactions with multiple caregivers: The importance of ethnicity and socioeconomic status. *Journal of Cross-Cultural Psychology*, *43*(2), 328–348. https://doi.org/10.1177/0022022110388564

Friedman, C. K., Leaper, C., & Bigler, R. S. (2007). Do mothers' gender-related attitudes or comments predict young children's gender beliefs? *Parenting: Science and Practice*, *7*(4), 357-366. https://doi.org/10.1080/15295190701665656

Fuhs, M. W., & Day, J. D. (2011). Verbal ability and executive functioning development in preschoolers at head start. *Developmental Psychology*, *47*(2), 404-416. https://doi.org/10.1037/a0021065

Gall, M. D. (1970). The use of questions in teaching. *Review of Educational Research*, *40*(5), 707-721.

Ganotice Jr, F. A., Downing, K., Mak, T., Chan, B., & Lee, W. Y. (2017). Enhancing parent-child relationship through dialogic reading. *Educational Studies*, *43*(1), 51-66. https://doi.org/10.1080/03055698.2016.1238340

Gathercole, S. E., & Baddeley, A. D. (1993). *Working memory and language.* Hillside, NJ: Erlbaum.

Gaudreau, C., King, Y. A., Dore, R. A., Puttre, H., Nichols, D., Hirsh-Pasek, K., & Golinkoff, R. M. (2020). Preschoolers benefit equally from video chat, pseudo-contingent video, and live book reading: Implications for storytime during the coronavirus pandemic and beyond. *Frontiers in Psychology*, 2158. https://doi.org/10.3389/fpsyg.2020.02158

Geary, D. C. (2000). From infancy to adulthood: The development of numerical abilities. *European Child & Adolescent Psychiatry*, *9*(2), S11-S16. https://doi.org/10.1007/s007870070004

Gelman, S. A., Taylor, M. G., & Nguyen, S. P. (2004). Mother-child conversations about gender: Understanding the acquisition of essential beliefs. *Monographs of the Society for Research in Child Development*, *69*(1), i-142. https://doi.org/10.1111/j.0037-976X.2004.00274.x

Ghassabian, A., Rescorla, L., Henrichs, J., Jaddoe, V. W., Verhulst, F. C., & Tiemeier, H. (2014). Early lexical development and risk of verbal and nonverbal cognitive delay at school age. *Acta Paediatrica*, *103*(1), 70-80. https://doi.org/10.1111/apa.12449

Gilkerson, J., Richards, J. A., Warren, S. F., Oller, D. K., Russo, R., & Vohr, B. (2018). Language experience in the second year of life and language outcomes in late childhood. *Pediatrics*, *142*(4), 1-11. https://doi.org/10.1542/peds.2017-4276

Gilkerson, J., Richards, J. A., Warren, S. F., Oller, D. K., Russo, R., & Vohr, B. (2018). Language experience in the second year of life and language outcomes in late childhood. *Pediatrics*, *142*(4), 1-11. https://doi.org/10.1542/peds.2017-4276

Gillette, J., Gleitman, H., Gleitman, L., & Lederer, A. (1999). Human simulations of vocabulary learning. *Cognition*, *73*(2), 135-176. https://doi.org/10.1016/S0010-0277(99)00036-0

Goldenberg, E. R., Repetti, R. L., & Sandhofer, C. M. (2022). Contextual variation in language input to children: A naturalistic approach. *Developmental Psychology*, *58*(6), 1051-1065. https://doi.org/10.1037/dev0001345

Goldin-Meadow, S., Levine, S. C., Hedges, L. V., Huttenlocher, J., Raudenbush, S. W., & Small, S. L. (2014). New evidence about language and cognitive development based on a longitudinal study: Hypotheses for intervention. *American Psychologist*, *69*(6), 588. https://doi.org/10.1037/a0036886

Goldschmidt, K. (2020). The COVID-19 pandemic: Technology use to support the wellbeing of children. *Journal of Pediatric Nursing*, *53*(1), 88-90. https://doi.org/10.1016/j.pedn.2020.04.013

Golinkoff, R. M., & Alioto, A. (1995). Infant-directed speech facilitates lexical learning in adults hearing Chinese: Implications for language acquisition. *Journal of Child Language*, *22*(3), 703-726. https://doi.org./10.1017/S0305000900010011

Golinkoff, R. M., & Ames, G. J. (1979). A comparison of fathers' and mothers' speech with their young children. *Child Development*, *50*(1), 28-32. https://doi.org/10.2307/1129037

Golinkoff, R. M., Can, D. D., Soderstrom, M., & Hirsh-Pasek, K. (2015). (Baby) talk to me: the social context of infant-directed speech and its effects on early language acquisition. *Current Directions in Psychological Science, 24*(5), 339-344. https://doi.org/10.1177/0963721401

Golinkoff, R. M., de Villiers, J., Hirsh-Pasek, K., Iglesias, A., & Wilson, M. S. (2017). *User's manual for the Quick Interactive Language Screener (QUILS™): A measure of vocabulary, syntax, and language acquisition skills in young children.* Baltimore, MD: Paul H. Brookes

Golinkoff, R. M., Ma, W., Song, L., & Hirsh-Pasek, K. (2013). Twenty-five years using the intermodal preferential looking paradigm to study language acquisition: What have we learned? *Perspectives on Psychological Science, 8,* 316-339. https://doi.org/10.1177/1745691613484936

Gómez, E., & Strasser, K. (2021). Language and socioemotional development in early childhood: The role of conversational turns. *Developmental Science*, *24*(5), e13109. https://doi.org/10.1111/desc.13109

Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability. *Remedial and Special Education*, *7*(1), 6-10.

Graf Estes, K., & Hurley, K. (2013). Infant-directed prosody helps infants map sounds to meanings. *Infancy*, *18*(5), 797-824. https://doi.org/10.1111/infa.12006

Greenberg, J. (2012). More, all gone, empty, full: Math talk every day in every way. *YC Young Children*, *67*(3), 62-64.

Gregory, S. E., Kelly, C. L., & Kessler, K. (2021). Look into my "virtual" eyes: what dynamic virtual agents add to the realistic study of joint attention. *Frontiers in Virtual Reality*, *2*, 798899. https://doi.org/10.3389/frvir.2021.798899

Grieser, D. L., & Kuhl, P. K. (1988). Maternal speech to infants in a tonal language: Support for universal prosodic features in motherese. *Developmental Psychology*, *24*(1), 14-20. https://doi.org/10.1037/0012-1649.24.1.14

Griffin, T. M., Hemphill, L., Camp, L., & Wolf, D. P. (2004). Oral discourse in the preschool years and later literacy skills. *First Language*, *24*(2), 123-147. https://doi.org/10.1177/0142723704042369

Griggs, J., Tan, J. P., Buchanan, A., Attar-Schwartz, S., & Flouri, E. (2010). 'They've always been there for me': Grandparental involvement and child well-being. *Children & Society, 24*(3), 200-214. https://doi.org/10.1111/j.1099-0860.2009.00215.x

Gros-Louis, J., West, M. J., & King, A. P. (2014). Maternal responsiveness and the development of directed vocalizing in social interactions. *Infancy, 19*(4), 385-408. https://doi.org/10.1111/infa.12054

Guo, L. X., Pace, A., Masek L. R., Golinkoff, R.M., & Hirsh-Pasek K. (in press). Cascades in language acquisition: Re-thinking the linear model of development. *Advances in Child Development and Behavior*, ISSN 0065-2407. https://doi.org/10.1016/bs.acdb.2022.11.004

Haden, C. A., Cohen, T., Uttal, D., Marcus, M. (2016). *Building learning: Narrating and transferring experiences in a children's museum.* In Sobel, D. M., Jipson, J. J. (Eds.), *Cognitive development in museum settings: Relating research and practice* (pp. 84–103). New York, NY: Routledge.

Haden, C. A., Haine, R. A., & Fivush, R. (1997). Developing narrative structure in parent–child reminiscing across the preschool years. *Developmental Psychology*, *33*(2), 295-307. https://doi.org/10.1037/0012-1649.33.2.295

Háden, G. P., Mády, K., Török, M., & Winkler, I. (2020). Newborn infants differently process adult directed and infant directed speech. *International Journal of Psychophysiology*, *147*(1), 107-112. https://doi.org/10.1016/j.ijpsycho.2019.10.011

Hadley, E. B., Dickinson, D. K., Hirsh-Pasek, K., Golinkoff, R. M., & Nesbitt, K. T. (2016). Examining the acquisition of vocabulary knowledge depth among preschool students. *Reading Research Quarterly*, *51*(2), 181-198. https://doi.org/10.1002/rrq.130

Hair, E., Halle, T., Terry-Humen, E., Lavelle, B., & Calkins, J. (2006). Children's school readiness in the ECLS-K: Predictions to academic, health, and social outcomes in first grade. *Early Childhood Research Quarterly*, *21*(4), 431-454. https://doi.org/10.1016/j.ecresq.2006.09.005

Hakoyama, M., & MaloneBeach, E. E. (2013). Predictors of grandparent–grandchild closeness: An ecological perspective. *Journal of Intergenerational Relationships, 11*(1), 32-49. https://doi.org/10.1080/15350770.2013.753834

Hall, D. G., & Waxman, S. R. (1993). Assumptions about word meaning: Individuation and basic-level kinds. *Child Development*, *64*(5), 1550–1570. https://doi.org/10.2307/1131552

Hammer, C. S., Morgan, P., Farkas, G., Hillemeier, M., Bitetti, D., & Maczuga, S. (2017). Late talkers: A population-based study of risk factors and school readiness consequences. *Journal of Speech, Language, and Hearing Research*, *60*(3), 607-626. https://doi.org/10.1044/2016_JSLHR-L-15-0417

Han, M., De Jong, N., & Kager, R. (2023). Relating the prosody of infant-directed speech to children's vocabulary size. *Journal of Child Language*, 1-17. https://doi.org/10.1017/S0305000923000041

Hanushek, E. A., Peterson, P. E., Talpey, L. M., & Woessmann, L. (2019). The achievement gap fails to close. *Education Next*, *19*(3), 1-9.

Hargrave, A. C., & Sénéchal, M. (2000). A book reading intervention with preschool children who have limited vocabularies: The benefits of regular reading and dialogic reading. *Early Childhood Research Quarterly*, *15*(1), 75-90. https://doi.org/10.1016/S0885-2006(99)00038-1

Harley, K., & Reese, E. (1999). Origins of autobiographical memory. *Developmental Psychology*, *35*(5), 1338-1348. https://doi.org/10.1037/0012-1649.35.5.1338

Hart, B., & Risley, R. R. (1995). *Meaningful differences in the everyday experiences of young American children*. Baltimore, MD: Paul H. Brooks.

Hassinger-Das, B., Hirsh-Pasek, K., & Golinkoff, R. M. (2017). The case of brain science and guided play. *YC Young Children*, *72*(2), 45-50.

Henning, A., Striano, T., & Lieven, E. V. (2005). Maternal speech to infants at 1 and 3 months of age. *Infant Behavior and Development*, *28*(4), 519-536. https://doi.org/10.1016/j.infbeh.2005.06.001

Henrichs, J., Rescorla, L., Schenk, J.J., Schmidt, H.G., Jadooe, V.W.V., Hofman, A., ... & Tiemeier, H. (2011). Examining continuity of early expressive vocabulary development: The Generation R study. *Journal of Speech, Language, and Hearing Research*, *54*(3), 854–869. https://doi.org/10.1044/1092-4388(2010/09-0255)

Herold, D. S., Nygaard, L. C., & Namy, L. L. (2012). Say it like you mean it: Mothers' use of prosody to convey word meaning. *Language and Speech*, *55*(3), 423-436. https://doi.org/10.1177/0023830911422212

Hindman, A. H., & Wasik, B. A. (2015). Building vocabulary in two languages: An examination of Spanish-speaking dual language learners in Head Start. *Early Childhood Research Quarterly*, *31*, 19-33. https://doi.org/10.1016/j.ecresq.2014.12.006

Hirsh-Pasek, K., & Burchinal, M. (2006). Mother and caregiver sensitivity over time: Predicting language and academic outcomes with variable-and person-centered approaches. *Merrill-Palmer Quarterly (1982-)*, 449-485.

Hirsh-Pasek, K., & Golinkoff, R. M. (1996). *The origins of grammar: Evidence from early language comprehension.* Cambridge, MA: MIT Press.

