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The Relation Between Teacher Vocabulary Use in Play and Child Vocabulary Outcomes

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Abstract

Although extensive research exists on vocabulary instruction during book reading in preschool classroom, comparatively little research has been conducted on vocabulary exposure in classroom play contexts and child vocabulary outcomes. The purpose of this study was to examine Head Start teacher and child vocabulary use in dyadic play sessions and the relation between teachers' vocabulary use and children's vocabulary outcomes. One Enhanced Milieu Teaching (EMT) session for each of 53 teacher–child dyads was transcribed and coded for teacher use of target and sophisticated vocabulary, use of teacher strategies to support vocabulary development, and child use of vocabulary. Descriptive data indicate variability for both teacher and child vocabulary use in the play sessions. Both teacher total number of vocabulary words and vocabulary supports were significantly related to child vocabulary use within sessions. Implications for practice are discussed.

Keywords

vocabulary, milieu teaching, preschool, Head Start

There is a strong link between the vocabulary knowledge at kindergarten entry and later academic and reading outcomes. Receptive vocabulary and oral language in kindergarten predict reading comprehension in fourth and seventh grade (Dickinson & Porche, 2011; Tabors, Snow, & Dickinson, 2001). However, there is well-documented variability in the vocabulary exposure and development of children from diverse backgrounds. Children who come from economically disadvantaged homes, on average, have vocabulary skills below their peers (Farkas & Beron, 2004) and are often exposed to less vocabulary input and less home literacy experiences that promote language, early literacy, and vocabulary (Hart & Risley, 2003; Rowe, 2008). In addition, children who have delayed language skills in preschool are at a disadvantage for later reading and academic skills. Children with specific language impairments have difficulty learning new words given the same supports as children who are typically developing (Nash & Donaldson, 2005). For children who have multiple risk factors such as language delays and limited literacy exposure in the early years, the need for experience hearing and using diverse vocabulary in early childhood education settings is imperative.

Facilitating Vocabulary Learning in Play Contexts

Extensive literature exists on effective strategies for vocabulary instruction in preschool classrooms in book reading contexts (Marulis & Neuman, 2010; Mol, Bus, & de Jong, 2009). However, there is little guidance from the research about how vocabulary learning is facilitated in play contexts (Neuman, 2011), which account for approximately 30% of the preschool day (Early et al., 2010). Supporting vocabulary learning during play as an intervention is typically studied as an addition to book reading (Han, Moore, Vukelich, & Buell, 2010; Roskos & Burstein, 2011; Wasik, Bond, & Hindman, 2006). Studies in which play is a component do not provide information about how the play is structured or what adult behaviors are used during play to facilitate vocabulary learning (e.g., Roskos & Burstein, 2011; Wasik et al., 2006). These procedures must be operationally defined to allow for replication in research and practice.

Play contexts are ideal opportunities for embedding meaningful vocabulary instruction (Grifenhagen, 2012). Play provides meaningful, engaging opportunities for teachers to have extended conversations with children and multiple opportunities to provide supports for learning

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novel vocabulary. Vocabulary is best learned when it is meaningful, when children are engaged, and when instruction is embedded in natural interactions (Harris, Golinkoff, & Hirsh-Pasek, 2011). Recommended teacher behaviors during play include following the child's lead and engaging in conversations, and these behaviors might facilitate children's language use. For example, conversational and open-ended questions have been found to correlate with child language output (Girolametto, Weitzman, van Lieshout, & Duff, 2000). Extended conversations, in which words are defined in context, also have been linked to positive vocabulary outcomes for children (Dickinson & Tabors, 2001). Exposure to sophisticated vocabulary, words that are less commonly used or heard by children, is associated with vocabulary development (Dickinson & Porche, 2011; Weizman & Snow, 2001). Engaging children in conversations in which they have opportunities to hear and use vocabulary words supports vocabulary outcomes for children (Bowers & Vasilyeva, 2011; Cabell et al., 2011).

