ABSTRACT

Title of Dissertation: READY FOR KINDERGARTEN: A
                                 TRAINING PROGRAM DESIGNED TO
                                 ENCOURAGE PARENT-CHILD
                                 CONVERSATION DURING THE
                                 PRESCHOOL YEARS

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                                 Methodology

Many children in the United States begin kindergarten unprepared to converse in the academic

language surrounding instruction, putting them at greater risk for later language and reading

difficulties. Importantly, correlational research has shown there are certain experiences prior to

kindergarten that foster the oral language skills needed to understand and produce academic

language. The focus of this dissertation was on increasing one of these experiences: parent-child

conversations about abstract and non-present concepts, known as decontextualized language

(DL). Decontextualized language involves talking about non-present concepts such as events that

happened in the past or future, or abstract discussions such as providing explanations or defining

unknown words. As caregivers' decontextualized language input to children aged three to five is

consistently correlated with kindergarten oral language skills and later reading achievement, it is

surprising no experimental research has been done to establish this relation causally. The study

described in this dissertation filled this literature gap by designing, implementing, and evaluating

a decontextualized language training program for parents of 4-year-old children (N=30). After obtaining an initial measure of decontextualized language, parents were randomly assigned to a control condition or training condition, the latter of which educated parents about decontextualized language and why it is important. All parents then audio-recorded four mealtime conversations over the next month, which were transcribed and reliably coded for decontextualized language. Results indicated that trained parents boosted their DL from roughly 17 percent of their total utterances at baseline to approximately 50 percent by the mid-point of the study, and remained at these boosted levels throughout the duration of the study. Children's DL was also boosted by similar margins, but no improvement in children's oral language skills was observed, measured prior to, and one month following training. Further, exploratory analyses pointed to parents' initial use of DL and their theories of the malleability of intelligence (i.e., growth mindsets) as moderators of training gains. Altogether, these findings are a first step in establishing DL as a viable strategy for giving children the oral language skills needed to begin kindergarten ready to succeed in the classroom.

READY FOR KINDERGARTEN: A TRAINING PROGRAM DESIGNED TO
ENCOURAGE PARENT-CHILD CONVERSATION DURING THE PRESCHOOL
YEARS

by

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Dissertation submitted to the Faculty of the Graduate School of the
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Dedication

To my Aunt Sharon.

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Chapter 1: Introduction

As of 2013, two-thirds of American fourth- and eighth-graders read below grade level (National Center for Education, 2013), constituting a concern facing the United States' education system. It is argued that remediation efforts (e.g., literacy programs) which address problems such as these are often, "too little, too late" (Heckman, 2011). Heckman (2006) argues that why certain individuals succeed and others do not is not determined by attending college, or even high school; instead, experiences that children have before formal schooling begins are largely responsible for their later trajectories of development.

One reason many children develop reading difficulties is because they arrive at kindergarten without the oral language skills needed to benefit from the language of instruction used in formal education settings. This type of language, known as academic language (Cummins, 1983; Schleppegrell, 2004; Snow, 2010; Snow & Uccelli, 2009), is ubiquitous in classrooms in the United States and involves communicating about topics in which the speaker and listener do not necessarily share similar background knowledge (Cummins, 1983; Snow, 1991). Academic language demands increase as children progress through the educational system, such that starting behind makes it difficult to catch up. In the early grades, students and teachers use academic language while teaching and discussing unknown concepts and vocabulary words, analyzing texts, and formulating arguments. For example, science lessons convey concepts and processes that are not immediately observable in the classroom (e.g., a lesson on volcanoes might include technical vocabulary such as *magma* and decontextualized explanations of how volcanoes erupt, neither of which are immediately grounded in the present context).

Difficulties associated with using academic language also result from the more complex syntactic structures that are not common in informal conversation (Curenton & Justice, 2004; Demir, Rowe, Heller, Levine & Goldin-Meadow, 2015; Uccelli, Galloway, Barr, & Meneses, 2015). Thus, understanding and producing this academic register is challenging as it involves talking and thinking about ideas removed from the present context and using more syntactically and lexically complex phrases that are less common during informal contexts (Snow & Uccelli, 2009).

Importantly, a growing body of research shows that certain experiences *before* formal schooling begins can provide children with the requisite foundation to comprehend and use academic language at the start of formal schooling. One type of experience involves parents' talk about topics beyond the here-and-now, known as decontextualized language (henceforth DL) (Snow, 1990). DL includes talking about past or future events, explanations about how the world works, defining unknown words, pretending to be something or someone else, or talk during book reading that connects the text to an experience in the child's life (Dickinson & Tabors, 2001). Experience conversing with DL is considered a precursor to academic language because, like academic language, it involves topics not grounded in the present context and contains many of the same challenging syntactic and lexical properties (Curenton & Justice, 2004; Demir et al., 2015; Dickinson & Tabors, 2001; Rowe, 2012).

Studies suggest that variability in the amount of DL preschool children hear prior to kindergarten is associated with variations in their oral language skills and later reading comprehension ability (Dickinson & Tabors, 2001). However, most of this work is correlational, and thus a causal link from DL exposure to child language and literacy

outcomes is not conclusive (see Peterson, Jesso & McCabe, 1999; Reese, Leyva, Sparks, & Grolnick, 2010; Reese & Newcombe, 2007 for exceptions related to talk about the past). To empirically establish experience with DL input as influencing children's oral language and literacy development, more experimental studies are needed to test the causal nature of this relation. Thus, the purpose of the present study to take this prior correlational work one step further by designing and testing a parent training program aimed at increasing parents' use of DL with their preschool-aged children. The training program involved educating parents about strategies for how to use DL with their children, and about why DL input is important for children's kindergarten readiness. Parent and child DL was then measured during the month following the training session relative to a group of parents who did not receive training.

Overview of Relevant Literature

Decontextualized Language

Broadly, DL is defined as talk about abstract concepts that are removed from the here-and-now (Dickinson & Tabors, 2001; Snow, 1991). As the term itself suggests, DL conveys information about something that is not grounded in the present context, or conveys information to a listener who may not share background knowledge with the speaker (Snow, 1991). Because language rather than the context is exploited to make one's point, DL typically consists of more complex syntax (Curenton, Craig, & Flanigan, 2008; Demir et al., 2015) and more sophisticated vocabulary words (Snow & Uccelli, 2009) than language that is more contextualized.

Parents vary substantially their use of DL. For instance, one study found that one type of DL -- narrative talk -- from low-income mothers during mealtimes ranged from zero to more than 64 percent of their total talk (Beals, 2001). More recently, Rowe (2012) found that during a 90-minute interaction between 50 mothers of varying socioeconomic backgrounds and their children aged 3;6 (3 years 6 months), maternal narrative utterances ranged between 0 and 220. These individual differences in parent DL are associated with later child language and literacy outcomes (Demir et al., 2015; Rowe, 2012). For example, middle-income parents' narrative and explanatory talk directed to 42-month-old children predicts their vocabulary size at kindergarten entry (Rowe, 2012). Similarly, the amount of parent pretend, explanation, and narrative utterances combined when children are 30-months predicts children's narrative ability prior to kindergarten (Demir et al., 2015; Tabors, Roach, & Snow, 2001). Moreover, parent DL to preschool children predicts these children's reading comprehension scores as late as fourth grade (Dickinson & Tabors, 2001). Thus, the importance of DL appears to extend not only to the oral language skills that children bring with them to kindergarten, but also reading achievement into elementary school.

Is It Possible to Increase Parent DL?

The strong relation between parent DL and children's language and literacy skills thus begs the question of whether parents' DL can be increased, and if so, would increasing the amount of DL in parent input influence children's use of DL and language outcomes? If parent DL input proves to be amenable to change, then future interventions could target this aspect of input as one viable way of preparing children for academic language, and potentially reducing the number of children of reading difficulties.

Changing individuals' behaviors can be difficult and in fact, studies that have attempted to change teacher talk in classroom settings have produced mixed effects (e.g., Landry, Anthony, Swank, & Monseque-Bailey, 2009). However, recently developed parent training programs have shown more promise. This work has focused on increasing more "concrete" aspects of parent behavior, which are relatively easy for parents to identify with and incorporate into their own interactions with their children. For example, these training studies have increased features of the input such as gesture from mothers with one-year-old children (Matthews, Behne, Lieven, & Tomasello, 2012), quantity of speech from mothers with two-year-old children, (Suskind et al., 2015), questions and comments during book reading for young preschool-aged children (see Mol, Bus, de Jong, & Smeets, 2008 for meta-analysis), and structured reminiscing about shared past events with children from two to five-years-old (Peterson et al., 1999). By definition, however, DL is more abstract than gesture and input quantity and encompasses more than just talk about the past. It therefore remains an open question whether educating parents about DL will lead to a short-term behavior change, and if so, whether change will persist outside of a laboratory setting in more naturalistic settings (e.g., at home). The remaining chapters of this dissertation discuss the design and implementation of a parent training protocol that addresses these limitations identified in previous work. Specifically, the program aimed to increase multiple aspects of DL rather than just talk about the past (e.g., talk about the past, future, explanations, questions), targeted older preschool-aged children who are developmentally ready to participate in DL conversation, and measured parent-child interaction in more familiar settings to the child.

Conceptual Frameworks

The present study is framed within social interactionist theory (Bruner, 1982; Vygotsky, 1978), and the proposed theory of change is drawn from work connecting individuals' knowledge and beliefs to their behaviors (Dweck, 1999; Dweck & Bempechat, 1983; Dweck & Leggett, 1988; Rowe, 2008; Suskind et al., 2015; Yeager & Walton, 2011).

Social Interactionist Theory

Social interactionist theories stress the importance of children's early environment and social interactions in language development (Bruner, 1982; Vygotsky, 1978). Using this framework helps explain why parent DL input contributes to children's oral language growth and in turn, readiness for academic language in kindergarten. Social interactionist theories emphasize that children's language skills do not develop by themselves, nor does high quality input on its own foster language skills. Instead, children's language skills develop as a result of rich, high quality interactions (e.g., DL) with more knowledgeable others such as parents and teachers.

Children do inherit some of their language abilities from parents, yet heritability studies suggest that genetics do not fully account for individual differences, as less than 40 percent of language abilities are genetically inherited among typically developing children (e.g., Stromswold, 2001). Social interactionist theories posit that the remainder of variance in abilities stems from variations in a child's environment. For instance, there is a positive association between socioeconomic status (SES) and child language development, and this relation is mediated or explained by the types of speech input parents offer their children on a daily basis (Hoff, 2003). There is now a considerable

body of research dedicated to identifying what "these types" of interactions look like, and which are most conducive to language learning. For example, children who hear more speech input from parents have larger vocabularies (e.g., Hart & Risley, 1995; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). However, the specific features or qualities within a parent-child interaction have been shown to be even more predictive of children's language development, above and beyond the effect of quantity (e.g., Rowe 2012; Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010, Weizman & Snow, 2001). Examples of these qualities include the diversity of vocabulary words (Pan, Rowe, Singer, & Snow, 2005), the complexity and diversity of syntactic constructions (e.g., Huttenlocher et al., 2010), and relevant to the present study, the frequency with which parents engage in DL conversations (e.g., Dickinson & Tabors, 2001). Overall, this broader framework would predict that any experimental increase in parent DL input would also lead to change in children's DL and oral language skills via parent-child daily interaction.

Within the social-interactionist literature, a framework proposed by Snow (1991) regarding the relation between language and literacy is particularly relevant to the present study because it specifies the types of input that facilitate children's language and literacy development. As shown in Figure 1, Snow (1991) argues that experience with DL in preschool provides children with the oral language skills (i.e., narrative and vocabulary ability) needed to benefit from the academic language used in instruction, which ultimately leads to successful reading achievement.
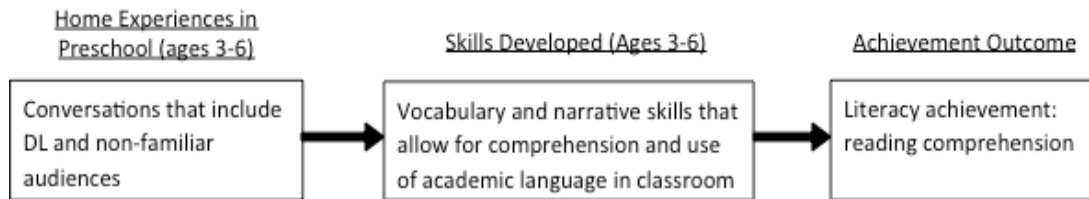
Figure 1 Theoretical relation between language and literacy

The present study focuses on the link between parent DL and children's oral language skills represented in the first two boxes in Figure 1, as this relationship sets the foundation for academic language preparation and ultimately reading success. Specifically, focus is placed on how DL input leads to increases in children's own DL as well as two key oral language skills - narrative and vocabulary ability - which have each been shown in the literature to: (1) be influenced by parent DL input, (2) be important skills to possess to successfully navigate the challenges of academic language, and (3) ultimately predict reading achievement.

Theory of Change: An Increase in Parent Knowledge

Increasing parent knowledge about DL and why it is important serves as the theory of change to explain why a parent training program would lead to change in parent DL input. Existing literature has pointed to variations in parent knowledge as a potential explanation for why parents communicate differently with their children (Rowe, 2008). Correlational studies show that on average parents who are more knowledgeable about aspects of child development communicate in ways that researchers, pediatricians, and practitioners argue are most conducive for child language development (Rowe, 2008). For example, Rowe (2008) found that parents with more knowledge of child development used more child-directed speech and more diverse vocabulary words compared to parents with less knowledge.

Dweck's theory of ability mindsets (Dweck & Bempechat, 1983; Dweck & Leggett, 1988) may be a useful framework for understanding why the beliefs that parents hold influence their child-directed speech. According to Dweck, individuals tend to identify with lay-theories about the source of intelligence, which fall on a spectrum from *entity-oriented* to *incremental-oriented*. Whereas entity theories emphasize that intelligence is inherited or fixed, incremental theories, also referred to as growth mindsets, stress that intelligence is malleable or changeable. In a series of studies conducted mostly with elementary-aged through high-school aged students, researchers have shown the utility of interventions promoting incremental mindsets over more traditional interventions targeting academic content (Blackwell et al., 2007; Paunesku, Walton, Romero, Smith, Yeager, & Dweck, 2015; Walton & Cohen, 2011; Yeager & Walton, 2011). These social-psychological interventions are typically one-time interventions lasting less than one hour which focus on increasing positive cognitions associated with academic achievement (Blackwell et al., 2007) or reducing cognitions such as stereotype threat (Walton & Cohen, 2011) by reinforcing incremental mindset beliefs. These brief sessions result in striking improvements in student achievement (e.g., GPA) relative to students who received interventions focused on content knowledge (e.g., algebra, study skills).

In addition to higher academic achievement, incremental theories of intelligence are also associated with more positive parent-child interactions, though less research has been done with parents than has been done with students. Moorman and Pomerantz (2010) induced mothers to either hold an incremental or entity theory of intelligence, and found that mothers with entity theories demonstrated more unconstructive behaviors

(e.g., control, performance-oriented behaviors, negative affect) than mothers induced to hold incremental theories when interacting with their children during a challenging task. More related to DL, parents who hold incremental beliefs about their child's language development are more likely to ask cognitively challenging questions (e.g., open-ended questions that request explanations or justifications) to their 4-year-old children (Donahue, Pearl, & Herzog, 1997) than parents who do not think they play as large of a role in their children's development.

Together the findings from the above studies can be thought of as a mechanism to explain why training and intervention studies are successful at increasing aspects of speech input (e.g., Suskind et al., 2015). One study has begun to connect the literature on social-psychological interventions to parent-child interaction. Suskind and colleagues (2015) increased the quantity of child-directed speech via increasing parents' knowledge and beliefs about their role in children's language development. Parents who heard messages such as e.g., "*your talk is what grows your baby's brain*" increased the quantity of words addressed to their two-year-old children because they increased their understanding about why child-directed speech is helpful for child language development and felt an increased sense of empowerment that they played an important role in their baby's development (Suskind et al., 2015). A similar approach was used in the present study. In particular, the current parent training program was designed to emphasize (1) why parent-child DL conversations are helpful in preparing children for the oral language skills needed to be successful in kindergarten, and (2) that parents play an important role in this process through messages that reinforced incremental mindsets. Thus the proposed theory of change posits that educating parents about DL's importance for children's

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language development and about parents' important role in this process will lead to increased parent DL use.

Study Overview

The present study had three goals. The first goal was to investigate whether a parent training program increases parent DL input to preschool children relative to a sample of untrained parents. The second goal examined whether this DL training led to an increase in children's use of DL, and two oral language skills that have been theoretically linked to success with academic language: narrative and vocabulary ability. The third goal examined -- within the group of parents who received training -- what parent and child characteristics helped to predict increases in parent and child DL.

To address these goals, a baseline measure of DL input was taken and children's narrative and vocabulary skills were measured prior to random assignment into a control or training condition. Next, parents assigned to the training condition participated in a one-on-one training session with the experimenter, which communicated the importance of DL and strategies for using it in everyday settings. Critically, drawing from the theoretical frameworks discussed, the training (1) communicated that DL is important for children's language development and (2) reinforced the belief that parents play an important role in this process through their communicative input and interaction. Parents in both conditions then recorded four mealtime conversations at home over a one-month period and change in parent and child DL was compared between conditions. Following this implementation phase, children's oral language skills were re-assessed. Additionally, parents' knowledge of child language development and their beliefs about the

malleability of intelligence were measured before and after training as a potential

mechanism to explain the hypothesized increase in DL use.

Research Questions

Three research questions along with corresponding hypotheses are outlined below.

> (1) Does a parent DL training program lead to a boost in parents' use of DL with
>
>   their preschool aged children?

While there have been few studies specifically examining whether it is possible to

increase parents' DL, a small body of literature has shown that it is possible to increase

different aspects of parents' input (e.g., Matthews et al., 2012; Suskind et al., 2015).

Thus, it is predicted that parents who receive DL training will significantly increase their

DL use relative to parents who do not receive training.

> (2) Do the children of parents who receive DL training exhibit an increase in their
>
>   own DL use and oral language skills?

Social interactionist theoretical frameworks state that children learn language

through input and interaction (Bruner, 1982; Vygotsky, 1978). Empirical work supports

this claim by showing that frequency of parent DL relates to children's DL use during the

same interaction (e.g., Dickinson & Tabors, 2001). Thus, it is predicted that if parents in

the training condition increase their DL, their children will as well. Similarly, it is

predicted that children whose parents receive DL training, and who increase in DL, will

also significantly increase their oral language skills measured using an independent

assessment. Prior studies have demonstrated positive correlations between DL input and

child vocabulary (Dickinson & Tabors, 2001; Rowe, 2012; Weizman & Snow, 2001), and

narrative skills (Demir et al., 2015; Dickinson & Tabors, 2001; Fivush, 1991; McCabe, 1992; McCabe, 1994; Reese, 1995). This would extend the limited body of experimental work primarily focused on talk about the past (e.g., Reese & Newcombe, 2007; Peterson et al., 1999) to be among the first explicit evidence to causally link DL to these developmental outcomes.

(3) What parent and child characteristics predict parent and child change in DL?

Research questions 3 is exploratory given the small sample size and focused on understanding which parents and children benefited the most from the training program. This is a critical question to examine because for future implementation it is important to consider whether the program works better for some families than others. First, among parents who receive training, parents' amount of DL at baseline was examined in relation to the rate of change in DL use. Within the intervention literature, there is little evidence regarding how parents' initial amount of input predicts change in parent or child DL use. Thus, the prediction for this question is non-directional (i.e., do parents who use more or less DL initially show the steepest gains over time?). Second, parents' general theories of intelligence and knowledge of child language development were examined as predictors of training gains. Dweck's (1999) theory of ability mindsets suggests that individuals who hold more incremental theories of intelligence believe more strongly that the environment rather than genetics influences development. Additionally, parents with more knowledge of child development are generally more likely to communicate with children in ways that promote language learning (Rowe, 2008). Thus it is predicted that parents who initially endorse a growth mindset and have more knowledge of child

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language development will respond more to the training, defined by a greater increase in their DL input.

Analyses also examined particular child characteristics that led children and parents to increase their DL. Studies have suggested that children with initially high language skills are able to benefit more from DL than children with lower skills (Hindman, Skibbe, & Foster, 2014). However, much of this work has been done with younger children than those tested in the current study. Thus, the prediction for this question again is non-directional regarding whether a particular group of children will benefit more from the training program than another.

Chapter 2: Literature Review

Social interactionist theories of language development posit that children's language acquisition relies heavily on facets of the environment such as interactions with caregivers (Bruner, 1982; Vygotsky, 1978). In particular, various characteristics of adult linguistic input are strongly associated with children's language and literacy outcomes (Hart & Risley, 1995; Hoff, 2006). While the *quantity* of input (i.e., the sheer amount of speech) contributes to the rate of growth and size of children's oral language skills (e.g., Hart & Risley, 1995; Huttenlocher, et al., 1991), various measures of input *quality* are often shown to be stronger predictors of oral language development (Cartmill et al., 2013; Huttenlocher et al., 2010; Pan, et al., 2005; Rowe, 2012). Exposure to one input quality, DL, is found to be particularly beneficial for preschool-aged children's oral language skills such as vocabulary and narrative ability, and eventual literacy skills. As many children start kindergarten with below average oral language skills putting them at later risk for reading difficulties (Farkas & Beron, 2004), it is critical to examine how DL contributes to these outcomes in order to identify potential early intervention strategies.

This chapter is divided into two reviews of literature that has examined the association between DL and children's language and literacy outcomes. After offering a definition and overview of DL, the first section reviews correlational research on how variations in the quality and quality of DL input during preschool contribute to variations in children's language and literacy outcomes. The next section then reviews intervention and training studies that have manipulated or increased aspects of adult communicative input. Throughout the review, focus is placed on reviewing studies with typically

developing children (see Crain-Thoreson & Dale, 1999 for review on children with language delays).

Two themes are conveyed in this review. First, there is strong empirical support in the literature that experience with DL before the start of formal schooling provides children with the requisite oral language skills to benefit from academic language, which in turn helps prepare them to learn to read. The second message from this review is that there are vast individual differences in how much parents expose preschool children to DL, suggesting that there is room for many adults to increase their use of DL (e.g., through experimental manipulations or interventions). Since better language outcomes are correlated with more parent DL use, one can reasonably assume that experimental manipulations that increase parents' DL input should also improve children's oral language skills. With this in mind, this chapter concludes with suggestions for how to address these literature gaps.

Decontextualized Language: An Overview

The idea that caregivers' talk about the non-present relates to children's language development was first discussed by Sigel's *parental distancing model* (Sigel, 1981). He argued that distancing strategies that "transcend the ongoing present" (Sigel & McGillicudy-DeLisi, 1984) facilitate children's representational thinking (e.g., memory reconstruction, planning, predicting) (Beals, 1993). Sigel (1981) delineated between low-level distancing strategies (e.g., labeling, observing) and high-level distancing strategies (e.g., inference, planning, evaluating). His later work provided empirical support for this distinction by showing a relation between mothers' high-level distancing strategies and children's representational thought (Sigel, 1982). Following the work of Sigel (1981;

1982), Cummins (1983) also drew a distinction between lower-order and higher-order forms of language. Cummins' distinction focused on language skills that are common to all individuals, and language skills that are fostered by specific experiences such as education. He referred to the former as *basic interpersonal communication skills (BICS),* or simply the ability to converse fluently, and to the latter as *cognitive academic linguistic potential (CALP),* or the ability to understand and express one's own ideas. Cummins (1983) argued that the latter is both where individual differences in language proficiency lie, and as the language needed to successfully navigate the classroom in Western, industrialized societies. More recently, van Kleek (2014) describes this same distinction as casual versus academic talk. She discusses "social-interactive" differences between these two registers, such that the purpose of casual talk is to, "get things done" (p. 727) while academic talk serves to advance knowledge and to better understand one's world.

While these distinctions all relied on different terminology, each identified a difference between the talk that occurs in school and talk that occurs in more casual settings. Further, they suggested that parents' talk about abstract concepts and ideas was instrumental for children's cognitive and linguistic development. Work by Snow (e.g., 1983; 1991) identified the same distinction between lower-level and higher-level speech, but used the distinction of contextualized (CL) and decontextualized language (DL). These terms will be used throughout the rest of the dissertation. According to Snow and others, DL is broadly considered to be any form of abstract language that is removed from the here-and-now (e.g., Dickinson & Tabors, 2001; Snow, 1991). Other terms for DL include extended discourse (Dickinson & Tabors, 2001; Ninio & Snow, 1996), non-

immediate talk (DeTemple & Beals, 1991; Dickinson & Tabors, 1991), or academic language (Cummins, 1983; Henrichs, 2010; Snow & Uccelli, 2009; Wells, 1999). The following types of DL will be reviewed, as they are the types of DL commonly used with preschool children and those examined in the study described in the remaining chapters of the dissertation:

- Narrative talk about the past and future, also referred to as elaborative reminiscing (Peterson et al., 1999; Reese & Newcombe, 2007), which is defined as talk that focuses on events in the past (e.g., *Remember when we went to the park last week? What did we do there?*) or that will happen in the future (e.g., *Next week we are going to visit grandma.*)

- Explanations about how something works or talk that requests or makes logical connections between objects, events, concepts or conclusions (Beals, 1993, 2001). Explanations can be in reference to people's action or speech (e.g. *don't turn the page until I finish reading the text*), or cause-and-effect explanations (e.g. *you have to put your coat on because it's cold outside*) (Beals, 2001). This category also often includes parents' definitions about unfamiliar or new words.