Hirsh-Pasek, K., Adamson, L. B., Bakeman, R., Owen, M. T., Golinkoff, R. M., Pace, A., ... & Suma, K. (2015). The contribution of early communication quality to low-income children's language success. *Psychological Science*, *26*(7), 1071-1083. https://doi.org/10.1177/0956797615581493

Hjetland, H. N., Lervåg, A., Lyster, S. A. H., Hagtvet, B. E., Hulme, C., & Melby-Lervåg, M. (2019). Pathways to reading comprehension: A longitudinal study from 4 to 9 years of age. *Journal of Educational Psychology*, *111*(5), 751-763. https://doi.org/10.1037/edu0000321

Hoff, E. (2006). How social contexts support and shape language development. *Developmental Review*, *26*(1), 55–88. https://doi.org/10.1016/j.dr.2005.11.002

Hoff, E. (2013). Interpreting the early language trajectories of children from low-SES and language minority homes: implications for closing achievement gaps. *Developmental Psychology*, *49*(1), 4-14. https://doi.org/10.1037/a0027238

Hoff, E., & Naigles, L. (2002). How children use input to acquire a lexicon. *Child Development*, *73*(2), 418-433. https://doi.org/10.1111/1467-8624.00415

Hollich, G., Hirsh-Pasek, K., & Golinkoff, R. M. (2000). I. What does it take to learn a word? *Monographs of the Society for Research in Child Development*, *65*(3), 1-16. https://doi.org/10.1111/1540-5834.00091

Horgan, E. S., & Poehlmann-Tynan, J. (2020). In-home video chat for young children and their incarcerated parents. *Journal of Children and Media*, *14*(3), 400-406. https://doi.org/10.1080/17482798.2020.1792082

Horwitz, S. M., Irwin, J. R., Briggs-Gowan, M. J., Heenan, J. M. B., Mendoza, J., & Carter, A. S. (2003). Language delay in a community cohort of young children. *Journal of the American Academy of Child & Adolescent Psychiatry*, *42*(8), 932-940. https://doi.org/10.1097/01.CHI.0000046889.27264.5E

Hsu, H., & Fogel, A. (2003). Stability and transitions in mother–infant face-to-face communication during the first 6 months: a microhistorical approach. Developmental Psychology, *39*(6), 1061–1082. https://doi.org/10.1037/0012-1649.39.6.1061

Huang, K. Y., Caughy, M. O. B., Genevro, J. L., & Miller, T. L. (2005). Maternal knowledge of child development and quality of parenting among White, African-American and Hispanic mothers. *Journal of Applied Developmental Psychology*, *26*(2), 149-170. https://doi.org/10.1016/j.appdev.2004.12.001

Hudon, T. M., Fennell, C. T., & Hoftyzer, M. (2013). Quality not quantity of television viewing is associated with bilingual toddlers' vocabulary scores. *Infant Behavior and Development*, *36*(2), 245-254. https://doi.org/10.1016/j.infbeh.2013.01.010

Huebner, C. E. (2000). Promoting toddlers' language development through community-based intervention. *Journal of Applied Developmental Psychology*, *21*(5), 513–535. https://doi.org/10.1016/S0193-3973(00)00052-6

Hughes, C. H., & Ensor, R. A. (2009). How do families help or hinder the emergence of early executive function? *New Directions for Child and Adolescent Development*, *123*, 35-50.

Huttenlocher, J., Vasilyeva, M., Cymerman, E., & Levine, S. (2002). Language input and child syntax. *Cognitive Psychology*, *45*(3), 337-374. https://doi.org/10.1016/S0010-0285(02)00500-5

Huttenlocher, J., Waterfall, H., Vasilyeva, M., Vevea, J., & Hedges, L. V. (2010). Sources of variability in children's language growth. *Cognitive Psychology*, *61*(4), 343–365. doi:10.1016/j.cogpsych.2010.08.002

Janus, M., & Duku, E. (2007). The school entry gap: Socioeconomic, family, and health factors associated with children's school readiness to learn. *Early Education and Development*, *18*(3), 375-403. doi:10.1080/10409280701610796a

Jean, A., Daubert, E., Yu, Y., Shafto, P., & Bonawitz, E. (2019). "Pedagogical questions empower exploration." In *Proceedings of the Annual Conference of the Cognitive Science Society*. Montreal, Canada.

Johnston, J. R., and Wong, M. Y. A. (2002). Cultural differences in beliefs and practices concerning talk to children. *Journal of Speech, Language, and Hearing Research*, *45*(5), 916–926. https://doi.org/10.1044/1092-4388(2002/074)

Jones, G., & Rowland, C. F. (2017). Diversity not quantity in caregiver speech: Using computational modeling to isolate the effects of the quantity and the diversity of the input on vocabulary growth. *Cognitive Psychology*, *98*, 1-21. https://doi.org/10.1016/j.cogpsych.2017.07.002

Jordan, N. C., Kaplan, D., Ramineni, C., & Locuniak, M. N. (2009). Early math matters: kindergarten number competence and later mathematics outcomes. *Developmental Psychology*, *45*(3), 850-867. https://doi.org/10.1037/a0014939

Judge, T. K., Neustaedter, C., & Kurtz, A. F. (2010). The family window: The design and evaluation of a domestic media space. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 2361–2370. https://doi.org/10.1145/1753326.1753682

Justice, L. M., Bowles, R. P., Pence Turnbull, K. L., & Skibbe, L. E. (2009). School readiness among children with varying histories of language difficulties. *Developmental Psychology*, *45*(2), 460. https://doi.org/10.1037/a0014324

Justice, L. M., Weber, S. E., Ezell, H. K., & Bakeman, R. (2002). A sequential analysis of children's responsiveness to parental print references during shared book-reading interactions. *American Journal of Speech-Language Pathology*, 11, 30–40. http://doi.org/10.1044/1058-0360(2002/004).

Kaiser, A. P., Chow, J. C., & Cunningham, J. E. (2022). A case for early language and behavior screening: Implications for policy and child development. *Policy Insights from the Behavioral and Brain Sciences*, *9*(1), 120-128. https://doi.org/10.1177/23727322211068886

Kakulla B. (2021). *Tech trends and the 50+: top 10 biggest trends.* AARP Research, Washington, DC.

Kalashnikova, M., & Burnham, D. (2018). Infant-directed speech from seven to nineteen months has similar acoustic properties but different functions. *Journal of Child Language*, *45*(5), 1035-1053. https://doi.org/10.1017/S0305000917000629

Kaplan, P. S., Goldstein, M. H., Huckeby, E. R., & Cooper, R. P. (1995). Habituation, sensitization, and infants' responses to motherse speech. *Developmental Psychobiology: The Journal of the International Society for Developmental Psychobiology*, *28*(1), 45-57. https://doi.org/10.1002/dev.420280105

Katz, G. S., Cohn, J. F., & Moore, C. A. (1996). A combination of vocal f0 dynamic and summary features discriminates between three pragmatic categories of infant-directed speech. *Child Development*, *67*(1), 205-217. https://doi.org/10.1111/j.1467-8624.1996.tb01729.x

Kaye, K. (1980). Why we don't talk 'baby talk' to babies. Journal of Child Language, *7*(3), 489-507. https://doi.org/10.1017/S0305000900002804

Keller, H., Papaligoura, Z., Künsemueller, P., Völker, S., Papaeliou, C., Lohaus, A., ... & Mousouli, V. (2003). Concepts of mother-infant interaction in Greece and Germany. *Journal of Cross-Cultural Psychology*, *34*(6), 677-689. https://doi.org/10.1177/0022022103257035

Kennison, S. M., & Byrd-Craven, J. (2015). Gender differences in beliefs about infant-directed speech: The role of family dynamics. *Child Development Research*, 871759. https://dx.doi.org/10.1155/2015/871759

Keys, T. D., Farkas, G., Burchinal, M. R., Duncan, G. J., Vandell, D. L., Li, W., ... & Howes, C. (2013). Preschool center quality and school readiness: Quality effects and variation by demographic and child characteristics. *Child Development*, *84*(4), 1171-1190. https://doi.org/10.1111/cdev.12048

Kirkorian, H. L., Choi, K., & Pempek, T. A. (2016). Toddlers' word learning from contingent and noncontingent video on touch screens. *Child Development*, *87*(2), 405-413. https://doi.org/10.1111/cdev.12508

Klahr, D., & Nigam, M. (2004). The equivalence of learning paths in early science instruction: Effects of direct instruction and discovery learning. *Psychological Science*, *15*(10), 661-667.

Kochanska, G., Coy, K. C., & Murray, K. T. (2001). The development of self-regulation in the first four years of life. *Child Development*, *72*(4), 1091-1111. https://doi.org/10.1111/1467-8624.00336

Konold, T. R., & Pianta, R. C. (2005). Empirically-derived, person-oriented patterns of school readiness in typically-developing children: Description and prediction to first-grade achievement. *Applied Developmental Science*, *9*(4), 174-187. https://doi.org/10.1207/s1532480xads0904_1

Kopp, C. B. (1982). Antecedents of self-regulation: a developmental perspective. *Developmental Psychology*, *18*(2), 199-214. https://doi.org/10.1037/0012-1649.18.2.199

Korat, O. (2009). The effects of CD-ROM storybook reading on Israeli children's early literacy as a function of age group and repeated reading. *Education and Information Technologies*, *14*(1), 39-53. https://doi.org/10.1007/s10639-008-9063-y

Kosie, J. E., & Lew-Williams, C. (2022). *Infant-Directed Communication: Caregivers' use of overlapping speech and non-speech signals in everyday communication with infants.* Poster presented at the 47th Annual Boston University Conference on Language Development. Boston, MA.

Krcmar, M., & Cingel, D. P. (2014). Parent–child joint reading in traditional and electronic formats. *Media Psychology*, *17*(3), 262-281. https://doi.org/10.1080/15213269.2013.840243

Kuchirko, Y. (2019). On differences and deficits: A critique of the theoretical and methodological underpinnings of the word gap. *Journal of Early Childhood Literacy*, *19*(4), 533-562. https://doi.org/10.1177/1468798417747029

Kuchirko, Y. A., & Tamis-LeMonda, C. S. (2019). The cultural context of infant development: Variability, specificity, and universality. *Advances in Child Development and Behavior*, 57, 27–63. https://doi.org/10.1016/bs.acdb.2019.04.004

Kuchirko, Y. A., Schatz, J. L., Fletcher, K. K., & Tamis-Lemonda, C. S. (2020). Do, say, learn: The functions of mothers' speech to infants. *Journal of Child Language*, *47*(1), 64-84. https://doi.org/10.1017/S0305000919000308

Kuhl, P. K. (2004). Early language acquisition: cracking the speech code. *Nature Reviews Neuroscience*, *5*(11), 831-843. https://doi.org/10.1038/nrn1533

Kuhl, P. K., Tsao, F. M., & Liu, H. M. (2003). Foreign-language experience in infancy: Effects of short-term exposure and social interaction on phonetic learning. *Proceedings of the National Academy of Sciences*, *100*(15), 9096-9101.https://doi.org/10.1073/pnas.1532872100

Kuhn, L. J., Willoughby, M. T., Wilbourn, M. P., Vernon-Feagans, L., Blair, C. B., & Family Life Project Key Investigators. (2014). Early communicative gestures prospectively predict language development and executive function in early childhood. *Child Development*, *85*(5), 1898-1914. https://doi.org/10.1111/cdev.12249

Kurdek, L. A., & Sinclair, R. J. (2001). Predicting reading and mathematics achievement in fourth-grade children from kindergarten readiness scores. *Journal of Educational Psychology*, *93*(3), 451. https://doi.org/10.1037/0022-0663.93.3.451

Kwon, K. A., Bingham, G., Lewsader, J., Jeon, H. J., & Elicker, J. (2013). Structured task versus free play: the influence of social context on parenting quality, toddlers' engagement with parents and play behaviors, and parent–toddler language use. *Child & Youth Care Forum*, *42*, 207–224. https://doi.org/10.1007/ s10566-013-9198-x

LaCour, M., McDonald, C., Tissington, L., & Thomason, G. (2013). Improving pre-kindergarten children's attitude and interest in reading through a parent workshop on the use of dialogic reading techniques. *Reading Improvement*, *50*(1), 1-11.