There is wide variability in the types of inputs children receive in early childhood settings (Justice, Mashburn, Hamre, & Pianta, 2008). Descriptive studies of vocabulary exposure indicate limited teacher language input in play contexts in preschool. In one study, teachers engaged in conversations only 14% of the time during free play (Dickinson, Pierre, & Pettengill, 2004). Researchers have also found that, during play, teachers did not introduce sophisticated words or define these words (Grifenhagen, Barnes, Collins, & Dickinson, 2017). Additional research is needed regarding the relation between teacher behaviors and child language use during play (Meacham, Vukelich, Han, & Buell, 2016).

Specific supports for vocabulary learning may be influential in the children's vocabulary development. Greater verbal information about vocabulary words by teachers is linked to greater vocabulary growth by preschool children (Cabell, Justice, McGinty, DeCoster, & Forston, 2015). Physical supports for vocabulary learning, including visual supports such as referring to pictures or objects, and multiple exposures to a word during book-based vocabulary instruction also facilitate vocabulary learning (Wang, Christ, & Chiu, 2014). The types of verbal and referential supports caregivers provide when teaching vocabulary either incidentally or explicitly appear to influence children's vocabulary acquisition.

Vocabulary input that occurs when the adult is following the child's lead (i.e., talking about what the child is doing rather than trying to recruit the child's attention to a new focus) may also affect vocabulary acquisition for young children. Support for following the child's lead during vocabulary instruction relates to the research on joint attention, which is when the adult and child are focused on the same object or action while communicating with each other. Results of studies of joint attention indicate that exposure to new vocabulary in joint attention episodes is related to better identification of vocabulary than exposure without joint attention (Dunham, Dunham, & Curwin, 1993; Krcmar, Grela, & Lin, 2007) and the amount of time in joint attention episodes with adults predicts later vocabulary outcomes (Akhtar, Dunham, & Dunham, 1991; Tomasello & Todd, 1983). Measuring children's exposure to vocabulary during episodes in which the adult is following the child's communicative or attentional lead may provide further information about the optimal interactional contexts for vocabulary learning.

Enhanced Milieu Teaching (EMT) and Vocabulary Instruction

EMT is a well-researched, semistructured, play-based individualized intervention that has been implemented by teachers, parents, and clinicians (Hancock & Kaiser, 2006). EMT is a naturalistic instructional approach as it is embedded in everyday activities and routines including play. Naturalistic instructional approaches have been effective in supporting skill acquisition and development across a number of early childhood domains, including language (Snyder et al., 2015). The Council for Exceptional Children's Division for Early Childhood (DEC; 2014) has identified embedding instruction across routines and activities as a recommended practice.

EMT is designed to teach a range of functional language skills to children including vocabulary, early semantic relations, and syntax. Within the classroom, teachers have been taught to use milieu teaching strategies in individualized sessions and across the day (Friedman & Woods, 2015; Kaiser & Grim, 2005; Yoder et al., 1995). EMT strategies include language modeling in response to child communication and prompting language production in the play context. Specific supports for vocabulary development (e.g., use of gestural and oral supports, linking words to child experiences, and defining words in context) may occur during EMT interactions, but the use of these strategies is not defined specifically in the model itself. Although much of the research with EMT has been conducted with children with identified disabilities, EMT has been used to support language development for young children who are at risk for language delays due to economic disadvantage (Hancock, Kaiser, & Delaney, 2002; Peterson, Carta, & Greenwood, 2005). Naturalistic strategies for promoting language, including milieu teaching, have been found to increase expressive language outcomes for children with disabilities (Lane, Lieberman-Betz, & Gast, 2016). EMT also aligns with the current research on guided play (Weisberg, Hirsh-Pasek, Golinkoff, Kittredge, & Klahr, 2016). In guided play, play is coupled with adult scaffolding to achieve identified goals.

Adults may set up the environment to support certain content, use questions to guide learning, or make comments to extend learning.

Teacher–child play-based interactions, such as those in EMT, are ideal contexts for promoting vocabulary and language development in preschool. Examining how the content of these interactions affects children's language development is important for designing optimal strategies for enhancing language learning for children at risk. Specifically, research is needed to determine how teacher vocabulary input and teacher use of strategies to increase vocabulary relate to children's language development. Currently, no studies have analyzed the relation between specific target vocabulary input during EMT sessions and child use of target words in the sessions.

