Exploring the Relationship Between Positive Behavior Support and Language Supporting Interactions in Preschool Classrooms

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

Figures Page

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

Language abilities are related to the development of many important skills in early childhood including social skills, relationships with peers, and emotional/behavior regulation (Clegg, Law, Rush, Peters, & Roulstone, 2014; Cohen & Mendez, 2009; Rescorla, Ross, & McClure, 2007; Roben, Cole, & Armstrong, 2013). The relationship between early oral language skills and future academic success is of particular interest for early educators preparing young children, especially as children transition from later preschool to Kindergarten. Language development in early childhood provides an essential foundation for future literacy skills (Dickinson, Golinkoff, & Hirsch-Pasek, 2010). Children with stronger language skills have significantly better scores on measures of listening and reading comprehension, letter identification, and decoding skills in the early elementary grades (Duff, Reen, Plunkett, & Nation, 2015; Lee, 2011; Sénéchal, Ouellette, & Rodney, 2006).

Children who exhibit language delays at the end of preschool and beginning of Kindergarten have persistently lower reading skills compared to their age-matched typically developing peers (Skibbe et al., 2008). Children with language delays at 54 months have lower scores on measures of school readiness upon school entry (Justice, Bowles, Turnbull, & Skibbe, 2009). Tomblin, Zhang, Buckwalter, and O'Brien (2003) reported that 56 percent of children diagnosed with a language delay in Kindergarten demonstrated characteristics of persistent language delay four years later. These deficits associated with delayed early language can persist even into adolescence (Rescorla, 2009). Thus, identifying ways to promote language

development in young children, particularly those who are at risk for language delays, is a critical area of focus in the field of early childhood development and education.

Low SES and Language Development

The relationship between early language and future academic success is particularly critical for young children from low socioeconomic (SES) backgrounds. Children from low SES backgrounds are at a higher risk for delayed language and literacy development (Halle et al., 2009; Hart & Risley, 1995; Hoff, 2013). The differences in language development between young children from low-income backgrounds and their middle-class peers are evident as early as infancy, and this gap persists and widens with age (Fernald, Marcham, & Weisleder, 2013; Hoff, 2003; Reardon, 2011). Delays in language development in this population are evident across multiple aspects of language including expressive and receptive vocabulary (Arriaga, Fenson, Cronan, & Pethick, 1998; Hart & Risley, 1995; Hoff, 2013; Rowe & Goldin-Meadow, 2009), grammar, and complex syntax (Arriaga, Fenson, Cronan, & Pethick, 1998; Hoff, 2013; Huttenlocher, Vasilyeva, Cymerman, & Levine, 2001).

Additionally, these delays in early language development appear to contribute to future academic performance (Walker, Greenwood, Hard, & Carta, 1994), and children from low SES background tend to score lower on measures of academic achievement in elementary school and later grades (see Sirin, 2005). While many efforts are in place to help ameliorate the effects that low-SES can have on children's development, research indicates that the language and achievement gaps have persisted (Hair, Hanson, Wolfe, & Pollak, 2015; Reardon, 2011; Sirin, 2005). Therefore, continued research to refine and improve effective and early language intervention is needed for young children who are at-risk for academic delays due to poverty.

This issue of delayed language in young children from low-income backgrounds is compounded by the evidence that this population is also significantly more likely to exhibit challenging behavior, as compared to their higher SES peers (Morgan, Farkas, Hillemeir, & Maczuga, 2009; Qi & Kaiser, 2003). Research indicates a strong negative correlation between challenging behavior and children's language development (Campbell, 1995). Frey and Kaiser (2014) found that children exhibiting persistent problem behavior throughout their preschool years demonstrated significantly lower language abilities as compared to their peers with typical pro-social behavior skills. Researchers argue that the relation between behavior and language is likely reciprocal in nature, in that children who have delayed language are more likely to exhibit problem behaviors because of their limited ability to express emotions and regulate their environment using appropriate communication (Roben, Cole, & Armstrong, 2013; Rescorla, Ross, & McClure, 2007). In turn, those problem behaviors may impact adult-child interactions in such a way that limits a child's language learning opportunities (Qi, Kaiser, & Milan, 2006; Curtis, Kaiser, Estabrook & Roberts, 2017). These findings suggest that researchers and practitioners should focus on identifying intervention strategies to support both language and social-emotional development in children who are at-risk.

Supporting Early Language Development

Extensive correlational and experimental research has examined the relationship between features of adult language input and child language development, creating a strong evidence base supporting parent and teacher use of core language promoting strategies. These features of adult behavior supporting language development can been broadly categorized into two types: (1) communication and interaction based, and (2) linguistic input.

Researchers have repeatedly demonstrated that one of the most important things adults can do to facilitate language growth is to respond contingently to children's initiations (Hoff &Naigles, 2002; Tamis-Lemonda, 2002). The effects of increased adult responsiveness are evident as early as the first year of life (Paavola, Kunnari, & Moilanen, 2005; Tamis-Lemonda, Bornstein, & Baumwell, 2001). Similar to findings in the parent literature, teachers' responsiveness to child initiations contributes to children's language learning in childcare and classroom environments in their early childhood years (Giralometto & Weitzman, 2002). Not only is global responsiveness to child communication important for language growth, *how* adults respond is important as well. Responses that contain semantically related information or an expansion of a child's utterance are associated with positive child language gains (Wasik, et al. 2006; Wasik & Hindman, 2011). Expansions and recasts are components of several evidence based language and communication interventions (Camarata, Nelson, & Camarata, 1994; Cleave, Becker, Curran, Van Horne, & Fey, 2015, Nelson, Camarata, Welsh, Butkovsky, Camarata, 1996; Roberts & Kaiser, 2015; Whitehurst et al., 988). Adults can also facilitate language growth by using scaffolding strategies, such as open-ended questions, that elicit language from children and support longer conversational exchanges (Pentimonti et al., 2017; Wasik, Bond, & Hindman, 2006; Wasik & Hindman, 2011).

The specific linguistic content of adult language is also an important component of interactions supporting language development. The vocabulary and sentence structures that adults model for children are essential components of high quality language interactions (Hart & Risley 1995; Hoff, 2003; Huttenlocher et al., 2001). Adults who model diverse vocabulary and complex sentence structures have a more positive impact on child language development (Hoff, 2003; Ruston & Schwanenflugel, 2010). For example, Hadley and colleagues (2016) found that

the diversity of parents' noun phrase subjects used in conversations during play was a strong predictor of children's sentence diversity. Similarly, within conversations in the classroom, the complexity of children's utterances can be predicted by the complexity of utterances modeled by teachers (Girolametto, Weitzman, & Greenberg, 2003; Justice, McGinty, Zucker, Cabell, & Piasta, 2013).

Children's language skills can be improved through interventions delivered by parents or teachers. The positive effects of caregiver interventions are most clear in literature examining the effects of training parents to implement language interventions with their young children with delayed or impaired language (see Roberts & Kaiser, 2011; Heidlage et al., under review). Roberts and Kaiser (2011) analyzed the outcomes of 18 group design studies examining the impact of training parents to implement language interventions on the expressive and receptive language skills of their young children with language impairments. Meta analyses indicated that on average, training parents resulted in a significant, positive change in child receptive language (g=0.35) and expressive language (g=0.61). Similarly, Kaiser and colleagues (2017) found a significant, positive effect of training parents on the expressive vocabulary of young children with and without language impairments (g=0.38). In both of these meta-analyses, results also indicated a significant positive effect on parent language behaviors; Roberts and Kaiser (2011) found a weighted mean effect size of 0.73 for responsiveness and 0.38 for use of language models. This finding related to change in parent responsiveness was replicated by Heidlage et al. (under review), who also found a large, significant, positive effect on parent responsiveness (g=0.73). These findings are encouraging, as they indicate that training indigenous implementers can be an effective means of increasing the dosage of facilitative language interactions that a child receives throughout a day.

In similar efforts to improve the language and literacy learning opportunities in childcare and preschool classrooms, researchers have examined the effects of training teachers and childcare providers to implement language focused curricula and interventions (e.g., Landry et al., 2011; Piasta et al., 2012; Wasik & Bond, 2001; Wasik et al., 2006). These studies follow a cascading model of intervention, in which researchers train teachers and childcare providers to implement an intervention in their classrooms. The teachers are the immediate 'recipients' of the primary intervention, and children are the distal recipients of the intervention through teachers' delivery of their newly-learned language support strategies. A critical question in this line of research is the extent to which the intended 'cascading' effect occurs; that is, do teachers implement the intervention with sufficient dosage and fidelity and, do child language skills increase as a result of these professional development (PD) interventions.

In a narrative review of studies examining the effects of training teachers to use language supportive strategies in the classroom, Dickinson (2011) concluded that the results of these teacher level interventions are largely mixed with some null or negative results. Dickinson's (2011) conclusions are supported by meta-analyses examining the impact of PD interventions on child language outcomes. Markussen-Brown, Juhl, Piasta, Bleses, Hojen, and Justice (2017) conducted a meta-analysis examining the effects of language and literacy focused PD interventions on language outcomes for young children. The authors found small, but statistically significant effects on phonological awareness and alphabet knowledge, but did not find significant effects for vocabulary (g=0.21*)*. A similar, independent meta-analysis of 14 studies focusing specifically on teachers serving children from low SES backgrounds also found a small effect on child language outcomes (Cunningham & Kaiser, 2017). The average effect size for receptive vocabulary (the most frequent child outcome measures in these studies) was 0.167,

which translates to a gain on the Peabody Picture Vocabulary Test of only 2.4 points for interventions lasting on average six months. A small gain of 2.4 points on a measure of receptive vocabulary may not be enough to change the learning trajectory of these young at-risk children in such a way that would significantly ameliorate this achievement gap. Finally, both Markussen-Brown and colleagues (2017) and Cunningham and Kaiser (2017) found that changes in teacher behaviors did not mediate child outcomes. This could indicate that the measures used to capture change in teacher behavior were not sensitive enough to capture the aspects of teacher change that would predict child outcomes *or* that changes in adult behaviors were not sufficient to impact child outcomes (Markussen-Brown et al., 2017).

Dickinson (2011) hypothesized two reasons why PD interventions fail to produce large, clinically meaningful changes in child language outcomes: (1) dosage of the language intervention is not sufficient because the amount of time teachers spend engaging in language promoting practices is too limited to change children's skills; and (2) the language promoting interventions are complex and require teachers to modify multiple features of their language interactions with children across the day, and to do so with high fidelity is challenging. The findings from these reviews of the PD literature indicate that, although the effects of training teachers in curriculum interventions and language support strategies are generally positive, these interventions alone often are not sufficient to significantly improve language outcomes for children at-risk due to poverty.