Ladd, G. W., Herald, S. L., & Kochel, K. P. (2006). School readiness: Are there social prerequisites? *Early Education and Development*, *17*(1), 115-150. https://doi.org/10.1207/s15566935eed1701_6

Lam-Cassettari, C., & Kohlhoff, J. (2020). Effect of maternal depression on infant-directed speech to prelinguistic infants: Implications for language development. *PLoS One*, *15*(7), e0236787. https://doi.org/10.1371/journal.pone.0236787

Lam, P., Hiscock, H., & Wake, M. (2003). Outcomes of infant sleep problems: a longitudinal study of sleep, behavior, and maternal well-being. *Pediatrics*, *111*(3), e203-e207. https://doi.org/10.1542/peds.111.3.e203

Landry, S. H., Smith, K. E., Miller-Loncar, C. L., & Swank, P. R. (1997). Predicting cognitive-language and social growth curves from early maternal behaviors in children at varying degrees of biological risk. *Developmental Psychology*, *33*(6), 1040-1053. https://doi.org/10.1037/0012-1649.33.6.1040

Larney, R. (2002). The relationship between early language delay and later difficulties in literacy. *Early Child Development and Care*, *172*(2), 183-193. https://doi.org/10.1080/03004430210890

Leaper, C., Anderson, K. J., & Sanders, P. (1998). Moderators of gender effects on parents' talk to their children: A meta-analysis. Developmental Psychology, 34, 3. https://doi.org/10.1037/0012-1649.34.1.3

Leavell, A. S., Tamis-LeMonda, C. S., Ruble, D. N., Zosuls, K. M., & Cabrera, N. J. (2012). African American, White and Latino fathers' activities with their sons and daughters in early childhood. *Sex Roles*, *66*, 53-65. https://doi.org/10.1007/s11199-011-0080-8

Lee, J. (2011). Size matters: Early vocabulary as a predictor of language and literacy competence. *Applied Psycholinguistics*, *32*(1), 69–92. https://doi.org/10.1017/S0142716410000299

Leech, K. A., Salo, V. C., Rowe, M. L., & Cabrera, N. J. (2013). Father input and child vocabulary development: The importance of wh-questions and clarification requests. *Seminars in Speech and Language*, *34*(4), 249–259. https://doi.org/10.1055/s-0033-1353445

Leech, K., Wei, R., Harring, J. R., & Rowe, M. L. (2018). A brief parent-focused intervention to improve preschoolers' conversational skills and school readiness. *Developmental psychology*, *54*(1), 15-28. https://doi.org/10.1037/dev0000411

LeFerve J. A., Fast, L., Skwarchuk, S. L., Smith-Chant, B. L., Bisanz, J., Kamawar, D., Penner-Wilger M. (2010). Pathways to mathematics: Longitudinal predictors of performance. *Child Development*, *81*(6), 1753-1767. http://dx.doi.org/10.1111/j.1467-8624.2010.01508.x

Levine, D., Pace, A., Luo, R., Hirsh-Pasek, K., Golinkoff, R. M., de Villiers, J., ... & Wilson, M. S. (2020). Evaluating socioeconomic gaps in preschoolers' vocabulary, syntax and language process skills with the Quick Interactive Language Screener (QUILS). *Early Childhood Research Quarterly*, *50*(1), 114-128. https://doi.org/10.1016/j.ecresq.2018.11.006

Lieven, E. (2010). Input and first language acquisition: Evaluating the role of frequency. *Lingua*, *120*(11), 2546-2556. https://doi.org/10.1016/j.lingua.2010.06.005

Liljequist, D., Elfving, B., & Skavberg Roaldsen, K. (2019). Intraclass correlation–A discussion and demonstration of basic features. *PloS one*, *14*(7), e0219854. https://doi.org/10.1371/journal.pone.0219854

Lillard, A. S., Lerner, M. D., Hopkins, E. J., Dore, R. A., Smith, E. D., & Palmquist, C. M. (2013). The impact of pretend play on children's development: a review of the evidence. *Psychological Bulletin*, *139*(1), 1-34. https://doi.org/10.1037/a0029321

Liu, H. M., Kuhl, P. K., & Tsao, F. M. (2003). An association between mothers' speech clarity and infants' speech discrimination skills. *Developmental Science*, *6*(3), F1-F10. https://doi.org/10.1111/1467-7687.00275

Lombardi, C. M., & Dearing, E. (2021). Maternal support of children's math learning in associations between family income and math school readiness. *Child Development*, *92*(1), e39-e55. https://doi.org/10.1111/cdev.13436

Longobardi, E., Spataro, P., Frigerio, A., & Rescorla, L. (2015). Language and social competence in typically developing children and late talkers between 18 and 35 months of age. *Early Child Development and Care*, *186*(3), 436-452. https://doi.org/10.1080/03004430.2015.1039529

Longoria, A. Q., Page, M. C., Hubbs-Tait, L., & Kennison, S. M. (2009). Relationship between kindergarten children's language ability and social competence. *Early Child Development and Care*, *179*(7), 919-929. https://doi.org/10.1080/03004430701590241

Lonigan, C. J., Burgess, S. R., & Anthony, J. L. (2000). Development of emergent literacy and early reading skills in preschool children: evidence from a latent-variable longitudinal study. *Developmental Psychology*, *36*(5), 596-613.

Lonigan, C. J., Farver, J. M., Phillips, B. M., & Clancy-Menchetti, J. (2011). Promoting the development of preschool children's emergent literacy skills: A randomized evaluation of a literacy-focused curriculum and two professional development models. *Reading and Writing*, *24*, 305-337.

Loukatou, G., Scaff, C., Demuth, K., Cristia, A., & Havron, N. (2022). Child-directed and overheard input from different speakers in two distinct cultures. *Journal of Child Language*, *49*(6), 1173-1192. https://doi.org/10.1017/S0305000921000623

Luo, R., Masek, L. R., Alper, R. M., & Hirsh-Pasek, K. (2022). Maternal question use and child language outcomes: The moderating role of children's vocabulary skills and socioeconomic status. *Early Childhood Research Quarterly*, *59*(2), 109-120. https://doi.org/10.1016/j.ecresq.2021.11.007

Luo, R., Tamis-LeMonda, C. S., & Song, L. (2013). Chinese parents' goals and practices in early childhood. *Early Childhood Research Quarterly*, *28*(4), 843-857. https://doi.org/10.1016/j.ecresq.2013.08.001

Luo, R., Tamis-LeMonda, C. S., Kuchirko, Y., F. Ng, F., & Liang, E. (2014). Mother–child book-sharing and children's storytelling skills in ethnically diverse, low-income families. *Infant and Child Development, 23*(4), 402-425. https://doi.org/10.1002/icd.1841

Ma, W., Golinkoff, R. M., Houston, D. M., Hirsh-Pasek, K. (2011). Word learning in infant- and adult-directed speech. *Language Learning and Development, 7*(3), 185-201. https://doi.org/10.1080/15475441.2011.579839

MacPhee, D. (2002). *Knowledge of infant development inventor: Manual*. Colorado: Colorado State University.

Maguire, M. J., Hirsh-Pasek, K., & Golinkoff, R. M. (2006). A unified theory of word learning: Putting verb acquisition in context. In K. Hirsh-Pasek, & R. M. Golinkoff (Eds.), *Action meets word: How children learn verbs* (pp. 364–392). New York: Oxford University Press.

Malhi, P., Menon, J., Bharti, B., & Sidhu, M. (2018). Cognitive development of toddlers: Does parental stimulation matter? *The Indian Journal of Pediatrics*, *85*, 498-503. https://doi.org/10.1007/s12098-018-2613-4

Mancilla-Martinez, J., & Lesaux, N. K. (2013). Spanish-speaking parents' beliefs about their young children's learning and language development. *NHSA Dialog*, *16*(4).

ManyBabies Consortium. (2020). Quantifying sources of variability in infancy research using the infant-directed-speech preference. *Advances in Methods and Practices in Psychological Science*, *3*(1), 24-52. https://doi.org/10.1177/2515245919900

Marchman, V. A., & Fernald, A. (2008). Speed of word recognition and vocabulary knowledge in infancy predict cognitive and language outcomes in later childhood. *Developmental science*, *11*(3), F9-F16. https://doi.org/10.1111/j.1467-7687.2008.00671.x

Marcovitch, S., & Zelazo, P. D. (2009). A hierarchical competing systems model of the emergence and early development of executive function. *Developmental Science*, *12*(1), 1-18. https://doi.org/10.1111/j.1467-7687.2008.00754.x

Markman, E. M., & Wachtel, G. F. (1988). Children's use of mutual exclusivity to constrain the meanings of words. *Cognitive Psychology*, *20*(2), 121-157. https://doi.org/10.1016/0010-0285(88)90017-5

Martin, A., Igarashi, Y., Jincho, N., & Mazuka, R. (2016). Utterances in infant-directed speech are shorter, not slower. *Cognition*, *156*, 52-59. https://doi.org/10.1016/j.cognition.2016.07.015

Masataka, N. (2002). Pitch modification when interacting with elders: Japanese women with and without experience with infants. *Journal of Child Language*, *29*(4), 939-951. https://doi.org/10.1017/S0305000902005378

Masek, L. R., McMillan, B. T., Paterson, S. J., Tamis-LeMonda, C. S., Golinkoff, R. M., & Hirsh-Pasek, K. (2021). Where language meets attention: How contingent interactions promote learning. *Developmental Review*, *60*, 100961. https://doi.org/10.1016/j.dr.2021.100961

Masek, L. R., Paterson, S. J., Golinkoff, R. M., Bakeman, R., Adamson, L. B., Owen, M. T., ... & Hirsh-Pasek, K. (2021). Beyond talk: Contributions of quantity and quality of communication to language success across socioeconomic strata. *Infancy*, *26*(1), 123-147. https://doi.org/10.1111/infa.12378

Masek, L. R., Ramirez, A. G., McMillan, B. T., Hirsh-Pasek, K., & Golinkoff, R. M. (2021). Beyond counting words: A paradigm shift for the study of language acquisition. *Child Development Perspectives*, *15*(4), 274-280. https://doi.org/10.1111/cdep.12425

Masek, L. R., Weiss, S. M., McMillan, B. T., Paterson, S. J., Golinkoff, R. M., & Hirsh-Pasek, K. (2022). Contingent conversations build more than language: How communicative interactions in toddlerhood relate to preschool executive function skills. *Developmental Science*, e13338. https://doi.org/10.1111/desc.13338

Massey, S. L., Pence, K. L., Justice, L. M., & Bowles, R. P. (2008). Educators' use of cognitively challenging questions in economically disadvantaged preschool classroom contexts. *Early Education and Development*, *19*(2), 340–360. https://doi.org/10.1080/10409280801964119

Masur, E. F., Flynn, V., & Eichorst, D. L. (2005). Maternal responsive and directive behaviours and utterances as predictors of children's lexical development. *Journal of Child Language*, *32*(1), 63-91. https://doi.org/10.1017/S0305000904006634

Matte-Gagné, C., & Bernier, A. (2011). Prospective relations between maternal autonomy support and child executive functioning: Investigating the mediating role of child language ability. *Journal of Experimental Child Psychology*, *110*(4), 611-625. https://doi.org/10.1016/j.jecp.2011.06.006

McCabe, A., & Peterson, C. (1991). *Getting the story: A longitudinal study of parental styles in eliciting oral personal narratives and developing narrative skill.* In A. McCabe & C. Peterson (Eds.), *Developing narrative structure* (pp. 217–253). Hillsdale, NJ: Erlbaum.

McCabe, P. C., & Meller, P. J. (2004). The relationship between language and social competence: How language impairment affects social growth. *Psychology in the Schools*, *41*(3), 313-321. https://doi.org/10.1002/pits.10161

McCarthy, D. (1954). Language disorders and parent-child relationships. *Journal of speech and hearing disorders*, *19*(4), 514-523.

McClelland, M. M., Cameron, C. E., Duncan, R., Bowles, R. P., Acock, A. C., Miao, A., & Pratt, M. E. (2014). Predictors of early growth in academic achievement: The head-toes-knees-shoulders task. *Frontiers in Psychology*, *5*, 599. https://doi.org/10.3389/fpsyg.2014.00599

McClure, E. R. (2015). *Infant and toddler engagement in video mediated interactions* [Doctoral dissertation]. Georgetown University. View/Open. https://repository.library.georgetown.edu/bitstream/handle/10822/1040766/McClure_georgetown_0076D_13341.pdf

McClure, E. R., Chentsova-Dutton, Y. E., Barr, R. F., Holochwost, S. J., & Parrott, W. G. (2015). "Facetime doesn't count": video chat as an exception to media restrictions for infants and toddlers. *International Journal of Child-Computer Interaction*, *6*(1), 1-6. https://doi.org/10.1016/j.ijcci.2016.02.002

McClure, E. R., Chentsova-Dutton, Y. E., Holochwost, S. J., Parrott, W. G., & Barr, R. (2018). Look at that! Video chat and joint visual attention development among babies and toddlers. *Child Development*, *89*(1), 27–36. https://doi.org/10.1111/cdev.12833

McClure, E., & Barr, R. (2017). Building family relationships from a distance: Supporting connections with babies and toddlers using video and video chat. In R. Barr & D. N. Linebarger (Eds.), Media exposure during infancy and early childhood: The effect of content and context on learning and development (pp. 227–248). New York, NY: Springer. https://doi.org/10.1007/978-3-319-45102-2_15

McGinty, A. S., Justice, L. M., Zucker, T. A., Gosse, C., & Skibbe, L. E. (2012). Shared-reading dynamics: Mothers' question use and the verbal participation of children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, 55(4), 1039–1052. https://doi.org/10.1044/1092-4388(2011/10-0298)

McKee, K., Cabrera, N. J., Hennigar, A., Mittone, D., Díaz, G., & Reich, S. M. (2021). Teaching mothers and fathers about how children develop: Parenting knowledge and practices. *Handbook of Positive Youth Development: Advancing Research, Policy, and Practice in Global Contexts*, 467-482.

McKeown, M. G., & Beck, I. L. (2003). Taking advantage of read alouds to help children make sense of decontextualized language. In A. van Kleeck, A. A. Stahl, & E. B. Bauer (Eds.), On reading books to children: Parents and teachers (6th ed., pp. 159–176). Mahwah, NJ: Lawrence Erlbaum.