Measurement Issues

When evidence-based literacy interventions have been implemented, there has been little demonstration of growth by participants on standardized tests of vocabulary development (McLeod & Kaiser, 2009). Measures more closely related to the intervention context (e.g., researcher-developed measures of target vocabulary) show greater results or growth than standardized measures (McLeod & Kaiser, 2009). However, measurement at different time points (e.g., during intervention and end of intervention) as well as measurement contexts (e.g., standardized measures, observational measures) may provide more information about vocabulary input and outcomes as well as links among measures. Intervention studies that analyze teacher inputs within the classroom relate the input to children's end-of-intervention outcomes or growth rather than assessing the transactional nature of the interactions within the classroom (Justice, McGinty, Zucker, Cabell, & Piasta, 2013). Immediate relations between teacher inputs need to be explored further.

Purpose and Research Questions

The research aims of this study were to explore the relation between preschool teachers' vocabulary input in semistructured EMT play sessions and child outcomes during the session and after completion of 60 sessions. The research questions were:

Research Question 1: What types of vocabulary words and strategies are teachers using during sessions?
Research Question 2: What is the relation between teacher vocabulary input during sessions and child vocabulary use within the session and at the end of intervention?
Research Question 3: What is the relation between teacher use of strategies to support vocabulary development during sessions and child use of vocabulary within sessions and at the end of intervention?
Research Question 4: What is the relation between teacher's vocabulary use in related turns during sessions and child vocabulary within sessions and at the end of intervention?

Method

The data for this study were collected as part of a randomized control trial (RCT) examining the effects of two language-focused preschool curricula interventions implemented in Head Start classrooms located in an urban city in the southeast United States (Dickinson, Hofer, Barnes, & Grifenhagen, 2014; Kaiser et al., 2010). In this study, centers were assigned to one of three conditions: classroom implementation of a literacy-focused curriculum, *Opening the World of Learning* (OWL; Schickedanz & Dickinson, 2005); classroom implementation of *OWL* combined with EMT for target children identified as having delayed language skills (OWL + EMT); and classroom implementation of the existing curriculum, an enhanced version of *Creative Curriculum* (CC; Dodge, Colker, & Heroman, 2001). Classrooms in the program were randomly grouped into six clusters and randomly assigned at the cluster level. Within each cluster were multiple centers, and within each center were multiple classrooms. Intervention teachers were trained in the year prior to implementation of the intervention curricula, and intervention was implemented during one school year (approximately 8 months). A total of 129 teachers in 52 classrooms and 247 children exhibiting low language and 242 matched children with typical language participated in the RCT.

Participants

The participants of this study were drawn from the clusters randomly assigned to the OWL + EMT intervention. This condition included 36 teachers and teacher assistants from 19 classrooms and 62 children with low language from their classrooms. For the RCT, only children who were identified as having low-language skills, based on a total score of 75 or lower on the Preschool Language Scale, Third Edition (PLS-3; Zimmerman, Steiner, & Pond, 2002) at the beginning of the year, participated in the EMT sessions. Six of the participating children had been identified to receive special education services and had Individualized Education Programs (IEP) in place at the beginning of intervention.

Data from 53 EMT sessions including 36 teachers and 53 different children were used in the analysis. Data were analyzed from video samples that were recorded to examine fidelity of the interventions for the RCT. Because videotaping for fidelity in the larger study focused on sampling the teachers rather than individual children, only 53 of 62

Table 1. Descriptive Data of the Sample.

Characteristics	Teachers (%) (n = 36)	Children (%) (n = 55)
Female	100	41.6
Age in months		52.8
Years teaching	13.5	
Education		
High school	2.7	
Child Development Associate's	51.4	
Associate's (other)	32.4	
Bachelor's	13.5	
Ethnicity		
African American	92.0	97.2
Euro-American	8.0	2.2
Hispanic-American		0.6

children assigned to the EMT condition were video recorded. For the purposes of the RCT, fidelity sessions were conducted at three time points (i.e., beginning, middle, and end of academic year). To include as many child participants as possible, all EMT fidelity videos were included. If a child appeared in more than one fidelity video that included 7 min or more of recorded play, then one of the videos was randomly chosen. The teacher and child characteristics for the study sample are provided in Table 1.