As pointed out by Dickinson (2011), using a comprehensive set of language promoting strategies can be a difficult and complex task for teachers in classrooms that serve at-risk children. Few studies have examined how features of instructional models, classroom organization or teacher management of child behavior influence teacher-child interactions in

ways that enhance, or inhibit, children's language learning. In the language-focused PD literature, teaching training is often solely focused on specific skills related to promoting language development (see Markussen-Brown et al., 2017). However, teacher-child language interactions do not occur in an isolated one-on-one setting; teachers interact with multiple students daily within complex classroom environments. Teachers are responsible for addressing child development goals across multiple domains, managing and training support staff members, and maintaining the physical and temporal environment of their classroom (Doyle, 2006). From an ecological perspective on development, all of these features of a classroom environment interact with individual child and teacher characteristics to produce the context in which learning can occur (Bronfenbrenner, 1994; Downer, Sabol, & Hamre, 2010).

In addition, the individual learning needs of children in classrooms may vary widely, thus, teachers need to be able to model and elicit communication from a range of children. For example, in their review of the literature Cunningham and Kaiser (2017) found that the percentage of students identified as English Language Learners within classrooms across the included studies ranged from 2.7-79%. Additionally, the literature indicates that as many as 5 million children exhibit challenging behavior in preschool classrooms (Powell, Fixen, & Dunlap, 2007), and the presence of challenging behavior has clear links to children's language learning (Campbell, 1995; Chow & Wehby, 2017; Curtis et al., 2017; Curtis, Frey, Watson, Hampton, & Roberts, 2018; Qi, Kaiser, & Milan, 2006). Therefore, it may be necessary to provide teachers with training that addresses more foundational skills, such as classroom management, positive behavior support, and individualization, in order to maximize the effectiveness of a more domain specific, and complex, set of intervention strategies. Effective teacher training that addresses the range of factors influencing high quality language interactions with their students is critical

because teacher-child language interactions in preschool account for variance in children's language and literacy skills up to fourth grade (Dickinson & Porche, 2011).

Supporting Social-Emotional Development

The effects of teacher positive behavior support on young children's social skills are well established (e.g., Bennedict, Horner, & Squires, 2002; Duda, Dunlap, Fox, Letini, & Clarke, 2004). Features of positive behavior interventions include (a) communicating clear, positive behavior expectations; (b) providing positive reinforcement for prosocial behavior; (c) organization of physical and temporal environment to maximize engagement; (d) explicit instruction on important prosocial skills; and (e) individualized supports for children with persistent challenging behavior (Hemmeter, Fox, Jack, & Broyles, 2007; Hemmeter, Ostrosky, & Fox, 2006). One specific positive behavior support intervention for early childhood classrooms is the Pyramid Model (Fox, Dunlap, Hemmeter, Joseph, & Strain; 2003; Hemmeter, et al., 2006). The Pyramid Model focuses on preventing challenging behavior, promoting prosocial behavior, teaching emotion regulations, and implementing effective strategies for intervening with children with challenging behavior. The Pyramid Model is a tiered model of support in which nurturing relationships and a supportive classroom environment are the universal base for the promotion of prosocial behavior in all children. The secondary and tertiary tiers focus on explicit instruction of social and emotional skills (such as friendship and problem solving) and intervening with children who display more persistent challenging behavior. Research indicates that this intervention is effective at changing both teacher practices (e.g. Fox, Hemmeter, Snyder, Binder, & Clarke, 2011) and child behavior (Hemmeter, Snyder, Fox, & Algina, 2016).

Research indicates that there is a positive association between teachers' use of high quality positive behavior support strategies in their classrooms and student language gains. For example, Bierman and colleagues (2008) found that children enrolled in classrooms that were randomly assigned to receive a social-emotional intervention that focused on problem solving and positive social behavior (Head Start REDI: Research-based Developmentally Informed), were significantly more likely to have higher language and literacy skills at the end of preschool, than children in a BAU control (Bierman et al., 2008). Similarly, Feriberg, Connell, and Lorentz (2001), found a significant association between teacher's classroom management and organization and children's academic achievement. Additionally, Dobbs-Oates, Kaderavek, Guo and Justice (2011) found that teacher behavior management skills were positively related to children's task orientation, and that these two variables interacted to predict child language and literacy related outcomes.

One explanation for these related outcomes may be that children with better social skills tend to have greater academic success (Caprara, Barbanelli, Pastorelli, Bandura, & Zimbardo, 2000; Malecki & Elliott, 2002; Nix, Bierman, Domitrovich, & Gill, 2013). Another potential pathway for this change is that training in classroom management and positive behavior support strategies impacts *teacher* behaviors in ways that increase teacher-child language interactions, and, subsequently, enhance children's language learning opportunities. There is some preliminary evidence demonstrating that teacher's use of language in the classroom is correlated with classroom management. Analyses of pilot data used to validate the TPOT (a PBS/classroom management measure associated with the Pyramid Model), demonstrated a moderate correlation between ratings of key Pyramid Model practices and the Language Modeling Subscale of the

CLASS, which broadly captures if a teacher is engaging in frequent, quality conversations with children (Snyder, Hemmeter, Fox, Bishop, & Miller, 2013).

Cross-Domain Research

Downer and colleagues (2010), argue that research on classroom interventions and teacher-child relationships needs to extend beyond examining what they refer to as 'within-domain relationships', or relationships among teacher and child variables within the same domain of development to include analysis across domains of development. Much of the current PD literature on early language development could be considered within-domain, in that the researchers investigated the relationship between teachers' use of language or literacy specific strategies on child language and literacy outcomes. Few studies are what Downer and colleagues (2010) refer to as "cross-domain" research, in which the researchers examined the relationship between a teacher variable from one domain (e.g., classroom management) and its effects on children's outcomes across different domains (e.g., academic achievement).

Given the dynamic nature of classroom environments in which teachers and children interact, it is expected that teacher strategies for positive behavior support and for language learning would be related, and children's language learning would be influenced by both. Classrooms are complex ecologies in which environmental features, such as classroom schedule, physical design, and staffing provide the context for teacher interactions with children (Doyle, 2006). For teachers, the environmental context may affect their strategies for 1) classroom management; 2) interactions that respond to and promote social emotional development and positive behavior; 3) strategies and interactions that promote language development; and 4) other instructional interactions. Downer et al. (2010) argue that adult-child interactions are influenced

by a variety of these contextual factors. Features of the classroom-learning environment interact with child level factors, and together form the basis for interactions in the classroom (Downer et al., 2010).

Theoretical Framework

The primary goal of the project was to examine the relationship between two components of teacher behavior that provide essential support for children's development. These components are: strategies that support positive behavior and social emotional development and strategies that support language development. In this project, we examined how classroom management and positive behavior support aspects of teachers' behavior were related their interactions that provide communicative and linguistic support for children's language learning. Based on the ecological systems perspective, and the cross-domain development theory proposed by Downer et al. (2010), the following conceptual model (see Figure 1) represents the hypothesized relationship between effective classroom management and positive behavior support and language learning opportunities in the classroom.

This hypothetical model depicts how classroom management and PBS may influence the duration and frequency of high-quality teacher-child language interactions indirectly through changes in both teacher and child behaviors. More specifically, we hypothesize that effective classroom management influences child behavior by increasing independence, prosocial skills, and engagement, and decreases in challenging behavior. Similarly, we hypothesize that teachers with effective management strategies in place are able to dedicate less of their time responding to challenging behavior, redirecting and re-engaging children, and more time forming positive relationships and engaging in play and conversation with children. These features of both teacher

and child behavior interact with each other to set the stage for sustained, positive interactions, in which there are more frequent opportunities for language-learning.

Further, this model suggests that when teachers are taught specific positive behavior support/management strategies through an intervention such as Pyramid, their use of strategies that support language development will also increase, even though these strategies are not taught directly in the intervention. Within this model, we hypothesize that this increase in time allotted to such interactions are the mechanism through which classrooms with higher quality PBS and management result in children with higher language skills. In this present study, we aimed to conduct an initial empirical validation of this model, by first determining if a relationship does exist between features of classroom management/PBS and the frequency and quality of language learning opportunities.

Research Questions

In line with the call for expanding cross-domain research in the field of early childhood, the overarching goal of our research was to better understand the mechanism through which teacher and classroom level factors, specifically classroom management practices and positive behavior support strategies, may impact child language learning opportunities. We examined how the implementation of these classroom practices affects teacher language facilitating behaviors during teacher-child interactions in the classroom. This research addressed the following questions:

RQ1: To what extent do teachers of young children exhibit language supporting strategies in their interactions with children in their classrooms in terms of (a) frequency of conversation, (b) use of language support strategies (modeling language, expanding or

recasting child language, and asking open –ended questions to elicit language); and (c) responsiveness to child communication.

RQ2: Is teacher use of classroom management and positive behavior support procedures associated with their use of language supporting strategies during interactions with children in the classroom?

RQ3: Do teachers trained in the Pyramid Model differ in their language interactions with children in their classrooms compared to teachers who are not trained in the Pyramid Model?

CHAPTER II

METHODS

This project was comprised of two studies designed to address the research questions presented above: (1) An observational study, utilizing a correlational design, to explore the relationship between positive behavior support (PBS) and features of teacher-child language interactions in preschool classrooms, and (2) An experimental study examining the effects of a PBS classroom intervention the quality of teacher-child language interactions in a small sample of childcare and preschool classrooms. The second study was embedded within an RCT examining the impact of a program wide implementation of the Pyramid Model, on teachers' use of positive behavior support strategies in preschool classrooms (R305A150141).

Study 1

The goal of Study 1 was to examine the relationship between ratings of teacher use of positive behavior support and features of their language interactions with children. The focus of this study was to obtain observational data that described teacher-child language interactions at multiple levels, and to correlate these measures with ratings of teacher use of PBS strategies. Three language variables were analyzed: (1) global rating of quality of teacher language support (as measured by the Language Modeling [LM] subscale of the Classroom Assessment Scoring System [CLASS, Pianta, LaParo, Hamre, & Mashburn, 2007]) ; (2) observed teacher responsiveness to child-initiated communication; and (3) observed teacher frequency of utterances coded as language supportive.

Population and setting. Data from a total of 51 participants were analyzed for Study 1. Demographic data for teachers including years of experience and education level are in Table 1. All teacher participants were the lead teacher in a childcare center or classroom serving preschool-aged children. Teacher data were collected in 15 different sites: 5 Head Start centers (N=15 teachers), 5 childcare centers serving middle to low-income communities (N=19 teachers), and 5 childcare centers serving children from predominantly middle to high income backgrounds (N=17 teachers). Descriptive characteristics of the classrooms are summarized in Table 2. The classrooms averaged 14 students, with one lead and one assistant teacher. Thirty-three percent of classrooms had at least one child with a significant language delay enrolled, and 64.7% had at least one dual language learner enrolled (as reported by the teacher during the interview portion of the TPOT observation). On the CLASS (Pianta et al., 2007), classrooms received an average score of 5.60 on Emotional Support, 4.98 on Classroom Organization, and 2.32 on Instructional Support. CLASS domains are scored on a scale from 1-7, with a 1 indicating low quality and a 7 indicating the highest quality; see methods for a more detailed description of this measure. For the 39 teachers enrolled in the Program Wide Pyramid Model RCT, data collection for this correlational analysis occurred prior to the implementation of the program-wide coaching with the intervention group.