McRoberts, G. W., McDonough, C., & Lakusta, L. (2009). The role of verbal repetition in the development of infant speech preferences from 4 to 14 months of age. *Infancy*, *14*(2), 162–194. https://doi.org/10.1080/15250000802707062

McWayne, C. M., Cheung, K., Wright, L. E. G., & Hahs-Vaughn, D. L. (2012). Patterns of school readiness among head start children: Meaningful within-group variability during the transition to kindergarten. *Journal of Educational Psychology*, *104*(3), 862-878. https://doi.org/10.1037/a0028884

Melzi, G., Schick, A. R., & Kennedy, J. L. (2011). Narrative elaboration and participation: Two dimensions of maternal elicitation style. *Child Development*, *82*(4), 1282-1296. https://doi.org/10.1111/j.1467-8624.2011.01600.x

Menn, K. H., Michel, C., Meyer, L., Hoehl, S., & Männel, C. (2022). Natural infant-directed speech facilitates neural tracking of prosody. *NeuroImage*, *251*, 118991. https://doi.org/10.1016/j.neuroimage.2022.118991

Milankov, V., Golubović, S., Krstić, T., & Golubović, Š. (2021). Phonological awareness as the foundation of reading acquisition in students reading in transparent orthography. *International Journal of Environmental Research and Public Health*, *18*(10), 5440. https://doi.org/10.3390/ijerph18105440

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology*, *41*(1), 49-100. https://doi.org/10.1006/cogp.1999.0734

Mol, S. E., Bus, A. G., De Jong, M. T., & Smeets, D. J. (2008). Added value of dialogic parent–child book readings: A meta-analysis. *Early Education and Development*, *19*(1), 7-26. https://doi.org/10.1080/10409280701838603

Monserud, M. A. (2010). Continuity and change in grandchildren's closeness to grandparents: Consequences of changing intergenerational ties. *Marriage & Family Review*, *46*(5), 366-388. https://doi.org/10.1080/01494929.2010.528320

Monteiro, R., Fernandes, S., & Rocha, N. (2022). What do preschool teachers and parents think about the influence of screen-time exposure on children's development? Challenges and opportunities. *Education Sciences*, *12*(1), 52. https://doi.org/10.3390/educsci12010052

Moore, D. S., Spence, M. J., & Katz, G. S. (1997). Six-month-olds' categorization of natural infant-directed utterances. *Developmental Psychology*, *33*(6), 980-989. https://doi.org/10.1037/0012-1649.33.6.980

Morgan, P. L., Farkas, G., Hillemeier, M. M., Hammer, C. S., & Maczuga, S. (2015). 24-month-old children with larger oral vocabularies display greater academic and behavioral functioning at kindergarten entry. *Child Development*, *86*(5), 1351-1370. https://doi.org/10.1111/cdev.12398

Morini, G., & Blair, M. (2021). Webcams, songs, and vocabulary learning: a comparison of in-person and remote data collection as a way of moving forward with child-language research. *Frontiers in Psychology*, *12*(1) 3347-3361. https://doi.org/10.3389/fpsyg.2021.702819

Moyle, M. J., Weismer, S. E., Evans, J. L., & Lindstrom, M. J. (2007). Longitudinal relationships between lexical and grammatical development in typical and late-talking children. *Journal of Speech, Language, and Hearing Research*. 50(2), 508–528. https://doi.org/10.1044/1092-4388(2007/035)

Mudrick, H. B., Robinson, J. L., & Brophy-Herb, H. E. (2020). Low-income children's readiness for group-based learning at age 3 and prekindergarten outcomes at age 5. *Journal of Early Childhood Research*, *18*(3), 259-274. https://doi.org/10.1177/1476718X19898740

Mueller, M. M., & Elder Jr, G. H. (2003). Family contingencies across the generations: grandparent-grandchild relationships in holistic perspective. *Journal of Marriage and Family*, *65*(2), 404-417. https://doi.org/10.1111/j.1741-3737.2003.00404.x

Muhinyi, A. & Rowe, M. (2019). Shared reading with preverbal infants and later language development. *Developmental Psychology, 64*(1), 1-11. https://doi.org/10.1016/j.appdev.2019.101053

Myers, L. J., LeWitt, R. B., Gallo, R. E., & Maselli, N. M. (2017). Baby FaceTime: Can toddlers learn from online video chat? *Developmental Science*, *20*(4), e12430. https://doi.org/10.1111/desc.12430

Naoi, N., Minagawa-Kawai, Y., Kobayashi, A., Takeuchi, K., Nakamura, K., Yamamoto, J. I., & Shozo, K. (2012). Cerebral responses to infant-directed speech and the effect of talker familiarity. *Neuroimage*, *59*(2), 1735-1744. https://doi.org/10.1016/j.neuroimage.2011.07.093

Narayan, C. R., & McDermott, L. C. (2016). Speech rate and pitch characteristics of infant-directed speech: Longitudinal and cross-linguistic observations. *The Journal of the Acoustical Society of America*, *139*(3), 1272-1281. https://doi.org/10.1121/1.4944634

Neitzel, C., & Stright, A. D. (2003). Mothers' scaffolding of children's problem solving: establishing a foundation of academic self-regulatory competence. *Journal of Family Psychology*, *17*(1), 147-159. https://doi.org/10.1037/0893-3200.17.1.147

Nelson, D. G. K., Hirsh-Pasek, K., Jusczyk, P. W., & Cassidy, K. W. (1989). How the prosodic cues in motherese might assist language learning. *Journal of Child Language*, *16*(1), 55-68. https://doi.org/10.1017/S030500090001343X

Neugarten, B. L., & Weinstein, K. K. (1964). The changing American grandparent. *Journal of Marriage and the Family*, *26*(2), 199–204. https://doi.org/10.2307/349727

Newman, R. S., Rowe, M. L., & Ratner, N. B. (2016). Input and uptake at 7 months predicts toddler vocabulary: The role of child-directed speech and infant processing skills in language development. *Journal of Child Language*, *43*(5), 1158-1173. https://doi.org/10.1017/S0305000915000446

Newport, E. L., Gleitman, H., & Gleitman, L.R. (1977). Mother, I'd rather do it myself: Some effects and non-effects of maternal speech style. In C. E. Snow & C. A. Ferguson (Eds.), Talking to children (edn, pp. 109-149). Cambridge, UK: Cambridge University Press.

Ochs, E., & Schieffelin, B. (1984). Language acquisition and socialization: Three developmental stories and their implications. In R. A. Schweder & R. A. LeVine (Eds.), *Culture theory: Essays on mind, self, and emotion* (pp. 276–322). Cambridge, UK: Cambridge University Press.

Olofsson, Å., & Niedersøe, J. (1999). Early language development and kindergarten phonological awareness as predictors of reading problems: From 3 to 11 years of age. *Journal of Learning Disabilities*, *32*(5), 464-472.

Olsen-Fulero, L., & Conforti, J. (1983). Child responsiveness to mother questions of varying type and presentation. *Journal of Child Language*, *10*(3), 495-520. https://doi.org/10.1017/S030500090000533X

Olson, J., & Masur, E. F. (2015). Mothers' labeling responses to infants' gestures predict vocabulary outcomes. *Journal of Child Language*, *42*(6), 1289-1311. https://doi.org/10.1017/S0305000914000828

Onnis, L., Waterfall, H. R., & Edelman, S. (2008). Learn locally, act globally: Learning language from variation set cues. *Cognition*, *109*(3), 423-430. https://doi.org/10.1016/j.cognition.2008.10.004

Oshima-Takane, Y., & Titova, P. (2021). Changes in Parental Input Patterns of Wh-Questions. *Proceedings of the 45th annual Boston University Conference on Language Development*, 598-611. Somerville, MA: Cascadilla Press.

Paavola, L., Kunnari, S., & Moilanen, I. (2005). Maternal responsiveness and infant intentional communication: Implications for the early communicative and linguistic development. *Child: Care, Health and Development*, *31*(6), 727-735. https://doi.org/10.1111/j.1365-2214.2005.00566.x

Pace, A., Alper, R., Burchinal, M. R., Golinkoff, R. M., & Hirsh-Pasek, K. (2019). Measuring success: Within and cross-domain predictors of academic and social trajectories in elementary school. *Early Childhood Research Quarterly*, *46*(1), 112-125. https://doi.org/10.1016/j.ecresq.2018.04.001

Pace, A., Luo, R., Hirsh-Pasek, K., & Golinkoff, R. M. (2017). Identifying pathways between socioeconomic status and language development. *Annual Review of Linguistics*, *3*(1), 285-308. https://doi.org/10.1146/annurev-linguistics-011516-034226

Pan, B. A., Rowe, M. L., Singer, J. D., & Snow, C. E. (2005). Maternal correlates of growth in toddler vocabulary production in low-income families. *Child Development*, *76*(4), 763-782. https://doi.org/10.1111/1467-8624.00498-i1

Pancsofar, N., & Vernon-Feagans, L. (2006). Mother and father language input to young children: Contributions to later language development. *Journal of Applied Developmental Psychology*, *27*(6), 571-587. https://doi.org/10.1016/j.appdev.2006.08.003

Pankhurst, M., Mehta, K., Matwiejczyk, L., Moores, C. J., Prichard, I., Mortimer, S., & Bell, L. (2019). Treats are a tool of the trade: an exploration of food treats among grandparents who provide informal childcare. *Public Health Nutrition*, *22*(14), 2643-2652. https://doi.org/10.1017/S1368980019000685

Panter, J. E., & Bracken, B. A. (2009). Validity of the Bracken School Readiness Assessment for predicting first grade readiness. *Psychology in the Schools*, *46*(5), 397-409. https://doi.org/10.1002/pits.20385

Parish-Morris, J., Hennon, E. A., Hirsh-Pasek, K., Golinkoff, R. M., & Tager-Flusberg, H. (2007). Children with autism illuminate the role of social intention in word learning. *Child Development*, *78*(4), 1265-1287. https://doi.org/10.1111/j.1467-8624.2007.01065.x

Parish-Morris, J., Mahajan, N., Hirsh-Pasek, K., Golinkoff, R. M., & Collins, M. F. (2013). Once upon a time: Parent–child dialogue and storybook reading in the electronic era. *Mind, Brain, and Education*, *7*(3), 200-211. https://doi.org/10.1111/mbe.12028

Patrucco-Nanchen, T., Friend, M., Poulin-Dubois, D., & Zesiger, P. (2019). Do early lexical skills predict language outcome at 3 years? A longitudinal study of French-speaking children. *Infant Behavior and Development*, *57*, 101379. https://doi.org/10.1016/j.infbeh.2019.101379

Pears, K. C., Fisher, P. A., Kim, H. K., Bruce, J., Healey, C. V., & Yoerger, K. (2013). Immediate effects of a school readiness intervention for children in foster care. *Early Education & Development*, *24*(6), 771-791. https://doi.org/10.1080/10409289.2013.736037

Pegg, J. E., Werker, J. F., & McLeod, P. J. (1992). Preference for infant-directed over adult-directed speech: Evidence from 7-week-old infants. *Infant Behavior and Development*, *15*(3), 325-345. https://doi.org/10.1016/0163-6383(92)80003-D

Pennington, B. F., & Ozonoff, S. (1996). Executive functions and developmental psychopathology. *Journal of Child Psychology and Psychiatry*, *37*(1), 51-87. https://doi.org/10.1111/j.1469-7610.1996.tb01380.x

Peter, V., Kalashnikova, M., Santos, A., & Burnham, D. (2016). Mature neural responses to infant-directed speech but not adult-directed speech in preverbal infants. *Scientific Reports*, *6*(1), 1-14. https://doi.org/10.1038/srep34273

Peterson, C., & McCabe, A. (1994). A social interactionist account of developing decontextualized narrative skill. *Developmental Psychology*, *30*(6), 937. https://doi.org/10.1037/0012-1649.30.6.937

Pinquart, M. (2017). Associations of parenting dimensions and styles with externalizing problems of children and adolescents: An updated meta-analysis. *Developmental Psychology*, *53*(5), 873-932. https://doi.org/10.1037/dev0000295

Porritt, L. L., Zinser, M. C., Bachorowski, J. A., & Kaplan, P. S. (2014). Depression diagnoses and fundamental frequency-based acoustic cues in maternal infant-directed speech. *Language Learning and Development*, *10*(1), 51-67. https://doi.org/10.1080/15475441.2013.802962

Pruden, S. M., Goksun, T., Roseberry, S., Hirsh-Pasek, K., Golinkoff, R. M. (2012). Find your manners: How do infants detect the invariant manner of motion in dynamic events? *Child Development*, *83*, 977-991. https://doi.org/10.1111/j.1467-8624.2012.01737.x

Pruden, S. M., Hirsh-Pasek, K., Golinkoff, R. M., & Hennon, E. A. (2006). The birth of words: Ten-month-olds learn words through perceptual salience. *Child Development*, *77*(2), 266-280. https://doi.org/10.1111/j.1467-8624.2006.00869.x