- Finally, adults often employ strategies during non-present conversations to encourage children's participation. Most notably, parents often ask open-ended questions (e.g., *how does that work? what did you do at school today?*) that scaffold children's use of non-present talk. While questions have not traditionally been included in DL definitions, the argument can be made that by taking a social interactionist perspective on language development, questions serve as a

powerful mechanism for increasing the quantity and quality of children's social

interactions with others.

Contextualized and Decontextualized Language

DL is most easily explained by situating it on a continuum of language

contextualization (Henrichs, 2010; Scollon & Scollon, 1981; Snow, 1983; Van Kleek,

2014): on one end are topics that are completely grounded in the present context, known

as CL, and on the other end are DL topics that are completely removed from the present

context. Snow (1983) describes DL as conversation that places little reliance on cues

from the surrounding context. Using the examples from above, narratives are considered

decontextualized because the topic of conversation focuses on a place or event that either

happened in the past or will happen in the future. Conversely, conversations that include

CL have much of the necessary information in the immediate context. The reduced

conversational demands of CL lessen the magnitude of individual differences across

speakers, as argued by Cummins (1984). For example, a CL conversation might involve a

mother pointing out a picture of an elephant while reading a book. This discussion is

considered contextualized because the picture of the elephant is perceptually present in

front of the child. This same conversation could be made decontextualized if the mother

followed up by saying, "*remember when we saw an elephant last week at the zoo*". In the

decontextualized case, these topics extend beyond what is directly available on the page,

and are conveyed using language to make the point (van Kleeck, Vander Woude, &

Hammett, 2006).

CL and DL offer unique benefits for children's linguistic growth during different

points in development. For younger children, ages 12 to 24 months, CL facilitates the

development of expressive and receptive vocabulary ability. During this period, CL occurs primarily during episodes of joint attention, defined as any episode in which both the infant and parent are jointly focused on an object, event, or action in the immediate situation (Tomasello & Farrar, 1986). Since both the parent and infant are focused on an object at the same time, these episodes enable parents to label the object in focus, thus creating an opportunity for the infant to map the parent's label on to the object in front of him or her (Tomasello & Farrar, 1986). Research suggests that differences in vocabulary ability between children who engage in more and less frequent joint attention episodes with parents emerge as early as 12 months of age (Smith, Adamson, & Bakeman, 1988; Tomasello & Todd, 1983). Joint attention, therefore, encourages CL in the sense that language is being communicated from parent to child *with help from the immediate context*.

During the second year of life, CL during joint attention episodes still remains an important influence for children's developing language skills. Ninio (1980) found that mothers who more frequently labeled pictures during book reading, or asked questions such as, "*what is that?*" had infants ages 17-22 months with greater expressive and receptive vocabulary abilities. By jointly focusing on a picture, parents' labeling behaviors help introduce new words to children with additional contextual supports (e.g., other illustrations, text, or gesture). Thus, early forms of CL such as those that occur during joint attention interactions promote children's oral language development, particularly vocabulary during the first two years of life (Smith, et al., 1988; Tomasello & Todd, 1983).

Starting around age 30-months, research shows that children's language skills begin to benefit from parent DL input (Demir et al., 2015; Rowe, 2012), yet these conversations still occur infrequently and are considerably challenging for children of this age. When children are between 18 and 30 months of age, the proportion of DL in their input is very low, making up only between two and six percent of parents' total speech, on average, most of which is focused on explanations and pretense (Rowe, 2012). On average, children hear considerably more DL by 42-months-old (nine percent of total input), and the DL input they hear at this age has been shown to predict vocabulary at kindergarten entry (Rowe, 2012). The strengths of these relations between DL input and child language skills are small to moderate, (r's between 0.29 and 0.34) but remain significant when controlling for relevant demographic factors (i.e., maternal education), the quantity of talk (i.e., number of utterances), and the number of CL utterances (Demir et al., 2015; Rowe, 2012). Interestingly, the relation between CL to child language outcomes is weaker. For example, Demir et al. (2015) found that the amount of CL children hear at 30 months did not significantly predict vocabulary size at kindergarten entry, whereas DL did.

From age three to five, the proportion of parents' decontextualized input continues to increase, on average, while the proportion of contextualized input decreases, at least among middle-income families (Reese, 1995). Additionally, children's vocabulary and narrative abilities are stronger at the onset of kindergarten in families where parents gradually replace CL with DL during the preschool years (Reese, 1995). In contrast, parents who maintain or increase their CL over time typically have children with lower oral language abilities (Reese, 1995). Thus, in line with social interactionist

language theories, these studies demonstrate that developmentally appropriate input for children ages three to five consists of a gradual introduction to DL with concurrent reduction in CL (e.g., Demir et al., 2015; Reese, 1995; Rowe, 2012).

<center>**Review of Correlational Studies**</center>

Relation between DL and Children's Language Development

Research shows that parents differ in the amount of DL they use with children, and that these differences are associated with individual variation in children's vocabulary and narrative skills. Like other features of parent input, DL is typically measured by recording interactions between caregivers and children at school, at home, or in the laboratory. Correlational studies focus on how variability in parental input relates to variations in child language. As such, many designs are longitudinal and follow children's language development for months or years after the initial DL measurements were taken.

The Harvard Home School Study of Language and Literacy Development (HSSLLD; Dickinson & Tabors) study is perhaps the most intensive examination of the long-term effects of DL input during the preschool years. The researchers measured DL and child language skills among a sample of lower-income families in the United States beginning when children were 3 and following their language and literacy outcomes through age 11 (Dickinson & Tabors, 2001). The goal of this study was to identify the precursors to literacy with the hypothesis that exposure to DL would influence pre-kindergarten oral language ability, which would in turn predict which children would demonstrate successful literacy skills in elementary school. Results indicated that children who heard more DL between the ages of 3 and 5 had significantly higher

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narrative production and receptive vocabulary scores at kindergarten entry (Tabors et al., 2001). Similarly, a composite score of parent DL input (i.e., narrative, pretend, and explanatory talk) when children were in preschool strongly predicted state reading comprehension scores in fourth grade (Dickinson & Tabors, 2001) after controlling for other relevant home literacy environment variables (e.g., parent report of frequency of book reading). Second, both children's narrative and vocabulary abilities in kindergarten strongly predicted receptive vocabulary in fourth and seventh grade (Tabors, Snow, & Dickinson, 2001). Thus, the skills children possess at the start of kindergarten – heavily influenced by DL they are exposed to by parents – build on each other over time to ultimately play a significant role in reading ability, particularly comprehension, in late elementary and middle school. Since the HSSLLD study, other work has examined how specific types of DL relate to children's development. The following section reviews these studies and other work that used similar correlational research designs by reviewing each type of DL: talk about the past and future, explanations and definitions, and open-ended questions. Some findings of the HSSLLD are also reported when relevant to a specific type of DL.

Narrative talk. Narratives about past and future events are considered decontextualized because these conversations involve displaced events and are thus not grounded in the present context or setting. Labov (1982) has argued that the basic premise of a narrative is to recount information about a distant event or idea in a way that can be understood by others who did not experience it. Using this framework, Haden, Haine and Fivush (1997) outlined ways in which white, middle-income mothers engage their children in narrative conversations. They argue that all narratives describe what

happened, yet successful narratives also include evaluative devices, or linguistic features that serve to give a listener perspective on the narrator's story (Haden et al., 1997; Reese et al., 2010). For example, evaluative devices include orienting references to time to make the story more comprehensible to the listener (e.g., setting the scene at the beginning of the story by describing location), dialogue or internal state talk, and evaluations that illustrate the narrator's perspective or opinion. These linguistic features also make narratives more syntactically complex, serve to contextualize a decontextualized topic for a listener who is unfamiliar with the topic of conversation. Thus narratives that contain these evaluative devices are thus consistent with features of academic language (Fivush & Fromhoff, 1988; Heath, 1983; Reese & Fivush, 1993; Reese, Haden, & Fivush, 1993). In general, variation in narrative talk is quantified by the number and quality of evaluative devices used to provide information to the listener. Haden and colleagues (1997) among others (see also Reese, et al., 2010) made a distinction between 'highly elaborative' mothers who use more elaborative devices such as asking open-ended questions and encouraging children's participation in the storytelling episode, compared to 'low elaborative' mothers who use yes/no questions, do not confirm children's participation in the conversation, and engage in shorter reminiscing episodes.

The majority of research examining the features of narratives that promote oral language development have been conducted with middle-class populations. This literature gap is troublesome as ethnographic research suggests lower-income parents or parents from different ethnicities hold different goals for engaging children in narrative

talk, and as a result, use alternative strategies for discussing displaced events (e.g., Heath, 1983).

   Narrative talk about the past. Most narrative research focuses on talk about the past rather than the future. Parents' narrative elaborativeness while talking about the past predicts aspects of children's later language and literacy development. Not surprisingly, parents' narrative talk is most strongly related to children's own narrative skills. These narratives are typically produced in the lab or home following a prompt from the researcher to discuss a special, displaced event. For example, Fivush (1991) and Peterson and McCabe (1992) found that 2- to 3-year-old children of middle-income mothers who used more orienting, referential, and evaluative statements told narratives about the past with more evaluative devices one year later. Peterson and McCabe (1994) recorded middle-income mothers' and fathers' uses of orienting prompts (i.e., *wh*-questions such as *where did we go?*) while reminiscing about past events with their 2 to 4-year-old children. Results indicated that children whose parents used more orienting information also provided more orientations in their own narratives one year later.

   Haden et al. (1997) and Reese (1995) examined parent-child narrative talk using older children, aged 42-70 months in order to more fully understand how parents' narrative talk influences children's own narrative development at the start of formal schooling. Similar to Fivush (1991), Haden et al. (1997) found that 3-year-olds of mothers and fathers who emphasized evaluations in their narratives used more evaluations themselves when they were 5-years-old. Reese (1995) found that mothers who increased their elaborations of a narrative when children were between 40 and 58 months had children who demonstrated greater narrative and story comprehension

abilities at 70 months. Parental narrative talk to preschool children has also been shown to predict vocabulary size at kindergarten entry (Rowe, 2012), as well as receptive vocabulary in both early (second grade) and later (fifth grade) elementary school (Weizman & Snow, 2001).

Other research has measured parent-child narrative conversation in more naturalistic settings and highlighted contexts that encourage these conversations. For instance, mealtime is a context that lends itself to talk about the past relative to book reading or play. Across cultures, families gather together for meals and engage in conversation, often about what happened earlier in the day, about a problem and/or solution to a problem, or to plan the next day's events (Snow & Beals, 2001). Clearly, families do not abide by these norms all of the time, but it seems that many American and European families at least acknowledge that mealtimes are an opportunity for discourse with other family members (Snow & Beals, 2001). This opportunity to converse with family members during mealtimes may be one reason that families who eat meals together regularly have children with better academic outcomes (Fiese, Foley, & Spagnola, 2006; Snow & Beals, 2001). Beals and Snow (1994) found that along with explanations, narratives were the most frequent type of DL to occur at family mealtime conversations with three-year-old children. DeTemple and Beals (1991) found that narrative talk alone made up 12 percent of the talk during mealtimes with four-year-old children.

Narrative talk about the future. Though parents do talk about the future, there is far less research on this specific type of parent-child conversation. In fact, the only available research focusing specifically on future discussions has been conducted with

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middle-income populations in highly-structured settings. The limited research on future

talk may be because English does not have one standard future tense, or because the

narrative literature in general has focused more on how parents discuss the past. The

available literature has concentrated mostly on comparing and contrasting how future talk

differs from past talk. Lucariello and Nelson (1987) for instance observed that parents'

rate of future talk was similar to past talk with two-year-old children, but that parents

used more future talk in settings in which there was more shared knowledge between the

parent and child (e.g., discussing upcoming routine events such as getting ready for bed).

Other studies show that the rate of future talk tends to increase between 20 and 32 months

(Benson, Talmi, & Haith, 1999). Starting between children's second and third birthday,

measurements of parents' future talk remains stable over time (Hudson, 2002).

Future talk is similar to talk about the past in that it involves discussion about

displaced events (Labov, 1982). Research also shows that past and future talk activate

overlapping neural regions in the brain (Addis, Wong, & Schacter, 2007). However, it

also differs from past talk in important ways. Hudson (2002) found that future talk is

often more temporally complex than past talk because it makes use of hypotheticals and

predictions (e.g., *maybe we'll go to the store later today*) rather than straightforward

recounting of previously experienced events (e.g., *yesterday we went to the store*). In

order to engage in this type of future talk, children need the requisite planning skills and

the ability to imagine their future self-engaging in an action or participating in an event.

This is especially important as preschool-aged children still often view the future as fixed

or unchangeable (Atance & O'Neill, 2005). Indeed, studies examining children's ability

to talk about the future finds the most individual differences in aspects of *future-oriented*

thinking, such as asking children to hypothesize what items they would need to bring on a hypothetical trip to a desert (Atance & Metzoff, 2005; Atance & O'Neill, 2005).

Parents' future talk is related to aspects of children's oral language skills. Similar to talk about the past, parental future talk that includes more elaborations, questions, and temporal markers appear benefit children's developing language skills. Hudson (2006) found that mothers who used more elaboration in their co-constructed future discussions had four-year-old children who used more future-oriented language, referenced hypothetical states more often (e.g., *might, could)*, and used more temporal terms during this interaction (*tomorrow, later)*. Even more so than other aspects of DL, future talk has important implications for school readiness beyond simply boosting oral language skills. Talking and thinking about the future may help children not only develop more complex ways to express themselves, but also hone planning skills, self-regulation, flexible thinking, and potentially prosocial behaviors (Atance, 2015; Chernyak, Leech, & Rowe, under review). Therefore, future research should examine more carefully the variation in adults' talk about future concepts and how children learn to think about the future from their social interactions with others.

Explanatory talk. Traditional definitions of explanatory talk have focused only on talk about cause-and-effect relationships (Piaget, 1928), or talk that is, "*meant to clarify something that might be obscure or ambiguous*" (Barbieri, Colavita, & Scheuer, 1990, p. 246). This type of talk typically includes sentential connectors such as *because* or *so* to link two ideas together (Beals, 1993). For example, Piaget (1928) identified three types of explanations: physical explanations between two events, psychological explanations between two actions or intentions, and logical explanations between two

judgments or ideas. Despite these distinctions, Piaget (1928) argued that all three types of explanations involve cause-and-effect relation between two entities. However, as argued by Beals (1993), this definition is overly simplistic, which resulted in her formulation of a more comprehensive definition of explanations, and the one used throughout the rest of the dissertation.

As defined by Beals (1993), explanations involve "talk that requests or makes a logical connection between objects, events, concepts, or conclusions." Explanatory talk according to Beals (1993) more broadly assumes that the explainer possesses knowledge of a connection (not necessarily causal) between two entities. Further, the explainer understands that the listener does not necessarily share this knowledge; thus the goal of the explainer is to clarify the nature of the connection to the listener through language. Thus, explanations can be considered a subset of DL because language is primarily used to convey meaning rather than shared background knowledge or a reliance on the immediate context.

Weizman and Snow (2001) found that compared to book reading or unstructured play, mealtimes provided the most opportunities for lower-income parents to provide explanations to five-year-old children. Beals (2001) found that on average explanatory talk made up approximately 15 percent of lower-income parents' talk during mealtimes, though this proportion ranged from 0 percent to 43 percent. Variability was also observed in the types of explanations that parents used. Beals' (1993) expanded definition identified explanations that are: (1) intentional (*why I am telling you to do something*), (2) causal (*why something happened*), (3) internal states (*why I want something*) (4) procedural (*how you do something*); (5) evidential (*how you know something*), (6)

consequential (*why these consequences are happening*). Unlike narrative talk, the proportion of parents' explanatory talk remains fairly constant across the preschool period, at least in lower-income families from the HSSLD study. Beals (2001) found explanatory talk to comprise 15 percent of parent input during meal time when children were three to five-years-old. Rowe (2012) found that parents from diverse socioeconomic backgrounds used between 10 and 13 explanatory utterances during a 90-minute interaction with two to four-year-old children. Explanatory talk not only gives children information about how the world works, but also exposes children to new vocabulary words and definitions. This type of explanatory talk occurs relatively infrequently compared to explanations about intentions or cause-and-effect events. For example, Beals (1993) found that definitional talk comprised only 6.7 percent of explanatory talk of low-income mothers and fathers. Weizman and Snow (2001) found that definitions of rare-words were even less frequent, making up less than one percent of parents' total talk to five-year-old children from lower-income families.

Explanatory talk predicts children's language and literacy outcomes even after controlling for other factors (e.g., DL at school from the teacher, maternal years of education) (Dickinson & Tabors, 2001). Parents' explanatory talk to 5-year-old children during mealtimes is predictive of children's receptive vocabulary in sixth and seventh grade (Weizman & Snow, 2001). Not surprisingly, the greater proportion of explanatory talk that children hear at age three, the better able they are to provide high quality definitions to known vocabulary words at age five (Beals, 2001). Further, the number of rare words parents' use with children relates to vocabulary size at age five and seven (Weizman & Snow, 2001). Rowe (2012) found that the number of explanations 42-

month-old children hear predicts their vocabulary size at kindergarten entry even after controlling for parent education level and quantity of parent talk.

Questions during decontextualized conversations. Social interactionist theories of language development describe the process of learning language as dependent on both input and *interaction.* Thus, for parent input to facilitate language learning, there must be an interactional component. One way to encourage interaction during parent-child conversation is through question-and-answer exchanges. While contextualized questions posed to younger children are beneficial for early vocabulary development, questions during DL are helpful for older children as their language abilities grow and become better able to participate in more complex conversations.

Most research involving questions during non-present talk has been examined during episodes of reminiscing about the past. During talk about the past, many parents scaffold children's participation by asking questions that prompt children to include orienting information (*What happened first? Where were you?*). By asking children for this information, parents highlight the important aspects of narratives for children and encourage children to participate verbally. Peterson and McCabe (1994) argue that questions of this sort allow children to internalize the aspects of a well-produced narrative (that is, those that are consistent with the language of formal schooling) and in turn spontaneously produce these features in their own narratives. Indeed, when parents use more of these open-ended probes, children tend to produce more complete, well-structured narratives themselves (McCabe & Peterson, 1983). Mothers' contextual questions (e.g., *Where did we go yesterday? When do you usually have swimming?)* during co-constructed narratives when children are 30 months predicts children's own

use of *when* and *where* statements in their independent narratives at 36-months (Peterson & McCabe, 1994). In addition, parents who were trained to use more open-ended prompts and wh-questions had children who told more detailed narratives with more spatial and temporal referents one year later (Peterson et al., 1999). Together, these studies illustrate how parents can model effective narrative structure with their children. By prompting children with orienting questions, parents signal to their children that these evaluative devices are important components of effective narratives.

Questions embedded in future discussions also facilitate the interactional component of DL conversation. During talk about the future with four-year-old children, mothers were found to use more than three times the number of questions than statements (Hudson, 2002). Instead of simply telling children what will happen in the future, many middle-income mothers pose hypothetical questions (*Would you like to have a birthday party at McDonalds?*) to children to encourage them to consider what might happen in the future (Hudson, 2002). Hudson (2006) found that middle-income mothers who asked more questions to their four-year-old children while discussing both a novel and familiar future event had children who provided more elaborations and temporal terms during these discussions. Indeed, there is much variation in how much parents use these probes with children, but these types of questions are argued to be helpful ways of encouraging children's participation in non-present conversation.

Questions are also prominent within explanatory talk. As described above, explanations often unfold over multiple speaker turns, and questions often serve as a way to bring other speakers into the conversation. There is a considerable work examining adults' explanatory utterances following children's questions (e.g., Callanan & Oakes,

1992; Chouinard, 2007; Frazier, Wellman, & Gelman, 2009; Tizard & Hughs, 1984).

These studies show that children ask as many as 25 explanation-seeking questions per

hour (Chouinard, 2007). Parents also ask children to explain or clarify a previous

statement (Callanan, Shrager, & Moore, 1995). For instance, Callanan and colleagues

(1995) describe instances when parents ask children *why* or *how* following a statement

from the child:

> Child (4;9): Well, the candle is bad for him [: the snowman].
> Parent: Why?
> Child: Because it can make him melt.

Callanan et al. (1995) note that many of these explanatory conversations involve back-

and-forth contributions from both the parent and child, often with the help of questions.

Thus, parents' questions can be thought of as a scaffolding mechanism aimed to bring

children into a conversation that is slightly more complex than one they might initiate on

their own. Considering questions when examining parent-child DL conversation will

provide a more complete picture of how DL can boost children's oral language skills by

encourage interaction between the speakers.

Why Do Parents Vary in their DL Input?

While the considerable variation in parental use of DL has been well documented

in the literature, there have been very few studies explicitly examining sources of this

variation. However, research focusing on variability in child-directed speech more

broadly can offer clues to why we see such variation, such as differences in

socioeconomic status and in parents' own knowledge and belief systems.

In regards to SES differences, lower SES parents, on average, talk less to children

(e.g., Hart & Risley, 1995), which could lead to a proportional decrease in DL as well.

Indeed, compared to children from lower SES families, children from higher SES families typically hear more speech, more sophisticated words (Weizman & Snow, 2001) and more complex sentences (Hoff 2003; Huttenlocher et al., 2010; Huttenlocher, Vasilyeva, Waterfall, Vevea, & Hedges, 2007), all of which positively predict language development (Pan et al., 2005; Rowe, 2012). Lower SES parents have also been shown to communicate in different ways with children. Rather than eliciting conversation, lower SES mothers more often use language to direct their child's behavior (Hart & Risley, 1995; Hoff, 2006), which lends itself to more contextualized topics and therefore less DL. In book reading contexts, middle-income mothers' book reading comments, on average, are comprised of more DL than lower-income mothers' comments (Baker et al., 2001).

These input differences can be partially attributed to differences in parental cognitions and belief systems. Heath's ethnographic work (1983) found that across SES groups parents held different beliefs about child rearing that led the middle class parents to produce narratives that were more linear and congruent with academic discourse compared to the lower-income groups. Rowe (2008) found that parents' knowledge of child development mediated the relation between SES and several measures of child-directed speech. Another study with middle-class parents found that parents who held incremental beliefs about the role of the environment on children's learning and achievement interacted with their children in more cognitively challenging ways (e.g., using more complex speech and asking more questions) (Donahue et al., 1997). Moorman and Pomerantz (2010) took this finding one step further by experimentally inducing parents to hold either entity or incremental mindsets, and found a positive association between incremental mindsets and constructive interactions with elementary

school aged children. Thus, parental beliefs and cognitions about the role of parent-child interaction in development likely account for some of the differences reviewed in the previous section. A fruitful area of research therefore would be to investigate whether the same characteristics associated with differences in parent-child interaction more broadly (e.g., knowledge of child development, beliefs about parent-child interactions) also relate specifically to DL use. Understanding this question would allow future intervention studies to target these characteristics as theory-driven way to enact change on DL use.

Why is DL Predictive of Language and Literacy Outcomes?

One reason why DL is considered a strong predictor of later language and literacy outcomes is because it is a mechanism that prepares children for language used in school settings. Researchers have argued that in industrialized societies (mostly Western) such as the United States, there exists an interactional style that is used during classroom instruction and communication that is distinct from colloquial, more casual conversations that consist of CL (Levine, Levine, Schnell-Anzola, Rowe, & Dexter, 2012). This form of communication, known as academic language, has been referred to by Cummins (1984) as 'context-reduced' discourse and by Valdés and Geoffrion-Vinci (1998) as 'academic register'. Academic language, on average, is considered to be lexically, pragmatically, and syntactically more complex than CL and necessary for any type of oral communication in the classroom (Snow, 1990; Snow & Uccelli, 2009). Of course, academic language is also made up of CL to some degree, yet the proportion of DL in academic language is much higher than other conversational settings found outside the classroom.

For example, formal instruction might consist of explicit instruction in providing formal definitions, which requires the definer to supply a superordinate and a relative clause (Snow et al., 1991). Specifically, if one were to define *hammer*, an appropriate formal definition might consist of, "*a hammer is a type of tool that is used to drive in a nail*". Here the individual provides a superordinate, *tool,* as well as a relative clause that explains the use of the hammer, "*that is used to drive in a nail*". Providing a formal definition necessarily involves language that cannot rely on help from the immediate context. In other words, simply saying that the hammer, "*goes like this*" while pretending to hammer a nail is not decontextualized, because the way in which the individual explains the use of a hammer relies on contextualized information (i.e., pretending to hammer a nail by using gesture). Another example of the prevalence of DL in classrooms involves instruction in content areas such as science. Many science lessons involve describing phenomena that are not physically present. For example, a science lesson might involve learning about invisible entities such as germs. The teacher may convey her point by providing a decontextualized explanation of what germs are, description of how germs spread, and how they cause sickness. Clearly, academic language poses several challenges to a young learner who has had little experience with it: it requires only language to convey a point, and even more, the language used is more lexically dense and grammatically complex than informal conversations about the here-and-now. Nonetheless, since many similarities exist between parent DL input and academic language, one can argue that children who have more experience with DL during preschool begin kindergarten prepared for the challenges of participating in academic language in the classroom.