Measures of PBS and global ratings of language support were collected in 51 classrooms. A subset of teachers (N=25) also participated in audio and video-recorded language observations. The audio and video recorded samples of teachers during center time activities were analyzed to examine specific features of teacher language support. Thus, observational

measures of specific features of teacher-child interactions were obtained for 25 of the 51 (49%) teachers for whom data were collected on the global language support variable of the CLASS. [1]

Data collection procedures. Variables analyzed in Study 1 included: (1) ratings of positive behavior support; (2) rating of teacher language support; and (3) observed features of teacher-child language interactions (frequency of child directed utterances, responsiveness, and use of language supportive strategies).

Positive behavior support. The lead teachers' use of positive behavior support practices was assessed using the Teaching Pyramid Observation Tool (TPOT; Fox, Hemmeter, & Snyder, 2014). The TPOT is scored during a live observation, during which the observer takes anecdotal notes of teacher behaviors related to the subscales of the assessment, and assigns ratings on a score sheet. The subscales of the assessment include: (1) Key Practices, which includes items related to the use of positive behavior support strategies in the classroom such as effective transitions, providing clear expectations, and explicitly teaching pro-social skills; and (2) Red Flags, which include items related to 'problematic practices' such as using harsh reprimands, disorganization, and negative language.

To use the TPOT, assessors must be trained to reliability though an approved and standardized training program. Inter-rater reliability for this measure is reported as greater than 0.89 for scores assigned on the Key Practices Subscale and greater than 0.84 for scores assigned

[1] For four teacher participants, one TPOT observation and the video language observations were collected in the Spring of 2017, and an additional TPOT observation and a CLASS observation were collected in the Fall of 2017 as a part of the Pyramid Model RCT. For these participants, the Spring 2017 TPOT scores were used in the analysis of language sample outcomes, while the Fall 2017 TPOT scores were used in the analysis of CLASS LM outcomes. An average of their two TPOT scores was calculated, and included in the descriptive summary analysis

on the Red Flags subscale. Additionally, the correlations between the TPOT subscales and the subscales of the Early Childhood Environmental Rating Scale-Revised (ECERS-R; Harms, Clifford, & Cryer, 2005), indicate the strong construct validity of this measure. The authors report a moderate and negative correlation between the TPOT Red Flag subscale scores and ECERS-R overall classroom quality scores (Hemmeter, Fox, & Snyder, 2014). Additionally, correlations between 0.43-0.55 were noted between several of the ECERS-R subscales and scores on the TPOT Key Practices subscale (Hemmeter, Fox, & Snyder, 2014).

Reliability observations were conducted in 17 classrooms, randomly selected from the total sample of 51 classrooms. In instances (N=2) in which it was not possible for two observers to conduct the TPOT observation together live, reliability was scored via video. The average inter-rater reliability for the TPOT observations was 83.98% (range: 78-90%). Interobserver agreement above 80% is considered acceptable for the TPOT (Fox, Hemmeter, & Snyder, 2014).

Global rating of teacher language support. The CLASS is designed to assess the overall quality of the classroom environment in terms of emotional support, classroom organization, and instructional support. The CLASS requires a two-hour observation, divided into four 30-minute cycles in which an observer observes the classroom for 20 minutes and then scores observation for 10 minutes. The observers assign a rating for each of the subscales; scores range from 1 (indicating lowest quality) to 7 (indicating highest quality). Averages across the four observation cycles are obtained for each subscale. The language modeling (LM) subscale of the CLASS is designed to measure both quantity and quality of teacher use of language facilitation strategies in conversations with children in the classroom. Indicators of high quality language support include frequent conversations among children and teachers, frequent use of strategies that support child expression, and modeling of sophisticated vocabulary and language. The CLASS demonstrates

strong internal reliability, with across cycle coefficients ranging from 0.79-0.91 across test sub-dimensions (Pianta et al., 2007). In terms of validity, the primary CLASS subscales of emotional and instructional support are significantly correlated with the total scores of a commonly used classroom quality assessment (the ECERS), with coefficients of 0.52 and 0.40 respectively (LaParo, et al., 2004). All observers attended a CLASS certification course and achieved at least 80% reliability with a gold standard coder. Reliability observation were conducted in 16 classrooms, randomly selected from the total sample of 51 classrooms. Agreement on CLASS items is defined as two observers scoring an item within +/- one point of each other. Average interrater reliability was 90.23% (range: 67.5% -100 %).

Features of teacher language input. Three features of teacher-child language interactions in the classroom were measured from audio and video-recorded samples of teacher interactions during free-choice center time: (1) frequency of conversations with children, (2) responsiveness to child communication attempts, and (3) frequency of utterances coded as language supportive. Teachers were audio and video-recorded during free-choice center time twice across two days. Results from a G-study conducted with the first nine teacher participants indicated that two samples of 20 minutes in duration were needed to obtain a stable estimate of teacher talk in the classroom (g=0.79 for total utterances; 0.66 for total language supportive utterances; 0.74 for proportion of total utterances coded as language supportive; note that *g* coefficients higher than 0.6 are considered acceptable [Bakeman, McArthur, Quera, & Robinson, 1997]). Thus, two 20-minute video and audio-recorded samples of teachers interacting with children during center time were collected, transcribed, and coded. Teacher outcome data were averaged across the two samples and used in the analyses.

Transcription and coding procedures. Transcription of video and audio-recorded teacher-child interactions were completed using standard procedures for orthographic transcription and marking morphemes according to the Systematic Analysis for Language Transcripts (SALT; Miller & Iglesias, 2012). Every adult utterance was transcribed, and was assigned three codes: (1) to whom the utterance was directed (child/ group of children, another adult/self); (2) whether or not the statement was responsive to a child initiation (defined as occurring within 3 seconds of a child initiation); and (3) category of language. To code for category of language, each adult utterance was scored using the Code for Interactive Recording of Children's Learning Environments (CIRCLE; Atwater et al., 2014) definitions of teacher language. The CIRCLE defines 10 categories of teacher talk: (1) positive feedback; (2) negative feedback; (3) expansions/repetitions; (4) open ended questions; (5) closed ended questions; (6) requests for action; (7) reading and reciting; (8) singing; (9) exuberant vocalizations; and (10) general conversations. CIRCLE has been used successfully in previously published research focusing on using the code to describe teacher and child language and engagement in preschool classrooms with adequate inter-rater reliability ranging from 84.6-97.5% (Greenwood, Carta, Atwater, Goldstein, Kaminski, & McConnell, 2013).

To address the specific goals of this study, several categories of teacher talk defined in the CIRCLE code were expanded to allow for the differentiation of statements related to children's behavior and organization of the classroom. Additionally, categories were added to indicate when teacher comments were contingently related to children's play and children's conversational initiations. Specifically, the positive feedback category was subdivided into general and specific praise to capture the use of specific behavior praise, which is considered to be best practice in supporting children's prosocial behavior. The general conversations category

was expanded to record five types of talk: (1) nonspecific general conversation (saying "ok", "sure", "let's see here", "here you go", "oh my goodness", etc.), (2) related comments (comments directed to a specific child that are related to the activity in which the child is engaging in or in response to a child conversational initiation), (3) non-related comments (comments made by the teacher that are not related to the child's play or the child's communication to the teacher), (4) giving procedural information (making a statement to a child for the purpose of providing classroom information such as changes in the schedule, reminder of classroom rules, etc.), and (5) providing specific prompts for language (i.e. time delays, explicit say prompts, providing choices). Definitions for these categories can be found in Appendix A.

Based on previous research on features of adult language that facilitate language learning in young children (e.g., Camarata et al. 1994; Cleave et al., 2015; Hoff & Naigles, 2002; Roberts & Kaiser, 2015; Pentimonti et al., 2017; Wasik & Hindman, 2011) four language content codes were defined as 'language supportive' teacher behavior: (1) comments that were semantically related to the activity the child was currently engaging in, the child's play acts, or to an utterance a child made within the last 5 seconds; (2) open ended questions; (3) repetitions or expansions of child utterances; and (4) providing specific prompts for language. Based on these definitions, the selected outcome variables were calculated.

Language supportive interactions. Frequency of teacher use of language supportive strategies was calculated by summing the number of utterances coded as contingent commenting, open ended questions, repetitions/expansions, and prompts for language. The total number of teacher utterances that were coded as language supportive was divided by the total number of

child-directed teacher utterances to yield the percentage of teacher utterances that were language supportive.

Responsiveness. Every teacher utterance was marked as being responsive (occurring within 3 seconds of a child initiation (verbal or non-verbal) or initiated. The total number of teacher utterances coded as responsive was divided by the total number of child-directed utterances by the teacher to yield a responsiveness score. Additionally, although child language was not transcribed, child verbal and non-verbal attempts to communicate were marked in each transcript. If a teacher missed an opportunity to respond to a child attempt to communicate a code for "no response" was marked in the transcript. Initially, we intended to use this "no response" code to estimate a frequency of missed opportunities to respond. However, due to camera angles and placement of the microphone, only children immediately next to the teacher could be heard and limited child non-verbal attempts to communicate were captured on camera, making it impossible to reliably mark child utterances and thus, to accurately calculate frequency of missed opportunities to respond. Therefore, only the responsiveness score described above was used in the analysis.

Interobserver agreement. The video recorded samples of teacher language were transcribed and coded by research assistants trained to 85% or higher reliability prior to the beginning of the study. Every transcript was verified by a second independent transcriber. Twenty-five percent of the samples (N=12) were coded by an independent coder. The coders were three masters' level students with a background that included course work in language development. Average agreement across all codes was 92.75% (range: 91.4-94%). Average agreement on responsiveness coding was 98.26 (range: 96.8-100) Average agreement on

identification of a language supportive versus language non-supportive utterances was 86.9 (range: 81.2%-90%).

Analysis. SPSS was used to conduct all analyses. Considering the hierarchical nature of the sample (teachers nested in centers), the first step in the analysis was to calculate an intra-class correlation coefficient (ICC) for each outcome variable to determine if a significant portion of the variance in the outcome variables of interest could be attributed to differences at the center level. ICC values for each dependent variable (CLASS LM scores, responsiveness, frequency of child directed utterances, and frequency of language supportive utterances) are presented in Table 3. ICC values above 0 indicate that some portion of variance in outcomes could be attributed to covariation at the cluster level. Therefore, multilevel regression was used for all language outcome variables.