Purdy, J. (2008). Inviting conversation: Meaningful talk about texts for English language learners. *Literacy*, *42*(1), 44–51. https://doi.org/10.1111/j.1467-9345.2008.00479.x

Purpura, D. J., & Reid, E. E. (2016). Mathematics and language: Individual and group differences in mathematical language skills in young children. *Early Childhood Research Quarterly*, *36*, 259-268. https://doi.org/10.1016/j.ecresq.2015.12.020

Quiroz, B. G., Snow, C. E., & Zhao, J. (2010). Vocabulary skills of Spanish—English bilinguals: impact of mother—child language interactions and home language and literacy support. *International Journal of Bilingualism*, *14*(4), 379-399. https://doi.org/10.1177/1367006910370919

Ramani, G. B., Rowe, M. L., Eason, S. H., & Leech, K. A. (2015). Math talk during informal learning activities in Head Start families. *Cognitive Development*, *35*(1), 15-33. https://doi.org/10.1016/j.cogdev.2014.11.002

Ramey, C. T., & Ramey, S. L. (2004). Early learning and school readiness: Can early intervention make a difference? *Merrill-Palmer Quarterly*, *50*(4), 471-491. https://doi.org/10.1353/mpq.2004.0034

Ramírez-Esparza, N., García-Sierra, A., & Kuhl, P. K. (2014). Look who's talking: Speech style and social context in language input to infants are linked to concurrent and future speech development. *Developmental Science, 17*(6), 880-891. https://doi.org/10.1111/desc.12172

Ramírez, N. F., Weiss, Y., & Sheth, K. K. (2023). Parentese in infancy predicts 5-year language complexity and conversational turns. *Journal of Child Language,* 1-26. https://doi.org/10.1017/S0305000923000077

Reed, J., Hirsh-Pasek, K., & Golinkoff, R. M. (2017). Learning on hold: Cell phones sidetrack parent-child interactions. *Developmental Psychology*, *53*(8), 1428-1436. https://doi.org/10.1037/dev0000292

Reese, E., Haden, C. A., & Fivush, R. (1993). Mother-child conversations about the past: Relationships of style and memory over time. *Cognitive Development, 8*(4), 403-430. https://doi.org/10.1016/S0885-2014(05)80002-4

Reilly, S., Wake, M., Ukoumunne, O. C., Bavin, E., Prior, M., Cini, E., ... & Bretherton, L. (2010). Predicting language outcomes at 4 years of age: findings from Early Language in Victoria Study. *Pediatrics*, *126*(6), e1530-e1537. https://doi.org/10.1542/peds.2010-0254

Reynell, J. (1991). Reynell Developmental Language Scales (U.S. Edition). Western Psycohlogical Services.

Rhyner, P. M., & Bracken, B. A. (1988). Concurrent validity of the Bracken Basic concept scale with language and intelligence measures. *Journal of Communication Disorders*, *21*(6), 479–489.

Rideout, V. (2017). *The Common Sense Census: Media Use by Kids Age Zero to Eight.* San Francisco, CA: Common Sense Media

Riggs, N. R., Blair, C. B., & Greenberg, M. T. (2004). Concurrent and 2-year longitudinal relations between executive function and the behavior of 1st and 2nd grade children. *Child Neuropsychology*, *9*(4), 267-276. https://doi.org/10.1076/chin.9.4.267.23513

Roben, C. K., Cole, P. M., & Armstrong, L. M. (2013). Longitudinal relations among language skills, anger expression, and regulatory strategies in early childhood. *Child Development, 84*(3), 891-905. https://doi.org/10.1111/cdev.12027

Roberts, E., Bornstein, M. H., Slater, A. M., & Barrett, J. (1999). Early cognitive development and parental education. *Infant and Child Development: An International Journal of Research and Practice*, *8*(1), 49-62.

Roberts, J., Jurgens, J., & Burchinal, M. (2005). The role of home literacy practices in preschool children's language and emergent literacy skills. *Journal of Speech, Language, and Hearing Research : Jslhr*, *48*(2), 345–59. https://doi.org/10.1044/1092-4388(2005/024)

Robinson, J. B., Burns, B. M., & Davis, D. W. (2009). Maternal scaffolding and attention regulation in children living in poverty. *Journal of Applied Developmental Psychology*, *30*(2), 82–91. https://doi.org/10.1016/j.appdev.2008.10.013

Rodriguez, B. L., & Olswang, L. B. (2003). Mexican-American and Anglo-American mothers' beliefs and values about child rearing, education, and language impairment. *American Journal of Speech-Language Pathology*, *12*(4), 452-463. https://doi.org/10.1044/1058-0360(2003/091)

Rodriguez, E. T., Tamis-LeMonda, C. S., Spellmann, M. E., Pan, B. A., Raikes, H., Lugo-Gil, J., & Luze, G. (2009). The formative role of home literacy experiences across the first three years of life in children from low-income families. *Journal of Applied Developmental Psychology*, *30*(6), 677-694. https://doi.org/10.1016/j.appdev.2009.01.003

Romeo, R. R., Leonard, J. A., Robinson, S. T., West, M. R., Mackey, A. P., Rowe, M. L., & Gabrieli, J. D. E. (2018). Beyond the 30-million-word gap: Children's conversational exposure is associated with language-related brain function. *Psychological Science*, *29*(5), 700-710. doi:10.1177/0956797617742725

Roseberry, S., Hirsh-Pasek, K., Golinkoff, R. M. (2014). Skype me! Socially contingent interactions help toddlers learn language. *Child Development, 85*(3), 956-970. https://doi.org/10.1111/cdev.12166

Roseberry, S., Hirsh-Pasek, K., Parish-Morris, J., & Golinkoff, R. M. (2009). Live action: Can young children learn verbs from video? *Child Development*, *80*(5), 1360-1375. https://doi.org/10.1111/j.1467-8624.2009.01338.x

Rowe, M. L. (2008). Child-directed speech: Relation to socioeconomic status, knowledge of child development and child vocabulary skill. *Journal of Child Language*, *35*(1), 185-205. https://doi.org/10.1017/S0305000907008343

Rowe, M. L. (2012). A longitudinal investigation of the role of quantity and quality of child-directed speech in vocabulary development. *Child Development*, *83*(5), 1762–1774. https://doi.org/10.1111/j.1467-8624.2012.01805.x

Rowe, M. L., & Goldin-Meadow, S. (2009). Differences in early gesture explain SES disparities in child vocabulary size at school entry. *Science*, *323*(5916), 951-953. www.doi.org/10.1126/science.1167025

Rowe, M. L., & Snow, C. E., (2020). Analyzing input quality along three dimensions: Interactive, linguistic, and conceptual. *Journal of Child Language*, *47*(1), 5-21. https://doi.org/10.1017/S0305000919000655

Rowe, M. L., & Weisleder, A. (2020). Language development in context. *Annual Review of Developmental Psychology*, *2*, 201-223. https://doi.org/10.1146/annurev-devpsych-042220-121816

Rowe, M. L., Coker, D., & Pan, B. A. (2004). A comparison of fathers' and mothers' talk to toddlers in low-income families. *Social Development*, *13*(2), 278-291. https://doi.org/10.1111/j.1467-9507.2004.000267.x

Rowe, M. L., Leech, K. A., & Cabrera, N. (2017). Going beyond input quantity: *Wh*-questions matter for toddlers' language and cognitive development. *Cognitive Science*, *41*(S1), 162-179. https://doi.org/10.1111/cogs.12349

Rudd, L. C., Lambert, M. C., Satterwhite, M., & Zaier, A. (2008). Mathematical language in early childhood settings: What really counts? *Early Childhood Education Journal*, *36*(1), 75-80. https://doi.org/10.1007/s10643-008-0246-3

Sachs, J., & Nelson, K. E. (1983). Talking about the there and then: The emergence of displaced reference in parent-child discourse. *Children's Language*, *4*, 1-28.

Sadler, P. M., & Tai, R. H. (2007). The two high-school pillars supporting college science. *Science*, *317*(5837), 457-458. https://doi.org/10.1126/science.1144214

Saffran, J. R. (2001). Words in a sea of sounds: The output of infant statistical learning. *Cognition*, *81*(2), 149-169. https://doi.org/10.1016/S0010-0277(01)00132-9

Saint-Georges, C., Chetouani, M., Cassel, R., Apicella, F., Mahdhaoui, A., Muratori, F., ... & Cohen, D. (2013). Motherese in interaction: at the cross-road of emotion and cognition? (A systematic review). *PloS one*, *8*(10), e78103. https://doi.org/10.1371/journal.pone.0078103

Salo, V. C., Reeb-Sutherland, B., Frenkel, T. I., Bowman, L. C., & Rowe, M. L. (2019). Does intention matter? Relations between parent pointing, infant pointing, and developing language ability. *Journal of Cognition and Development*, *20*(5), 635-655. https://doi.org/10.1080/15248372.2019.1648266

Scarborough, H. S., Neuman, S. B., & Dickinson, D. (2001). Connecting early language and literacy to later reading (dis) abilities: Evidence, theory, and practice. *Approaching Difficulties in Literacy Development: Assessment, Pedagogy and Programmes* (pp. 97–110).

Scherer, K. R., Banse, R., Wallbott, H. G., & Goldbeck, T. (1991). Vocal cues in emotion encoding and decoding. *Motivation and Emotion*, *15*(1), 123-148.

Schroer, S. E., & Yu, C. (2022). The real-time effects of parent speech on infants' multimodal attention and dyadic coordination. *Infancy*, *27*(6), 1154-1178. https://doi.org/10.1111/infa.12500

Schwab, J. F., Rowe, M. L., Cabrera, N., & Lew-Williams, C. (2018). Fathers' repetition of words is coupled with children's vocabularies. *Journal of Experimental Child Psychology*, *166*(1), 437-450. https://doi.org/10.1016/j.jecp.2017.09.012

Sénéchal, M., LeFevre, J. A., Smith-Chant, B. L., & Colton, K. V. (2001). On refining theoretical models of emergent literacy the role of empirical evidence. *Journal of School Psychology*, *39*(5), 439-460. https://doi.org/10.1016/S0022-4405(01)00081-4

Shapiro, N. T., Hippe, D. S., & Ramírez, N. F. (2021). How chatty are daddies? An exploratory study of infants' language environments. *Journal of Speech, Language, and Hearing Research*, *64*(8), 3242-3252. https://doi.org/10.1044/2021_JSLHR-20-00727

Share, M., Williams, C., & Kerrins, L. (2018). Displaying and performing: Polish transnational families in Ireland Skyping grandparents in Poland. *New Media & Society*, *20*(8), 3011-3028. https://doi.org/10.1177/1461444817739272

Shatz, M. (1978). Children's comprehension of their mothers' question-directives. *Journal of Child Language*, *5*(1), 39-46. https://doi.org/10.1017/S0305000900001926

Shneidman, L. A., & Goldin-Meadow, S. (2012). Language input and acquisition in a Mayan village: How important is directed speech? *Developmental Science*, *15*(5), 659-673. https://doi.org/10.1111/j.1467-7687.2012.01168.x

Silverstein, M., & Marenco, A. (2001). How Americans enact the grandparent role across the family life course. *Journal of Family Issues*, *22*(4), 493-522.

Silvey, C., Demir-Lira, Ö. E., Goldin-Meadow, S., & Raudenbush, S. W. (2021). Effects of time-varying parent input on children's language outcomes differ for vocabulary and syntax. *Psychological science*, *32*(4), 536-548.

Simmons, N., & Johnston, J. (2007). Cross-cultural differences in beliefs and practices that affect the language spoken to children: mothers with Indian and Western heritage. *International Journal of Language & Communication Disorders*, *42*(4), 445-465. https://doi.org/10.1080/13682820600988926

Singh, L., Nestor, S., Parikh, C., & Yull, A. (2009). Influences of infant-directed speech on early word recognition. *Infancy*, *14*(6), 654-666. https://doi.org/10.1080/15250000903263973

Slusser, E., Ribner, A., & Shusterman, A. (2019). Language counts: Early language mediates the relationship between parent education and children's math ability. *Developmental Science*, *22*(3), e12773. https://doi.org/10.1111/desc.12773

Smagorinsky, P., & Mayer, R. E. (2014). Learning to be literate. In K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (2nd ed., pp. 605-625). Cambridge, UK: Cambridge University Press.

Smiley, P. & Huttenlocher, J. (1995). Conceptual development and the child's early words for events, objects and persons. In M. Tomasello & W. Merriman (Eds.), *Beyond names for things: the acquisition of verbs* (pp. 21-62) Hillsdale, NJ: Erlbaum.

Snow, C. E., & Ferguson, C. A. (1977). *Talking to children: Language input and acquisition.* Cambridge University Press.