Conclusions Based on Correlational Studies

Several important points can be drawn from the correlational studies that have examined the relation between early DL input and later oral language skills. First, these studies support the proposed mechanisms for why DL contributes to language and literacy outcomes. DL is much of the language of formal schooling (LeVine et al., 2012), and frequent experience with using DL prepares children for the types of discussions and interactions they will face in kindergarten and beyond with teachers and peers. Second, these studies all suggest that parents vary considerably in how much they use DL with their children, such that parents who use more DL have children with better language skills. Yet, an important limitation of these studies is that DL has been measured using correlational research designs. From these studies, much is known about what types of DL parents use with children of certain ages, and the conclusions that can be drawn for why DL is such an important experience during the preschool years. However, while these conclusions regarding links between DL and literacy outcomes are consistent, they are not causal. Specifically, while DL correlates with later language and literacy outcomes, the lack of controlled experimental designs introduces the possibility that other variables may also be influencing the strength of this relation (e.g., parents with children who have stronger language skills are the ones who are using more DL). Therefore, these studies only take the first step in understanding the benefits of DL.

Experimental designs, however, allow one to make a causal claim about the effect of one variable on another. While experimental designs on the manipulation of parent input have certain limitations, they offer a complementary perspective to the numerous observational studies on this topic. Therefore, the purpose of the remainder of the review

is to summarize the limited body of research that has explored whether adult input can be manipulated, and if so, whether manipulating caregiver input can affect child language and literacy outcomes. As literature in this area is limited, a broader review of language interventions in general will serve as empirical support that adult DL input to young children can indeed be manipulated. Chapter Three and Four will then describe the development and implementation of a small-scale training study based on this literature to increase parents' use of DL to four-year-old children.

Review of Experimental Studies

Manipulation of Parent Input and DL

While few studies have attempted to manipulate DL input specifically, several studies have attempted to manipulate other features of adult input. For example, lower-income mothers and caregivers are able to increase the quantity of their child-directed speech following several training sessions (Suskind et al., 2013; 2015). Suskind and colleagues (2013) observed that after an experimenter modeled specific ways to increase input quantity and provided feedback on the caregiver's baseline input quantity, these caregivers demonstrated a 31.6 percent increase in number of words addressed to children over a six-week period. A pilot study with low-income parents using the same protocol, described by Leffel and Suskind (2013) and Suskind and colleagues (2015), was found to increase mothers' total number of words, the number of conversational turns with their child, and the diversity of vocabulary words directed to children. The quantitative linguistic feedback model (i.e., reviewing baseline input data with the experimenter) was a likely mechanism of change, as it served as a measurable and tangible goal for increasing input.

Matthews et al. (2012) demonstrated that it was possible to increase mothers' use of gesture after a single laboratory training session. They taught mothers pointing techniques to encourage gaze-following in their nine to eleven month-old infants, after which parents were asked to implement at home for one month. After this period, it was demonstrated that trained mothers pointed more frequently and their infants displayed more gaze following when pointing to objects (e.g., pictures in a book or bubbles). The authors hypothesized that the training resulted in an increase in responsiveness to their infant's gaze or gestures, which is encouraging as these mothers participated in a single training session and then implemented these strategies for only 15 minutes per day over the course of a month.

Other studies show that it is possible to increase the quantity and quality of speech input during specific contexts such as shared book reading. While not a DL intervention explicitly, one common intervention protocol, dialogic reading (Whitehurst et al., 1988), is grounded in social interactionist theory, and improves children's language and literacy skills by encouraging adults to scaffold and support children's story understanding and participation. The language that is encouraged through dialogic reading is a combination of CL (e.g., labeling, summarizing) and DL (e.g., open-ended questions, expansions). Typically, dialogic reading training is conducted over two 30-minute sessions with a post-intervention follow-up session occurring approximately one month later. Dialogic reading interventions have successfully manipulated parents' input during book reading (see Mol et al., 2008 for review).

Dialogic reading interventions have also resulted in significant and lasting language and literacy gains for preschool-aged children, primarily in the domain of

vocabulary (Arnold, Lonigan, Whitehurst, & Epstein, 1994; Chow & McBride-Chang, 2003; Chow, McBride-Chang, Cheung, & Chow, 2008; Huebner, 2000; Lever & Senechal, 2011; Wasik & Bond, 2001; Whitehurst et al., 1988; Whitehurst et al., 1994; Zevenbergen, Whitehurst, & Zevenbergen, 2003). The seminal study of dialogic reading was conducted by Whitehurst and colleagues (1988), who demonstrated significant immediate and delayed (nine months) gains in expressive vocabulary and mean length of utterance (MLU) for two-year-old children whose parents participated in a one-month dialogic reading training intervention. Since then, many other studies including children ranging in age from two to four have supported these initial findings of gains in expressive vocabulary (Arnold et al., 1994; Huebner, 2000; Lonigan & Whitehurst, 1998; Wasik & Bond, 2001; Whitehurst et al., 1994), receptive vocabulary (Chow & McBride-Chang, 2003; Chow et al., 2008; Wasik & Bond, 2001), narrative (Lever & Senechal, 2011; Zevenbergen et al., 2003), and print knowledge (Chow & McBride-Chang, 2003). Mol and colleagues' (2008) meta-analysis reported that dialogic reading interventions explain approximately eight percent of the variance in children's kindergarten expressive language skills. Dialogic reading research, however, has not delineated between the effectiveness of the contextualized and decontextualized strategies taught and is limited to book-reading contexts only. Thus it is difficult to draw any conclusions about the effectiveness of DL specifically and generalize these interactions to other common conversational contexts. Further, Whitehurst and colleagues' (1988) initial study was intended for two-year-old children who are slightly younger than the age at which DL has shown to be beneficial for children's development (Rowe, 2012).

Far fewer studies have focused explicitly on manipulating parent DL, yet the few that have report promising findings. Following relatively short training periods, parents from varying backgrounds are able to increase the amount of DL they use with preschool-aged children (Boland, Haden, & Ornstein, 2003; Morgan & Goldstein, 2004; Peterson et al., 1999; Reese & Newcombe, 2007; Reese et al., 2010). DL interventions with parents have focused mainly on increasing narrative talk. For example, the degree to which parents can reminisce about past events is found to be susceptible to change through training (Peterson et al., 1999; Reese & Newcombe, 2007; Reese et al., 2010). Studies show that parents are able to increase the number of evaluative devices used while telling narratives, such as the use of open-ended questions, expansions (e.g., *tell me more about that*), back-channeling (i.e., clarification request such as *huh?*) following a one-time training period (Boland et al., 2003; Peterson et al., 1999) or over three training sessions (Reese & Newcombe, 2007). Reese and Newcombe (2007) also found that all mothers benefited from training, regardless of how much they used these evaluative devices before training or their educational background.

Children's language skills also benefit from manipulations of parent DL. Interventions that focus explicitly on DL have been shown to produce more positive child language outcomes than other intervention designs such as dialogic reading (Reese et al., 2010). Reese and colleagues (2010) conducted a direct comparison between dialogic reading and elaborative reminiscing and found that children whose parents received elaborative reminiscing training, on average, use more evaluative devices when recounting past events (i.e., number of descriptors, internal state mentions, temporal and

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causal terms, character introductions in their narratives), compared to children whose parents received dialogic reading training (Reese et al., 2010).

Some research indicates that the benefits of a parent DL intervention for children's language skills do not manifest themselves immediately after the intervention, but rather significantly after the end of the intervention period. For example, one year after the intervention but not immediately following the intervention, children whose parents received an elaborative reminiscing intervention included more spatial and temporal information in their narratives as compared to children of untrained parents (Peterson et al., 1999). This suggests that it may take time for children's oral language skills to benefit from parent DL input; the authors hypothesized that this effect was due to children's narrative development requiring sustained practice over time, with repeated DL exposure from parents.

Shared book reading is also a context during which parents have been trained to increase DL input. Morgan and Goldstein (2004) trained lower-income parents to incorporate decontextualized comments such as text-to-life utterances, explanations, and interpretations into shared book reading interactions with their 4-year-old children. Following weekly feedback from experimenters, most parents were able to incorporate the three strategies at least once into book reading interactions, yet there was considerable variability in the success of individual parents. Parents, on average, showed the greatest increases in text-to-life utterances, perhaps because this type of talk is the easiest for children to engage in (Morgan & Goldstein, 2004). In addition to parents' increases in DL use, children also demonstrated increases in DL use that were proportionally similar to parents' gains. Parents, however, were less successful in using all three strategies

during the same book reading session after the training concluded; most parents

sacrificed the use of one strategy for the use of another (Morgan & Goldstein, 2004).

The second study that used book reading as a context to increase parent DL input

used a school-mediated intervention program. Like Morgan and Goldstein (2004),

Jordan, Snow, and Porsche (2000) recruited educators to train parents to use different

contextualized and decontextualized reading strategies during book reading (i.e.,

introducing vocabulary, discussing storybook narratives, telling personal narratives, and

discussing information books). In addition to parent training, teachers provided parents

with weekly structured activities to promote the targeted strategy. While parents' use of

the strategies was not explicitly measured from pre to post-test as was the case with

Morgan and Goldstein's (2004) study, results indicated that parental report of their

participation in intervention activities predicted the amount that children gained from pre

to post-test. Additionally, children who began the intervention period with lower

language skills gained more throughout the intervention than children who started with

higher skills, most likely because the higher skilled children were already experiencing

some degree of DL strategy use from parents and thus had less room to grow. Jordan and

colleagues (2000) noted that the effect size (d=0.64) of children's gains in language was

striking considering they came from families who were educated, above the poverty

level, and relatively low-risk. This suggests that even well-educated parents have room to

improve their conversational skills with their preschool children to prepare them for the

demands of formal schooling.

Manipulation of Teacher DL

Parents are not the only adults who are able to increase DL use following experimental interventions. In fact, more research has manipulated teachers' use of DL. Interventions with pre-kindergarten teachers have lasted as short as a two-day professional development seminar (Flowers, Girolametto, Weitzman, & Greenberg, 2007; Girolametto, Weitzman, LeFebvre, & Greenberg, 2007) to as long as one school year (Domitrovich, Gest, Gill, Bierman, Welsh, & Jones, 2008). In other studies, teachers received the same number of training hours (e.g., 18 total hours), but spaced out over time (Girolametto, Weitzman, & Greenberg, 2012; Ruston & Schwanenflugel, 2010). Most DL training components of teacher-based interventions include strategies for small and large-group settings, with fewer studies training teachers to implement DL strategies with individual students (Ruston & Schwanenflugel, 2010; van Kleeck et al., 2006).

In addition to differences in the training design, studies have targeted different DL strategies. For example, some programs are structured such that teachers are trained to incorporate one DL strategy at a time (Domitrovich et al., 2008), or incorporate particular rare vocabulary words into daily conversations (Ruston & Schwanenflugel, 2010). Other studies provide general strategies such as asking open-ended questions or expanding children's utterances that can be adapted to multiple teaching contexts (Domitrovich et al., 2008; Girolametto et al., 2007; Ruston & Schwanenflugel, 2010; van Kleeck et al., 2006). Most of the literature indicates that training teachers, like parents, results in significant and measurable gains in their use of DL in the classroom. Teachers that receive training in DL strategies have been shown to more frequently relate text to children's lives or experiences (Flowers et al., 2007; Girolametto et al., 2007), and one study showed that teachers doubled their use of DL comments such as inferences,

predictions, and justifications following intervention (Girolametto et al., 2012). Whereas teachers in a control condition showed a slight decrease in their DL comments, intervention group teachers increased their DL comments from 2.5 per minute to 4.2 per minute during daily large-group book reading (Giralametto et al., 2012). Other studies indicate that teachers are more able to increase their DL use in certain contexts over others; for example, interventions have resulted in teachers increasing their DL utterances during mealtime and free play (Domitrovich et al., 2008) or craft time (Girolametto et al., 2012), but not during book reading.

Similar to interventions with parents, teacher DL interventions have resulted in mostly positive gains for children's developing oral language skills. Some studies show increases in children's ability to use DL (Flower et al., 2007; Girolametto et al., 2007; Girolametto et al., 2012; van Kleek, Vander Woude, & Hammett, 2006;) while fewer studies show increases in specific oral language outcome measures (Domitrovich et al., 2008; Ruston & Schwanenflugel, 2010). Ruston and Schwanenflugel (2010), for instance, reported that children's expressive but not receptive vocabulary skills improved following an intensive DL conversation intervention, and children with the lowest initial skills benefited the most from the intervention.

Other teacher interventions have not been as successful. For example, an attempt to train teachers in more effective teaching practices, one being to increase their DL prompts (e.g., asking children to talk about a previously read story or eliciting definitions about unfamiliar words), did not result in an increase in DL input over the course of the intervention (Powell, Diamond, Burchinal, & Koehler, 2010). However, the intervention was successful at increasing teachers' code-related talk (e.g., comments about words,

print, and letters) and general classroom management skills. Landry and colleagues (2009) were not able to show significant change in teacher DL, whereas teachers' print and letter knowledge instruction increased significantly from pre to post-test compared to teachers who did not attend a professional development seminar that targeted general effective teacher practices.

Conclusions from Experimental Studies

While this body of research is quite limited, the available literature suggests that it is indeed possible to manipulate parents' DL input through relatively short term, cost-effective interventions. The relative ease with which researchers are able to manipulate parent and teacher DL suggests that these interventions may lead to substantial and lasting change in children's oral language skills, and in turn, potentially influence children's later reading comprehension. The experimental literature also suggests, however, that not all intervention strategies are equally successful. Interventions that targeted both code-related (e.g., print knowledge) and DL input typically show more success with code-related input, which may be because increasing DL needs more targeted training than was provided by the interventions.

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Literature Gaps

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While much has been learned about DL from the existing correlational and experimental literature, there is still much more to gain from studying DL input. Perhaps the area in which research is most needed is in more parent training/intervention studies, as most available studies that have explored parent DL have been correlational or with teachers. Parents spend a great deal of time with children, have a vested interest in promoting their language development (Reese et al., 2010), and share a great deal of

background knowledge (i.e., memories about past events) which can serve as a springboard to conversations that include DL. Further, interventions that involve parents have shown to be much more effective than attempting to directly improve children's language skills (Bus, Van Ijzendorn, & Pelligrini, 2005; Peterson et al., 1999; Scarborough & Dobrich, 1994). The study described Chapter Three and Four of the dissertation will address this literature gap by examining whether a training program increases parents' DL relative to parents who do not receive the training program.

Second, while the literature is growing in the area of experimental training studies, it remains an open question of *why* parents and teachers show increases in DL following training. In other words, what is the mechanism of change in parent behavior? One potential explanation highlighted above is that the training serves to modify parent's knowledge about how they view their role in helping their child develop language. Social-psychological interventions with adolescent students offer support for this mechanism, as reinforcing incremental mindsets among these students lead to striking improvements in academic achievement outcomes (e.g., Walton & Yeager, 2011). In a similar vein, educating parents about *why* DL is important for children's language development conveys the message that parents' style of communication significantly impacts their child's language growth. Focusing on parent knowledge as the mechanism of change is found to be a viable way to increase the quantity of parents' input to children (Suskind et al., 2013; Suskind et al., 2015), as parents' knowledge of child development relates to their use of language-advancing communicative input (Rowe, 2008).

Finally, a consistent gap in the literature of both parent and teacher training studies is a better understanding of who benefits most from the intervention. This is

important to understand in order to scale up training studies or target specific populations of parents, teachers, or children. One possibility is that parents' beliefs about the source of intelligence or knowledge of child language may lead parents to converse differently with children, although this prediction has not been explicitly tested. Drawing from Dweck's theory of ability mindsets (Dweck & Bempechat, 1983; Dweck & Leggett, 1988), parents' who hold incremental beliefs about the source of intelligence may hold stronger beliefs that their input influences their child's language development. Thus, these parents might benefit more from the training in the sense that they believe the information they learned will have a direct benefit to their child's language development.

Similarly, not all children may benefit equally from a parent DL training program. While children on average are developmentally ready to use DL by age four, there still exists wide variability in children's oral language skills. Some studies find that children with initially low ability levels tended to benefit most from language interventions compared to children with higher initial skills (Jordan et al., 2000; Ruston and Schwanenflugel, 2010; Whitehurst et al., 1994), because these children may simply have more room to grow in oral language and early literacy skills. Other studies find that children who are more linguistically advanced benefit more from DL input (Reese & Cox, 1999; Hindman et al., 2014), perhaps because they possess more advanced discourse and vocabulary skills to participate in these types of conversations. However, the question of who will benefit most from DL interventions is still unknown, but a fruitful area for future research.

General Conclusions

Literacy is a necessary skill to function in today's society yet the rate of reading difficulties among children in the United States remains remarkably high. In 2013, sixty-five percent of American fourth graders were identified as reading below grade level (National Center for Education, 2013), constituting a growing concern facing the United States' education system (Snow, Burns, & Griffin, 1998). By middle-school, students are expected to not only comprehend text, but write essays and reports based on their understanding of the text, making any earlier difficulties from elementary school compound with time (Snow & Uccelli, 2009). Indeed, Snow (2010) argues that proficiency with academic language facilitates learning not only in reading, but also in the content areas of science and social studies.

Encouraging DL use with children from an early age offers a solution to downsides associated with post-hoc remediation efforts. Observational data suggests that even small amounts of DL when children are as young as three uniquely predict literacy skills into middle school (Dickinson & Tabors, 2001). Furthermore, DL interventions have been shown to be effective in improving children's literacy skills and do not involve expensive materials since the intervention itself revolves around enhancing existing conversation. Thus, a viable solution to prevent rather than remediate language and literacy delays is to promote early quality language environments before kindergarten that include, among other things, opportunities for DL.

Chapter 3: Method

The primary goal of the study was to investigate whether a parent training program increases the frequency of DL input to preschool children relative to a group of untrained parents. A second goal was to examine whether increasing parent DL input leads to an increase in children's use of DL, and an improvement in their oral language skills relative to a group of children whose parents did not receive training. The final, exploratory goal was to determine if training was more beneficial for some parents and children than others. To address these goals, a longitudinal design was used that included a measure of DL at six time points, two in the lab and four collected in the participants' homes. Children were also assessed on a battery of oral language assessments and parents completed a series of surveys prior to and following parent training. This chapter describes the sample, procedure, measures, and analyses utilized to address these goals.

Participants

Participating families were recruited through direct mailings to families of four-year-old children, magazine and social media advertisements, and through preschool centers in the greater Boston and Cambridge area. Parents who expressed interest were contacted by phone or email for an initial eligibility screener. During this conversation, study procedures were described as a study to better understand the benefits of family mealtimes. If parents were interested and met all inclusion criteria described below, a visit to the laboratory was scheduled. Prior to data collection, it was predicted that the majority of sampling would occur within preschool and childcare centers where families may potentially talk to each other about the training. However, this was not the case, as the majority of families who participated were recruited through mailings and online

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parenting groups. Families enrolled in the study did not know each other and contamination of condition procedures was not an issue.

Inclusion criteria for participation in the study was based on parent report and was as follows: (a) the child was between 4;0 and 5;0 at study enrollment; (b) the parent reported that English was spoken at least 50 percent of the time in the home; (c) there was no known child developmental or language delay. Four-year-olds were sampled because research has shown that children begin talking about the non-present between two and three years of age, and that parents vary quite a bit in the amount of DL they use with children at 42 months (Rowe, 2012). Thus, four-year-old children in this sample should have some experience with this these types of interactions, but still have room to increase their DL use.

31 families enrolled in the present study. Out of the 31 initial families, 1 family dropped out of the study. Participating children (14 boys, 16 girls) were on average 4;5 (53 months; SD = 3.1; Range = 48 - 58). 19 percent of the children did not have siblings. Of the children that did have siblings, 84 percent of children were first-born (i.e., had at least one younger sibling) while the remaining children had at least one older sibling. Mothers or fathers were eligible to participate as long as the same parent participated at both lab visits and all mealtime recordings. Of the participating parents, 28 were mothers and 2 were fathers. Parents reported that including themselves and the target child, the average number of individuals living in their household was 3.8 (SD = 0.56, range = 3.0 to 5.0). Ninety-one percent of the participating parents self-identified as Caucasian. The remaining parents identified as Asian or Pacific Islander (n = 1) and African American (n

= 1). The majority of parents (96%) reported completing at least a four-year college degree.

Procedure

Visit 1: Baseline Measures and Training

Each family visited the lab for an initial 60- to 75-minute visit. Consent was first obtained from parents by explaining the study procedures, reviewing the consent form, and answering any questions. This initial consent process did not include any information specific to the training condition. Following consent, parents and children were invited to participate in a ten-minute videotaped interaction. Parents were asked to have a snack with their child (provided by the researchers) and interact as they typically would at home. If other siblings were present, they were also included in this interaction. The interaction occurred in a child-friendly testing room without any experimenters present. Videotapes of the interaction were later coded and used as a baseline measure of parent and child DL. It was thus important to not provide information about the training protocol before this baseline to ensure that a true baseline measure of input was obtained. Following this baseline interaction, an oral language assessment battery was administered to children (described below) while the parent completed a series of questionnaires. After completion of the questionnaires, a slip of paper was randomly selected from a box to determine whether the parent would be assigned to the training or control condition. The condition-specific (i.e., training and control) procedures were then implemented. The following two sections describe procedures for parents assigned to the training and control condition, respectively.

Training condition. After completing the questionnaires, parents assigned to the training condition received DL training. The training lasted approximately 20 minutes and involved a brief introduction to DL by the researcher, a video describing DL, and a follow up conversation between the parent and experimenter. To introduce the topic, parents were told that one specific benefit of mealtimes are the conversations that occur, especially those that prepare children for the types of language used in the kindergarten classroom. One way for parents to prepare children for kindergarten is to use a type of language called decontextualized talk[1] because it gives children experience with the interactions that are common in the classroom. It was explained that this type of talk is especially helpful for children of this age and the goal is to educate families about these conversations and why they are important. Because DL is an excellent way to get children *ready* for kindergarten, an approach, R.E.A.D.Y. was developed for the current study (**R**ecall past events with your child; **E**xplain unfamiliar concepts and words; **A**sk questions; **D**iscuss future events; **Y**ou can make a difference in your child's future academic success: DL is a great way to prepare your child for kindergarten). Each aspect of the approach is derived from previous research that has demonstrated the types of DL that most influence children's oral language development and most likely to occur during mealtimes (Dickinson & Tabors, 2001).

Parents then watched a 15-minute training video developed specifically for this study on a laptop computer. First, the concept of DL was introduced in parent-friendly language and information was provided for why DL helps grow children's language skills. Second, parents were introduced to the concept of READY, which provided them

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[1] Parents were introduced to decontextualized talk as *academic language* or *academic talk,* as these terms were thought to be more accessible to parents during pilot testing, but for consistency the term decontextualized language is still used throughout this section.

an easy acronym for remembering different DL conversations. In order, each letter of the

R.E.A.D.Y acronym was introduced and examples and modeling were provided.

Specifically, clips of parents and children using each type of DL were shown as examples

(e.g., for **R.**, recounting past events was introduced, and then a clip of a parent recounting

a past event with her child was shown). The final portion of the video involved providing

information regarding the importance of DL (i.e., the **Y**ou in R.E.A.D.Y.). It was

hypothesized this would increase parent knowledge about the link between DL input and

children's oral language development and reinforce the belief that their DL played an

important role in this process. A copy of the video, and a booklet summarizing the main

points of the video was given to each parent to keep. Appendix A includes an example of

these materials.

Following the video, the parent and researcher had a short semi-structured

conversation regarding the main points of the video. The parent was asked if they had any

questions and then asked to summarize the video in their own words. This conversation

typically lasted between 5 and 10 minutes. Training condition parents were then

encouraged to use R.E.A.D.Y. conversations as much as possible over the next month.

Book reading, mealtimes, playtime, car rides, and storytelling, were highlighted via the

video and pamphlet as contexts that are conducive to using DL. Parents were informed

that mealtime conversations are a particularly good time to talk about decontextualized

topics (e.g., Aukrust & Snow, 1998; Beals, 2001), and as such, they were asked to record

one mealtime conversation per week for the next four weeks. Parents were also asked to

complete a daily diary (described under Implementation Phase).

Control condition. Parents in the control condition did not receive any information about DL and continued to think the purpose of the study was to better understand why mealtimes in general are beneficial for children's development. Control condition families were also asked to audio-record a weekly meal and fill out a daily diary that asked specific questions about the climate of one mealtime each day (e.g., was the TV on?). These parents were also given an audio recording device to record four mealtime conversations using the same procedures as the training condition parents.