For the outcome variables obtained from the language samples (frequency of child directed utterances, responsiveness, and frequency of language supportive utterances) neither teacher years of experience nor education level were significant predictors. Due to the small sample size (limiting statistical power to detect effects with multiple predictors), and in the interest of parsimony, these predictor variables were dropped from the model for the language sample outcomes. The following statistical model was used for the language sample outcome variables:

$$Language\ Score_{ij} = \beta_{0j} + \beta_{1j}(TPOT\ Scores)_{ij} + e_{ij}$$

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10}$$

Teacher attainment of a college degree (or higher) was a significant predictor of CLASS LM scores, and for this outcome measure, it was included in the model as a covariate. The following represents the statistical model used for the CLASS LM outcome variable:

$$Language\ Score_{ij} = \beta_{0j} + \beta_{1j}(TPOT\ Scores)_{ij} + \beta_{2j}(Yrs.Experience)_{ij} + e_{ij}$$

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10}$$

$$\beta_{2j} = \gamma_{20}$$

For all dependent variables, allowing the TPOT score slope to vary randomly did not result in a significant contribution to the overall variance, and thus, a random intercept with fixed slopes model was utilized.

Study 2

Study 2 was designed to extend the correlational analysis in Study 1, by examining how teachers in centers randomized to receive program wide PM training differed in terms of language support from teachers who did not receive such training. As indicated, this study was embedded within an RCT being conducted by Drs. Mary Louise Hemmeter and Erin Barton at Vanderbilt University. Ten Head Start and childcare centers (with a total of 35 participating teachers with post-test data available) were randomized to receive program-wide support and training on the Pyramid Model or to a business as usual control group (see Appendix B for a full project description). Teacher performance on the TPOT and CLASS were measured pre- and post-training (beginning and end of school year) as a part of this larger study.

Population and setting. Post-test data from 35 teachers were analyzed in Study 2. Twenty of the teachers were randomized (at the center level) to receive program wide Pyramid

Model training, and 15 teachers were randomized to a BAU control group. Summary teacher and classroom characteristics for this group of teachers/classrooms analyzed in Study 2 can be found in Table 4.

Data collection procedures. The measures and data collection procedures used in Study 1 were repeated for the 35 participants after the program wide Pyramid Model training concluded (May and June 2018). Specifically, CLASS and TPOT data were collected in each participating classroom, and language samples were analyzed from the video- and audio- recorded observations in the classrooms in which the lead teacher consented to this additional observation at post-test (N=8, one in the control group and seven in the intervention group). Note that because only one teacher from the control group participated and completed two post-test language samples, comparisons between control and intervention teachers were not possible; data were analyzed for only the seven teachers in the intervention group. We originally proposed to recruit more participants from the larger RCT for the language sample measure, however, several sites elected not to participate in this portion of the study because they did not wish to commit to any observations beyond those being conducted as a part of the larger study.

The pre- and post-test outcomes obtained from the language samples of the seven teachers in the intervention group were analyzed for change over time. The same procedures for transcription and coding in Study 1 were used in the post-test analysis of teacher language samples. Twenty percent of the samples (N=3) were coded by an independent coder to determine IOA. Average agreement across all codes was 94.25 (range: 93.2-95.3). Average agreement on responsiveness coding was 99.75 (range: 99.5-100) Average agreement on identification of a language supportive vs. non-language supportive utterances was 88.9 (range: 86-91.8).

Analysis. A multilevel regression model was used to determine if participating in the program wide Pyramid Model intervention group significantly predicted post-test CLASS LM scores. As with Study 1, for each outcome variable, the ICC was calculated to determine if multilevel modeling was required. The ICC for post-test CLASS LM scores was 0.48. MLM was used for the analysis because the ICC was above 0. Three Level-1 predictors were entered into the model: (1) a dichotomous variable representing inclusion in the experimental versus BAU group; (2) baseline CLASS LM score; (3) a dichotomous variable representing whether or not the teacher had a college degree or higher. The college degree variable was retained in this model to be consistent with the correlational analysis conducted in Study 1.

Thus, the following model was used:

$$Post\ LS = \beta_{0j} + \beta_{1j}(Pyramid\ Training)_{ij} + \beta_{1j}(Pre\ LS)_{ij} + \beta_{1j}(College\ Degree)_{ij} + e_{ij}$$

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10}$$

$$\beta_{2j} = \gamma_{20}$$

$$\beta_{3j} = \gamma_{20}$$

To analyze changes in specific features of teacher language from pre to post-test, we examined the average change in (1) total child directed utterances and (2) frequency of language supportive utterances (3) percentage of overall talk coded as language supportive (4) change in the frequency of utterances related to classroom and behavior management (requests for action, giving procedural information, and negative feedback) across the seven teachers who participated in the intervention group.

CHAPTER III

RESULTS

Study 1

Descriptive outcomes. Summary statistics for all variables are in Table 5. The average TPOT score across the 51 participating teachers was 50.37 (SD: 14.4, range: 23.01-90.27). This score indicates that on average, approximately half of the indicators represented on the TPOT key items subscale were observed in these classrooms. The average CLASS LM subscale score was 2.75 (SD 0.83, range: 1-4.75). This score indicates that on average, teachers' language support fell in the low to moderate quality range. For the 25 teachers with language sample data, the average total number of utterances in a 20-minute sample was 322.9 utterances (SD: 64.0, range: 215-447); an average of 309.96 utterances (95%; range: 90-100%) were directed to children (SD: 63.47, range: 202-447). Of the child-directed utterances, an average of 131.8 (SD: 43.77, range: 27-231) were identified as language supportive. The average percentage of total teacher utterances coded as language supportive was 41.81% (SD: 9.9%, range: 12.2-58.51%). The most common type of language supportive utterance was related commenting (mean: 80.46 utterances, SD: 27.45). On average, 44.9% of teacher utterances directed at children were coded as responsive to a child initiation (SD: 10.9, range: 28-63%). No significant differences were found on any of the tested variables (TPOT, CLASS LM, frequency of child-directed utterances, frequency of language supportive utterances, and responsiveness) between teachers from centers

serving children from low-income backgrounds and teachers from centers serving children from middle to upper-income backgrounds.

Multilevel regression outcomes. Results from the multilevel regression analysis can be found in Tables 6-9. The standardized regression outcomes (equivalent to Pearson's r correlations) can be found in Table 10. Results of the analysis indicate that teachers with higher TPOT scores were significantly more likely to score higher on the CLASS LM subscale (=0.03, r= 0.57, p=0.003). Thus, for every one point increase on the TPOT we would predict a 0.03 point increase on CLASS LM subscale scores. Teacher TPOT scores were also a significant predictor of the frequency of child-directed utterances (β=1.90, r=0.52, p=0.011) as was the frequency of language supportive utterances (β=1.37, r=0.53, p=0.007). These findings indicate that for every 1 point increase on the TPOT, we would predict a 1.90 utterance increase in total child-directed utterances, and the use of 1.37 more language support strategies in a 20-minute language sample. TPOT scores were also a significant predictor of the percentage of total utterances coded as language supportive (β=0.25, r=0.44, p=0.032). TPOT scores were not however predictive of the percentage of child-directed utterances coded as responsive (β=0.03, r=0.05, p=0.824).

Study 2

Descriptive outcomes. Means and standard deviations for the measures obtained at post-test can be found in Table 11. The average post-test TPOT score for the 35 teachers who completed the Program Wide Pyramid Model study was 51.40 (SD: 14.47, range 15.79-87.50). At post-test, teachers employed at schools randomized to receive program wide Pyramid Model

training scored, on average, 11.4 points higher on the TPOT than the BAU control group (when controlling for pre-test TPOT scores and college education); this finding approached significance (p=0.069).

Post-test analysis of CLASS LM scores. The average LM CLASS score for the full sample was 2.81 (SD: 0.82, range: 1.75-5.25). The average LM CLASS score for teachers in the intervention group was 2.91 (SD: 0.91) and the average score for teachers in the control group was 2.68 (SD: 0.70). Results of the multilevel regression analysis of teachers' post-test CLASS LM scores can be found in Table 12. The results indicate that teachers in the intervention group scored, on average, 0.38 points higher on the CLASS LM subscale than the control group, when controlling for pretest CLASS LM scores and college education. This translates to an effect size of approximately 0.28. However, this relationship was not statistically significant (p=0.332). Thus, while the trend is in the expected direction (favoring the Pyramid intervention group), the small sample size and non-significant findings preclude drawing conclusions about the effects of Pyramid Model training on teacher's global use of language support strategies in the classroom.

Pre-post analysis of language samples. For the seven teachers in the intervention group for whom language sample data were available, the average total number of utterances at post-test was 331.78 (SD: 55.61, range: 233-404). The average total number of child-directed utterances was 324.36 (SD: 51.83, range: 223-371). The average total number of child-directed utterances coded as language supportive was 189.07 (SD: 21.87, range: 102.5-141.5). The analysis of the change in language sample outcomes from pre- to post-test indicated that on average, the seven teachers in the intervention group spoke to children more frequently after

participating in the Pyramid intervention. There was an average increase from pre- to post test of 65 child-directed utterances (range of -4.5-115.5; See Figure 2 for pre to posttest changes for individual teachers). Similarly, teachers used more language supportive utterances at post-test, with an average increase from pre- to post-test of 27.85 language supportive utterances (Range: -3.5-94 utterances; See Figure 3). The largest changes occurred in teacher use of contingent commenting and in repetitions or expansions of child language. More specific strategies for eliciting child language (open-ended questions and prompts for language) remained stable pre- to post-test.

Mixed results were noted for percent of child directed utterances coded as responsive, with two teachers demonstrating an increase in responsiveness, and five demonstrating stable or decreasing responsiveness. Teachers also did not consistently demonstrate a decrease in behavior management related statements (requests for action, negative feedback, giving procedural information) after intervention (contrary to our hypothesis). On average teachers' use of these statements remained unchanged pre- to post-intervention, with high variability across teachers (average decrease of 0.5 behavior related statements, with a range from -83 to +42). Three of the seven teachers demonstrated a decrease, while four of the seven demonstrated an increase in use of behavior management-related statements.

CHAPTER IV

DISCUSSION

The purpose of this study was to extend what is known about factors that contribute to the language-learning environment in early childhood classrooms. This goal was addressed through two analyses. First, we used a correlational design to examine the relationship between measures of classroom management and positive behavior support (as measured by the TPOT) and the frequency and quality of language support provided by teachers in early childhood classrooms. Findings suggest teachers with better classroom management and PBS skills were significantly more likely to talk to children; these teachers used language supportive strategies more frequently and scored higher on a global measure of quality of language support. These findings are in line with what Snyder et al. (2013) found in the validation study for the TPOT. TPOT scores were a stronger predictor of frequency of strategy use (measured in the language samples) than overall percentage of total utterances coded as language supportive. We did not find a significant relationship between TPOT scores and the frequency of child-directed utterances coded as responsive, possibly because our measure of responsiveness was limited and not comparable to measures of responsiveness frequently reported in the literature (a percentage of total child utterances to which the teacher responds).