Snow, K. L. (2006). Measuring school readiness: Conceptual and practical considerations. *Early Education and Development*, *17*(1), 7-41. https://doi.org/10.1207/s15566935eed1701_2

Snow, P. C., Eadie, P. A., Connell, J., Dalheim, B., McCusker, H. J., & Munro, J. K. (2014). Oral language supports early literacy: A pilot cluster randomized trial in disadvantaged schools. *International Journal of Speech-language Pathology*, *16*(5), 495-506. https://doi.org/10.3109/17549507.2013.845691

Soderstrom, M. (2007). Beyond baby talk: re-evaluating the nature and content of speech input to preverbal infants. *Developmental Review*, *27*(4), 501–532. https://doi.org/10.1016/j.dr.2007.06.002

Soderstrom, M., Blossom, M., Foygel, R., & Morgan, J. L. (2008). Acoustical cues and grammatical units in speech to two preverbal infants. *Journal of Child Language*, *35*(4), 869-902. https://doi.org/10.1017/S0305000908008763

Soltis, K., Davidson, T. M., Moreland, A., Felton, J., & Dumas, J. E. (2015). Associations among parental stress, child competence, and school-readiness: Findings from the PACE study. *Journal of Child and Family Studies*, *24*, 649-657. https://doi.org/10.1007/s10826-013-9875-2

Song, J. Y., Demuth, K., & Morgan, J. (2010). Effects of the acoustic properties of infant-directed speech on infant word recognition. *The Journal of the Acoustical Society of America*, *128*(1), 389-400. https://doi.org/10.1121/1.3419786

Spence, M. J., & Moore, D. S. (2003). Categorization of infant-directed speech: Development from 4 to 6 months. *Developmental Psychobiology: The Journal of the International Society for Developmental Psychobiology*, *42*(1), 97-109. https://doi.org/10.1002/dev.10093

Spinelli, M., Fasolo, M., & Mesman, J. (2017). Does prosody make the difference? A meta-analysis on relations between prosodic aspects of infant-directed speech and infant outcomes. *Developmental Review*, *44*(1), 1-18. https://doi.org/10.1016/j.dr.2016.12.001

Stelle, C., Fruhauf, C. A., Orel, N., & Landry-Meyer, L. (2010). Grandparenting in the 21st century: Issues of diversity in grandparent–grandchild relationships. *Journal of Gerontological Social Work*, *53*(8), 682-701. https://doi.org/10.1080/01634372.2010.516804

Stern, D., Spieker, S., Barnett, R. K., & MacKain, C. (1983). The prosody of maternal speech: Infant age and context-related changes. *Journal of Child Language*, *10*(1), 1-15. https://doi.org/10.1017/S0305000900005092

Stewart, R. B., & Marvin, R. S. (1984). Sibling relations: the role of conceptual perspective-taking in the ontogeny of sibling caregiving. *Child Development*, *55*(4), 1322–1332. https://doi.org/10.2307/1130002

Stokes, S. F., & Klee, T. (2009). Factors that influence vocabulary development in two-year-old children. *Journal of Child Psychology and Psychiatry*, *50*(4), 498-505. https://doi.org/10.1111/j.1469-7610.2008.01991.x

Stolt, S., Lind, A., Matomäki, J., Haataja, L., Lapinleimu, H., & Lehtonen, L. (2016). Do the early development of gestures and receptive and expressive language predict language skills at 5; 0 in prematurely born very-low-birth-weight children? *Journal of Communication Disorders*, *61*, 16-28. https://doi.org/10.1016/j.jcomdis.2016.03.002

Storch, S. A., & Whitehurst, G. J. (2002). Oral language and code-related precursors to reading: Evidence from a longitudinal structural model. *Developmental Psychology*, *38*(6), 934. doi:10.1037/0012-1649.38.6.934

Strouse, G. A., McClure, E., Myers, L. J., Zosh, J. M., Troseth, G. L., Blanchfield, O., Roche, E., Malik, S., & Barr, R. (2021). Zooming through development: Using video chat to support family connections. *Human Behavior and Emerging Technologies*, *3*(4), 552–571. https://doi.org/10.1002/hbe2.268

Strouse, G. A., Troseth, G. L., O'Doherty, K. D., & Saylor, M. M. (2018). Co-viewing supports toddlers' word learning from contingent and noncontingent video. *Journal of Experimental Child Psychology*, *166*, 310-326. https://doi.org/10.1016/j.jecp.2017.09.005

Sultana, N., Wong, L. L., & Purdy, S. C. (2020). Natural language input: Maternal education, socioeconomic deprivation, and language outcomes in typically developing children. *Language, Speech, and Hearing Services in Schools*, *51*(4), 1049-1070. https://doi.org/10.1044/2020_LSHSS-19-00095

Susperreguy, M. I., & Davis-Kean, P. E. (2016). Maternal math talk in the home and math skills in preschool children. *Early Education and Development*, *27*(6), 841-857. https://doi.org/10.1080/10409289.2016.1148480

Swerts, M., & Krahmer, E. (2010). Visual prosody of newsreaders: Effects of information structure, emotional content and intended audience on facial expressions. *Journal of Phonetics*, *38*(2), 197-206. https://doi.org/10.1016/j.wocn.2009.10.002

Tamis-LeMonda, C. S., & Bornstein, M. H. (1994). Specificity in mother-toddler language-play relations across the second year. *Developmental Psychology*, *30*(2), 283-292. https://doi.org/10.1037/0012-1649.30.2.283

Tamis-Lemonda, C. S., & McFadden, K. E. (2010). The United States of America. In M. H. Bornstein (Ed.), Handbook of cultural developmental science (pp. 2299–2322). New York, NY: Psychology Press.

Tamis-LeMonda, C. S., Bornstein, M. H., Kahana-Kalman, R., Baumwell, L., & Cyphers, L. (1998). Predicting variation in the timing of language milestones in the second year: An events history approach. *Journal of Child Language*, *25*(3), 675-700. https://doi.org/10.1017/S0305000998003572

Tamis-LeMonda, C. S., Kuchirko, Y., & Song, L. (2014). Why is infant language learning facilitated by parental responsiveness? *Current Directions in Psychological Science*, *23*(2), 121-126. https://doi.org/10.1177/0963721414522813

Tamis-LeMonda, C. S., Kuchirko, Y., & Tafuro, L. (2013). From action to interaction: Infant object exploration and mothers' contingent responsiveness. *IEEE Transactions on Autonomous Mental Development*, *5*(3), 202-209. https://doi.org/10.1109/TAMD.2013.2269905

Tamis-LeMonda, C. S., Bornstein, M. H., & Baumwell, L. (2001). Maternal responsiveness and children's achievement of language milestones. *Child Development*, *72*(3), 748-767. https://doi.org/10.1111/1467-8624.00313

Tamis-LeMonda, C. S., Custode, S., Kuchirko, Y., Escobar, K., & Lo, T. (2019). Routine language: Speech directed to infants during home activities. *Child Development*, *90*(6), 2135-2152. https://doi.org/10.1111/cdev.13089

Tamis-LeMonda, C. S., Kuchirko, Y., Luo, R., Escobar, K., & Bornstein, M. H. (2017). Power in methods: Language to infants in structured and naturalistic contexts. *Developmental Science*, *20*(6), e12456. https://doi.org/10.1111/desc.12456

Tamis-LeMonda, C. S., Shannon, J. D., Cabrera, N. J., & Lamb, M. E. (2004). Fathers and mothers at play with their 2-and 3-year-olds: Contributions to language and cognitive development. *Child Development*, *75*(6), 1806-1820. https://doi.org/10.1111/j.1467-8624.2004.00818.x

Tamis-LeMonda, C. S., Song, L., Leavell, A. S., Kahana-Kalman, R., & Yoshikawa, H. (2012). Ethnic differences in mother–infant language and gestural communications are associated with specific skills in infants. *Developmental Science*, *15*(3), 384-397. https//doi.org/10.1111/j.1467-7687.2012.01136.x

Tarasuik, J. C. M., Kaufman, J., & Galligan, R. (2013). Seeing is believing but is hearing? Comparing audio and video communication for young children. *Frontiers in Psychology*, *4*, 64. https://doi.org/10.3389/fpsyg.2013.00064

Tarasuik, J. C., Galligan, R., & Kaufman, J. (2011). Almost being there: Video communication with young children. *PloS one*, *6*(2), e17129. https://doi.org/10.1371/journal.pone.0017129

Taumoepeau, M., & Ruffman, T. (2006). Mother and infant talk about mental states relates to desire language and emotion understanding. *Child Development*, *77*(2), 465-481. https://doi.org/10.1111/j.1467-8624.2006.00882.x

Thiele, D. M., & Whelan, T. A. (2006). The nature and dimensions of the grandparent role. *Marriage & Family Review*, *40*(1), 93-108. https://doi.org/10.1300/J002v40n01_06

Thiessen, E. D., Hill, E. A., & Saffran, J. R. (2005). Infant-directed speech facilitates word segmentation. *Infancy*, *7*(1), 53-71. https://doi.org/10.1207/s15327078in0701_5

Tomasello, M., & Farrar, M. J. (1986). Joint attention and early language. *Child Development*, *57*(6), 1454-1463. https://doi.org/10.2307/1130423

Tomasello, M., Carpenter, M., & Liszkowski, U. (2007). A new look at infant pointing. *Child Development*, *78*(3), 705-722. https://doi.org/10.1111/j.1467-8624.2007.01025.x

Tomopoulos, S., Dreyer, B. P., Tamis-LeMonda, C., Flynn, V., Rovira, I., Tineo, W., & Mendelsohn, A. L. (2006). Books, toys, parent-child interaction, and development in young Latino children. *Ambulatory Pediatrics*, *6*(2), 72-78. https://doi.org/10.1016/j.ambp.2005.10.001

Tompkins, V., Bengochea, A., Nicol, S., & Justice, L. M. (2017). Maternal inferential input and children's language skills. *Reading Research Quarterly*, *52*(4), 397-416. https://doi.org/10.1002/rrq.176

Toub, T. S., Rajan, V., Golinkoff, R. M., & Hirsh-Pasek, K. (2016). *Guided play: A solution to the play versus learning dichotomy.* In D. Geary, & D. Berch (Eds.), *Evolutionary perspectives on child development and education* (pp. 117–141). Switzerland: Springer International Publishing. Retrieved from http://www. springer.com/us/book/9783319299846

Troseth, G. L., Saylor, M. M., & Archer, A. H. (2006). Young children's use of video as a source of socially relevant information. *Child Development*, *77*(3), 786-799. https://doi.org/10.1111/j.1467-8624.2006.00903.x

Uccelli, P., Demir-Lira, Ö. E., Rowe, M. L., Levine, S., & Goldin-Meadow, S. (2019). Children's early decontextualized talk predicts academic language proficiency in midadolescence. *Child Development*, *90*(5), 1650-1663. https://doi.org/10.1111/cdev.13034

Ursache, A., Noble, K. G., & Pediatric Imaging, Neurocognition and Genetics Study. (2016). Socioeconomic status, white matter, and executive function in children. *Brain and Behavior*, *6*(10), e00531. https://doi.org/10.1002/brb3.531

Uther, M., Knoll, M. A., & Burnham, D. (2007). Do you speak E-NG-LI-SH? A comparison of foreigner-and infant-directed speech. *Speech Communication*, *49*(1), 2-7. https://doi.org/10.1016/j.specom.2006.10.003

Vallotton, C., & Ayoub, C. (2011). Use your words: The role of language in the development of toddlers' self-regulation. *Early Childhood Research Quarterly*, *26*(2), 169-181. https://doi.org/10.1016/j.ecresq.2010.09.002

Verdine, B. N., Golinkoff, R. M., Hirsh-Pasek, K., Newcombe, N. S., & Bailey, D. H. (2017). Links between spatial and mathematical skills across the preschool years. *Monographs of the Society for Research in Child Development*, *82*(1), 1-149.

Verdine, B. N., Irwin, C. M., Golinkoff, R. M., & Hirsh-Pasek, K. (2014). Contributions of executive function and spatial skills to preschool mathematics achievement. *Journal of Experimental Child Psychology*, *126*, 37-51. https://doi.org/10.1016/j.jecp.2014.02.012

Vernon-Feagans, L., Willoughby, M., & Garrett-Peters, P. (2016). Predictors of behavioral regulation in kindergarten: Household chaos, parenting, and early executive functions. *Developmental Psychology*, *52*(3), 430-441. https://doi.org/10.1037/dev0000087

Viesel-Nordmeyer, N., Röhm, A., Starke, A., & Ritterfeld, U. (2022). How language skills and working memory capacities explain mathematical learning from preschool to primary school age: Insights from a longitudinal study. *Plos One*, *17*(6), e0270427. https://doi.org/10.1371/journal.pone.0270427

Vygotsky, L. S. (1962). *Thought and language.* (E. Hanfmann & G. Vakar, Trans.) Cambridge, MA: MIT Press. (Original work published 1934).