Implementation Phase

During the month following the first lab visit, parents audio recorded one mealtime per week, filled out the daily diary, and for parents in the training condition, were asked to use DL as much as possible with their children. All parents were instructed to turn on the recording device when both the target parent and child were seated and to allow the device to record for at least 10 minutes. All family members were allowed to participate in the conversation as long as the target parent and child were present. This decision was made in order to make the meals as representative to their everyday interactions as possible. Parents could choose to record breakfast, lunch, dinner, or a snack and that the recorded meal could differ from week to week. This gave parents flexibility and encouraged parents to complete four recordings rather than skip a week if they became busy or forgot on the scheduled recording day or time. Parents also submitted a form that listed each family member that was present during the mealtime to help identify participants during the transcription phase.

There were different versions of the daily diary for each condition. Appendix B includes an example daily diary for the training and control group. For the training

condition, parents were given a blank calendar with spaces to provide examples of each type of READY conversation. They were instructed to fill out this calendar daily and told this will help them think about DL during the days they did not record a mealtime. Parents were also told that these conversations do not have to occur at mealtimes, as the video described other contexts (e.g., book reading, play time) that are also conducive to talk about the non-present. For example, if the parent and child talked about the child's upcoming doctors visit on a car ride, the parent would briefly note this under the D (*discuss future events)* section. The daily commitment for filling out the diary was less than two minutes. This diary served as a way to keep parents engaged in the training between the periods of experimenter contact. The control condition parents filled out a daily diary of similar length in which they recorded information about the perceived climate of their mealtime (e.g., *how long did the meal last?*; *what did you child eat*"). The control diary served as a way to ensure that the study commitment was as similar as possible across conditions.

Parents in both groups were contacted once a week during the implementation phase (approximately five days after their first visit and weekly thereafter). The method of contact was based on preference (phone, email, text). Every parent except one (who preferred email) asked to be contacted by text message. For parents in the DL condition this contact served (1) to encourage them to use READY talk, (2) to remind them to record their mealtime conversations, and (3) ask if they have any questions about READY talk or recording. For parents in the control condition, this contact was a simple reminder to record their mealtime conversations and address any recording-related issues.

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A standardized script was used to ensure that parents received approximately the same amount and type of contact.

Visit 2: Follow-up

Families returned to the lab approximately one month after their initial visit. The mean length between visits was 31.5 days (SD = 5.1; Range = 27 - 51), and this length did not significantly differ between conditions. The procedure from the first visit was repeated, except there was no training session. Thus for the follow-up visit, parents and children were videotaped having a snack, the children's language skills were re-assessed (described below), and parents completed the same set of questionnaires. Parents were then debriefed and those in the control condition were given a copy of the training video and pamphlet.

<h2 style="text-align:center">Coding and Measures of DL</h2>

The recordings taken at the baseline visit, four home mealtimes, and the follow-up visit were transcribed at the level of the utterance using the CHAT conventions of the Child Language Data Exchange System (CHILDES; MacWhinney, 2000). A total of 173 parent-child interactions out of a possible corpus of 180 were transcribed and coded. As participants were asked to only record a ten-minute segment of their meal, longer mealtime recordings were truncated at ten minutes in order to transcribe and process the data in a timely manner. Trained research assistants transcribed all of the interactions. A second research assistant then verified each transcript. Either the transcriber or verifier was blind to condition assignment. Discrepancies between transcribers were resolved by conversation or by consulting a third trained transcriber.

The goal of DL coding was to capture the broad definitions of DL from previous work while maintaining a coding system that would be sensitive enough to detect the hypothesized training effect on parent and child DL. Therefore, a distinction was made between DL talk that was discussed in the video, *Trained DL*, versus talk that was decontextualized but not included in the READY curriculum, *Untrained DL*. Codes were entered at the level of the utterance directly onto each transcript. The CLAN program from CHILDES (MacWhinney, 2000) was then used to automatically count coded utterances separately by category. Two individuals were trained to code the transcripts based on the categories described below. One coder was blind to condition assignment. The two coders initially coded 15 percent of the transcripts separately. These transcripts were then compared to establish reliability. On these transcripts, percent agreement averaged 80% with a mean Cohen's Kappa of 0.73. The condition-blind coder then coded the remaining transcripts. After 75 percent of the transcripts were coded, a second reliability check was performed, which reached similar levels of reliability.

Trained DL

Trained DL talk was defined as utterances that fell into the R.E.A.D.Y talk categories covered in the video. The target parent and child's utterances[2] that involve topics removed from the here-and-now were marked and categorized based on aspects of R.E.A.D.Y: (1) past events, (2) explanations and definitions, and (3) future events (Table 1). Coding categories were not mutually exclusive, however, very few utterances received multiple codes. To determine whether an utterance should be categorized into a *Trained DL* category, the coder decided whether the specific utterance encouraged the

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[2] Utterances from all speakers were transcribed, but only utterances produced by the target child and target parent were coded

speaker to step out of his/her present self (e.g., future talk such as discussing an

upcoming vacation) or to use language in a way to convey an abstract phenomenon or

concept (e.g., explaining why a storm caused the electricity to go out). These rules fell in

line with previous work that has operationalized decontextualized talk in these ways (e.g.,

Cummins, 1983; Snow, 1983).

Table 1 Trained DL Coding Scheme

Category and Definition	Example
PAST EVENTS: Any utterance that refers to a specific event that occurred in the past, prior to the present context.	• You guys were sledding so fast. • You gave that shirt to me last Fathers' Day.
EXPLANATIONS + DEFINITIONS: Talk that requests or makes logical connections between objects, events, concepts, or conclusions.	• Today daddy's not going to work because it's a holiday. • She can't have chocolate because she's a little baby.
FUTURE EVENTS: Any utterance that refers to a future event that will or might occur after the present context.	• I wonder who the parent helper's gonna be today at school. • You're gonna turn five in May of this year.
QUESTIONS: Open-ended questions that occur within the above three categories.	• And then what did we do with the stuffed animals that everyone brought? • Why you gonna have lunch with Candace?

As the training video focused on the role of open-ended questions in promoting

parent-child conversation (**A** – ask questions), all open-ended questions that occurred

during these decontextualized conversations were also marked. Only questions that

occurred during Trained DL conversations were considered (e.g., *what happened last*

week at the zoo? but not "*what type of vegetable is that?*" when referring to food in front

of the child). Previous research has found that open-ended questions framed with *wh-*

(who, what, when where, why, how) encourage children to respond with longer

utterances and therefore are thought to encourage back-and-forth conversation (Rowe,

Leech, & Cabrera, 2016). As such, only these questions were considered, as they should complement other forms of non-present talk by increasing the number of turns between speakers.

Based on this coding, the following measures were created for analysis. First, the number of past, future, and explanatory utterances produced by each speaker was computed. Second, these three variables were summed together to create a Trained DL composite score (DL). Third, the number of Trained DL utterances that were open-ended questions was also counted. As these utterances were already counted in the Trained DL composite score, they were considered as a stand-alone category (e.g., *what did we do last weekend?* was given both a past event code and a question code).

Untrained DL

Additional categories of DL were identified based on previous research and examination of the transcripts, termed *Untrained DL*. These categories were made up of talk about topics beyond the here-and-now, but were not covered in the training video. This category included talk about scripts and routines (e.g., *what do we normally do on Tuesdays?*), connections between the present and non-present (e.g., *that picture looks like the one we have at home),* and other non-present talk (e.g., pretend talk, talk about letters/sounds, generics, and hypothetical scenarios).

Conversion to Proportion Measures

Trained DL and *Untrained DL* were computed for each of the six measurement occasions (visit 1, 4 mealtimes, visit 2). To control for differences in the number of total utterances produced by speakers, the number of decontextualized utterances was divided by the total number of utterances to create proportion measures (PROPDL). Proportions

offer the benefit of equating speakers' utterances such that one can compare proportions both within speakers (e.g., meal 1 to meal 4) as well as across speakers. Further, one assumption of the growth curve modeling used in Chapter Four is that the dependent variable taken at one time point is measured in the same way and directly comparable to measurements taken at other time points within the same individual. Proportions, however, are bounded by 0 and 1 and thus can often be positively skewed and in violation of normality assumptions. Appendix D presents preliminary analyses of parent and child DL distributions and discusses this limitation in more detail.

Measures of Child Oral Language

Children's oral language skills were measured during a 10-minute assessment completed by the experimenter at the first and second laboratory visits. Appendix C describes each measure in more detail. These measures have been shown by previous research to be correlated with adult DL input and thus are most likely to be influenced by a DL training program. Children were introduced to the assessment as a series of word and picture games. The same tasks were conducted at both lab visits, but the stimuli were different between the visits. The order of tasks was the same for each child at each visit: narrative production, formal definitions, and future-oriented thinking[3]. The following section summarizes the procedures and coding for each assessment in the battery.

Narrative Production

Pilot testing indicated that a narrative task involving a wordless picture book (as

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[3] We also examined children's theory of mind (ToM) performance, as we hypothesized that thinking about others' beliefs and thoughts should be affected by conversations about the non-present that require the speaker/listener to step out of her present self. We, however, saw no significant associations between ToM and any type of parent or child talk and thus do not discuss these findings.

described in the dissertation proposal) proved too demanding for children under age five. Thus, children's narrative skill was assessed using a procedure adapted from Demir et al. (2015). The child and the experimenter viewed a German children's cartoon lasting one minute about a mouse named Maus and an elephant named Ellie. The two selected stories (visit 1 and visit 2) contained a series of causally connected events (initiating event, attempts to achieve a goal, an outcome, and a resolution). The procedure was introduced as a storytelling game by telling the child, "*We are going to play a storytelling game. Here is a cartoon about a mouse named Maus and an elephant named Ellie. Watch the cartoon carefully because after it is finished it will be your turn to tell me the story.*" The experimenter and child watched the cartoon together and when it ended, the experimenter prompted the child's narrative retelling by saying "*tell me everything you can about that story.*" After the child retold the story, the experimenter posed three questions taken from Demir et al. (2015), which included two literal questions (e.g., "*how did Maus fool Ellie?*") and one inferential question (e.g., "*what would be a good title for this story?*"). The experimenter read each question and three potential answers and the child chose the answer he/she thought was best. The children's productive narratives and answers to the questions were videotaped, and the productive narratives were later transcribed and coded using the CHAT conventions (see below). This task lasted approximately 5 minutes.

Coding. Four indices of narrative quality were calculated from the narrative task, following procedures of previous research (Demir et al., 2015). The CLAN program automatically calculated (1) the number of utterances and (2) number of different words (i.e., word types) children used while recounting the cartoon to the experimenter. Third, each narrative was given a score for narrative structure. This scheme was take from

Demir and colleagues' 2015 study, which based their coding on the work of Stein (1988). The goal of the structure score was to give more credit to narratives that were causally connected, and mentioned the character's goal, means to achieve the goal, and outcome. To code the narratives, two research assistants read each narrative transcript and assigned a score ranging from 0 to 6. Disagreements were resolved in discussion between the two coders. Finally, the last measure of narrative quality was children's answers the comprehension questions. The number of correct answers was tallied (possible scores ranged from 0 to 3).

These four narrative measures were then composited using principal components analysis (PCA) to produce a narrative quality score. This was done for two reasons. The first reason was pragmatic in order to reduce the number of child narrative measures. A second more theoretical reason involved research on the components of high quality narratives (Stein, 1988). The goal was to capture, in one measure, multiple facets of high quality narratives including length (number of utterances), vocabulary diversity (word types), structural quality (0-6 measure of structure), and comprehension (number of correctly answered questions). These variables were thus combined into a composite for both visits using PCA, which weighted the four components positively and explained 50 percent of the variance in the original measures.

Formal Definitional Skill

The formal definitions task (Snow, Cancini, Gonzalez, Shriberg, 1989) involved eliciting definitions of known vocabulary words from children. The experimenter told the child participants, "*when I read a word to you, I want you to tell me what it means*". Children's definitions to ten nouns were then video recorded for later coding. Identical

stimuli to past studies were drawn from nouns on the Wechsler Intelligence Scale for Children (WISC) (Dickinson & Snow, 1987; Kurland & Snow, 1997; Snow et al., 1989). As children were expected to know the meaning of each word, the quality of the definition was the focus of coding. This task lasted between 2 and 3 minutes.

Coding. Coding of definitions was adapted from previous studies and focused on identifying properties of formal definitions (Davidson, Kline & Snow, 1986; Kurland & Snow, 1997; Snow et al., 1991). Exact coding procedures from previous research were not used given the young and restricted age range of the current sample of children. However, the idea of formal definitions was operationalized similarly to past work. A formal is defined by the inclusion of a superordinate to identify category membership, and a relative clause to describe attributes of the word (Davidson et al., 1986; Snow, 1990). For example, an exemplary formal definition of the word *chair* is, "a chair is a type of furniture (SUPERORDINATE), that I sit on when I watch TV (RELATIVE CLAUSE). Formal definition structure is emphasized in classroom discourse; thus the rationale for this approach is that more DL conversation should encourage children to adopt this definitional structure.

Definitions were given a score for the presence and quality of the superordinate and relative clause. For superordinates, a score of 0 was given if no superordinate was provided. A score of 1 was given if a general superordinate was provided (e.g., a knife is something for cutting). A score of 2 was given if a specific, constraining superordinate was provided (e.g., a knife is a utensil for cutting). To score relative clause usage, scores of zero were given if no relative clause was provided, a score of 1 was given if the child provided a descriptor or use for the word (e.g., a chair …so you can sit), and a score of 2

was given if the child used the proper relative clause syntax (e.g., a chair is something that you sit on). Scores for superordinate and relative clause usage were tallied to produce a total formal definition score. Children could receive score between 0 and 4 for each word. The experimenter asked the child to define 10 words, thus making the total possible score range between 0 and 40.

Future-Orienting Thinking

Children's future-orienting thinking and reasoning was measured using the mental time travel task (Atance & Metzoff, 2005). In this task, children were presented with a picture of an outdoor scene and told the following, "*let's pretend we are going to walk through this _____* (desert, snowy mountain, forest with a stream)". Next, three pictures of objects were revealed to the child while the experimenter said, "*which of these three things do you need to bring with you?*" The pictures were then labeled and children produced a forced-choice response by either verbally choosing or pointing to one of the objects. Next, the experimenter asked the child, "*and why do you need to bring _____?*". Children were shown two pictures at each visit and their verbal explanations for their choice were videotaped for later scoring. This task lasted approximately 3 minutes.

Coding. Coding for this task was based on Atance & Metzoff (2005). Two scores were given for each of the two stimuli and summed to create a total score. First, children's forced choice responses were scored based on which object they chose to bring (correct choice = 1; incorrect choice = 0). Second, children's explanations for which object they chose to bring were coded for the presence of future-oriented language and any mention of an internal state. Future oriented language included words such as: *going to; will; could; would; can; when; might; maybe; in case;* and *if.* State terms included

words that explicitly referred to internal feelings; for example, *hungry, thirsty, hurt*, or *cold*. Using these guidelines, explanations were coded on a 0 to 2 continuum with 0 representing no future oriented language *(it's hot outside)*, 1 represented future oriented language (*I would bring water because it might be hot)*, and 2 representing a future oriented state (*I would bring water because I might get thirsty)*. Note the difference between a score of 1 and 2 is the mention of an internal state, *thirsty*. As children produced forced-choice and explanations for two pictures at each visit, the total possible score ranged from 0 to 8.

Parental Questionnaires

Questionnaires were administered at both visits. All parents regardless of condition assignment completed the same set of questionnaires at both visits. The questionnaires measured (1) parents' knowledge of children's language development, (2) parents' general beliefs and theories of the source of intelligence; (3) parent report of DL input to their child, (4) parent report of other activities in the home, and (5) mealtime climate.

Parent Knowledge

Thirty Million Words Questionnaire (SPEAK; Suskind et al., 2015) was developed to assess parent knowledge about children's language development following an intervention aimed at increasing parents' quantity of talk to two-year-old children. The SPEAK includes 30 statements about child language development and parents indicate the degree to which they agree with each statement. The response scale is a Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Items assess parents' beliefs about how

their language input influences children's development (e.g., *how many words 3-year-olds know can predict how well they might do in kindergarten*) and knowledge of child language developmental milestones (e.g., *by the age of 3, children answer questions just as quickly as adults*). Responses to this questionnaire were shown to significantly change following a language intervention focused on increasing the quantity of parent input (Suskind et al., 2013, 2015). The total possible score was 44.

Parental Beliefs

Theories of Intelligence (Dweck, 1999) was developed to assess individual's lay theories about the source of intelligence. Broadly this was used to assess parents' general beliefs about the degree to which intelligence is fixed or malleable. This questionnaire contains four items that represent an entity theory of intelligence (e.g., *Your intelligence is something about you that you can't change very much*), and four items that represent an incremental theory of intelligence (e.g., *You can always greatly change how intelligent you are*). Incremental items were reverse coded to produce a mean theory of intelligence, where lower scores represent a pure incremental theory and higher scores represent a pure entity theory. In other studies (e.g., Blackwell, Trzesniewski, & Dweck, 2007) this measure has shown internal reliability of 0.78 (M = 4.45, SD = 0.97).

Parental Report of Home Activities

Parents completed an adapted version of the *Home Literacy and Numeracy Questionnaire* (LeFevre, Polyzoi, Skwarchuk, Fast, and Sowinski, 2010). Parents indicated the frequency with which they engaged in 23 home activities using a 6-point rating scale (0 = "*never*" to 5 = "*daily*"). 15 of the items were drawn from the original

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survey (e.g., *how often have you encouraged your child to memorize math facts?*; *how often have you played a computer game together?*), and the remaining 8 items were developed for the present study to specifically measure parents' decontextualized talk with their child across multiple settings (e.g., *how often have you asked your child to predict what will happen next while reading a book?*; *how often have you told your child about a past experience of yours?*). The responses from the eight decontextualized language items were summed and averaged to create a composite tapping parents' self-reported use of decontextualized talk with their child ($\alpha = .74$). The remaining 15 items from the original survey were averaged to create a composite representing engagement in other activities.

Mealtime Climate

The *About Your Child's Mealtime* questionnaire (AYCM-R; Davies, Ackerman, Davies, Vannatta, & Noll, 2007) is a parent report measure of the frequency of children's eating behaviors, family interactions during mealtimes, and the perceived mealtime climate (e.g., *the family looks forward to meals together*). AYCM-R served to divert attention from the language development items and was consistent with the control condition procedures. The AYCM –R consists of 25 Likert scale items rated from 1 (*never*) to 5 (*almost always*) and has been shown to have good internal consistency across parents of different races, ethnicities, and educational backgrounds (Davies et al., 2007).

Chapter Four: Results

This chapter first presents analyses evaluating the effectiveness of the DL training program. First, descriptive and preliminary analyses for demographic variables, baseline parent and child decontextualized language use, and baseline parent questionnaire responses are presented. Preliminary analyses were conducted on this data to examine potential differences between conditions at baseline. Next, the three substantive research questions were addressed to examine training effects on parent DL, training effects on child DL, and analyses to identify predictors of DL change among training group participants.

Descriptive Statistics and Preliminary Analyses

Demographic Variables

Parents completed a demographic questionnaire at the first laboratory visit and descriptive results for the entire sample are presented in Table 2. Independent sample *t*-tests were used to examine whether parents in the two conditions differed significantly on any demographic variables. There were no significant differences between conditions, yet there was a marginal difference between the average number of family members in the training group (M = 3.67, SD = 0.72) versus the control group (M = 4.06; SD = 0.25), t = 2.01, $p = 0.06$. Other than this one difference, the composition of the two groups was reasonably equated for demographic variables identified as related to parental input (e.g., gender, parent education, and child age). As such, we did not include these variables in the analyses presented in the remaining sections.

Table 2 Counts and means (SD) of demographic variables at baseline

	Total Sample	Control	Training	*p*-value
Number of first-borns	26	12	14	0.19
Number of girls	16	8	8	1.00
Number of mothers	29	14	15	0.48
Child age (in months)	52.81 (3.11)	52.94 (3.41)	52.67 (2.87)	0.81
Parent education	4.65 (0.66)	4.50 (0.82)	4.80 (0.41)	0.21
Family size (in persons)	3.87 (0.56)	4.06 (0.25)	3.67 (0.72)	0.06~
Hours in Child Care	19.56 (16.3)	16.33 (14.72)	23.58 (17.97)	0.26

~*p* < 0.10

As described in Chapter Three, parents in both conditions documented information about each recorded mealtime including the type of meal and the family members present. This information is displayed in Table 3 for the 27 families who returned the meal log (90 percent of the total sample). In both conditions, the majority of families chose to record their dinner conversations. Note that none of these descriptive statistics differed significantly by condition.

Table 3 Descriptive statistics from mealtime recording logs

	Total Sample	Control	Training
Type of Meal			
Breakfast	20%	21%	18%
Lunch	19%	19%	18%
Dinner	58%	56%	60%
Snack	3%	4%	4%
# Family Members Present	3.49 (0.88)[1]	3.48 (0.67)	3.50 (0.90)

[1]Standard errors in parentheses

Parent and Child Decontextualized Language at Baseline

Prior to group assignment, substantial variability was observed in parents' use of DL (Table 4). On average, parents produced 19.79 decontextualized utterances at baseline (SD = 18.37; Range = 0 – 56) out of a total of 126.5 utterances (SD = 29.5; Range = 77 – 195). DL therefore comprised approximately 16 percent of parents' total

utterances (SD = 0.15; Range = 0.00 -- 0.48)[4]. On average, children used fewer DL

utterances than parents (M = 6.76; SD = 9.45; Range = 0 – 46). However, children also

used fewer total utterances resulting in similar proportion values. On average, DL made

up 13 percent of children's talk during the baseline interaction (SD = 0.14; Range = .00 –

0.67).

Variation was also observed in what types of DL parents and children used at

baseline (Table 4). In this sample, parents talked more about the past (M = 0.08; SD =

0.10) than the future (M = 0.04; SD = 0.08), t(29) = 1.95, p = 0.06. Explanatory talk (M =

0.04; SD = 0.05) was also less frequent that talk about the past, t(29) = 2.10, p = 0.04.

Parents' open-ended questions during these DL conversations were relatively infrequent.

On average, the number of open-ended question utterances during DL conversations was

1.7 percent of their total utterances (SD = 0.03), with a range from 0 to 8 percent.

Children also used more past talk (M = 0.07; SD = 0.10) than future (M = 0.02; SD =

0.05) or explanatory talk (M = 0.03; SD = 0.05), p's < 0.01. Children also asked very few

questions during these decontextualized conversations (M = 0.002; SD = 0.007).

Table 4 Proportion of parent and child DL types at baseline

| | Parent | | Child | |
	Mean (SD)	Range	Mean (SD)	Range
Past	0.08 (0.10)	0 – 0.38	0.07 (0.10)	0 – 0.43
Future	0.04 (0.08)	0 – 0.39	0.02 (0.05)	0 – 0.21
Explanations	0.03 (0.05)	0 – 0.23	0.03 (0.05)	0 – 0.21
Questions	0.02 (0.03)	0 – 0.09	0.002 (0.007)	0 – 0.03
Composite (PROPDL)	0.16 (0.14)	0 – 0.48	0.13 (0.15)	0 – 0.67

There were no significant differences between conditions in parents' proportion of

utterances that were DL at baseline, p's > 0.25. Similarly, there were no significant

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[4] One interaction at visit 1 was lost due to equipment failure resulting in a sample of n=29

differences in children's DL use by condition at baseline, p's > 0.15. Thus, at the start of the study before random assignment occurred, the average amount of DL use among parents and children was similar across conditions.

Parental Questionnaire Measures

Visit 1. Descriptive statistics of parental report of (1) decontextualized language, (2) other home activities, (3) theories of intelligence, and (4) knowledge of language were computed for the sample at baseline. Descriptive results for the entire sample are presented in Table 5. At baseline, parents on average reported using DL conversations (e.g., *explaining why something happened to your child)* roughly two to four times per week (M = 3.36; SD = 0.62). Other activities (e.g., *asking your child to measure ingredients while cooking)* were reported to occur less frequently, approximately 1 to 3 times per month (M = 1.39; SD = 0.36). Parents' theories of intelligence were roughly at the mid-point between a pure entity and pure incremental (i.e., growth mindset) theory (M = 2.29; SD = 0.84). Finally, scores on the SPEAK questionnaire to measure knowledge of language development were positively skewed, suggesting that this sample had substantial knowledge of this domain (M = 36.02; SD = 2.75). Independent-sample t-tests confirmed no significant differences on any of these measures between parents assigned to the training and control conditions at baseline (Table 5).

We also examined correlations between questionnaire measures and parent and child DL talk at visit 1. The only significant and positive correlation that emerged was between parents' theories of intelligence and their use of past talk and decontextualized questions, as measured by both the number of utterances and as a proportion of total utterances. Specifically, parents who endorsed a greater growth mindset used more past

talk ($r = 0.44$, $p = 0.01$) and asked more decontextualized questions ($r = 0.32$, $p = 0.09$)

with their children at baseline. No significant association was observed between parents'

mindsets and their future or explanatory talk, p's > 0.05. Further, parents who endorsed

greater growth mindsets had children who used more past talk, $r = 0.47$, $p = 0.01$. We

hypothesized that parents' knowledge of child development should relate to DL use, but

neither parent nor child DL was related to scores on the SPEAK.