Second, to test the direction of the relationship, we used data from an experimental design to examine the effects of a professional development intervention that taught the use of classroom management and PBS strategies on the quantity and quality of teacher language

support. The pre-post analysis of a small subgroup of teachers in the intervention group (N=7) indicated that on average, teachers' frequency of child directed utterances and use of language supportive strategies increased after intervention. However, contrary to our hypothesis, this increase in conversations and use of language supportive utterances was not associated with a decrease in teacher utterances dedicated to managing behavior. These findings should however be interpreted with caution due to the very limited sample size and high variability in teacher outcomes. Findings from the post-test analysis of the CLASS LM scores suggest that teachers in the intervention group, on average, demonstrated a higher quality of language support at post-test compared to teachers in the BAU control group, however, this difference was not statistically significant. It is important to note that the implementation of coaching in the Pyramid Model in the larger RCT differs from the coaching reported in other published studies examining Pyramid. Specifically, in this RCT, program-wide implementation was used, in which members of the Vanderbilt research supported and trained instructional coaches and leadership teams within the individual childcare sites in supporting staff use of Pyramid Practices.

Taken together, the findings from these analyses provide tentative support for a part of our conceptual model describing the relationship between the organizational/social-emotional environment and the language-learning environment of the classroom. Specifically, we found a direct relationship between teacher use of organizational and PBS strategies and the frequency with which they (a) talk to children and (b) use language supporting strategies. Within our conceptual model, we hypothesized that with greater management and PBS strategies in place, teachers would spend more time engaging in play and conversations with children as opposed to managing challenging behavior, and thus, the number of opportunities for conversing with children would increase (see Figure 1).

The positive changes in teacher language support from pre to post-test, as well as the direction of effects favoring the intervention group on the post-test LM CLASS scores, provide modest support for our theory that classroom organization and PBS may play an important role in setting up opportunities for teachers to engage in more frequent high quality language interactions with children in their classroom. However, due to the lack of statistically significant effects of the Pyramid intervention on teacher language quality outcomes, we cannot draw strong conclusions about the direction of effect. It could be that the effect actually moves in the opposite direction, such that the level of teacher language support influences the extent to which PBS strategies are utilized. It is also possible that the relationship is more cyclical or dynamic in nature, such that increased PBS leads to decreased challenging behavior/increased high quality conversations, and in turn those high quality conversations support sustained child engagement, further limiting challenging behavior, and increasing opportunities for more conversation.

It is also important to note that our pre-post analysis of teacher's use of behavior management did not substantiate our hypothesized mechanism for the change in teacher language support (i.e., increases in use of language supportive utterances occur because teachers have more time to engage in high quality conversations when they are spending less time time redirecting challenging behavior). One explanation for this finding is that Pyramid Model training actually changes other aspects of teacher behavior that could influence teacher-child dynamics in such a way that promotes increased quality conversations. The TPOT identifies a number of key items that are specifically related to language (and overlap with some of the communication behaviors measured in our language samples and the CLASS), such as acknowledging child communication attempts, responding to child initiations with follow up comments and questions, and engaging in conversations with children. Additionally, there are

several Key Items that do not directly overlap with our measures of language support, but do identify features of teacher behavior that support teacher- child conversations such as communicating on the child's eye level, actively engaging in play with children, and providing specific positive feedback and encouragement. It is possible that changes in these features of interactions explain the increase in conversation and quality language input post-intervention.

Alternatively, our original hypothesis may be correct, but our measurement of behavior related statements may not have been sensitive to the types of changes in teacher behaviors that may occur as a result of Pyramid Model training. In coding behavior related statements, we did not account for: (a) the effectiveness of the direction or statement (i.e. did the child comply or re-engage), (b) if the teacher had effective strategies for following up if the child did not comply or re-engage, or (c) if the direction met the standards taught in Pyramid Model coaching (simple, positive, tells the child exactly what to do). Thus, teachers may not have changed in their overall *frequency* of use of behavior management statements, but in the *quality and efficacy* of those statements. It is possible that higher quality/more effective behavior management statements are less likely to interrupt or end conversational exchanges between adults and children as compared to less effective statements in which a teacher repeats a task direction or makes a threatening or punishing statement. Providing directions and reminders at an appropriate rate is part of efficient classroom management. To understand how PBS and classroom management influence language learning opportunities, it may be important examine more closely the quality and effectiveness of those teacher statements. This hypothesis may also help to explain why TPOT scores were more strongly related to frequency of quality language support strategy use, as compared to the overall percentage of utterances coded as language supportive.

Implications for Research and Practice

The findings from these analyses have important implications for the field. First, they indicate that when researchers evaluate teacher use of language supportive strategies (such as within the context of a PD intervention), the measurement and analysis of contextual features, in addition to the targeted language strategies, may be key in fully understanding the outcomes. The findings from this analysis may offer a potential explanation for why some PD intervention studies (e.g. Dickinson, 2011, Hamre et al., 2010; Pence, Justice, & Wiggins, 2008) have found that teachers have difficulty implementing language-focused interventions with high fidelity. It is possible that classroom management and PBS moderate the effects of language focused PD interventions, such that teachers who already have strong organizational and management skills are able to utilize the targeted intervention strategies related to language more frequently and perhaps with higher fidelity. The ecological perspective grounding the conceptual model evaluated in this project states that characteristics at the classroom environment, teacher, and individual child level interact to form the learning environment (Bronfenbrenner, 1994; Doyle, 2006). This implies that learning opportunities in the classroom are the result of teachers' instructional skills interacting with multiple contextual variables. This perspective may be especially important for conversation-based language interventions, in which it is expected that teachers will utilize language support strategies in the context of naturally occurring conversations, rather than during discrete trials or planned instructional activities. It is possible that teachers' ability to use naturally occurring opportunities, embed language modeling and instruction, and leverage interactions as language teaching events is influenced by variations in the classroom environment.

The findings of this project offer support for the development of more comprehensive models of PD. The current findings suggest that it may be important to support teachers across instructional domains as opposed to targeting one or two instructional domains in isolation. Again, one explanation for the limited effects of PD interventions on child language outcomes may be that language-focused PD interventions are too narrowly focused to have an impact in complex classroom language-learning environments. The complexity of the classroom ecology (child characteristics, staffing patterns, allocation of instructional time) and teachers' skills in other domains (e.g., PBS, classroom management, effective instruction across the curriculum) may limit the dosage and fidelity of the language intervention resulting in a weak effect on child language outcomes. It may be difficult to implement any curriculum at high levels of fidelity when teachers do not have foundational skills in classroom management and positive behavior supports that allow for positive teacher-child interactions and opportunities to utilize language supportive strategies.

The small, non-significant, positive effect of the program-wide Pyramid Model intervention on language quality could also indicate that while improving teacher classroom management and PBS strategies may support increased opportunities for high quality language in teacher-child interactions, systematic coaching on targeted strategies for supporting language is still needed. This is also tentatively supported by the findings from the pre-post analysis, which indicated that teachers did not increase their use of more complex strategies for eliciting child language (open-ended questions and specific prompts for language). We hypothesize that an effective PD intervention would be one that supports teachers in both domains by providing training in foundational skills to build more frequent, sustained conversational and instructional

opportunities during the day and specific linguistic and communicative strategies that could be used within those opportunities.

Additionally, it is possible that the co-variation observed in child language and behavior in preschool classrooms is, in part, the result of teacher behavioral co-variation in their support for language learning and positive behavior. In the current study, we found that teachers who demonstrated limited classroom management and positive behavior support strategies provided less support for language development. We could hypothesize that as a result, children in these classrooms may have more problem behaviors and fewer language skills than children in classrooms where teachers provide stronger support for both areas of development. Cross-domain PD approaches that support teachers in improving their classroom management strategies prior to, or in conjunction with, training in language focused support could enhance the fidelity to which teachers are able to implement language and literacy based interventions at a dosage high enough to actually change child language and social-emotional outcomes.

Future Directions

The outcomes from this project suggest that there is a need for more information about cross-domain effects of teacher behaviors and language support and instruction in preschool classrooms. To further inform our conceptual model, more information is needed about the specific, malleable aspects of classroom management and positive behavior support that drive the relationship with language teaching behaviors found in the present study. Future research should examine if changes in teacher use of specific organizational or PBS strategies are more closely associated with the quality and frequency of conversational exchanges than others. With a larger sample, it would be possible to determine if there are key items from the TPOT that are

associated with changes in teacher language support. Future studies should examine these factors, as this information could be used identify specific management and PBS skills to target as the foundation of language focused PD, and help to identify what classroom features are most supportive of extended, high quality conversations between teachers and children.

Additionally, in the current studies, we measured a limited set of features of the classroom language learning environment, that centered primarily on teacher use of broad language support strategies. There is still much to be understood about how various features of classroom, child, and teacher characteristics interact to construct the language learning environment. Furthering this knowledge may aide us in leveraging or targeting these characteristics to more effectively support teachers and children. We argue that the consideration of (a) individual learner characteristics and the contribution of child behavior; (b) classroom-level contextual variables such as staff-child ratios, the composition of the class (size, number of children with IEPs or needing language support), types of activities and flow of the scheduled activities; and (c) additional features of teacher language input (linguistic content, distribution and individualization of input across children) are important areas for further research studies examining the social-emotional and language learning environments in preschool classrooms.

It is well established that early language is learned in dyadic interactions between adults and children, and thus to gain a full picture of language learning opportunities in the classroom, it is important to measure and analyze the contributions of both partners (Adamson et al., under review, Hoff, 2006; Snow, 1977). As indicated in our model, we predict that child engagement is one link between classroom management and PBS to teacher use of language supporting strategies; when children are engaged in activities and demonstrating low rates of challenging

behavior, teachers have more opportunities to participate in high quality conversations with them. To fully understand this pathway, it will be important to measure and analyze the contribution of child behavior and engagement to the relationship between teacher behavior and language support strategies as indicated in this study. It is possible that joint teacher-child engagement in shared activities acts as a mediating variable in this relationship (i.e., teacher use of PBS and management skills predicts the frequency and duration of sustained child engagement in activities with teachers and other children, and this engagement is predictive of the amount of high quality conversations occurring in a classroom).

Additionally, future research should examine the role that individual child characteristics play in predicting the provision of language support to individual children. The limitation of both the language samples used in this project (in which only teacher language input was recorded) and the LM subscale of the CLASS, is that they do not capture the differential experiences of individual children in the classroom. Rather, both measures provide an overall "average" experience of all children in the classroom. Thus, we have no indication of which children "received" the teacher input, and whether or not the teacher evenly distributed her high quality input across children. Understanding how teachers distribute their language support across children may be another critical piece in understanding the lack of child effects found in many language-focused PD interventions, particularly in classrooms serving children from low-income backgrounds where the prevalence of delays in language and pro-social development may be high (Qi & Kaiser, 2004).