Warren-Leubecker, A., & Bohannon III, J. N. (1984). Intonation patterns in child-directed speech: Mother-father differences. *Child Development*, *55*(4), 1379-1385. https://doi.org/10.2307/1130007

Wei, R., Leech, K. A., & Rowe, M. L. (2020). Decontextualized language use during Chinese and American caregiver-child interactions. *Journal of Applied Developmental Psychology*, *71*, 101214. https://doi.org/10.1016/j.appdev.2020.101214

Weisberg, D. S., Hirsh-Pasek, K., Golinkoff, R. M., Kittredge, A. K., & Klahr, D. (2016). Guided play: Principles and practices. *Current Directions in Psychological Science*, *25*(3), 177-182. https://doi.org/10.1177/0963721416645512

Weisberg, D. S., Hirsh-Pasek, K., & Golinkoff, R. M. (2013). Guided play: Where curricular goals meet a playful pedagogy. *Mind, Brain, and Education*, *7*(2), 104-112. https://doi.org/10.1111/mbe.12015

Weisleder, A., & Fernald, A. (2013). Talking to children matters: Early language experience strengthens processing and builds vocabulary. *Psychological Science*, *24*(11), 2143-2152. https://doi.org/10.1177/0956797613488145

Weizman, Z. O., & Snow, C. E. (2001). Lexical output as related to children's vocabulary acquisition: Effects of sophisticated exposure and support for meaning. *Developmental psychology*, *37*(2), 265-279. https://doi.org/10.1037/0012-1649.37.2.265

Werker, J. F., Pegg, J. E., & McLeod, P. J. (1994). A cross-language investigation of infant preference for infant-directed communication. *Infant Behavior and Development*, *17*(3), 323-333. https://doi.org/10.1016/0163-6383(94)90012-4

West, K. L., & Iverson, J. M. (2017). Language learning is hands-on: Exploring links between infants' object manipulation and verbal input. *Cognitive Development*, *43*, 190-200. https://doi.org/10.1016/j.cogdev.2017.05.004

Whitehurst, G. J., Falco, F. L., Lonigan, C. J., Fischel, J. E., DeBaryshe, B. D., Valdez-Menchaca, M. C., & Caulfield, M. (1988). Accelerating language development through picture book reading. *Developmental Psychology*, *24*(4), 552-559. https://doi.org/10.1037/0012-1649.24.4.552

Wilhelm, O., Hildebrandt, A., & Oberauer, K. (2013). What is working memory capacity, and how can we measure it? *Frontiers in Psychology*, *4*, 433. https://doi.org/10.3389/fpsyg.2013.00433

Willard, A. K., Busch, J. T., Cullum, K. A., Letourneau, S. M., Sobel, D. M., Callanan, M., & Legare, C. H. (2019). Explain this, explore that: A study of parent–child interaction in a children's museum. *Child Development*, *90*(5), e598-e617. https://doi.org/10.1111/cdev.13232

Woodcock, R. W., & Johnson, M. B. (1990). *WoodcockJohnson Psycho-educational Battery—Revised*. Allen, TX: DLM Teaching Resources.

Wu, Z., & Gros-Louis, J. (2015). Caregivers provide more labeling responses to infants' pointing than to infants' object-directed vocalizations. *Journal of Child Language*, *42*(3), 538-561. https://doi.org/10.1017/S0305000914000221

Yadav, S., & Chakraborty, P. (2022). Child–smartphone interaction: Relevance and positive and negative implications. *Universal Access in the Information Society*, *21*(3), 573-586.

Yarosh, S., Chew, Y. C. D., & Abowd, G. D. (2009). Supporting parent–child communication in divorced families. *International Journal of HumanComputer Studies*, *67*(2), 192–203. https://doi.org/10.1016/j.ijhcs.2008.09.005

Yeary, J., Zoll, S., & Reschke, K. (2012). When a parent is away: Promoting strong parent-child connections during parental absence. Zero to Three, 32 (5), 5–10.

Yoder, P. J., & Davies, B. (1990). Do parental questions and topic continuations elicit replies from developmentally delayed children? A sequential analysis. *Journal of Speech, Language, and Hearing Research*, *33*(3), 563-573. https://doi.org/10.1044/jshr.3303.563

Yu, C., & Smith, L. B. (2012). Embodied attention and word learning by toddlers. *Cognition*, *125*(2), 244-262. https://doi.org/10.1016/j.cognition.2012.06.016

Yu, Y., Bonawitz, E., & Shafto, P. (2019). Pedagogical questions in parent–child conversations. *Child Development*, *90*(1), 147-161. https://doi.org/10.1111/cdev.12850

Zakin, A. (2007). Metacognition and the use of inner speech in children's thinking: A tool teachers can use. *Journal of Education and Human Development, 1*, 1–14.

Zangl, R., & Mills, D. L. (2007). Increased brain activity to infant-directed speech in 6-and 13-month-old infants. *Infancy*, *11*(1), 31-62. https://doi.org/10.1207/s15327078in1101_2

Zelazo, P. D. (2015). Executive function: Reflection, iterative reprocessing, complexity, and the developing brain. *Developmental Review*, *38*, 55–68. https://doi.org/10.1016/j.dr.2015.07.001

Zelazo, P. D., Muller, U., Frye, D., & Marcovitch, S. € (2003). Study 4: Negative priming and executive function. *Monographs of the Society for Research in Child Development, 68*(Serial No. 274), 73–92.

Zeman, J., Cassano, M., Perry-Parrish, C., & Stegall, S. (2006). Emotion regulation in children and adolescents. *Journal of Developmental & Behavioral Pediatrics*, *27*(2), 155-168.

Zevenbergen, A., & Whitehurst, G. (2003). Dialogic reading: A shared picture book reading intervention for preschoolers. *On Reading Books to Children: Parents and Teachers*, 177–200.

Ziegler, R., Schlett, C., Casel, K., & Diehl, M. (2012). The role of job satisfaction, job ambivalence, and emotions at work in predicting organizational citizenship behavior. *Journal of Personnel Psychology*, *11*(4), 176-190. https://doi.org/10.1027/1866-5888/a000071

Zimmerman, F. J., Gilkerson, J., Richards, J. A., Christakis, D. A., Xu, D., Gray, S., & Yapanel, U. (2009). Teaching by listening: The importance of adult-child conversations to language development. *Pediatrics*, *124*(1), 342-349. https://doi.org/10.1542/peds.2008-2267

Zimmerman, I. L., Steiner, V. G., & Pond, R. E. (2011). PLS-5: Preschool language scale-5. San Antonio, TX: Psychological Corporation.

Zosh, J. M., Hopkins, E. J., Jensen, H., Liu, C., Neale, D., HirshPasek, K., Solis, L. S., & Whitebread, D. (2017). Learning through play: A review of the evidence. The LEGO Foundation. https:// doi.org/10.13140/RG.2.2.16823.01447

Zosh, J. M., Strouse, G. A., Myers, L. J., Xu, C., Stuckelman, Z. D., McClure, E., ... & Barr, R. (2022). Virtual Grandparenting: Identifying Barriers to Supportive Video Chat between Grandparents and Grandchildren. Human Behavior and Emerging Technologies, 2022. https://doi.org/10.1155/2022/9454654

Zosh, J. M., Strouse, G. A., Myers, L. J., Xu, C., Stuckelman, Z. D., McClure, E., ... & Barr, R. (2022). Virtual Grandparenting: Identifying Barriers to Supportive Video Chat between Grandparents and Grandchildren. Human Behavior and Emerging Technologies, 2022. https://doi.org/10.1155/2022/9454654

Zucker, S., & Riordan, J. (1988). Concurrent validity of new and revised conceptual language measures. Psychology in the Schools, 25(3), 252-256. https://doi.org/10.1002/1520-6807(198807)25:3<252::AID-PITS2310250305>3.0.CO;2-S

Appendix A

PARENT LANGUAGE BELIEF QUESTIONNAIRE

Instructions: Thank you for doing this for us! ***There are no right or wrong answers!*** Here is a list of ways you might talk or play with your child between the ages of 15- and 21-months. Please select how often you do each of these things.

	Never	Sometimes	Often	Always
*† 1. I address my child and my adult friends with the same tone of voice.	1	2	3	4
2. I let my child figure things out on his or her own because this is how children learn best.	1	2	3	4
*3. I use shorter sentences when I talk to my child than I do when talking to my friends.	1	2	3	4
4. My child enjoys reading with me.	1	2	3	4
5. I answer phone calls I receive while playing with my child.	1	2	3	4
*†6. I speak to my child as I would speak to an adult; this is how they will learn to speak intelligently.	1	2	3	4
7. I use picture books to teach my child new words.	1	2	3	4

*8. During a typical conversation with my child I ask lots of questions.	1	2	3	4
9. I use my phone (calling, texting, etc.) while my child is talking to me.	1	2	3	4
*10. I use “baby talk” – my voice gets higher and more melodic when speaking to my child than when speaking to an adult.	1	2	3	4
11. I allow my child to express frustration through yelling.	1	2	3	4
12. I talk louder to my child than I do when talking to my friends.	1	2	3	4
§13. When I read a storybook to my child, I tell my child not to interrupt me.	1	2	3	4
*14. I use shorter words when I talk to my child than when I talk to my friends.	1	2	3	4
*15. I speak more slowly when I talk to my child than when I talk to my friends.	1	2	3	4
16. I allow my child to use my phone for entertainment purposes (e.g., watching a show or video, playing a game).	1	2	3	4
17. I read picture books with my child.	1	2	3	4
§†18. I ask my child to repeat new words to help him or her learn to talk.	1	2	3	4
*19. I repeat myself more when I talk to my child than when I talk to my friends.	1	2	3	4

20. I silence my phone when spending time with my child.	1	2	3	4
§†21. I choose what my child and I talk about.	1	2	3	4
22. I tell my child what to do because this is how children learn best.	1	2	3	4
23. I tell my child it is too late to read a book if it is past bedtime.	1	2	3	4
24. Other people use “baby talk” with my child.	1	2	3	4
§25. My child chooses what we talk about.	1	2	3	4
26. I ask my child to wait a minute if they want my attention when I am busy.	1	2	3	4
*27. I repeat what my child says, adding new words.	1	2	3	4
28. My child wants to use my phone.	1	2	3	4
§29. I answer when my child tries to talk to me.	1	2	3	4
§30. When I read a storybook, I try to see what my child is interested in and wants to hear about.	1	2	3	4
*†31. I correct my child if s/he uses the wrong word.	1	2	3	4
32. I use my phone during mealtimes.	1	2	3	4
33. I tell my child to be quiet if they are talking at an inappropriate time.	1	2	3	4

34. I raise my voice when my child misbehaves.	1	2	3	4
*35. I change my words when my child does not understand me.	1	2	3	4
§36. I allow my child to take a turn in conversations that include adults who are not family members.	1	2	3	4
§†37. I ask my child to speak clearly.	1	2	3	4
§38. I talk about what is happening when my child and I are playing or doing things together.	1	2	3	4
*†39. I speak to my child as I speak to adults to help him or her learn proper language.	1	2	3	4
40. I ignore text messages I receive while playing with my child.	1	2	3	4

COVID-19 Additional Questions

Instructions: Compared to your lifestyle before the pandemic began, consider how often you have engaged in these activities and behaviors in the last two weeks. If your child was born after March 2020, please mark "N/A."

	Much less often	Less often	No difference	More often	Much more often	N/A
1. I answer phone calls I receive while playing with my child.	1	2	3	4	5	6
2. I use my phone (calling, texting, etc.) while my child is talking to me.	1	2	3	4	5	6

3. I allow my child to use my phone for entertainment purposes (e.g. watching a show or video, playing a game).	1	2	3	4	5	6
4. I silence my phone when spending time with my child.	1	2	3	4	5	6
5. My child wants to use my phone.	1	2	3	4	5	6
6. I use my phone during mealtimes.	1	2	3	4	5	6
7. I ignore text messages I receive while playing with my child.	1	2	3	4	5	6

Note: * = IDS items; § = Non-IDS, promoting language items; † = Items are reverse coded.

Appendix B

IRB/HUMAN SUBJECTS APPROVAL

Institutional Review Board
210H Hullihen Hall
Newark, DE 19716
Phone: 302-831-2137
Fax: 302-831-2828

DATE:	January 20, 2023
TO:	Alexus Ramirez
FROM:	University of Delaware IRB
STUDY TITLE:	[1548843-15] IDS Influences Word Learning
SUBMISSION TYPE:	Continuing Review/Progress Report
ACTION:	APPROVED
EFFECTIVE DATE:	January 20, 2023
NEXT REPORT DUE:	February 11, 2024
REVIEW TYPE:	Administrative Review
REVIEW CATEGORY:	Expedited review category # *(6,7)*

Thank you for your Continuing Review/Progress Report submission to the University of Delaware Institutional Review Board (UD IRB). The UD IRB has reviewed and APPROVED the proposed research and submitted documents via Administrative Review in compliance with the pertinent federal regulations.