Visit 2. Parents completed the same set of questionnaires at visit 2 (Table 5). To

determine whether there was a difference by condition in responses between the first and

second visit, repeated measures ANOVAs were conducted with time as the within-subject

variable and condition as the between-subject variable on the four questionnaire

measures. Only parental report of DL yielded a significant time by condition interaction,

such that parents in the training group (M = 3.50; SD = 0.52) reported using more DL

conversations with their children compared to parents in the control group (M = 3.08; SD

= 0.79) at visit 2. Parents who received the training did not report an increase in other

home activities, nor did they change their knowledge of child development (as measured

by the SPEAK), or their theories of intelligence.

Table 5 Mean (SD) responses to parent questionnaires at visit 1 and visit 2

	Total	Control	Training	*p*-value
Visit 1				
Parent report of DL	3.36 (0.62)	3.34 (0.68)	3.40 (0.58)	0.79
Parent report of other activities	1.39 (0.36)	1.40 (0.38)	1.38 (0.35)	0.84
Theories of intelligence[a]	2.29 (0.84)	2.34 (0.92)	2.14 (0.74)	0.35
Knowledge of child language[b]	36.02 (2.75)	36.14 (2.91)	35.90 (2.67)	0.81
Visit 2				
Parent report of DL	3.26 (0.69)	3.08 (0.79)	3.50 (0.52)	0.08
Parent report of other activities	1.39 (0.39)	1.33 (0.46)	1.46 (0.29)	0.37
Theories of intelligence	2.50 (0.87)	2.68 (0.94)	2.24 (0.76)	0.17
Knowledge of child language	36.5 (2.40)	36.5 (2.31)	36.46 (2.58)	0.94

[a] Lower scores indicate greater endorsement of incremental or growth mindset

Research Question 1

Does a parent training program lead to a boost in parent DL? This section addresses whether parents who received DL training increased their DL talk relative to parents assigned to the control condition. This question was examined by directly measuring parents' decontextualized language across the six time points and examining any differences in DL between groups. To examine DL during the naturalistic interactions, linear mixed effects models were built to measure change over time in DL use. The following sections describe exploratory data analysis, the model building process, and inferences from the final, best fitting model.

Exploratory Data Analysis

As shown in Table 6, parents varied widely in their use of DL at all points during the study, which is consistent with past research. Note that all DL values are reported in proportions (PROPDL) in order to control for differences in talkativeness, the number of speakers present at the interaction, and the length of the interaction. For example, while one parent used no DL during an entire meal, 95% of another parent's total utterances were comprised of DL. The majority of the sample fell somewhere in between these two extremes (M = 0.31; SD = 0.21).

Table 6 Means, SDs, and ranges of parent PROPDL at each time point by condition

	Total Sample			Control			Training		
	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range
Visit 1	0.16	0.15	0 - 0.48	0.14	0.16	0.00 - 0.48	0.17	0.14	0.02 - 0.39
Meal 1	0.33	0.21	0 - 0.89	0.24	0.21	0.08 - 0.89	0.41	0.17	0.00 - 0.70
Meal 2	0.41	0.18	0 - 0.78	0.31	0.15	0.02 - 0.60	0.52	0.15	0.21 - 0.78
Meal 3	0.33	0.22	0 - 0.95	0.21	0.19	0.00 - 0.68	0.45	0.18	0.17 - 0.95
Meal 4	0.36	0.19	0 - 0.87	0.21	0.13	0.00 - 0.45	0.49	0.15	0.30 - 0.87
Visit 2	0.28	0.22	0 - 0.86	0.19	0.13	0.00 - 0.44	0.37	0.26	0.04 - 0.86

Model Building

Linear mixed effects models were used to assess change over time in parents'
PROPDL and to examine whether this change differed between parents assigned to the
training or control condition. As a starting point, a "saturated" model (i.e., a most
complex model with all possible predictors) based on theory and exploratory data
analysis was constructed. Theoretically, it was reasonable to expect a non-linear
trajectory of change in PROPDL, and Figure 2 illustrates two quadratic curves that could
approximate the data. After initially increasing their PROPDL, parents assigned to the
training condition could either fall back to levels similar to the control condition by the
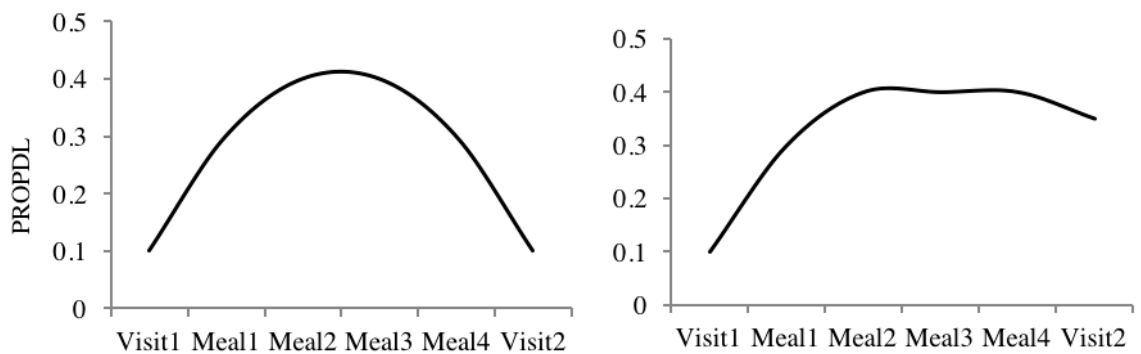end of the study (Figure 2a, left panel), or maintain their gains (Figure 2b, right panel).

Figure 2a-2b Hypothetical scenarios of change in training group

Indeed, visual inspection of the observed data (Figure 3) suggests that PROPDL followed
a curvilinear trajectory over time and approached the hypothesized scenario displayed in
Figure 2b. We then built a model that incorporated both a linear and quadratic measure of
time[5]. The chosen model is specified in Equation (1).

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[5] Note that a cubic term may also have fit the data, however this term was not included because there was
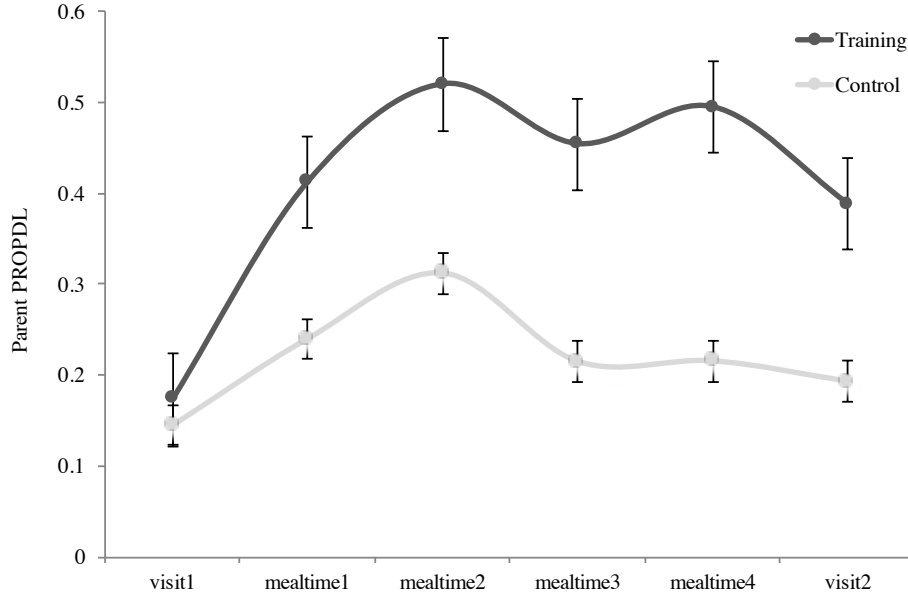no theoretical rationale to explain this trajectory of change.

Figure 3 Observed parent DL at each time-point

$$PROPDL_{ti} = \pi_{0i} + \pi_{1i}(t_{ti} - 2.5) + \pi_{2i}(t_{ti} - 2.5)^2 + e_{ti} \qquad e_{ti} \sim N(0, \sigma_t^2) \tag{1}$$

$$\begin{aligned} \pi_{0i} &= \gamma_{00} + \gamma_{01}(TRAINING_i) + u_{0i} \\ \pi_{1i} &= \gamma_{10} + \gamma_{11}(TRAINING_i) + u_{1i} \\ \pi_{2i} &= \gamma_{20} + \gamma_{21}(TRAINING_i) + u_{2i} \end{aligned} \qquad \boldsymbol{u}_i \sim N(0, \mathbf{T}) \tag{2}$$

In Equation (1), $PROPDL_{ti}$ represents the proportion of total utterances categorized as DL

for parent i at time t. Since the goal of this model was to detect differences between the

control and training conditions, time was centered at the middle of the study (2.5) so that

the interpretation of the intercept would reflect the PROPDL at the middle of the study. If

time was not centered, parameter estimates would estimate PROPDL at baseline, where a

difference between conditions was not predicted[6]. Thus π_{0i} represents the intercept, or the

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[6] We chose to center time at the midpoint, because we were interested in group differences observed during the more naturalistic context of mealtimes. However, it is possible that this choice exaggerated the estimated training boost because the comparison was made at the time in which group differences were most pronounced. To ensure this was not the case, we centered time at mealtime 4 and performed the same DL comparison by condition. Results revealed a very similar training boost as the model presented in the main text such that training group parents (M = 0.45; SE = 0.05) used significantly more DL than control group parents (M = 0.18; SE = 0.03), t(28) = 5.35, $p < 0.001$.

predicted use of PROPDL at the middle of the study (time 2.5). The two parameters, π_{1i} and π_{2i} represent the linear and quadratic rate of change at the middle of the study for parent i. In this analysis, time t was measured on an interval scale (0 = visit 1 to 5 = visit 2)[7].

In Equation (2), or the person-level of the model, $\pi_{0i}, \pi_{1i,} \pi_{2i}$ represent PROPDL at time 2.5, the linear effect at time 2.5, and the quadratic effect of how fast the function is accelerating/decelerating at time 2.5, respectively. Importantly, these estimates are for the control condition. Variation between conditions in the individual growth parameters (π_{0i}, $\pi_{1i,} \pi_{2i}$) was modeled by adding a dummy variable *TRAINING* (control = 0 and training = 1). These parameters ($\gamma_{01}, \gamma_{11}, \gamma_{21}$) are interpreted to be the difference between the training and control conditions such that positive values indicate greater PROPDL values for the training condition compared to the control condition.

Effects of training on the slope (γ_{11}) and quadratic terms (γ_{21}) were also modeled because exploratory data analysis suggested PROPDL trajectories were different by group. Positive parameter estimates of the slope (γ_{11}) would indicate an increase in PROPDL over time. A positive quadratic term (γ_{21}) would suggest that rate of change accelerated over time, whereas a negative quadratic term would indicate deceleration in the rate of change. Lastly, no additional covariates (e.g., parental education, parent or child gender) were added to level-2 of the model[8], because of random assignment, the

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[7] Parents were instructed to record the actual date the recording was made. This variable, number of days since baseline, was considered as a possible metric of time but not used because of missing data. there was no theoretical rationale to predict a PROPDL would differentially change in days versus visits. Therefore, the interval metric of time 0 – 5 was chosen for all models in the dissertation.

[8] In order to justify the decision to build models with no demographic covariates, we added family size into our saturated model to ensure it was not affecting the results. The parameter itself was not significant, and results remained the same when this variable was included in the model.

fact that parents did not vary in any covariate measured at baseline, and the small sample size.

Before testing this mean structure, the stochastic components of the model were specified. One strength of multi-level modeling is that the variation explained in the model can be partitioned into two parts: within-subject variation (e_{ij} level 1) and between-subject variation ($\mathbf{u}_i$ level 2). Our goal was to specify these components such that they would explain the most amount of variability in the data in the most parsimonious way. Each level-2 parameter was initially allowed to vary, as represented in Equation (2) as $\mathbf{u}_i$. However, a likelihood-ratio test suggested that a simpler model with only a randomly varying intercept (u_{0i}) fit the data no worse than the model with randomly varying intercept, linear, and quadratic effects $\chi^2(2) = 8.2, p > 0.05^9$. Thus at level-2, we fixed the random linear and quadratic effects and adopted a random-intercept model, which was assumed to be normally distributed with a mean of 0 and a standard deviation of τ^2.

At level-1, we focused on the error term e_{ij} in Equation (1), which describes the residual error of parent i's PROPDL not predicted by time. In classical regression models, it is assumed that residual variances do not covary. However, this is an inappropriate assumption for repeated measures designs because multiple observations of PROPDL were taken from the same parent and likely covary. While it is still assumed that residuals should be independent between individuals, it is expected that within-person residuals will be heteroscedastic and correlated across measurement occasions. Thus, alternative covariance patterns were explored to take into account these features.

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[9] Note that the variance component being tested is bounded by zero and thus does not have an exact chi-squared distribution. Fitzmaurice, Ware, & Laird (2004) recommend alleviating this concern by conducting a more stringent hypothesis test, in this case $\alpha = 0.01$.

Five covariance patterns were examined because the current dataset has commonly

spaced measurements (i.e., time was measured from 0 to 5), the number of repeated

measurements was the same for each parent (PROPDL was measured six times total), and

there is some missing data[10]. Table 7 displays the fit statistics for each covariance pattern

explored. While exploratory analyses suggested some auto-correlation between

measurements, AIC fit statistics revealed that an auto-regressive AR(1) structure did not

fit the data better over the simple covariance structure. Further, the simple pattern has one

fewer parameters than the AR(1) pattern, making this the more parsimonious choice in

addition to the better-fitting choice. Thus, the simple pattern was chosen which is

assumed to be normally distributed with a mean of 0 and a standard deviation of σ^2.

Table 7 Comparison of covariance patterns for parent DL

Covariance Pattern	Covariance Parameters	AIC[1]	-2LLN[1]
Simple	2	-78.1	-82.1
Auto-regressive (1)	3	-77.1	-83.1
Compound Symmetry	3	-76.2	-82.1
Toeplitz	3	-76.9	-82.9
Unstructured	22	-62.3	-106.3

[1] With negative fit statistics, larger absolute values indicate better fit to data

The last step in the model fitting process was to determine whether the mean

structure of the model was the most parsimonious model that still fit the data. To do this,

we compared this model to two simpler models. First, a reduced, more parsimonious

model that did not contain the quadratic term (π_{2i}) was compared to the saturated model

using a likelihood ratio test. Fit statistics from the saturated model suggested a

significantly better fit to the data compared to the simpler model without this term, thus

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[10] Seven interactions were missing due to a recorder malfunction (n=3), the parent forgot to record (n=2), the recording was less than 2 minutes (n=1), or the target parent was not present (n=1). We argue the data is missing at random and thus ignorable because the probability of missingness likely did not depend on condition or PROPDL use. Because of the small sample and the fact that missing data constituted less than four percent of the total corpus, we chose not to impute the missing values for mixed effect models.

we rejected this simpler, more parsimonious model, $\chi^2(2) = 22.1, p < .001$. Second, we built another reduced model without the γ_{11} and γ_{21} parameters from level 2 (the interaction between linear time and training, and quadratic time and training). A likelihood ratio test determined that the more complex, saturated model fit the data better than a model that eliminated these terms $\chi^2(1) = 9.0, p < .05$. Appendix D describes model diagnostics for the final model.

Model Inferences

Inferences from the mean structure of the model were obtained using Maximum Likelihood (ML) estimation. As shown in Table 8, the intercept term π_{0i} (M = 0.26; SE = 0.03) is interpreted to be PROPDL for parents in the control group at study mid-point, t(28) = 7.86, p <.001. The training parameter γ_{01} (M = 0.25; SE = 0.05) reflects the difference between the two conditions at the study mid-point, t(28) = 5.17, p <.001. In other words, while estimated PROPDL use for the control condition at the midpoint of the study averaged 26% of their total utterances, PROPDL for parents in the training condition exceeded 51% of their total utterances (as determined by summing the parameter estimate for the control group and the intercept effect) by the middle of the study, d = 1.95. Figure 4 plots the estimates based on this model for each group over time. Thus, to answer the first research question, parents assigned to the training group significantly boosted their DL relative to untrained parents.
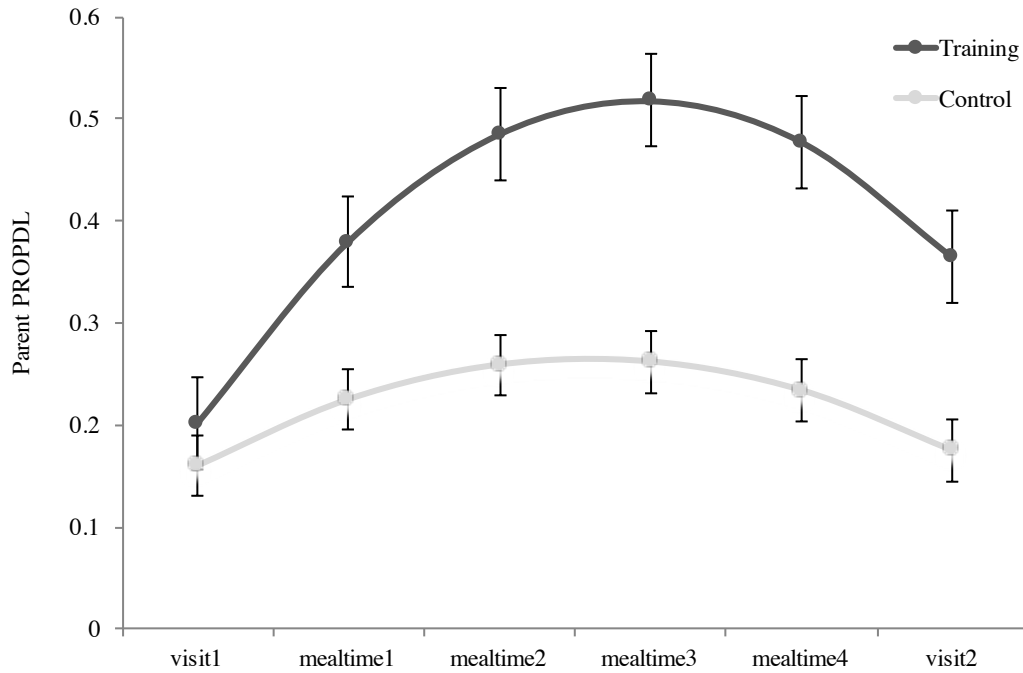
Figure 4 Predicted (estimated) values of parent PROPDL by condition at each time point

Table 8 Parameter estimates (SE) of fixed and random effects for parent PROPDL

Parent PROPDL		
FIXED EFFECTS		
Parameter	Statistical Notation	Estimate
Intercept (centered	π_{0i}	0.26***
		(0.03)
Linear Time	π_{1i}	0.003
		(0.01)
Quadratic Time	π_{2i}	-0.01*
		(0.007)
Training	γ_{01}	0.25***
		(0.05)
Training * Linear	γ_{11}	0.03*
		(0.02)
Training * Quadratic	γ_{21}	-0.02*
		(0.01)
RANDOM EFFECTS		
Level 1:		
Within-person	σ^2	0.03***
		(0.003)
Level 2:		
Intercept – Centered	τ^2	
		0.004*
		(0.002)
GOODNESS OF FIT AIC		-108.2

The data were examined in two additional ways to further support the significant findings above. First, the difference in PROPDL between the two conditions was estimated for each of the six time points by adding the training effect parameter γ_{01} to control group's intercept parameter π_{0i}. This difference can be termed the "training effect", and is considered to be the boost the training condition received for participating in the training program[11]. This effect is important to consider across multiple time points in intervention and training research because it indicates whether the training effect was sustained or whether it dissipated over time. Figure 5 presents this effect for each time point and suggests that average PROPDL was significantly different between the groups at each time point except for the baseline. Critically, Figure 5 also demonstrates that the effect was sustained over time.
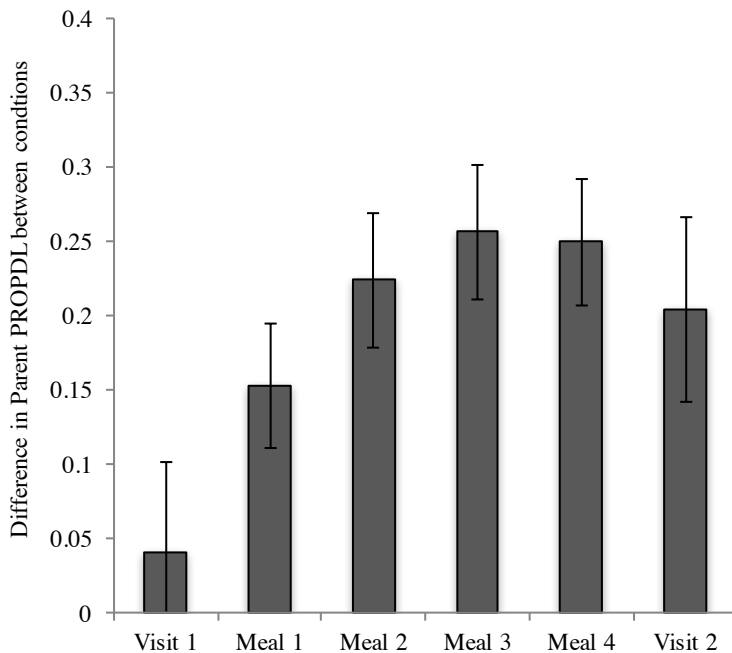

Figure 5 Training effect (difference in PROPDL between conditions) at each time point

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[11] To produce these values, SAS Proc Mixed *estimate* statements were used to determine the difference in PROPDL between conditions. Then a one-sample t test was conducted with the null hypothesis (H_0) = 0 to determine whether the difference in PROPDL conditions was significantly different from 0.