We hypothesize that children with stronger language and pro-social skills have better strategies for recruiting and sustaining positive interactions with teachers and peers, which, in turn, results in increased opportunities to practice and learn new language. In contrast, we

hypothesize that children who exhibit challenging behavior, or who have limited language abilities (as is common in children from at-risk backgrounds), are less likely to be exposed to frequent, high quality language interactions, and limited high quality interactions are predicted to constrain language growth. No studies to date have measured the dosage of teacher language support delivered to children with challenging behavior in early childhood settings. Again, considering the covariation of problem behavior and delayed language development, and the prevalence of delays in both social and linguistic development in children who are at-risk, understanding these relationships may be critical to supporting teachers for this population of children. Future research should focus on identifying the specific child characteristics that predict high vs. lower quality teacher language input and on using this information in professional development interventions to support teachers in providing individualized support to children based on their learning needs.

. In addition to understanding how child characteristics and engagement with teachers differentially predicts the quantity and quality of input they receive, there are several other features of the classroom environment that would warrant attention in future research. The language samples collected in the present project were collected during only free-choice center time. In line with our eco-behavioral model, we would expect that different segments of the preschool day (with differing levels of structure, expectations, and demands for both teachers and children) may be more or less facilitative of conversations between teachers and children. Additionally, it is possible that for some activities (such as circle time or whole group transitions) in which a teacher must manage multiple children at once, the relationship between a teacher's management skills and the opportunities for high quality multi-turn exchanges may be even stronger.

This hypothesis may provide an explanation the stronger relationship noted between LM CLASS scores and TPOT scores, as compared to the correlations of language sample outcomes and TPOT scores in the present project. CLASS and the TPOT observations occur across two-hours and sample multiple activity types including large group, small group, centers, and transitions, whereas the language samples in this project were collected only during center time. It is possible that CLASS LM scores capture variability in teacher language support as a function of the time of day or type of activity, and thus, correlates more strongly with a global measure that is also collected across activities. Future research could focus on determining if (a) teachers are more likely to engage in high quality conversations during certain times of day/activities and (b) if the relationship between classroom management/PBS and language learning opportunities is stronger during certain times of day.

Finally, the present study focused on a small set of features of teacher language input (overall quantity, responsiveness, and use of a select set of language supportive strategies). As previously noted, research indicates that there are a number of features of teacher input that are predictive of positive child outcomes. Further studies will investigate the quality of teacher linguistic input, particularly advanced vocabulary and features of syntax that are associated with reading comprehension and academic performance. Future research focused on correlating features of linguistic input with PBS measures, would contribute to a more detailed knowledge base regarding this cross-domain relationship. In addition to linguistic input, there are other features of interaction that are supportive of eliciting and extending child communication are important to measure. For example, Justice and colleagues (2018) recently found that teacher's use of communication facilitating behaviors (maintaining a slow conversational pace and giving children opportunities to contribute, warm affect and encouragement for participation,

stimulating conversation with open ended questions, and facilitating peer interactions) was the strongest predictor of child language skills. It is possible that these features also covary with PBS and management skills, and could be evaluated in future research.

Limitations

There are two important methodological limitations to consider when interpreting the results of the project. First, the sample sizes for the analyses, particularly for the language sample outcomes and for the experimental analysis, were small. Although significant correlations were found for the two of the three language sample outcomes, the small sample size prevented the examination of any additional covariates that may have helped to further explain the relationship. With a larger sample size, it would have been possible to examine other theoretically relevant classroom-level features such as the number of children, adult-to-child ratio, and the composition of children in the classroom (such as the number with an identified disability or the number of students who were dual language learners).

Sample size for Study 2 was limited to the number of teacher participants at the ten research sites that had been randomized as part of the larger RCT. Based on the *a priori* power analysis, the sample size of 35 teachers across 10 centers allowed for the detection of a large effect size of approximately 0.9 or higher (Cohen, 1992; Hulley, et al., 2013). The effect size for post-test differences between groups on the CLASS LM scores was 0.277, and thus, the study was underpowered to detect a small effect size. Although these findings should be interpreted as exploratory, they may still be important for the development of future studies.

Additionally, we were unable to conduct a post-test group (treatment vs control) comparison of outcomes from the language samples due to low participation from teachers in

both groups. Without data from a randomized design, we cannot conclude that the pre-post changes in teacher language support were due to the intervention and not to changes occur naturally over the course of the school year. A more comprehensive analysis of the features of teacher language input in teachers who did and did not receive Pyramid Model training would be extremely valuable in furthering our understanding of the mechanism by which changes in PBS and classroom management influence teacher use of language supportive strategies.

An additional methodological limitation of the present project was the inability to have blinded observers for the CLASS outcome measure. TPOT and CLASS outcome measures were often collected by the same observer. This was an issue only when the observer was not blind to the purpose of this project, which was the case for the first author who collected TPOT and CLASS data for several classrooms. However, reliability checks were conducted on approximately 20% (N=5) of the 22 CLASS observations conducted by the first author, and reliability scores were consistently above the minimum threshold. Although the lack of blinding could introduce bias into the outcomes, the influence of any potential bias appears to be minimal.

Conclusion

In conclusion, the findings from this project support the hypothesis that a positive relationship exists between classroom management/PBS, and the language-learning environment of preschool classrooms. We argue that these findings can support researchers and practitioners in (1) understanding why teachers struggle to implement language focused interventions and strategies in their classrooms with a high enough fidelity and dosage to effect change in child outcomes and (2) developing professional development models that consider the influence that these variables have on the learning context within a classroom, and provide foundational

support when needed to teachers both within and across domains in a way that maximizes effects for teachers, and subsequently children. Future studies should focus on examining additional classroom, teacher, and child-level characteristics that could contribute to this relationship, and further our knowledge about the contextual features that may support or inhibit language learning in preschool classrooms.

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TABLES

Table 1. *Teacher participant characteristics (Study 1)*

Gender	100% Female
Average Years of Experience	14.25 (range: 0-47)
Education	20% HS 10% CDA 20% Associate's 30% Bachelor's 20% Master's

Table 2. *Classroom characteristics (Study 1)*

Mean number of children per classroom[1]	14.09 (range: 4-26)
% of classrooms with at least 1 child with language delay[2]	33.3%
% of classrooms with at least 1 dual language learner[2]	64.7%
Mean CLASS Emotional Support Score	5.66 (range: 3.13-6.69)
Mean CLASS Classroom Organization Score	4.98 (range: 2.5-6.58)
Mean CLASS Instructional Support Score	2.32 (range: 1-4.58)

Note. [1]Present during the TPOT observation; [2]As reported by the teacher during the TPOT observation

Table 3 *Intra-class correlation coefficients by outcome variable*

Dependent Variable	ICC
CLASS Language Modeling score	0.40
Child Directed Utterances	0.37
Total Language Supportive Utterances	0.35
Percentage of Total Child Directed Utterances Coded as Language Supportive	0.24
Percentage of Total Child Directed Utterances Coded as Responsiveness	0.003

Note. All ICC values were non-significant.

Table 4. *Teacher and classroom characteristics (Study 2)*

Characteristics	
Mean Years of Teacher Experience	14.25 (range: 0-47)
Teacher Education	26% HS
	8% CDA
	20% Associate's
	30% Bachelor's
	20% Master's
Mean number of children per classroom[1]	13.2 (range: 6-29)
% of classrooms with at least 1 child with language delay[2]	17.14%
% of classrooms with at least 1 dual language learner[2]	17.14%
Mean CLASS Emotional Support Score	5.91 (range: 4.81-6.63)
Mean CLASS Classroom Organization Score	5.44 (range: 3.25-6.41)
Mean CLASS Instructional Support Score	2.47 (range: 1.33-5.25)

Note. [1]Present during the TPOT observation; [2]As reported by the teacher during the TPOT observation

Table 5. *Descriptive outcomes (Study 1)*

Measure	Mean (SD)	Range
Global Classroom Measures		
TPOT item level score (N=51)	50.37 (14.4)	23.01-90.27
TPOT Red Flags (N=51)	2.41 (3.16)	0-11
CLASS Language Modeling Score (N=51)	2.75 (0.83)	1-4.75
Language Sample (N=25)		
Total Number of Teacher Utterances	322.92 (64.0)	215-447
Total Number of Child-Directed Utterances	309.96 (63.47)	202-447
Number of Different Words	327.84 (42.22)	246-392
Mean Length of Utterances (in words)	5.82 (0.73)	4.38-7.48
Percentage Child Directed Utterances Coded as Responsive Utterances	44.9 (10.91)	28.0-63.0
Percentage Total Child-Directed Utterances Coded as Language Supportive	41.81 (9.9)	13.14-58.51
Percentage Total Child-Directed Utterances Coded as Responsive *and* Language Supportive	20.7 (7.5)	5.0-37.0
Total Number of Child Directed Utterances Coded as Language Supportive	131.8 (43.77)	27.0-231.0
Contingently related comments	80.46 (27.45)	19.0-161.0
Expansions, repetitions, recasts	17.58 (11.85)	1.0-52.0
Open ended questions/elicitations	27.00 (15.96)	3.0-60.0
Prompts for language	6.76 (5.33)	0.0-19.0

Note. Possible scores the TPOT item level score range from 0-100 (percentage of total Key Item indicators present). Possible scores for TPOT Red Flags range from 0-15 (total number of Red Flags observed). Possible CLASS LM scores range from 1-7.