As the Principal Investigator for this study, you are responsible for, and agree that:

- All research must be conducted in accordance with the protocol and all other study forms as approved in this submission. Any revisions to the approved study procedures or documents must be reviewed and approved by the IRB prior to their implementation. Please use the UD amendment form to request the review of any changes to approved study procedures or documents.
- Informed consent is a process that must allow prospective participants sufficient opportunity to discuss and consider whether to participate. IRB-approved and stamped consent documents must be used when enrolling participants and a written copy shall be given to the person signing the informed consent form.
- Unanticipated problems, serious adverse events involving risk to participants, and all non-compliance issues must be reported to this office in a timely fashion according with the UD requirements for reportable events. All sponsor reporting requirements must also be followed.

The UD IRB REQUIRES the submission of a PROGRESS REPORT DUE ON February 11, 2024. A continuing review/progress report form must be submitted to the UD IRB at least 45 days prior to the due date to allow for the review of that report.

If you have any questions, please contact the UD IRB Office at (302) 831-2137 or via email at hsrb-research@udel.edu. Please include the study title and reference number in all correspondence with this office.

INSTITUTIONAL REVIEW BOARD

Institutional Review Board
210H Hullihen Hall
Newark, DE 19716
Phone: 302-831-2137
Fax: 302-831-2828

DATE:	September 14, 2022
TO:	Alexus Ramirez
FROM:	University of Delaware IRB
STUDY TITLE:	[1644261-7] Exploring Interactions Between Children and their Grandparents Over Video Chat During COVID-19
SUBMISSION TYPE:	Continuing Review/Progress Report
ACTION:	APPROVED
EFFECTIVE DATE:	September 14, 2022
NEXT REPORT DUE:	October 5, 2023
REVIEW TYPE:	Administrative Review
REVIEW CATEGORY:	Expedited review category # *(6,7)*

Thank you for your Continuing Review/Progress Report submission to the University of Delaware Institutional Review Board (UD IRB). The UD IRB has reviewed and APPROVED the proposed research and submitted documents via Administrative Review in compliance with the pertinent federal regulations.

As the Principal Investigator for this study, you are responsible for, and agree that:

- All research must be conducted in accordance with the protocol and all other study forms as approved in this submission. Any revisions to the approved study procedures or documents must be reviewed and approved by the IRB prior to their implementation. Please use the UD amendment form to request the review of any changes to approved study procedures or documents.
- Informed consent is a process that must allow prospective participants sufficient opportunity to discuss and consider whether to participate. IRB-approved and stamped consent documents must be used when enrolling participants and a written copy shall be given to the person signing the informed consent form.
- Unanticipated problems, serious adverse events involving risk to participants, and all non-compliance issues must be reported to this office in a timely fashion according with the UD requirements for reportable events. All sponsor reporting requirements must also be followed.

The UD IRB REQUIRES the submission of a PROGRESS REPORT DUE ON October 5, 2023. A continuing review/progress report form must be submitted to the UD IRB at least 45 days prior to the due date to allow for the review of that report.

If you have any questions, please contact the UD IRB Office at (302) 831-2137 or via email at hsrb-research@udel.edu. Please include the study title and reference number in all correspondence with this office.

Agreement ID:

FDP Data Transfer and Use Agreement ("Agreement")

Provider: Temple University	Recipient: University of Delaware
Provider Scientist Name: Dr. Kathy Hirsh-Pasek Email: khirshpa@temple.edu	Recipient Scientist Name: Dr. Roberta Michnick Golinkoff Email: roberta@udel.edu
Agreement Term Start Date: Date of last signature below End Date: Three (3) Years after the Start Date	Project Title: Exploring How Early Language Input may Influence Children's School Readiness Attachment 2 Type: De-identified Data about Hu

Terms and Conditions

1) Provider shall provide the data set described in Attachment 1 (the "Data") to Recipient for the research purpose set forth in Attachment 1 (the "Project"). Provider shall retain ownership of any rights it may have in the Data, and Recipient does not obtain any rights in the Data other than as set forth herein.
2) If applicable, reimbursement of any costs associated with the preparation, compilation, and transfer of the Data to the Recipient will be addressed in Attachment 1.
3) Recipient shall not use the Data except as authorized under this Agreement. The Data will be used solely to conduct the Project and solely by Recipient Scientist and Recipient's faculty, employees, fellows, students, and agents ("Recipient Personnel") and Collaborator Personnel (as defined in Attachment 3) that have a need to use, or provide a service in respect of, the Data in connection with the Project and whose obligations of use are consistent with the terms of this Agreement (collectively, "Authorized Persons").
4) Except as authorized under this Agreement or otherwise required by law, Recipient agrees to retain control over the Data and shall not disclose, release, sell, rent, lease, loan, or otherwise grant access to the Data to any third party, except Authorized Persons, without the prior written consent of Provider. Recipient agrees to establish appropriate administrative, technical, and physical safeguards to prevent unauthorized use of or access to the Data and comply with any other special requirements relating to safeguarding of the Data as may be set forth in Attachment 2.
5) Recipient agrees to use the Data in compliance with all applicable laws, rules, and regulations, as well as all professional standards applicable to such research.
6) Recipient is encouraged to make publicly available the results of the Project. Before Recipient submits a paper or abstract for publication or otherwise intends to publicly disclose information about the results of the Project, the Provider will have thirty (30) days from receipt to review proposed manuscripts and ten (10) days from receipt to review proposed abstracts to ensure that the Data is appropriately protected. Provider may request in writing that the proposed publication or other disclosure be delayed for up to thirty (30) additional days as necessary to protect proprietary information.

Agreement ID:

7) Recipient agrees to recognize the contribution of the Provider as the source of the Data in all written, visual, or oral public disclosures concerning Recipient's research using the Data, as appropriate in accordance with scholarly standards and any specific format that has been indicated in Attachment 1.

8) Unless terminated earlier in accordance with this section or extended via a modification in accordance with Section 13, this Agreement shall expire as of the End Date set forth above. Either party may terminate this Agreement with thirty (30) days written notice to the other party's Authorized Official as set forth below. Upon expiration or early termination of this Agreement, Recipient shall follow the disposition instructions provided in Attachment 1, provided, however, that Recipient may retain one (1) copy of the Data to the extent necessary to comply with the records retention requirements under any law, and for the purposes of research integrity and verification.

9) Except as provided below or prohibited by law, any Data delivered pursuant to this Agreement is understood to be provided "AS IS." PROVIDER MAKES NO REPRESENTATIONS AND EXTENDS NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR THAT THE USE OF THE DATA WILL NOT INFRINGE ANY PATENT, COPYRIGHT, TRADEMARK, OR OTHER PROPRIETARY RIGHTS. Notwithstanding, Provider, to the best of its knowledge and belief, has the right and authority to provide the Data to Recipient for use in the Project.

10) Except to the extent prohibited by law, the Recipient assumes all liability for damages which may arise from its use, storage, disclosure, or disposal of the Data. The Provider will not be liable to the Recipient for any loss, claim, or demand made by the Recipient, or made against the Recipient by any other party, due to or arising from the use of the Data by the Recipient, except to the extent permitted by law when caused by the gross negligence or willful misconduct of the Provider. No indemnification for any loss, claim, damage, or liability is intended or provided by either party under this Agreement.

11) Neither party shall use the other party's name, trademarks, or other logos in any publicity, advertising, or news release without the prior written approval of an authorized representative of that party. The parties agree that each party may disclose factual information regarding the existence and purpose of the relationship that is the subject of this Agreement for other purposes without written permission from the other party provided that any such statement shall accurately and appropriately describe the relationship of the parties and shall not in any manner imply endorsement by the other party whose name is being used.

12) Unless otherwise specified, this Agreement and the below listed Attachments embody the entire understanding between Provider and Recipient regarding the transfer of the Data to Recipient for the Project:

I. Attachment 1: Project Specific Information
II. Attachment 2: Data-specific Terms and Conditions
III. Attachment 3: Identification of Permitted Collaborators (if any)

13) No modification or waiver of this Agreement shall be valid unless in writing and executed by duly-authorized representatives of both parties.

Agreement ID:

14) The undersigned Authorized Officials of Provider and Recipient expressly represent and affirm that the contents of any statements made herein are truthful and accurate and that they are duly authorized to sign this Agreement on behalf of their institution.

By an Authorized Official of Provider:	By an Authorized Official of Recipient:
Mar 31, 2021 Date	3/23/2021 Date
Name: Jaison G. Kurichi	Name: Cordell M. Overby, Sc.D.
Title: Associate Vice President fo	Title: Associate Vice President f
Contact Information for Formal Notices:	Contact Information for Formal Notices:
Name:	Name: Cordell Overby
Address:	Address: 124 Hullihen Hall University of Delaware Newark, DE 19716
Email:	Email: overbyc@udel.edu
Phone:	Phone: 302-831-2383

Agreement ID:

Attachment 1
Data Transfer and Use Agreement
Project Specific Information

1. Description of Data:

The data itself is entirely de-identified with each student assigned an ID number. Data was collected as part of the NICHD Study of Early Child Care and Youth Development (SECCYD; see https://www.nichd.nih.gov/research/supported/seccyd/pages/datasets.aspx). The NICHD Study was a longitudinal study that followed children from birth to 15-years-old. The goal of the NICHD study was to explore the effects of early child-care experiences on children's cognitive, language, and social-emotional development and health. It includes data related to the outcome measures of interest such as school readiness measures, transcripts, language scores, and academic achievement rates. The dataset includes information about participants' race, children's age, maternal education.

2. Description of Project:

There are large discrepancies in children's school readiness abilities that are related to experiencing poverty (Isaacs, 2012). Measures of early language quantity and quality in the home mediate the association between socioeconomic status (SES) and children's early language. Research has yet to unpack how early language might relate to children's preparation for school. Using the NICHD SECCYD dataset, we intend to explore how early parental input at 24- and 36-month-old children relates to children's performance on components of school readiness at 36- to 54-months. We hypothesize that parental input would relate to children's performance on school readiness tasks. The outcome variables of interest include knowledge-based assessments such as the Woodcock-Johnson Psycho- Educational Battery-Revised (WJ-R) and Bracken Basic Concept Scale (BBCS). Additionally, outcome variables included assessments of executive function, such as the Delay of Gratification, and Continuous Performance Task.

3. Provider Support and Data Transmission:

Provider shall transmit the Data to Recipient: (select one) ☑ electronically or ☐ by mail to:

Name:	Roberta Golinkoff
Address:	224 Willard Hall, University of Delaware
Email:	childsplaylab@gmail.com
Phone:	(302)316-5512

Agreement ID:

Upon execution of this Agreement, Provider shall send any specific instructions necessary to complete the transfer of the Data to the contact person listed above, if not already included below in this section of Attachment 1.

4. Reimbursement of Costs:

☑ None

☐ As governed by a separate written agreement between the parties
Reimbursement Agreement Reference # (if required):
_____

☐ As set forth herein:

5. Disposition Requirements upon the termination or expiration of the Agreement:

Upon termination of this agreement for any reason, including, but not limited to Recipient's decision to cease use of the Data, Recipient agrees to return or destroy all Data, including copies or portions incorporated in whole or in part.

Agreement ID:

Attachment 2
Data Transfer and Use Agreement
Data-specific Terms and Conditions:
De-identified Data about Human Subjects

Additional Terms and Conditions:

1. The Data will not include personally identifiable information as defined in NIST Special Publication 800-122. If the Data being provided is coded, the Provider will not release, and the Recipient will not request, the key to the code.

2. If Provider is a Covered Entity, the Data will be de-identified data, as defined by the Health Insurance Portability and Accountability Act of 1996 ("HIPAA").

3. Recipient will not use the Data, either alone or in concert with any other information, to make any effort to identify or contact individuals who are or may be the sources of Data without specific written approval from Provider and appropriate Institutional Review Board (IRB) approval, if required pursuant to 45 CFR 46. Should Recipient inadvertently receive identifiable information or otherwise identify a subject, Recipient shall promptly notify Provider and follow Provider's reasonable written instructions, which may include return or destruction of the identifiable information.

4. By signing this Agreement, Recipient provides assurance that relevant institutional policies and applicable federal, state, or local laws and regulations (if any) have been followed, including the completion of any IRB or ethics review or approval that may be required.

5. Recipient shall promptly report to the Provider any use or disclosure of the Data not provided for by this Agreement of which it becomes aware.

Agreement ID:

Attachment 3
Data Transfer and Use Agreement
Identification of Permitted Collaborators (if any)

For all purposes of this Agreement, the definition of "Collaborator Personnel" checked below will pertain:

☐ "Collaborator Personnel" means: None. No collaborators are permitted on the Project.

-OR-

☑ "Collaborator Personnel" means as set forth below and agreed upon between the Parties:

Faculty, employees, fellows, or students of an academic institution, which institution (i) has agreed to collaborate in the Project, (ii) has faculty, employees, fellows, or students who have a need to use or provide a service in respect of the Data in connection with its collaboration in the Project, and (iii) has been made aware of the terms of this Agreement and agreed to comply, and to cause its personnel to comply, with such terms. Collaborator Personnel for this project are specifically identiifed as Dr. Brenna Hassinger-Das, Ph.D. at Pace University.