Second, change in PROPDL was examined from visit 1 to visit 2. This analysis was conducted because it eliminated any potential differences in context between the lab and the home mealtime recordings and provided a more controlled way to examine condition differences. A 2 x 2 mixed factorial ANOVA with time (visit 1, visit 2) as the within-subjects factor and condition (control, training) as the between-subjects factor was conducted[12]. This analysis revealed a significant condition by time interaction, $F(1, 29) = 3.91$, $p = 0.05$. As illustrated in Figure 6, no condition differences were observed at visit 1, but training group PROPDL (M =0.37; SD = 0.25) was significantly greater than control group PROPDL (M = 0.19; SD = 0.13) at visit 2.
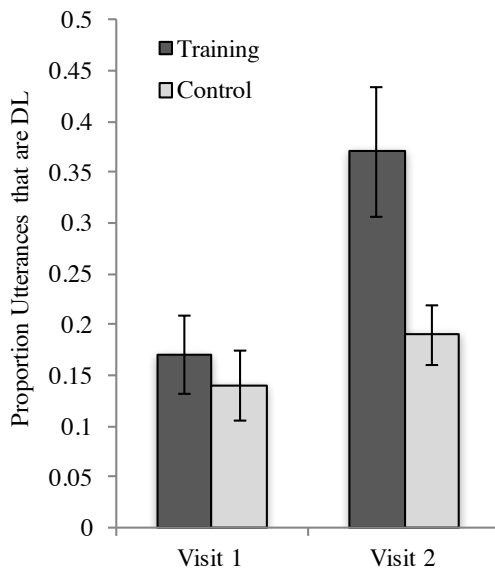

Figure 6 *Condition difference in parent PROPDL between first and second lab visit*

Additional Analyses of each DL Type

The above analysis examines a composite score of PROPDL; additional analyses were conducted to determine if every type of trained DL conversation (past, future, explanations, questions) demonstrated the same condition effect. The same model

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[12] Three data points (1 at the first visit, and 2 at the second visit) were missing, so the group mean was imputed for these missing values in order to retain the complete sample for this analysis

building strategy was used to construct four additional mixed effect models with past talk, future talk, explanatory talk, and open-ended questions as the dependent variables of interest. The mean structure and stochastic structure from Model 1 remained the same. Model estimates are reported in Appendix E and Figure 7 displays plots of the predicted proportion of past, future, explanations, and question utterances, respectively. Compared to the other types of DL, parents' talk about the past and decontextualized questions appeared to benefit most from the training. Fixed effect estimates demonstrated that the proportion of past talk at study midpoint was significantly greater for training group parents ($M = 0.28$; $SE = 0.04$) than control group parents ($M = 0.14$; $SE = 0.03$), $t(28) = 4.05$, $p < .001$. Additionally, training group parents ($M = 0.03$; $SE = 0.01$) asked significantly more open-ended questions during these DL conversations compared to control parents ($M = 0.02$; $SE = 0.007$), $t(28) = 2.92$, $p < 0.01$. This comparison between conditions was in the same direction for future and explanatory talk, but only reached marginal statistical significance, p's < 0.10.
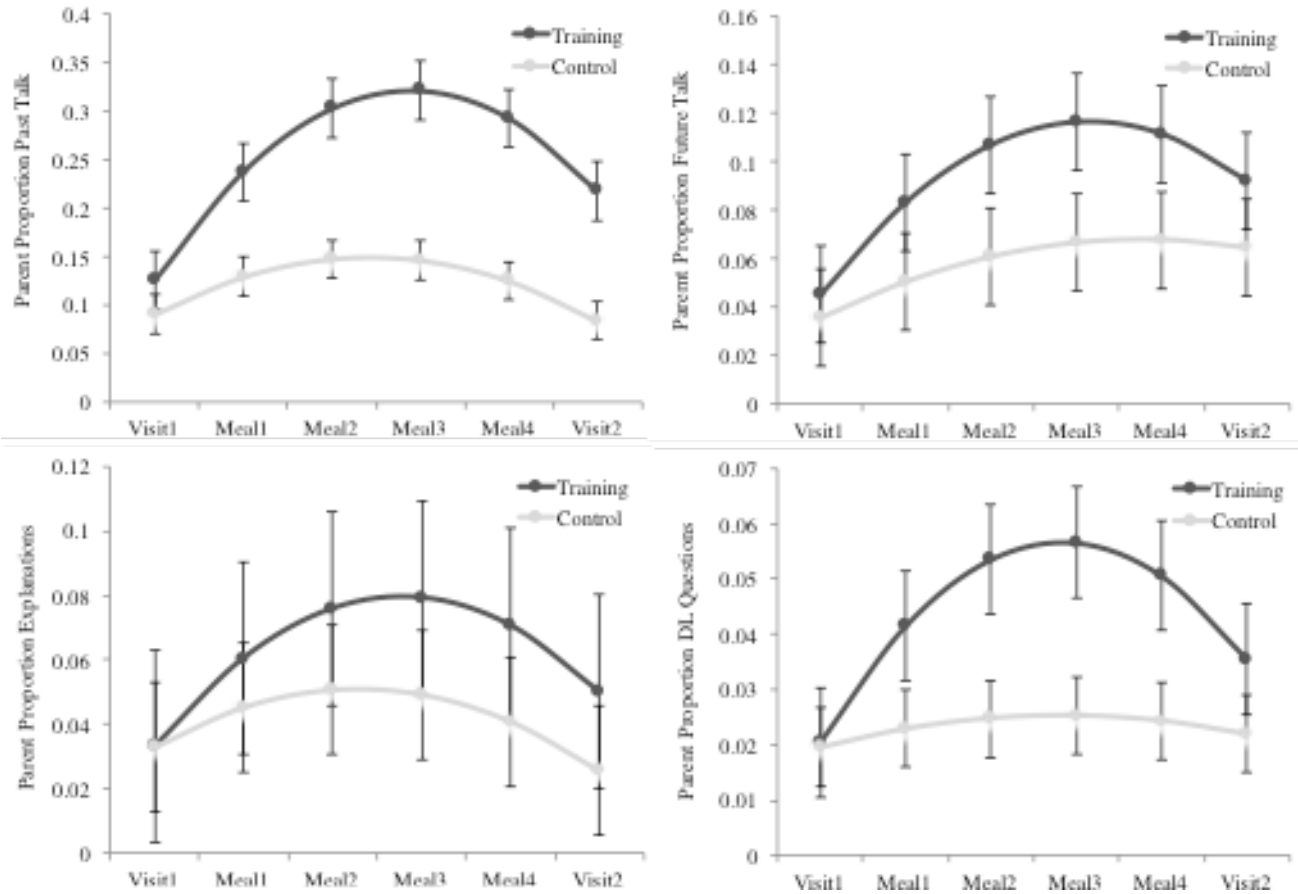
Figure 7 Predicted (estimated) values of past talk (top left), future talk (top right), explanatory talk (bottom left), and decontextualized questions (bottom right)

Analyses of Untrained DL and Contextualized Talk

The final two analyses using parent data focused on the extent to which the training program generalized to other decontextualized input features beyond those covered in the training video. This was accomplished by examining condition differences in *Untrained DL* as well as parents' contextualized utterances (estimates reported in Appendix E). As described in Chapter Three, utterances about the non-present that were not covered in the training video were categorized into an *Untrained DL* category. This included talk about scripts and routines, generic or hypothetical situations, and connections between the present and past/future. If untrained PROPDL also shows a training effect, then it can be

argued that parents understood the concept of DL and carried it over to other conversations about the non-present.
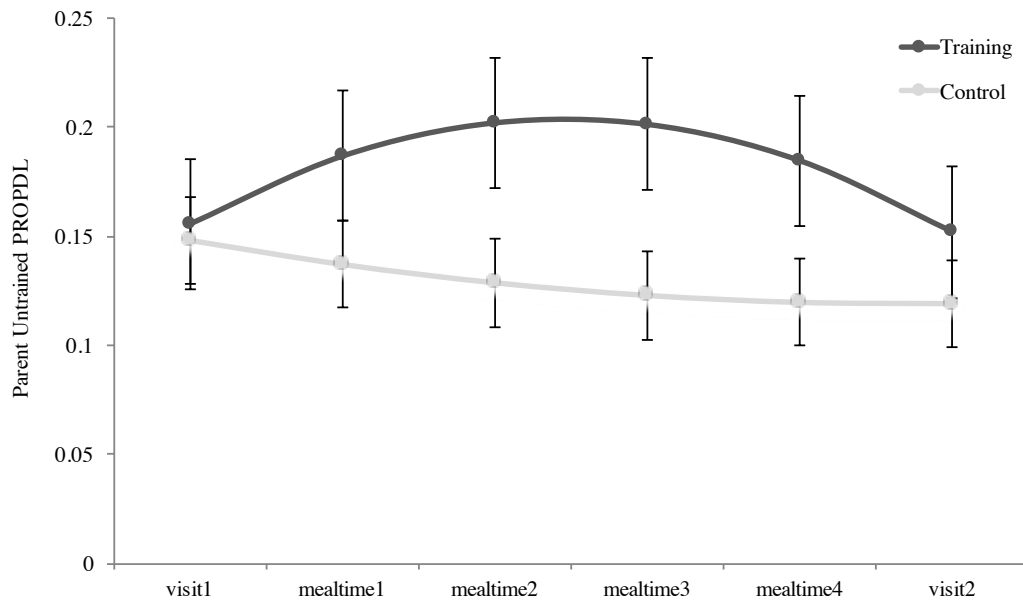

Figure 8 Proportion parent utterances that were untrained DL

Results supported this prediction. At baseline, control (M = 0.13; SE = 0.03) and training parents (M = 0.13; SE = 0.03) used similar amounts of untrained DL, t(28) = 0.03, p = 0.97. However, by the study midpoint, training group parents' untrained DL (M = 0.20; SE = 0.07) was significantly greater than control group parents' untrained DL (M = 0.12; SE = 0.03), t(28) = 2.34, p = 0.02 (Figure 8). However, model estimates also revealed this boost was gone by the second visit, such that the difference in untrained DL between groups was only 0.02, t(28) = 0.51, p = 0.61. Thus interestingly but not surprisingly, the boost the training group received in untrained DL was smaller in magnitude than the boost for trained DL. This suggests that this one-time training program was most effective at changing the behavior it specifically targeted, but critically, carried over to similar types of conversations.

A similar question concerned whether the training program led parents to simply talk more. This issue was investigated by comparing parents' contextualized talk at the mid-point of the study. Contextualized talk was calculated by subtracting parents' trained and untrained DL utterances from the total number of utterances. If no difference in utterances exists between conditions, one could argue that the knowledge gained during training did not over-generalize to input features beyond DL. At baseline, training group and control group parents both produced an average of 89 contextualized utterances. By the midpoint of the study, however, training group parents (M = 43.09; SE = 10.50) used significantly fewer contextualized utterances than control group parents (M = 78.08; SE = 7.44), t = -3.33, $p < 0.01$. Thus, trained parents appeared to have replaced contextualized talk with decontextualized talk.
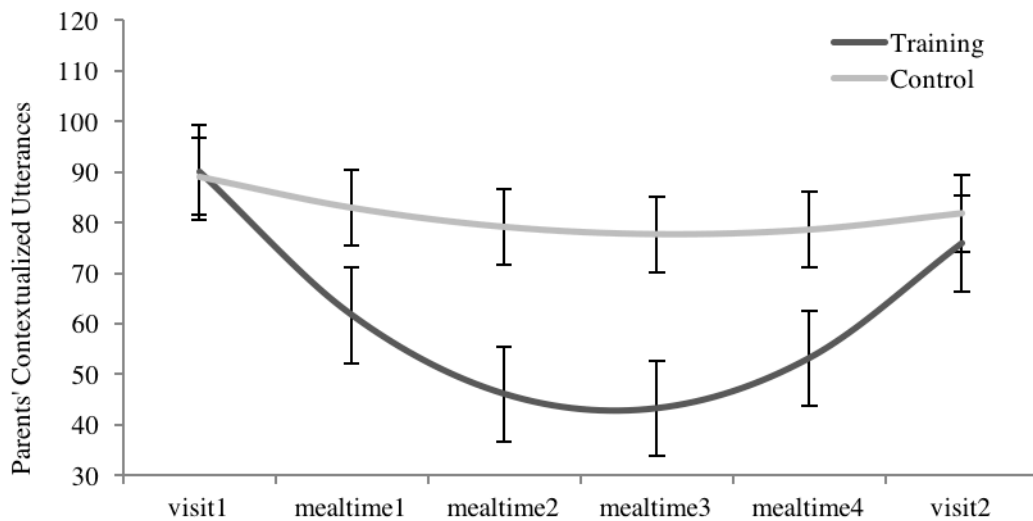

Figure 9 Parents' Contextualized Utterances

Altogether, the analyses with parents demonstrate that a DL training program led to positive and substantial gains in DL over a one-month period. The next section discusses how these effects translated to children's use of PROPDL.

The second question addressed whether the children of trained parents increased their

own DL use and oral language skills. In other words, did the benefits of parent training

transfer to children? We addressed this question by building similar models to research

question 1 but used the dependent variable of child PROPDL.

Exploratory Data Analysis

Similar to parents, children's PROPDL use was examined over the six time

points. Like parents, children also varied considerably in their participation in trained DL

conversations. Table 9 displays descriptive statistics for children's DL at each time point

by condition.

Table 9 Descriptive statistics of child PROPDL at each time point by conditio*n*

	Total Sample			Control			Training		
	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range
Visit 1	0.12	0.15	0.00 - 0.37	0.14	0.19	0.00 - 0.66	0.11	0.11	0.00 - 0.37
Meal 1	0.34	0.21	0.15 - 0.89	0.25	0.22	0.01 - 0.89	0.41	0.15	0.15 - 0.68
Meal 2	0.37	0.24	0.00 - 0.81	0.22	0.21	0.00 - 0.62	0.52	0.16	0.30 - 0.81
Meal 3	0.29	0.25	0.00 - 0.94	0.21	0.24	0.00 - 0.63	0.41	0.21	0.14 - 0.94
Meal 4	0.29	0.19	0.02 - 0.78	0.17	0.16	0.02 - 0.51	0.41	0.15	0.13 - 0.78
Visit 2	0.25	0.24	0.00 - 0.90	0.18	0.11	0.00 - 0.34	0.33	0.31	0.00 - 0.90

Model Building

The same model building strategy used for parents' PROPDL was used to model

children's use. Visual inspection of the data suggested that like parents, children's

PROPDL increased over time, but in a non-linear fashion (Figure 9). As such, the same

saturated model from the parent data (Equation 1 and 2) was adapted for children.

Interpretations of each parameter are identical to those from the parent model.
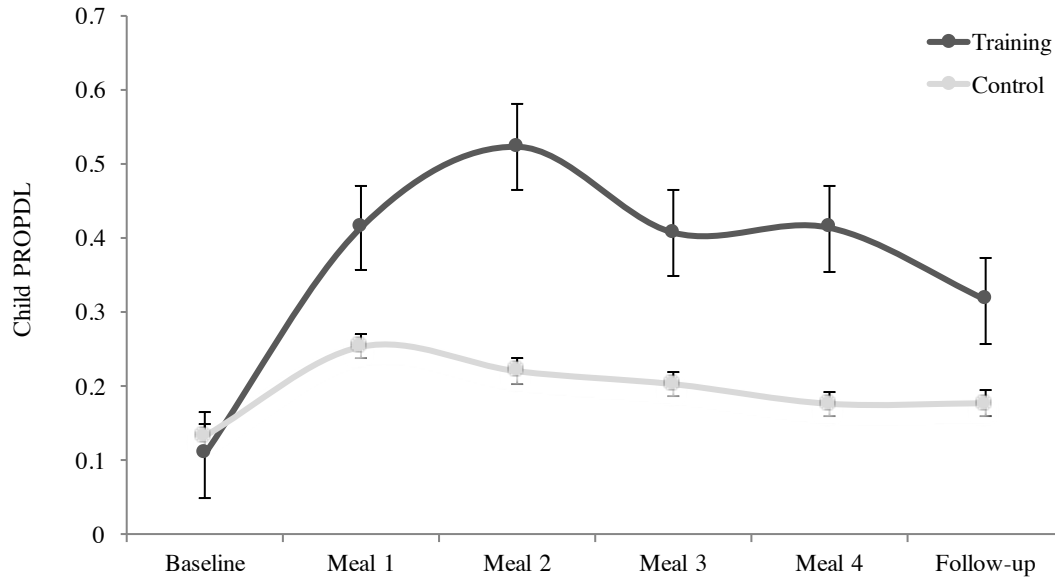
Figure 10 Empirical (actual) values of child PROPDL by condition at each time point

Model comparisons using REML estimation were conducted to specify the stochastic portion of the model. At level-2, likelihood ratio tests revealed that a random-intercept model best accounted for the between-subject variation. At level-1, the same five covariance patterns from the parent model were used to specify the residual errors. Results revealed that unlike parents, an auto-regressive structure best fit the data as judged by the AIC criterion (Table 10). However, coupled with the fact that AR(1) patterns use one more parameter than simple patterns and this parameter was not statistically significant, we opted to build a model similar to parents with a simple covariance pattern.

Table 10 Comparison of covariance patterns for child PROPDL

Covariance Structure	# Covariance Parameters	AIC	-2LLN
Simple	2	-46.0	-50.0
Autoregressive (1)	3	-47.0	-53.0
Compound Symmetry	3	-44.0	-50.0
Toepliz (2)	3	-46.8	-52.8
Unstructured	22	-33.8	-77.8

89

Finally, we compared this model to two reduced models in order to determine the best fitting model. Likelihood ratio tests confirmed that a model with a quadratic term fit the data better than a model with just a linear term, $\chi^2(1) = 19.4$, p < 0.001, and a model without the linear x group or quadratic x group interaction, $\chi^2(2) = 10.6$, p <0.01.

Model Inferences

The first three fixed effect parameters in Table 11 represent estimates of the control condition and the last three fixed effects represent the training effect, of the difference between the control and training parameters. Results indicate a significant effect of the parent training program on children's PROPDL. At the study mid-point, PROPDL made up 22 percent (SE = 0.04) of control group children's talk and 48 percent (SE = 0.05) for training group children, t(28) = 4.85, $p < 0.001$, $d = 1.80$. Thus by the middle of the study, children whose parents received DL training used more two times the DL as children whose parents did not receive training (Figure 10).
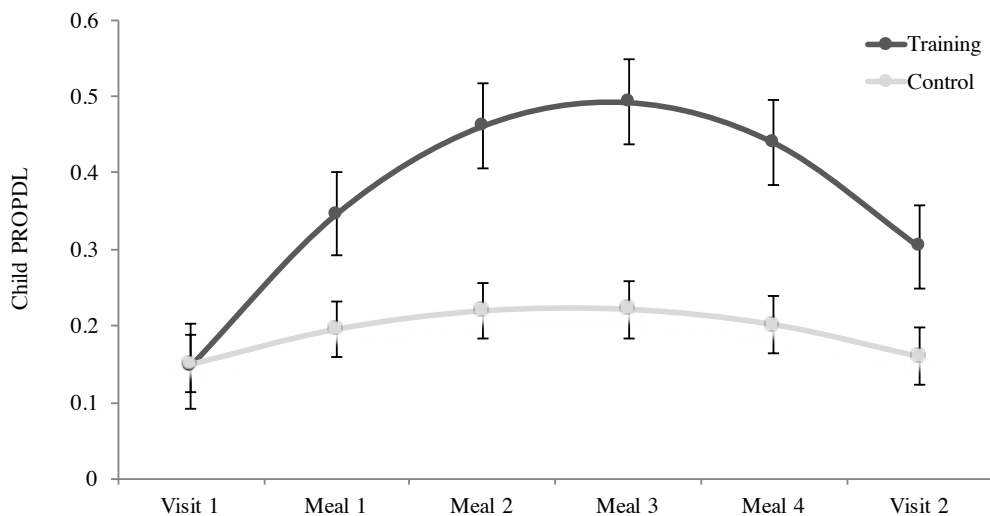

Figure 11 Predicted (estimated) values of child PROPDL by condition at each time point

Table 11 Parameter estimates (SE) of fixed and random effects for child PROPDL

Parameter	Statistical Notation	Estimate
Child PROPDL		
FIXED EFFECTS		
Intercept (centered)	π_{0i}	0.22***
		(0.04)
Linear Time	π_{1i}	-0.001
		(0.01)
Quadratic Time	π_{2i}	-0.01
		(0.008)
Training	γ_{01}	0.26***
		(0.05)
Training * Linear	γ_{11}	0.03
		(0.02)
Training * Quadratic	γ_{21}	-0.03**
		(0.01)
RANDOM EFFECTS		
Level 1:		
Within-Person	σ^2	0.03***
		(0.004)
Level 2:		
Intercept (centered)	τ^2	0.006**
		(0.003)
GOODNESS OF FIT		
AIC		-74.8

To examine whether the training boost persisted or declined over the course of the study, estimates of the difference in PROPDL between conditions were computed for each time point (Figure 11). In other words, the training effect parameter γ_{01} was added to control group's intercept parameter π_{0i} to yield an estimate of "training gains". Results indicated that PROPDL among children in the training group remained significantly above that of control group children until visit 2, when the difference between conditions reached only marginal significance, $p = 0.06$.
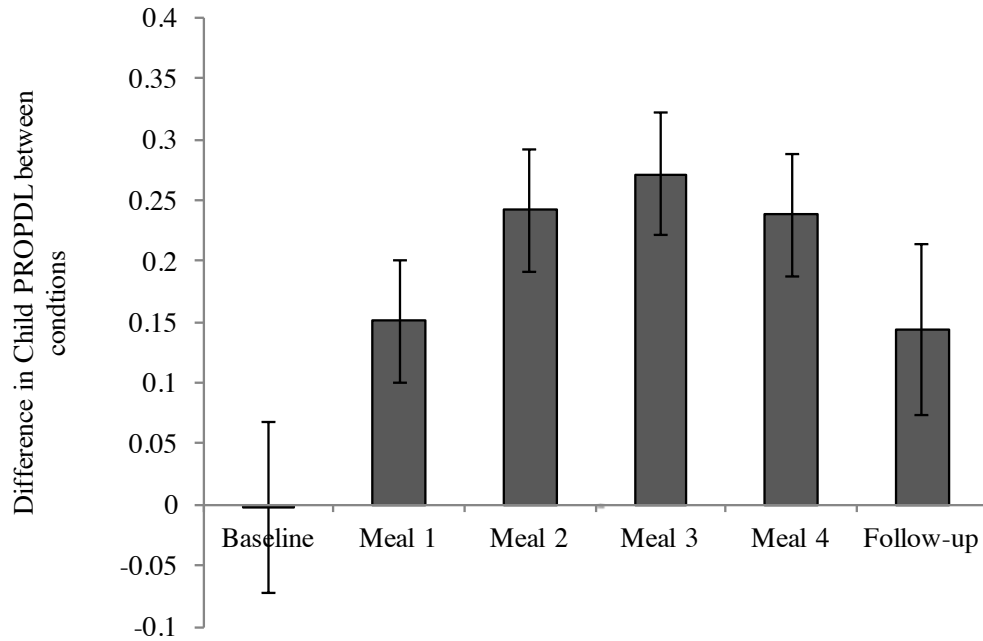
Figure 12 Training effect for child PROPDL

Next, a 2 x 2 mixed factorial ANOVA with time (visit 1, visit 2) as the within-subjects factor and condition (control, training) as the between-subjects factor was conducted in order to measure change in DL talk within the more controlled setting of the lab. A significant condition by visit interaction was observed, $F(1,29) = 4.17$, $p = 0.05$ (Figure 12). On average, while children in both conditions used similar amounts of PROPDL at visit 1, children in the training condition ($M = 0.32$; $SE = 0.08$) used significantly more PROPDL at visit 2 than children in the control condition ($M = 0.17$; $SE = 0.03$).

Figure 13 Difference in child PROPDL between first visit and second visit

Additional Analyses

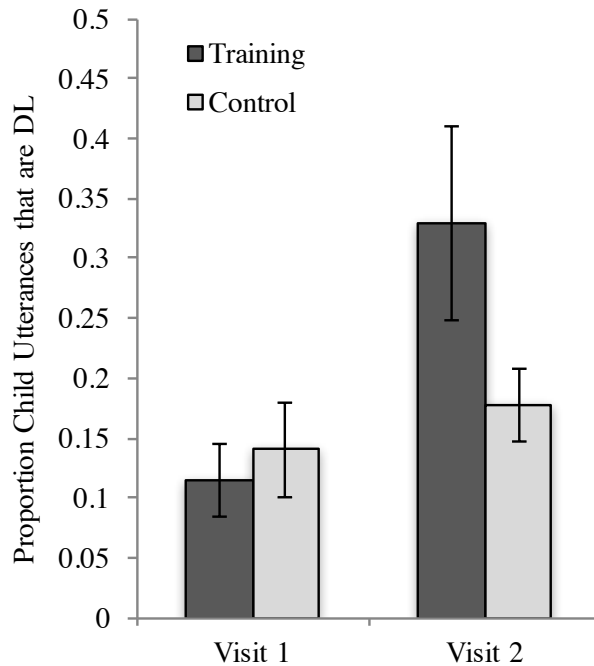We next examined whether there were certain types of child DL talk that changed more than others by running four separate mixed effects models with proportion past, future, explanation, and question utterances as the dependent variables, respectively. In general, children in both conditions used these DL conversations equally at baseline, and children's gains by the midpoint of the study mirrored their parents (Figure 13). Supplementary model output is displayed in Appendix E. Specifically, past talk made up 21 percent of children's utterances in the training group, compared to 13 percent in the control group at the midpoint of the study, $t(29) = 2.91, p < 0.001$. Children in the training condition ($M = 0.02$; $SE = 0.005$) also asked more open-ended questions during these DL conversations than children in the control group ($M = 0.01$; $SE = 0.002$), $t(29) =$

$2.91, p < 0.05$. No significant differences in children's future or explanatory talk were observed between conditions.
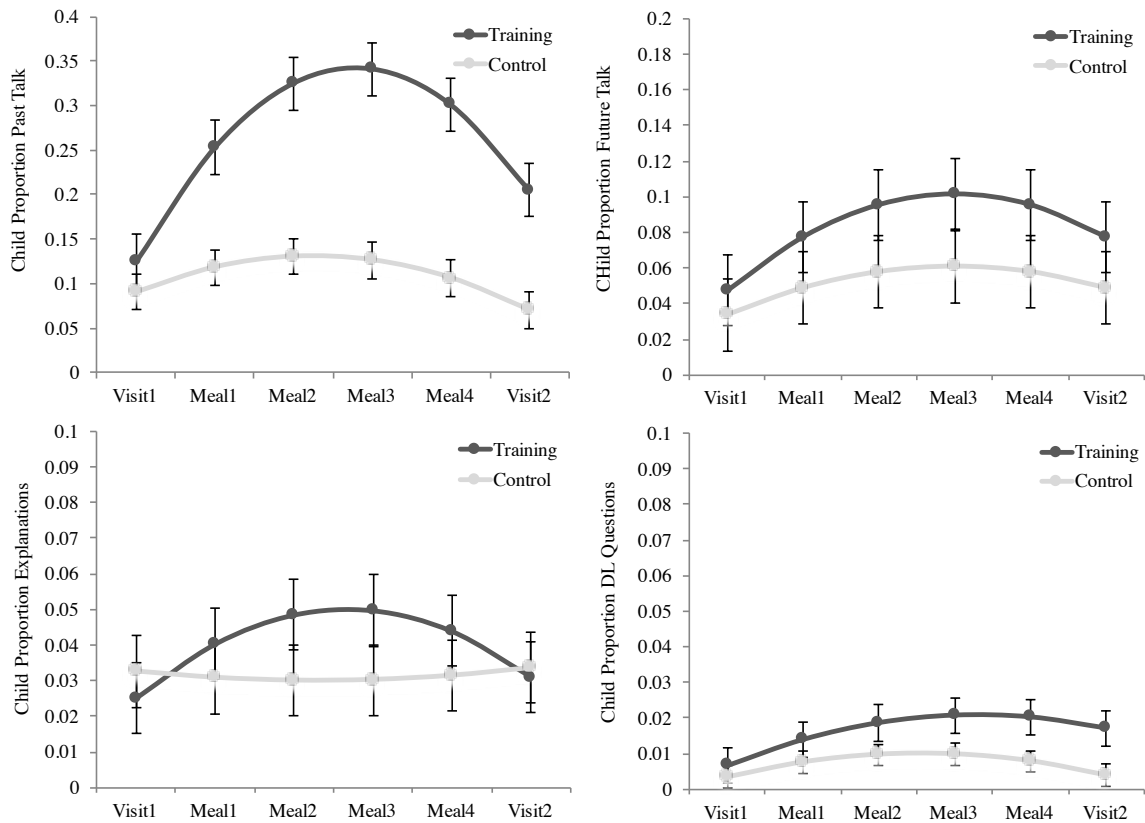
Figure 14 Individual types of children's trained DL

In addition to condition differences in trained DL talk, children's use of untrained DL was also examined. At the study midpoint, children in the training condition (M = 0.21; SE = 0.04) used more untrained DL than those in the control group (M = 0.15; SE = 0.03), but this difference only reached marginal significance, $t(29) = 2.91, p = 0.09$.