Table 6. *Multilevel regression results for CLASS LM scores (Study 1)*

Fixed Effects					
Parameter	Estimate	SE	t	p-value	95% CI
Intercept	1.26	0.40	3.16	0.003	0.45, 2.07
TPOT	0.027	0.01	3.19	0.003	0.01, 0.04
Advanced Degree	0.26	0.24	1.09	0.284	-0.23, 0.74
Random Effects					
Parameter	Estimate	SE	Wald Z	p-value	95% CI
Residual	0.48	0.11	4.15	0.00003	0.30, 0.77
Program	0.01	0.07	0.220	0.826	0.00, 107.85

Table 7. *Multilevel regression results for total child directed utterances (Study 1)*

Fixed Effects					
Parameter	Estimate	SE	t	p-value	95% CI
Intercept	205.09	40.68	5.04	0.00006	120.39, 289.77
TPOT	1.90	0.69	2.77	0.011	0.47, 3.32
Random Effects					
Parameter	Estimate	SE	Wald Z	p-value	95% CI
Residual	2325.24	875.98	2.66	0.008	1111.22, 4865.60
Program	782.13	905.63	0.864	0.388	80.99, 7561.48

Table 8. *Multilevel regression results for total language supportive utterances (Study 1)*

Fixed Effects					
Parameter	Estimate	SE	t	p-value	95% CI
Intercept	53.94	27.10	1.99	0.061	-2.72, 110.59
TPOT	1.37	0.46	2.99	0.007	0.41, 2.33
Random Effects					
Parameter	Estimate	SE	Wald Z	p-value	95% CI
Residual	1348.85	486.57	2.78	0.006	665.13, 2735.41
Program	77.17	335.85	0.230	0.818	0.02, 390441.17

Table 9. *Multilevel regression results for teacher responsiveness (Study 1)*

Fixed Effects					
Parameter	Estimate	SE	t	p-value	95% CI
Intercept	43.09	8.01	5.38	0.000049	26.20, 59.98
TPOT	0.03	0.14	0.225	0.824	-0.25, 0.32
Random Effects					
Parameter	Estimate	SE	Wald Z	p-value	95% CI
Residual	118.36	48.92	2.47	0.014	53.52, 261.75
Program	6.36	39.13	0.162	0.871	0.00004, 11104834.09

Table 10. *Standardized multilevel regression coefficients for teacher language outcome variables (Study 1)*

Dependent Variable	Standardized Regression Coefficient	p-value
CLASS Language modeling (LM) score	0.57	0.003
Child-Directed Utterances	0.52	0.011
Total Number Language Supportive Utterances	0.53	0.007
Percentage Total Child-Directed Utterances Coded as Language Supportive	0.43	0.032
Percentage Total Child-Directed Utterances Coded as Responsive	0.03	0.824

Table 11. *Descriptive outcomes from Pyramid Model RCT*

Measure	Unadjusted Pre-test Mean (SD)	Unadjusted Post-test Mean (SD)
Global Classroom Measures (N=35)		
TPOT key items (whole sample)	47.29 (11.45)	51.04 (14.47)
Intervention group (N=20)	46.32 (12.78)	54.90 (14.6)
Control group (N=15)	48.57 (9.65)	46.73 (13.35)
CLASS LM Score (whole sample)	2.54 (0.69)	2.81 (0.82)
Intervention group (N=20)	2.53 (0.79)	2.91 (0.91)
Control group (N=15)	2.57 (0.56)	2.68 (0.70)
Language Sample (N=7; Intervention group only)		
Total Number of Utterances	267.64 (41.54)	331.78 (55.61)
Total Number of Utterances directed to children	255.93 (42.87)	324.36 (51.83)
Number of Different Words	301.57 (39.89)	321.07 (56.30)
Mean Length of Utterances (words)	5.93 (0.50)	4.99 (0.51)
Percentage of Child Directed Utterances Coded as Responsive	47.58 (0.14)	43.25 (0.18)
Percentage of Child-direct Utterances Coded as Language Supportive	36.14 (11.29)	39.04 (6.728)
Total Utterances Coded as Language Supportive	95.07 (38.11)	129.07 (21.87)
Contingently related comments	62.50 (23.83)	81.71 (13.27)
Expansions, repetitions, recasts	10.35 (6.9)	20.00 (11.43)
Open ended questions/elicitations	16.70 (12.45)	16.23 (7.12)
Prompts for language	5.50 (6.34)	4.93 (4.51)
Total Utterances Coded as Behavior Related	51.86 (38.55)	51.36 (32.37)

Table 12. *Post-test analysis of CLASS LM scores (Study 2)*

Fixed Effects					
Parameter	Estimate	SE	t	p-value	95% CI
Intercept	1.84	0.56	3.30	0.003	0.69, 2.99
College Degree	0.388	0.27	1.44	0.16	-0.16, 0.94
Baseline LM	0.20	0.20	1.029	0.31	-0.20, 0.61
Pyramid Model	0.38	0.36	1.046	0.33	-0.49, 1.25
Random Effects					
Parameter	Estimate	SE	Wald Z	p-value	95% CI
Residual	0.42	0.12	3.39	0.001	0.23, 0.74
Program	0.19	0.18	1.065	0.287	0.03, 1.21