As the training program was developed for and implemented on parents, correlations between parent and child PROPDL are presented to illustrate a way in which the training effects may have carried over to children (Table 12). These strong associations suggest that the more parents use DL, the more children do as well. While

these correlations are not causal, they do provide some evidence that by intervening with parents, it was possible to also see behavior change in children.

Table 12 Correlations between parent and child PROPDL at each time point

	Correlation
Visit 1	0.74***
Meal 1	0.74***
Meal 2	0.85***
Meal 3	0.86***
Meal 4	0.82***
Visit 2	0.93***

***p < 0.001

Note. Correlations were similar for both conditions and therefore collapsed across the sample

Child Language Assessment

The final analysis with children examined whether training group children's oral language skills measured independently of the interaction changed from the beginning to the end of the study. At visit 1 and visit 2, children were assessed on several measures of oral language: narrative production, formal definitions, and future-oriented thinking. Average performance for each condition is reported in Table 13. PCA composites of narrative production scores ranged from -1.83 to 1.95 (M = 0.00; SD = 1.00). Children's formal definitional skill was on average 11.97 (SD = 6.93) with a theoretical range of 0-20. Finally, children's force choice responses on the future oriented thinking task were near ceiling (M = 1.83; SD = 0.46), with a theoretical ceiling of 2.00. Explanations were less proficient, with the average child producing future-oriented language (*it might be cold)* but not future state language (e.g., *I might feel cold)* (M = 2.07; SD = 1.44). Forced choice responses and explanations were summed together to create a composite score of future oriented thinking. There were no significant differences between conditions at baseline on any measures of oral language, *p*'s > 0.05.

Table 13 Child language assessment performance

	Control		Training	
	Mean (SD)	Range	Mean (SD)	Range
Visit 1				
Narrative Production	0.10 (1.11)	-1.82 – 1.95	-0.11 (0.89)	-1.81 – 1.26
Formal Definitional Skill	11.86 (7.37)	3.0 – 31.0	12.07 (6.72)	1.0 – 27.0
Future-Oriented Thinking	5.40 (1.77)	1.0 – 8.0	5.53 (2.26)	2.0 – 8.0
Visit 2				
Narrative Production	0.08 (0.89)	-1.41 – 1.21	0.07 (1.11)	-1.36 – 2.43
Formal Definitional Skill	14.21 (9.21)	3.0 – 31.0	14.38 (6.50)	1.0 – 27.0
Future-Oriented Thinking	4.87 (1.68)	2.0 – 7.0	5.14 (2.48)	0.0 – 8.0

The same assessment battery was administered at visit 2 and mean performance is reported in the bottom portion of Table 13. A 2 x 2 mixed factorial MANOVA with time (visit 1, visit 2) as the within-subjects factor, condition (control, training) as the between-subjects factor, and narrative production, formal definitional skill, and future oriented thinking as the dependent measures was conducted. No significant condition by visit interactions were observed on any of the three dependent measures, $F(3, 20) = 0.24$, p =.76. While children in the training group showed improvement on their narrative and formal definitional skills, this improvement did not reach statistical significance. Thus, while children whose parents received training were able to increase their DL during recorded parent-child interactions, there was no observed change in an independent measure of their oral language skills.

Research Question 3

The final research question sought to understand which families benefited most from training. Given the small sample size, this question was largely exploratory. First, we asked whether "training gains" could be predicted by initial parent and child DL use at baseline, parents' theories of intelligence or knowledge of child development, and

children's initial language abilities. Second, we qualitatively examined themes from the parent training diaries and from discussions after the training was completed to understand parental perceptions of the program.

Predictors of Training Gains

To operationalize training gains, PROPDL intercepts for each parent were computed using Empirical Bayes' Estimates. Specifically, each parents' random effect estimate was calculated and added to the fixed effect estimate of the intercept. The resulting vector of values is $\mathbf{u}_{0i}$ from Equation 2 (pg. 74). This method has been used in past work to predict later child vocabulary from earlier measures (e.g., Rowe et al., 2012), and these values are considered more precise than those produced from standard OLS regression models (Raudenbush & Bryk, 2002). This procedure resulted in a unique value for each parent in the training group, that reflected estimated PROPDL use at the middle of the study (M = 0.44; SD = 0.06; Range = 0.31 – 0.54). We then used several parent and child characteristics measured at baseline as predictors of these intercepts. Regression output for each characteristic is displayed in Table 14. Results indicate that initial parent DL (Model 1) and theories of intelligence[13] (Model 3) positively predicted parents' estimated intercept (i.e., PROPDL at study midpoint). In other words, more DL and stronger growth mindsets prior to training was associated with more PROPDL by study midpoint within the training condition. Neither parents' knowledge of child development nor children's DL at baseline predicted training gains, p's > 0.05. We next considered the combined effect of parents' baseline DL and their mindsets, by including

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[13] The original interpretation of the TOI was that higher scores indicated greater endorsement of entity theories. We, however, chose to reverse code this measure for interpretability purposes such that higher scores indicated greater endorsement of incremental theories.

them simultaneously in Model 6. However, neither predictor was significant, likely

because these variables were highly collinear ($r = 0.51$).

Table 14 Regression models predicting training group parents' PROPDL at study midpoint

	Estimated Parent PROPDL intercept (Intercept centered at study mid-point)					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Baseline Parent DL	0.51*					0.30
Baseline Child DL		0.37				
Baseline Parent Mindset[1]			0.56*			0.37
Baseline Knowledge[2]				0.01		
Baseline Child Oral Lang.					0.04	
R-Squared %	25.7%	13.8%	31.1%	0.0%	0.02%	35%

*p < 0.05
[1] Baseline parent mindset = score on Dweck's theory of intelligence measure taken at baseline prior to training.
[2] Baseline knowledge = parent score on SPEAK questionnaire taken at baseline prior to training.

Parents' Perceptions of Training

We were also interested in understanding what parents thought about the training

program to understand more about why we saw change and how the program could be

improved for future implementation. During the semi-structured conversation following

the training video at visit 1, most parents reported using DL conversations on a regular

basis. Interestingly however, many parents reported that while they used these

conversations regularly, they were not aware of why DL is helpful in preparing children

for kindergarten. For example, one mother reported engaging in future talk with her son

frequently for the purpose of preparing him for new or unfamiliar situations. She

remarked, "*I like to set him up for what's coming up next and be prepared. Just to have

expectations.*" This mother also shared that she never considered that these conversations

may be helpful for other reasons. Thus, it appears at least in this sample, the effectiveness

of the training lay more increasing knowledge about DL's benefits rather than what DL

is. We suspect that trained parents were motivated to increase their DL because they

learned of the important (additional) benefits it holds for children's development and readiness for kindergarten. Additionally, at the end of the second visit, we asked parents in the training group to discuss their reactions to the program. Most parents remarked that they thought the video and the weekly reminders and brochure to be quite helpful (see Appendix A for examples). For example, one mother said "*I personally thought having the booklet with me was really good…having READY on the front page was a good reminder of what we were trying to do*."

As this training program focused on increasing conversations that were -- by definition -- more abstract than content from previous programs, we examined diary entries to understand the extent to which these parents actually understood the concept of DL. As described in Chapter Three, parents were asked to enter examples of R.E.A.D.Y conversations into a daily training diary as a way to stay engaged with the training material (see example log in Appendix B). Most parents did not enter a daily example for every aspect of READY, though all but two parents entered at least one conversation per day into the log. Examination of these entries confirms that parents correctly categorized R.E.A.D.Y conversations into the appropriate categories, for instance entering a conversation about, "*a time I fell off my bike and cut my chin*" and "*last week when we went to the aquarium*" into the R (Recall past events) section, and a discussion about "*why it is important to follow recipes*" or "*why we need to sweep before we mop the floors*" into the E (Explain new words and concepts) category. Further, many parents commented that the diary was helpful in reminding them to think about READY talk outside of the time they recorded their meals. One mother stated at visit 2, "*It was helpful to have the log book…I would be like oh I haven't thought about anything in the past*

before. So then I would think about something that would be related to what we were doing and talk about it and write it down". This qualitative analysis adds to the quantitative findings from research question 1 and 2 by shedding light on the extent to which parents understood and were receptive to the messages conveyed in the training. We are encouraged that parents not only increased their DL input during the study period, but also reacted positively to the training approach.

Chapter 5: Discussion

Decades of research has identified consistent and positive associations between parents' DL and the development of children's oral language abilities (e.g., Dickinson & Tabors, 2001). To date however, there have been very few experimental studies to test these causal claims. It has remained an open question of whether it is possible to increase how much parents use DL, and if so, whether an increase would correspond to changes in children's own use of DL and their oral language development. The results of this dissertation demonstrated that a one-time DL training session with parents was enough to boost these parents' DL from roughly 17 percent of their total utterances to approximately 50 percent a few weeks later. Importantly, this gain was maintained through completion of the study. Perhaps more importantly, children of trained parents also boosted their DL input by similar margins during this period.

Contributions to Previous Research

This work expands on previous work in several ways to advance our understanding of the role of parent speech input in child language development. First, this study is among the first to experimentally manipulate DL input and examine what effects this manipulation has for child language production. Previous work has identified correlations between DL and child language production (e.g., Dickinson & Tabors, 2001), but these non-causal associations always left open the possibility that other factors (e.g., initial child language ability, parent education) may have mediated this relation. By randomly assigning families to a control or training condition, we reduced the possibility that these factors were influencing the relation between parent and child DL talk.

The extant experimental work in the area of parent-child interaction has focused on increasing less abstract input features of the input such as gesture (Matthews et al., 2012) in 1-year-olds or the quantity of speech in two-year-olds (Suskind et al., 2015). Additionally, work that has focused on abstract decontextualized aspects of the input trained parents or teachers to increase conversation in highly structured contexts such as book-reading or structured reminiscing in the laboratory. The present study adds to this body of literature by showing it is possible to increase conversations that are developmentally-appropriate for older, four-year-old children in less structured mealtime settings. In previous experimental studies with this age range, work has targeted talk about the past (Boland et al., 2003; Reese & Newcombe, 2007; Peterson et al., 1999; Taumoepeau & Reese, 2013), as well as extra-textual talk during book reading (e.g., Mol & Bus, 2008; the present study expands on these findings by training parents to talk about other non-present topics such as open-ending questioning, future talk, and explanatory talk.

Further, our design also allowed us to measure parent and child DL multiple times in a more ecologically valid way. In past work, trained behaviors were measured only once following training (e.g., Boland et al., 2003), only in the lab (e.g., Matthews et al., 2012), or only through parent report (e.g., Jordan et al., 2000), limiting the types of inferences to be drawn (see Suskind et al., 2015 for exception). We believe the multiple home recordings were a strength of the study because it allowed parent-child conversation to occur in a more natural and comfortable context than if we relied on recordings only in the lab with the experimenter present.

Methodologically, the growth modeling used to measure change over the six time points is considered a strength because it increased statistical power and resulted in a more representative picture of parent-child interaction. However, one limitation of this method was that the model used for the first two research questions used 6 fixed-effects parameters, but only two were used for interpretation purposes (i.e., the intercept and training parameters). Using non-linear models, for instance, would introduce a more parsimonious way to model change in DL by reducing the need for multiple higher-order polynomials.

Results from RQ1 showed that on average, trained parents increased their DL more than two-fold from baseline to the middle of the study. This boost is slightly less than what was found previous work targeting past talk specifically. For instance, Taumoepeau and Reese (2013) found that parents who received an elaborative reminiscing training increased their open-ended questioning to 3 times their baseline levels. Reese and Newcombe (2007) found that elaborative talk during past events increased also increased more than three-times compared to baseline levels. We also found that parents who initially used more DL were the ones that demonstrated the sharpest increases by the mid-point of the study. This finding differs from past work which demonstrated that parents' initial interactional style did not relate to their training gains following an elaborative reminiscing training program (Reese & Newcombe, 2007). This could be because the content of the DL program was more abstract than a program directed at increasing elaborative reminiscing, or because the homogenous demographics of the current sample. In some ways this is discouraging because it implies that the parents who already use DL are also the ones that can increase their input more readily.

Nevertheless, we observed that all parents who received the training boosted their DL by some degree, suggesting the program offered benefits to all parents in the current sample.

Finally, we found it quite encouraging that DL training program enacted measurable and substantial change in parent and child behaviors from what is considered to be a small training dose relative to the designs used in past work. For instance, an elaborative reminiscing intervention described in Reese and Newcombe (2007), Taumoepeau and Reese (2013), and Peterson et al., (1999) encouraged mothers to increase talk about past events, which was implemented over five sessions across a 10-month period. Suskind and colleagues (2015) encouraged caregivers to increase the quantity of their child-directed speech during eight 60-minute sessions with trained intervention specialists. Effect sizes from these studies ranged from 0.5 –1.0, whereas the effect sizes (Cohen's d) for our study were considerably larger ($d = 1.8$-1.9), suggesting relatively large training effects.

Theory of Change: What Led Parents to Increase their DL Use?

We argue that an increase in parents' knowledge of why DL is important led them to increase DL conversations with their preschool-children. Parents who received training commented that DL talk were a regular part of their day interactions and as such, these parents likely did not increase their knowledge of what DL is. However, most parents acknowledged they were not aware of the association between DL and kindergarten readiness. Thus, we argue that the training program succeeded at conveying the message of why DL is such an important experience for preschool children, which led to the desired behavior change in parents.

Our measures were not sensitive enough to quantitatively measure this change, and as a result we relied on qualitative feedback discussed in RQ3 to support this argument. However, we did measure a general construct of parents' knowledge of child language using the SPEAK questionnaire. Interestingly however, we did not find any associations between parent knowledge of child development and measures of parent or child speech at any time-point. This finding differs from prior work suggesting that general measures of parent knowledge are positively associated with measures of child-directed speech (Rowe, 2008), and parenting behaviors more generally (Benasich & Brooks-Gunn, 1996). We likely did not find an association for at least two reasons. First, parents in the sample on average reported very high levels of knowledge leading to substantially less variability in responses compared to other work which has used this measure (e.g., Suskind et al., 2015). We may have seen a positive association between DL use and this measure if there was more variability in reported knowledge. Second, the SPEAK was designed to measure general knowledge of child language development across the entire early childhood period (i.e., ages 0 – 5). While the SPEAK is more specific than other general measures of parenting knowledge (e.g., the KIDI), it was still not sensitive enough to capture variability in how parents view (1) their role in child language development, and (2) the role of talk and conversation with children. A measure that taps into these specific cognitions would be instrumental in understanding the variation in parental DL use specifically.

Increasing Child DL by Intervening with Parents

The results from RQ2 demonstrated that by intervening with parents, it is possible to increase children's DL use as well. We found that children of trained parents boosted

their DL input from 13 to 48 percent, a similar margin to what was found with parents. As the children in both conditions used similar amounts of DL at baseline and those in the training condition did not receive any targeted training (e.g., direct oral language instruction from the experimenters), it is likely that parents' gains carried over to children. Indeed, there was a strong positive correlation between parent and child DL talk at all time points. While we do not know the lasting impact of this boost in DL talk, we do know that experience with these conversations is helpful preparation for academic language in formal schooling. Thus, in light of this previous evidence we believe this behavior change can be considered a small, positive step towards academic language readiness.

Further, the boost in parent-child conversation may have afforded children some additional benefits that were not captured in the present coding scheme, which only measured the quantity of DL input. In particular, we hypothesize that the DL conversations trained parents had with their children may have been higher "quality" than the DL conversations control parents had in a few different ways. First, a qualitative examination of the coded transcripts indicated that the length of DL conversations seemed to be longer for trained families than control families. Longer conversations likely give children more turns to talk, thus providing them with additional opportunities to practice their developing DL skills. Second, feedback from parents at the end of the study indicated that the most "successful" conversations (i.e., those that the children were interested in engaging in), were those that were child-initiated. This is not surprising, and a next step with the current data would be to examine whether child-initiated

conversations were longer and included more child participation than parent-initiated conversations.

Lastly, we argue that the implementation of parent-focused interventions is faster, cheaper, and more standardized than programs that try to change child behaviors directly. In this training program, we intervened on conversation rather than on other parent-child activities that necessitate costs for materials, such as book-reading or play. Many programs that have directly intervened with children of this age have produced mixed results (Bus et al., 1995; Peterson et al., 1999; Ruston & Schwanenflugel, 2010, Scarborough & Dobrich, 1994). For example, a one-on-one intervention with a specialist that totaled 500 minutes of conversation produced only a moderate effect (Cohen's $d =$ 0.19) on children's expressive vocabulary (Ruston & Schwanenflugel, 2010). Further, while our findings were limited to parent-child interactions, our model could carry over to work in the area of school-based interventions which have shown some success in improving teacher-child interactions. For instance, training teachers or clinicians to use more DL during activities like snack-time may yield larger boosts in children's language than efforts to boost children's language through direct instructional techniques.

Strengths and Weaknesses of Training Program

This program was a first attempt at increasing parent-child conversations about the non-present in unconstrained contexts such as mealtimes. When designing the program, we borrowed features from previous interventions that have shown success in changing parent behavior. In particular, we administered the content of the program in the form of a video, similar to dialogic reading (e.g., Arnold et al., 1992) and input quantity-focused interventions (Suskind et al., 2015). This method was successful

because it standardized the content across parents and presented the material in a more visually appealing medium. Second, similar to previous work which increased parents' shared book reading strategies through weekly informational texts (Rich, 2014 retrieved from nytimes.com), we texted parents four times following training implementation to further encourage the use of READY talk. This weekly contact afforded additional boosts of training at regular intervals, which parents commented to be a positive feature of the program.

Other features of the training program could be modified in future implementations of this intervention. For instance, while the video content conveyed the message of what DL is and why it is important, it could have discussed the importance of children's participation to a greater degree. Indeed, the A in Ready (ask lots of questions) did attempt to encourage child participation through parent-child question and answer exchanges. However, we believe this was a very important point given past research, and should be prioritized in future interventions. Research suggests that across all stages of language development, parental speech input that encourages child participation (e.g., open-ended questions or directing utterances based on children's attention or gaze) is most helpful for oral language development because it challenges children to converse at a level just above what they can do without adult scaffolding. Thus, the message of increasing any form of parent input quality should be qualified with strategies for how to encourage participation from children.

Differential Effects of Training for Individual DL Types

Interestingly, we did not see the same training boost for all types of R.E.A.D.Y. talk, as parent and child talk about past events increased the most following training. This

is interesting as it was also the most common type of DL conversation parents and children used at baseline. Based on previous research, there are at least two reasons why past talk may have shown the greatest increases. First, past conversations may be less cognitively taxing for children to participate in than other forms of DL. Past talk is less temporally complex than talk about the future (Hudson, 2006), and these challenges potentially limited how much and what future discussions parents and children engaged in during the study. Indeed, preschool children often view their futures as fixed or unchangeable (Atance & O'Neill, 2005), likely placing constraints on how frequently they engage in these discussions. Further, future talk often draws on events from the past (e.g., *would you like to do the same thing for your birthday that you did last year?*) requiring children to imagine a future state or their future self based on background knowledge from the past. On the contrary, we rarely observed these temporal demands associated with past talk in our corpus of parent-child interactions.

Second, past conversations may have been more motivating for children to participate in because of the high degree of shared knowledge between the child and the parent. Four-year-old children often demonstrate difficulties understanding that others can have experiences, ideas, and opinions that are separate from their own. Thus non-present talk that focuses on events in which the child did not participate in, or have not occurred yet (i.e., future talk) may have hindered child verbal participation. Autobiographical past talk supports the development of memory during the preschool period (Nelson & Fivush, 2004), and it also could be that autobiographical past talk is also helpful for child language development. Thus, a next step would be to examine whether conversations about events that the child and parent experienced together were

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longer and included more child contributions than those about un-shared events. It would also be fruitful to examine whether children with better language skills hear and participate in these types of conversations more frequently than children with lower skills. These are questions our data set can address, and would hold interesting implications for understanding the relative contributions of different types of DL for child language development.

Specificity of Training Effects on Parent and Child Speech

The series of analyses examining condition differences in trained DL, untrained DL, and total utterances identified how far parents generalized the information from the training program. The training effect was most evident on the targeted input features (trained DL – R.E.A.D.Y talk), and also evident on untrained conversations about the non-present, though less so. While it is possible that parents thought these untrained DL conversations fell under the R.E.A.D.Y categories, we think this explanation is unlikely because entries from the daily diaries indicated parents categorized DL conversations in the correct R.E.A.D.Y categories. What we feel is a more compelling argument is that the training transmitted knowledge that R.E.A.D.Y talk is a concept rather than a series of individual conversations. Thus, it is not surprising that parents increased untrained DL conversation because they came to understand the concept of non-present talk and why it is important to use with preschool-aged children.

Another interesting observation was that the training did not lead parents and children to simply talk more. The boosts in their speech were targeted and isolated only to talk about the non-present. If trained parents did not fully understand our definition of non-present talk, this misunderstanding would have led to more un-coded utterances, and

as a result, more total utterances. The fact that this did not happen suggests parents did understand the concept of DL and only increased the density of DL conversation. We are not disappointed that the number of utterances did not increase, given that we know qualities of the input such as DL are more predictive than sheer input quantity for children of this age (e.g., Rowe, 2012). Thus, an intervention targeted at input quantity would likely not translate into child language gains.

Associations between DL and Parental Beliefs

Though the primary focus of the analyses was on identifying boosts in parent and child DL, it is also important to recognize that parents who used more DL with their children during the baseline interaction also reported stronger growth mindsets (i.e., *theories of intelligence* – TOI). One explanation of this finding is that parents who hold growth mindsets believe their children's abilities are changeable based on inputs from his/her environment including high quality interactions such as DL. Previous work that has induced parents to hold growth mindsets finds these parents are more likely to interact with their children in more constructive ways (e.g., Donahue et al., 1997; Moorman & Pomerantz, 2007). Our work adds to these findings by identifying other types of parental behaviors that may be influenced by growth mindsets. Interestingly, this association was only observed for past talk and decontextualized questions, the same two types of DL that showed the greatest change following training. While it is clear that these correlations do not entirely address how parents' mindsets relate to DL, this finding introduces another explanation for the substantial variability in parental communication styles both within this sample and the larger population.

We also found that when looking within the training condition, parents who initially reported stronger growth mindsets used more DL by the midpoint of the study. An explanation of this finding could be that parents who had initially stronger growth mindsets were more receptive to the messages communicated during the training. However, as it was also the case that mindset measure was positively correlated with baseline DL, we cannot determine the direction of influence (e.g., did the training change mindsets, or did mindsets influence who benefited more from training?).

Limitations and Future Directions

There are several factors that limit the conclusions that can be drawn from the present study. First, the sample size of 30 families was small and not representative of all families with four-year-old children. Thus, we must be cautious in our interpretations of the boost in DL input we observed in parents and children. It is possible that a separate sample of parents such as those from lower-SES backgrounds would lead to a different set of results than those observed with the present sample. However, it is also important to point out that while the participating parents on average were highly educated, the variation in DL at baseline and gains over time was substantial. This is consistent with work showing that even highly educated parents vary considerably in the ways they engage their child in reminiscing about the past (e.g., Fivush et al., 1994). Further, highly educated parents very similar to those who participated in the present study demonstrated the same range of variation in their decontextualized comments during shared book reading (Leech & Rowe, 2014). While these parents likely engage in these conversations on a regular basis, the results here and from this previous work suggest that even highly educated parents have room to increase features of their input. In fact, Newcombe and

Reese (2007) found that all parents benefited from an elaborative reminiscing training regardless of their educational background.

An important future extension of this work would be to implement the training program with a larger and more socioeconomically diverse sample of families. Will similar results be observed with a more diverse sample? There is little consensus from past research on whether lower- or higher-SES parents would benefit more from a DL training program. On one hand, higher SES parents on average communicate in ways that researchers, pediatricians, and practitioners argue are most conducive for child language development (e.g., Hoff, 2006). Further, there is some qualitative evidence that these communicative differences are a result of differences in how lower- and higher-SES parents view their children as communicative partners (Heath, 1983). Thus it could be the case that lower-SES parents would be less motivated to increase their DL. On the other hand, lower-SES parents who may use less of these conversations initially may have more room to increase their DL. Interestingly, however recent work revealed SES differences only in explanatory and pretend talk and not narrative talk between lower- and higher-income mothers (Rowe, 2012). Thus, it is an open and important question of whether parents from more diverse backgrounds would be receptive to this training and whether they would increase their DL to the same degree as parents in this sample.

The small sample size also led us to make some methodological concessions when addressing RQ1 and RQ2. Notably, we were not able to estimate the linear and quadratic random effect terms and were forced to fix them in the final model. The consequence of this choice was that estimated linear and quadratic change was identical for all parents despite substantial individual variation observed in preliminary analyses.

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Boosting the sample size would afford more flexibility when building our mixed effects models, and would likely allow us to model all the variability present in the data.