FIGURES

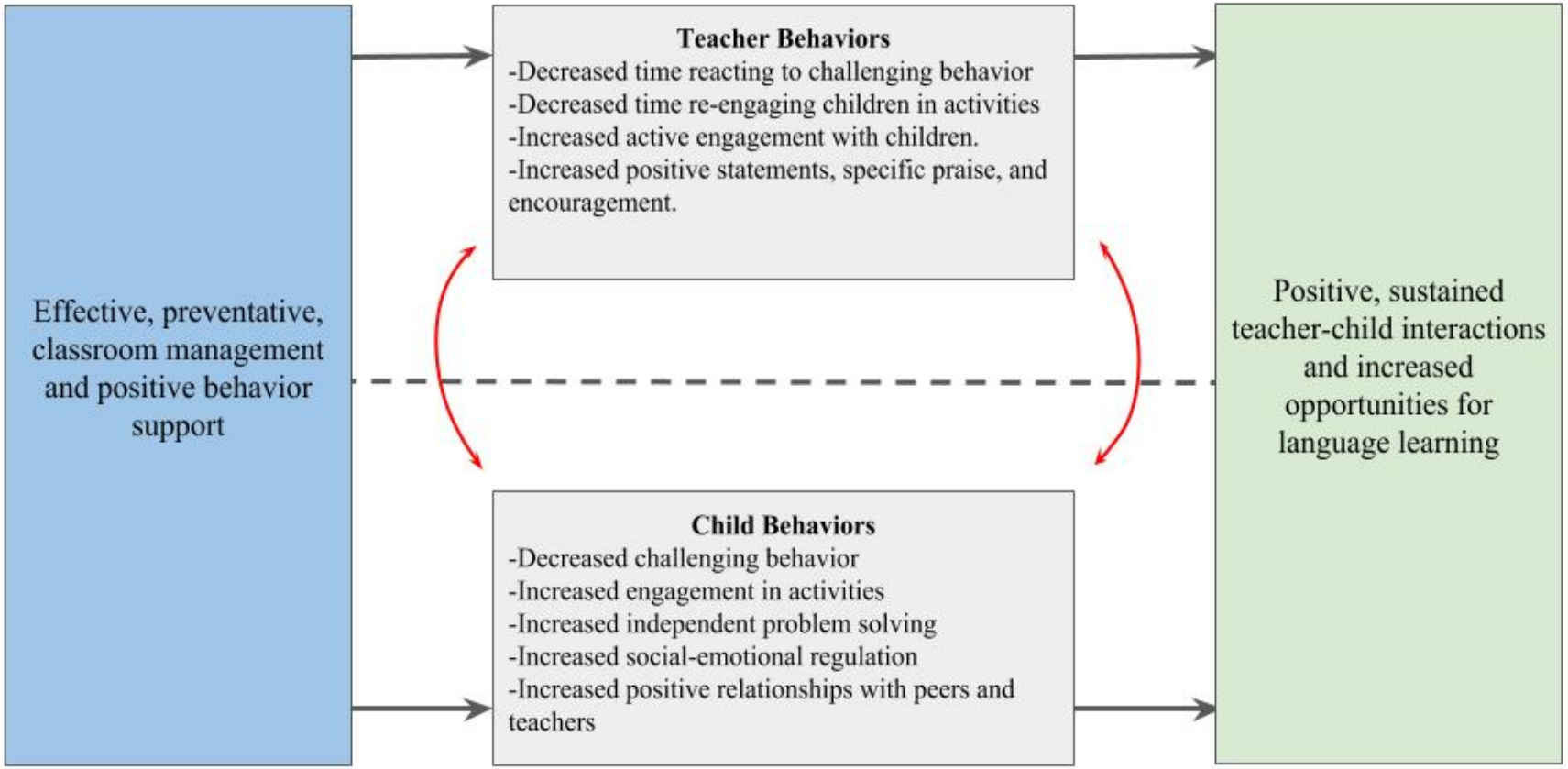

Figure 1. Conceptual Model

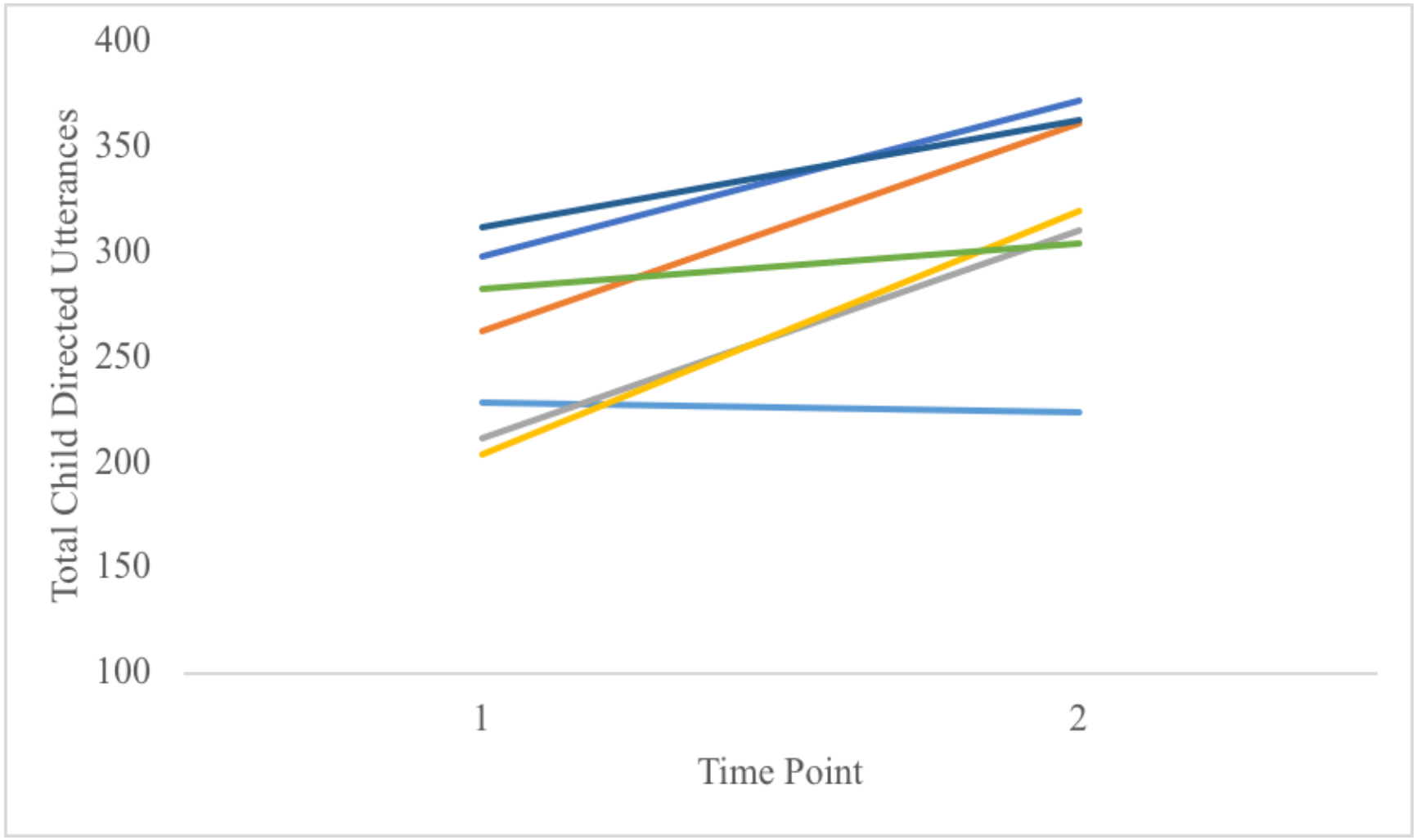

Figure 2. Changes in total child-directed utterances from pre- to post-test

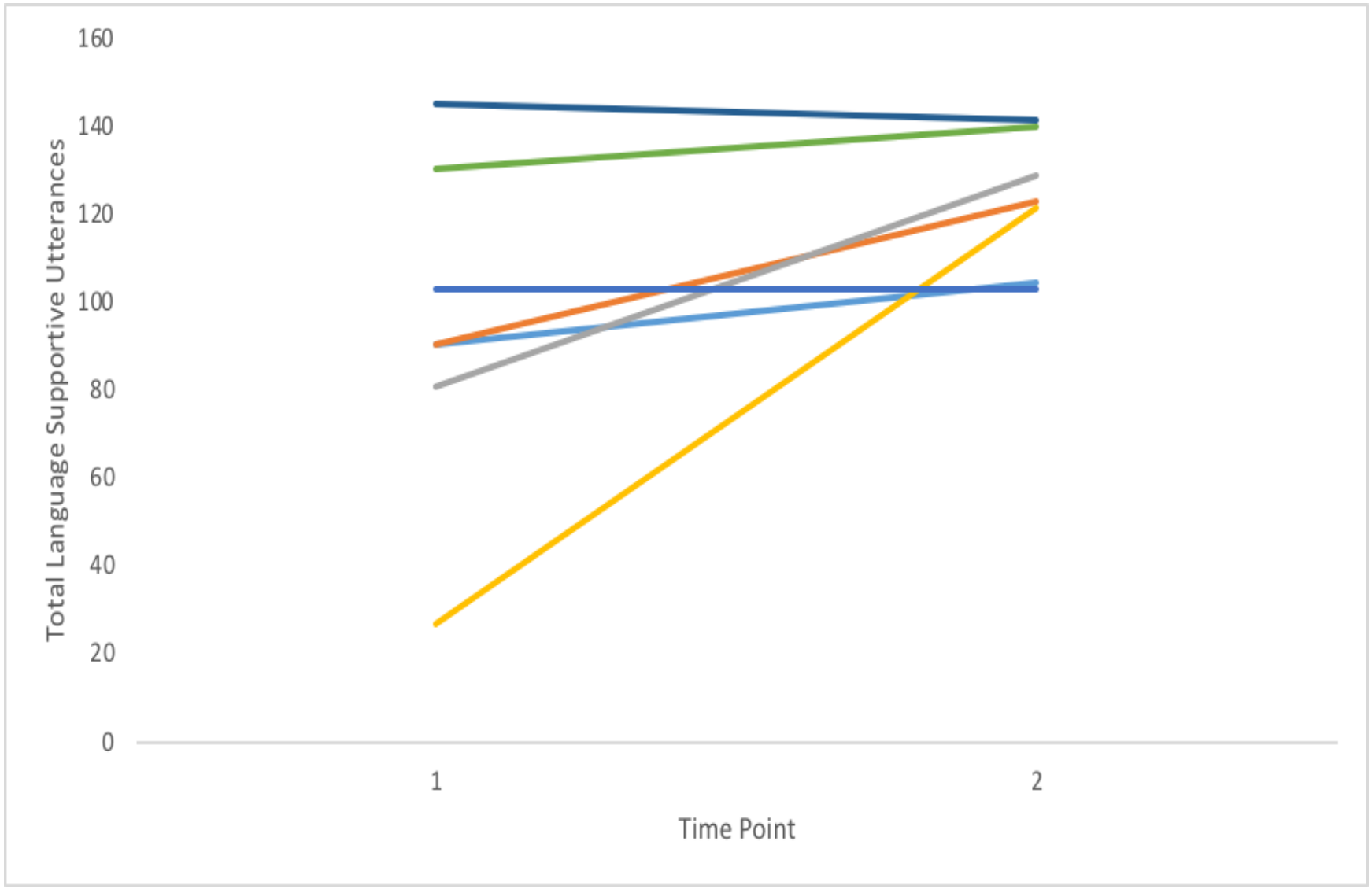

Figure 3. Changes in total language supportive utterances from pre- to post-test.

APPENDICES

Appendix A: Teacher language definitions

Category	Definition
Positive Feedback	The Teacher verbally indicates approval of the Child or the Child's group in one of two ways (see below) Each of the following can be counted if they are directed to the Child individually or to the Child's group as a whole (as long as the Child is included). *
General Praise	Non-specific, general positive statement to the child. Includes expressing affection or positive feelings (ex: "great job", "I love it", "nice")
Specific Praise	Positive comment to the child related to his/her behavior regulation that explicitly states what the child is doing as part of the positive feedback (ex: "I like the way you are sitting and reading your book quietly on the rug")
Negative Feedback	The Teacher indicates disapproval of the Child or the Child's group by one of the following: • Making a critical, disapproving comment about the Child or the Child's behavior • Indicating that the Child's behavior was incorrect or unacceptable, without complimenting effort • Giving the child a verbal prohibition (i.e., using words such as "stop," "quit," or "don't") • Speaking to the Child in a loud, angry, or sarcastic tone of voice*
Expansions and Repetitions	
Expansion	Lengthens, restates, or expands something the child has just said. *
Repetition	Imitates the child's words (does not include clarifying or confirming something a child said by rephrasing as a question)

Open ended questions	The teacher is requesting communication a child. The teacher: □ Asks the Child for a verbal or communicative response AND □ Phrases the request so that it asks for more than a simple discrete answer The request is giving the child an opportunity to give an elaborated response that reflects the child's knowledge, ideas, feelings, or opinions. *
Closed ended questions	The Teacher requests communication AND phrases the request so that it asks for a simple discrete answer. Asking for "simple discrete" answers includes asking for: □ A yes/no response (e.g., "Do you like this book?") □ A very short (1-2 word) specific answer (e.g., "What color is this?) *
Requests for action	The teacher asks the child or the child's group to perform a particular behavior in the immediate setting AND the request specifies the behavior the child(ren) are expected to perform. A ***Request for Action*** typically contains a verb describing what the child is supposed to do (e.g., "Start cleaning up now."; "Would you please come to the table?"). The category does not include requests for verbal or communicative behavior (i.e., asking the child to say something or to respond with a conventional communicative gesture such as nodding).*
Reading and reciting	The Teacher is reading or reciting a poem or passage to a child/group of children. This category is recorded only when the teacher is actually reading or reciting the words. Stopping to talk about the material would not be included.*
Singing	The teacher is singing with/to a child/group of children.*
Exuberant Vocalizations	The teacher does one of the following: □ Speaks or vocalizes to the Child or the Child's group in a positive and exuberant tone of voice ("wow!", "uhoh!", "yay!") □ Laughs in a joyful, positive way while interacting with the Child or the Child's group.*

General Conversations	
Non-specific general conversation	Short, non-specific statements that acknowledge a child's actions or communication ("ok", "sure", "we'll see", "oh my", etc.).
Related Comment	The teacher comments on what the child is working on or playing with or responds specifically to something that the child said. Could be an observation of the child's action (I noticed you are using a lot of red in your picture today) or giving information (ex: a child is drawing a picture of a radish and the teacher comments "radishes grow under the ground")
Non-related comment	The teacher makes a statement that is unrelated to the child's play/activity or what the child is talking about. (ex: child is playing with blocks and talking about his building, and the teacher comments "I think the muffins for snack look really good").
Giving information	The teacher provides procedural information to the child (reminder of rules, reminder of daily schedule, telling a child that a center is closed or full, etc.).

Note. * indicates a definition taken directly from the CIRCLE coding manual (Atwater et al., 2014).

Appendix B: Pyramid Model RCT project description

The purpose of this application under Goal 2, Early Learning Programs and Policies, is to develop and evaluate a feasible system for implementing the Pyramid Model program-wide. The Pyramid Model is a tiered framework that organizes empirically supported practices for promoting social-emotional competence and addressing challenging behavior of young children (Fox et al., 2003; Hemmeter, Ostrosky, & Fox, 2006). The **project goal** is to develop a scalable system, Program-wide Supports for Pyramid Model Implementation (PWS-PMI), to scaffold implementation of the Pyramid Model in early childhood settings. Guided by an implementation science framework and the extensive work on school-wide PBIS, the project will use an iterative process of development, observation, refinement, and evaluation to create the system. PWS-PMI will include the procedures and tools needed to implement the Pyramid Model with fidelity.

There is an increasing awareness among educators, researchers, and policy-makers about the rising number of young children who are beginning their school experiences without the emotional, social, and behavioral skills necessary for academic success. Research has demonstrated that behavior problems identified during the preschool years often persist, and that adolescents identified as having emotional disturbance have a history of problem behavior that began during the preschool years. Also, researchers have acknowledged the importance of social-emotional development to the acquisition of pre-academic skills and preparedness for school. Emerging evidence supports the use of the Pyramid Model (Hemmeter et al., 2011) to address children's social, emotional, and behavioral needs. However, research to date has not systematically examined a comprehensive set of implementation supports needed to sustain high-fidelity implementation of a multi-tiered model in authentic early childhood settings.

In the proposed project, we will fully develop a feasible and usable system of program-wide supports needed for high-fidelity implementation of the Pyramid Model, with a focus on programs serving children in poverty. We will develop, evaluate, and refine the key components of PWS-PMI, which include a leadership team who nurtures staff buy-in, promotes family involvement, monitors implementation fidelity, provides ongoing professional development, facilitates development of individualized behavior support plans, and uses data to guide decision-making. Product development will include: 1) A PWS-PMI implementation manual, 2) The Early Childhood Benchmarks of Quality (ECBoQ), and 3) a training package for supporting Program Leadership Teams. PWS-PMI will be developed using an iterative process that includes expert and practitioner review and field-testing.

PWS-PMI will be used in a pilot study with 16 (8 randomly assigned to intervention and 8 to control) programs in Florida and Tennessee that include at-risk children between the ages of 3 and 5 years. Experimental programs will be provided with training, technical assistance, and materials to implement PWS-PMI and will be compared to programs who are implementing "business as usual" practices. The relationship between implementing PWS-PMI with fidelity, changes in teacher implementation of the Pyramid Model, and child outcome measures (child challenging behavior, child social development) will be assessed using hierarchical liner modeling to account for nesting effects. Data on the feasibility, usability, and acceptability will be analyzed using both quantitative and qualitative measures. Measures include the ECBoQ, Preschool-Wide Evaluation Tool (PreSET), the Classroom Assessment Scoring System, the Teaching Pyramid Observation Tool, and the Social Skills Improvement System Rating Scale