A second limitation was the short duration of the study, which may have been one reason why we did not see significant changes in children's oral language skills. We chose a one-month implementation period because of past work showing successful training outcomes during this time frame (e.g., Matthews et al., 2012). Now that it is established that parent DL can be increased in the short-term, future studies should consider a more longitudinal approach to understand the trajectory of trained DL over time. This approach might include an additional training 'booster' session or a longer period to measure DL use. Indeed, work by Peterson and colleagues (1999) found that a boost in children's narrative skills following a parent elaborative reminiscing intervention was only evident one year after the training was implemented. It is important to consider that similar effects may be at play with the skills measured in the present study, and this should be taken into consideration when designing future parent training programs. A related limitation of the short study duration involves the extent to which the trained behaviors persist. Indeed, it is difficult to predict whether trained parents' DL would remain at these boosted levels after the study period and during un-recorded conversations. For instance, in the Suskind et al. (2015) intervention, the initial parent boost in child directed speech that was observed one-month following the intervention disappeared four-months following the training. It would be of great practical significance to understand whether the boosted levels of DL we documented here remain, and whether there are any parental characteristics to predict which parents decline.

General Conclusions

The commonly used idiom *talk is cheap* holds a more literal and positive meaning in light of the findings from this dissertation. In this study, we consider our findings to be a "proof-of-concept" of the idea that it is possible to increase a relatively abstract feature of parent input using a simple and cost-effective parent training program. While this study does not address all questions of how parents' DL input supports child language development, it does point us one step further to better understanding the powerful role that a child's communicative environment can play in their development during the early childhood period.

Appendices

Appendix A: Example Training Materials

Figure 1. Example page of training booklet parents received during the training program. The booklet also contained example conversation starters for different contexts, the daily diary, mealtime logs, and contact information in case of questions.

Appendix B: Example Parent Diaries

Control Condition Daily Diary

Week of (m/d to m/d)_____
We are interested in learning why mealtimes are so beneficial for children's development. Please describe one meal for each day of the week using the prompts below.

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Which meal are you describing?							
Who was present at the meal (e.g., other siblings)							
Was the TV on? (yes or no)							
Was did you talk about? Give one example.							
What did your child eat?							
How long did the meal last (in minutes?)							

Training Condition Daily Diary

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Recall past events							
Explain unfamiliar concepts and define new words							
Ask questions							
Discuss future events							
You can help your child get **R.E.A.D.Y** for kindergarten by using academic language!							

Appendix C: Additional Child Assessment Protocol and Coding

1. **Narrative Production Task**

Example Stimuli:
Still image of cartoon (left image Visit 1, right image Visit 2)
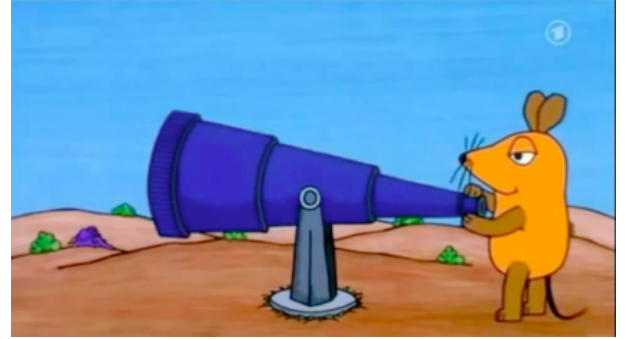
Comprehension Questions
1) **Soccer (Visit 1)**:
    a.   How does Ellie stop the ball from going in the goal?
          i.   Does Ellie pounce on it?
         ii.   Does Ellie catch the ball with her trunk?
         iii.   Or, does Ellie blow it away?

    b.   How does Mouse finally make a goal?
         i.   Does Mouse fool Ellie by throwing an apple?
         ii.   Does Mouse pop the soccer ball over Ellie's head?
         iii.   Or, does Mouse turn the goal around?

    c.   What is a good title for this story?
         i.   The backwards kick.
         ii.   Ellie makes a goal.
         iii.   Or, the sleeping goalie.

2) **Telescope (Visit 2)**
    a.   What is wrong with the telescope?
         i.   Is it too tall?
         ii.   Is it broken?
         iii.   Or is it just a toy?

    b.   What does Mouse do so he can see far away?
         i.   Does he clean off the lens?
         ii.   Or does he climb a ladder to look into the telescope?
         iii.   Does he pound the base into the ground?

    c.   What is a good title for this story?
         i.   The tall telescope.
         ii.   A blue sky with clouds.
         iii.   Or Ellie climbs the tree.

2. Formal Definition Task

Procedure: Children are introduced to a game with words where the experimenter reads a word and the child provides the definition. The following words were used for each visit:

Stimuli:

Visit 1	Visit 2
Knife	Chair
Umbrella	Cake
Clock	Cup
Hat	Milk
Bicycle	Shoe
Nail	Ball
Alphabet	Car
Donkey	Bird
Thief	Apple
Diamond	Bed

3. Future oriented thinking

Procedure: Children were shown pictures of outdoor scenes and asked to choose an item to take with them on a hypothetical trip.

Example Stimuli
Top scene is first revealed to child, followed by the three pictures below.
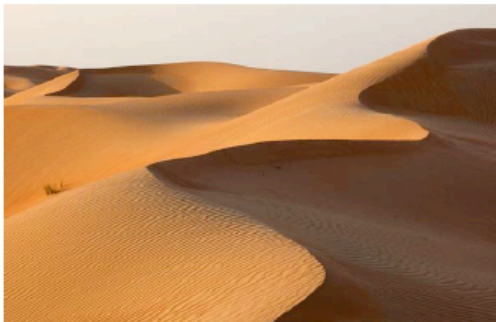
Appendix D: Model Diagnostics from RQ1 (Parent DL) and RQ2 (Child DL)

This appendix reports additional model-checking analyses on the mixed effects models built to test research question 1 and 2 in Chapter Four. First, the distribution of the dependent variable, PROPDL, was examined for both parents (Figure 1a) and children (Figure 1b).
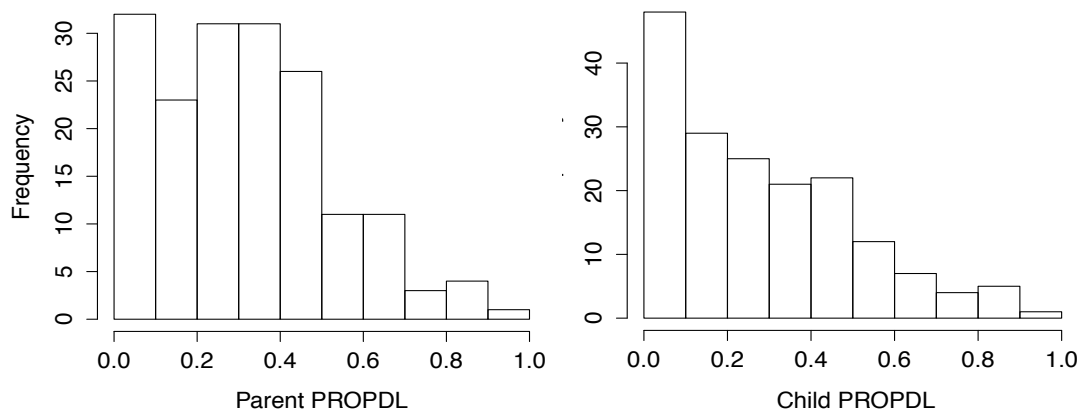

Figure 1a-1b. Distribution of Parent (left panel) and Child (right panel) PROPDL

As displayed in Figure 1a-1b, both dependent variables were strongly positively skewed, which is not surprising given the unit of measurement was a proportion bounded by 0 and 1. We considered using a transformed version of PROPDL for the main analysis, however our preliminary work indicated that using the untransformed version still produced a model that adequately fit our data. Second, a transformed PROPDL variable would have produced estimates that were far less interpretable than the untransformed dependent variable. Thus, we chose to fit the final models (to address research questions 1 and 2) without the transformed PROPDL variable.

Second, the assumption of normality, independence, variances, and presence of outliers/influential points were tested for the models used in research question 1 and 2. We examined both population-averaged (marginal) means as well as cluster-specific (conditional) means for these assumptions. For parent and child PROPDL, we created histograms of residuals and find that the assumption of normality is met for both models, as the distributions are approximately normal with very little skew for both population (Figure 2a) and cluster-specific means (Figure 2b).
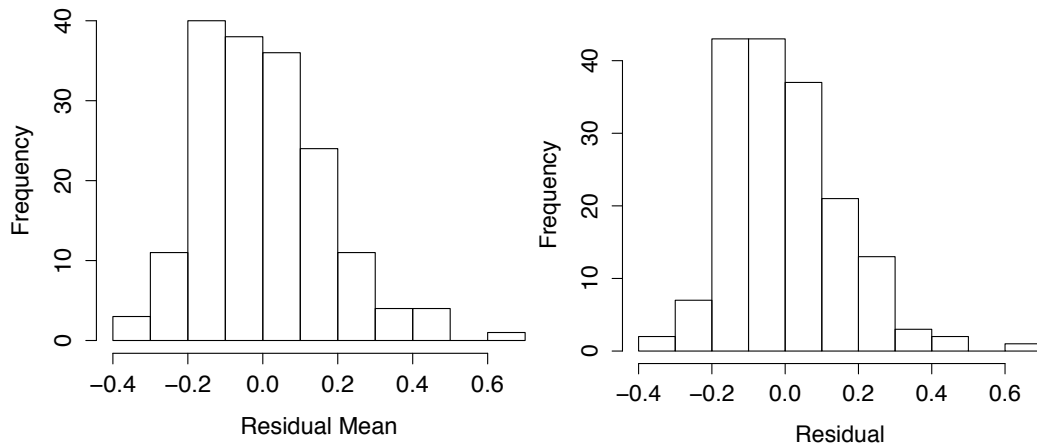

Figure 2a-2b. Normality assumptions for parent model showing population means (left panel) and cluster-specific means (right panel)
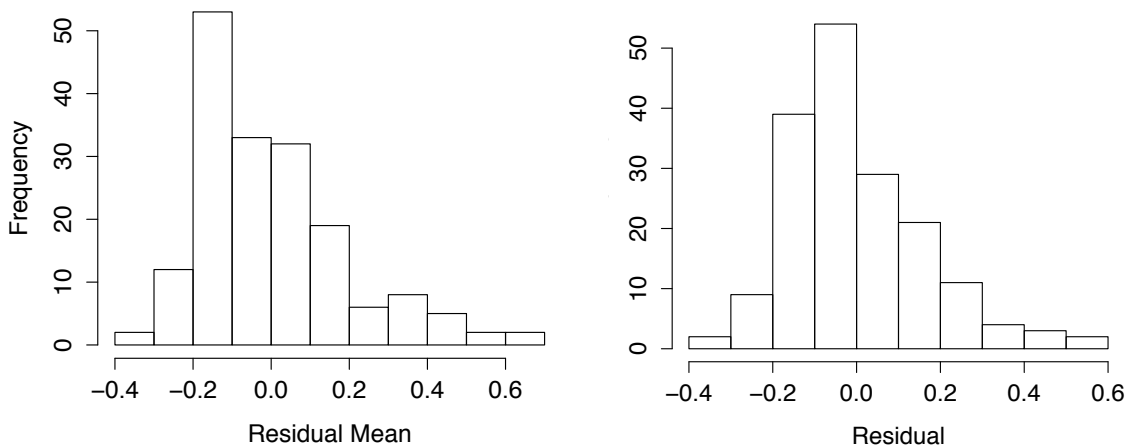
Figure 2c-2d. Normality assumptions for child model showing population means (left panel) and cluster-specific means (right panel)

We also considered the normality of the random effects (**b**$_i$), and as shown in the normality plot below (Figure 3) the effects look approximately normal. While it is generally good practice to examine these effects separately by group (control vs. training) we chose not to do this because of the small sample size.
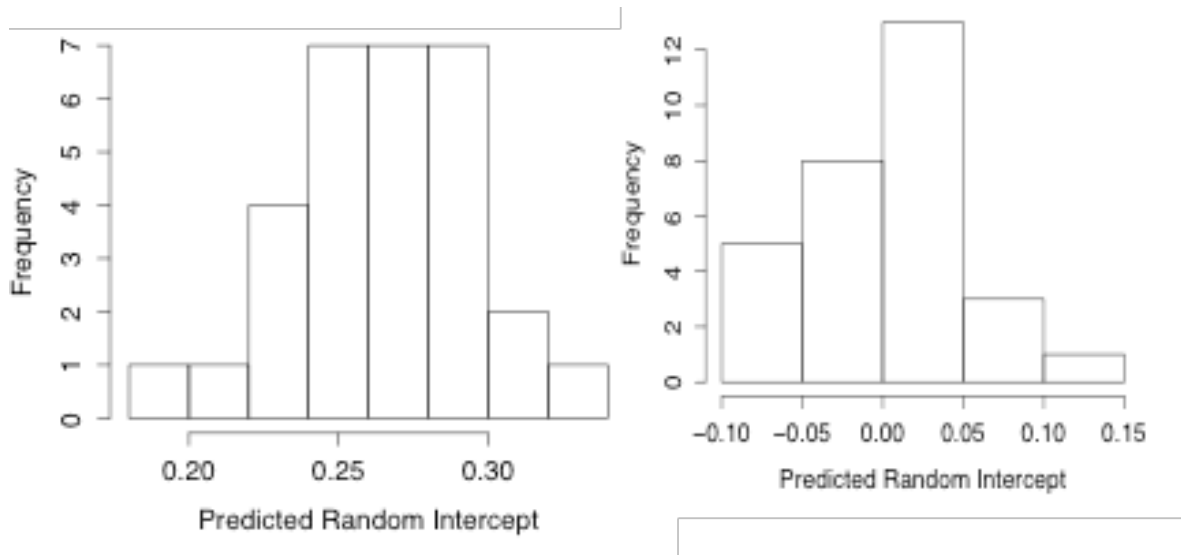

Figure 3a-3b. Normality of random effects for parent model (left panel) and child model (right panel)

Second, we assume the independence assumption is met, as one unit (i.e., one pare or one child's PROPDL) should be independent from any other unit. Third, we examined adequacy of the covariance structure of the residuals. Unlike standard OLS regression models, we do not assume constant variance in these models. Instead, we plotted parents' y_{ij} vs. y_{ij}hat and examined this plot for points that clustered tightly around the diagonal line (Figure 4). This assumption appears to be partially met, as there are some points which lay far away from the diagonal, which is probably an artifact of the small sample size.
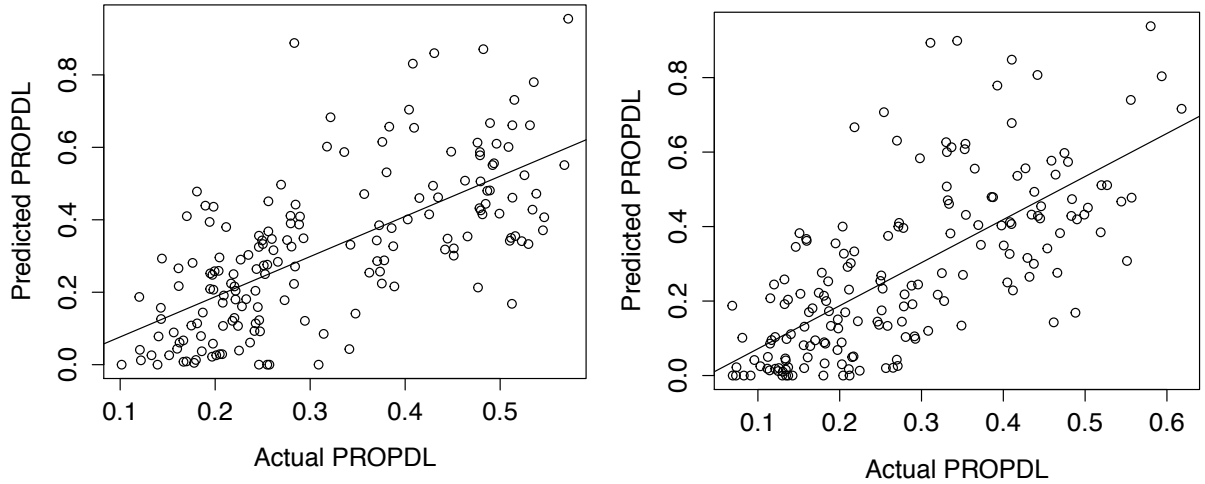
Figure 4a-4b. Scatter plot of parents' (left panel) and children's (right panel) predicted versus residual PROPDL values

Finally, we looked for the presence of outliers in both the population (Figure 5a) and cluster-specific (Figure 5b) residuals from the parent model. Similar plots (5c-5d) were generated from the child model. Inspection of these plots indicates that there are some outlying values. However, we argue that this fit between the residuals and predicted values is adequate given the small sample size.

Figure 5a-5b. Scatter plots showing presence of influential values from population (left panel) and cluster-specific (right panel) residuals from parent models

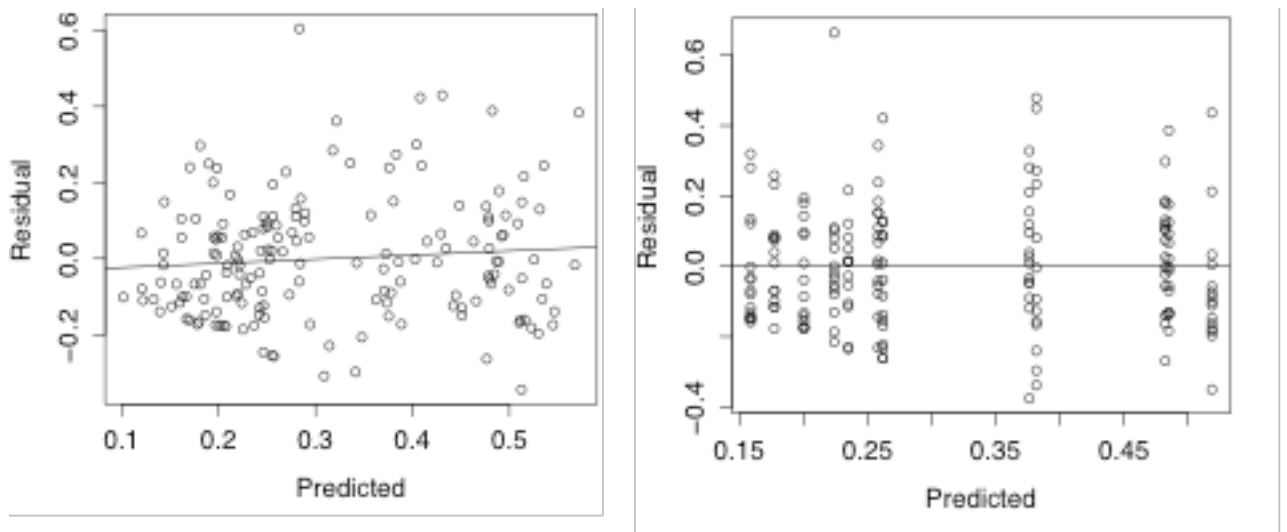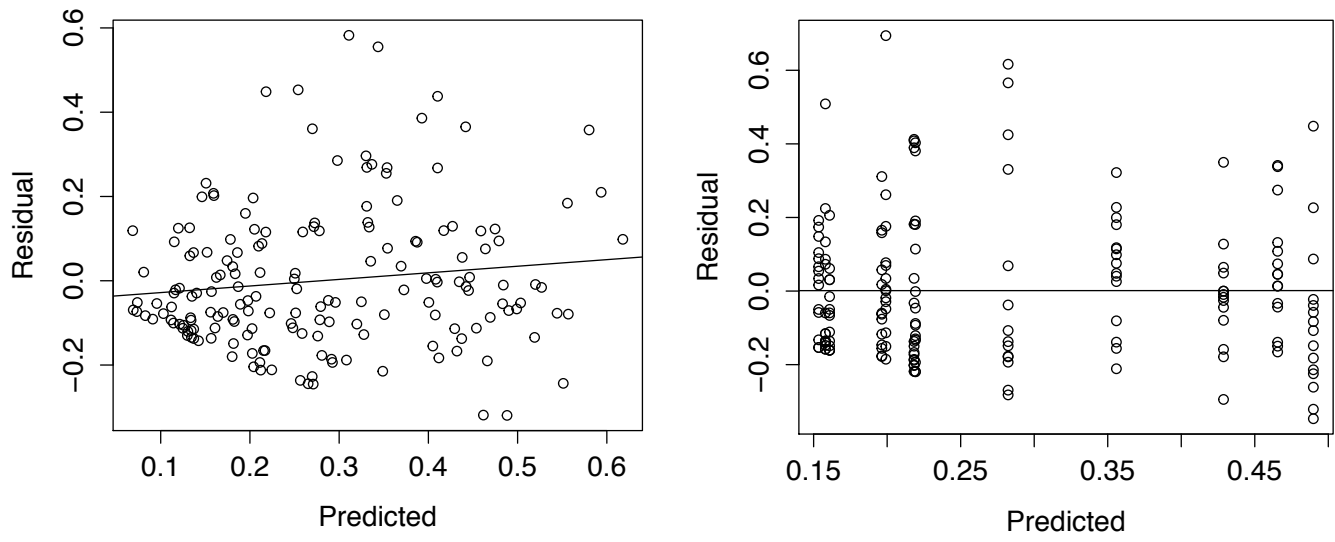*Figure 5c-5d.* Scatter plots showing presence of influential values from population (left panel) and cluster-specific (right panel) residuals from child models

Appendix E: Additional Analyses from Chapter Four

Table 1 presented below displays model parameter estimates for the additional analyses described in Chapter Four. Similar to the interpretations above, the Training parameter reflects the difference between the control and training condition

Table 1. Parents' estimated individual DL types, untrained DL, and contextualized utterances

	Model 1: Past Talk	Model 2: Future Talk	Model 3: Explanations	Model 4: Questions	Model 5: Untrained DL	Model 6: Cxt Utts
FIXED EFFECTS						
Intercept (centered)	0.14***	0.06***	0.05***	0.02**	0.12***	78.08***
	(0.03)	(0.02)	(0.01)	(0.007)	(0.02)	(7.43)
Linear Time	-0.001	0.006	-0.001	0.0001	-0.006	-1.46
	(0.009)	(0.007)	0.004	(0.002)	(0.008)	(2.04)
Quadratic Time	-0.009~	-0.002	-0.003	-0.0008	0.001	1.18
	(0.006)	(0.005)	(0.002)	(0.001)	(0.006)	(1.37)
Training	0.17***	0.05~	0.03~	0.03**	0.08*	-34.99***
	(0.04)	(0.03)	(0.01)	(0.01)	(0.03)	(10.50)
Training * Linear	0.02	0.004	0.005	0.003	0.005	-1.36
	(0.01)	(0.01)	(0.005)	(0.003)	(0.01)	(2.89)
Training * Quadratic	-0.01	-0.005	-0.002	-0.003	-0.01	5.19**
	(0.008)	(0.007)	(0.003)	(0.002)	(0.008)	(1.95)
RANDOM EFFECTS						
Level 1:						
Within-Person	0.02***	0.01***	0.003***	0.001***	0.02***	1028.11***
	(0.002)	(0.001)	(0.0004)	(0.0002)	(0.001)	(123.33)
Level 2:						
Intercept (centered)	0.005**	0.00	0.0003~	00003**	0.001	412.43**
	(0.002)	(0.00)	(0.0002)	(0.0001)	(0.001)	(159.61)
GOODNESS OF FIT						
AIC	-132.4	-278.6	-517.5	-616.5	-159.5	1702.2

Table 2. Children's estimated individual DL types, untrained DL, and utterances

	Model 1: Past Talk	Model 2: Future Talk	Model 3: Explanations	Model 4: Questions	Model 5: Untrained DL
FIXED EFFECTS					
Intercept (centered)	0.13***	0.06**	0.03**	0.01**	0.15***
	(0.03)	(0.02)	(0.001)	(0.003)	(0.03)
Linear Time	-0.004	0.003	0.0002	0.0001	-0.003
	(0.008)	(0.007)	(0.002)	(0.001)	(0.001)
Quadratic Time	-0.008	-0.003	0.0005	-0.001~	-0.005
	(0.006)	(0.004)	(0.002)	(0.001)	(0.006)
Training	0.21***	0.04~	0.02	0.01*	0.06~
	(0.05)	(0.03)	(0.01)	(0.005	(0.04)
Training * Linear	0.02	0.003	0.001	0.002	0.007
	(0.01)	(0.001)	(0.003)	(0.002)	(0.01)
Training * Quadratic	-0.02**	-0.003	-0.004	-0.0003	-0.003
	(0.009)	(-0.004)	(0.002)	(0.001)	(0.009)
RANDOM EFFECTS					
Level 1:					
Within-Person	0.02***	0.01***	0.002***	0.0003***	0.02***
	(0.003)	(0.001)	(0.0003)	(0.00003)	(0.002)
Level 2:					
Intercept (centered)	0.006**	0.00	0.007**	0.0003	0.001
	(0.007)	0.00	(0.0003)	(0.0001)	(0.001)
GOODNESS OF FIT					
AIC	-100.3	-297.9	-513.4	-838.8	-145.8

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