Training and Materials

Participating teachers were trained in large- and small-group training sessions (approximately 15 hr of training) to implement EMT. In addition, an EMT coach (a graduate student or research team member) visited each teacher approximately once every other week for 30 min during the 8 months of intervention. The coach reviewed specific EMT strategies, and the coach and the teacher discussed any concerns with using the EMT strategies. The coach provided in-vivo verbal feedback on EMT strategy use, use of target vocabulary, and sentence length targets while the teacher completed an EMT session with a target child.

Each teacher or assistant teacher conducted two to three EMT sessions per week with two children with low language enrolled in her classroom. Children received approximately 60 individual sessions during the intervention. For the EMT session, the teacher worked individually with the child in the classroom, but separated from other children in the classroom (e.g., at a table others were not using or in a corner of the room away from other children). Broad vocabulary and sentence length targets were selected for each child by researchers using information from the language screening before the beginning of the preschool year. The target vocabulary and sentence length were based on a three-tiered model (Level 1 = entry level vocabulary and 1–3 word sentences; Level 2 = mid-level vocabulary and 4 or more word sentences; Level 3 = advanced/mid-level vocabulary and complex sentences) with all children meeting the criteria for Levels 1 or 2 at the beginning of the year.

Throughout the intervention, thematic play materials that included toys and activities in which the target vocabulary could be used were prepared for each child–teacher pair. Teachers received toy sets (e.g., babies and bath toys, a dollhouse with accessories, play dough with implements), materials for vocabulary probes, and a short story book specific to the theme materials and their target children's language level (Level 1 or Level 2) each week. Vocabulary words were chosen for each target level to complement the weekly theme. For example, *decorate* was a Level 2 word for the theme of making play dough cakes. Vocabulary words were identified to reflect common words used on early childhood vocabulary measures (MacArthur–Bates Communicative Development Inventories, Fenson et al., 2007; the Peabody Picture Vocabulary Test, Fourth Edition [PPVT-4], Dunn & Dunn, 2007; Expressive Vocabulary Test, Second Edition [EVT-2], Williams, 2007). Target words were not taken directly from the measures but were chosen as similar to the categories represented in the vocabulary measures. To align with themes, some overlap between words on measures and the target vocabulary words did occur. There were approximately 10 target vocabulary words for each set of materials. During each session, the teacher first administered the vocabulary probe. Teachers were instructed to focus on the target vocabulary that the child did not identify on the probe during the play sessions. After the probe, the teacher and child read a short story that indicated how to play with the toys and introduced the vocabulary. The teacher and children then played with the materials for approximately 10 min. During this play session, teachers used EMT strategies to promote language and target vocabulary use. See Table 2 for definitions and examples of EMT strategies teachers were trained to use.

Data Collection

The first 7 min of each video that included teacher–child interaction in play were analyzed. Teachers were asked to conduct 10-min play sessions with children. However, some teachers included the probe and book reading within the 10 min, while others completed 10 min of play. As such, samples varied in length, with the majority being 7 min or more. Data were prorated when samples were less than 7 min by calculating a per minute rate for each variable, multiplying this by the amount of time less than 7 min and adding this value to the original count. This occurred in 17 of the 53 samples. Of the samples that were less than 7 min, the mean length was 6.1 min with a range of 3.87 to 6.98 min. Sessions which were shorter than 7 min occurred due to a variety of reasons (e.g., transition to new activity, child

Table 2. EMT Strategies.

Strategy type	Definition	Example
Environmental Arrangement	Interventionist selects materials and arranges the materials and play area to promote communication attempts.	Interventionist has materials in sight, but out of reach of the child to promote requesting.
Responsive Interactions	Interventionist responds to all child communication, follows the child's lead in play, and expands child communication to model new language.	The child points to cars. Interventionist says, "Let's play cars!"
Time Delay	Interventionist sets up an opportunity for the child to request a material or action, looks expectantly at the child and waits for a response.	Interventionist holds a toy in each hand and looks expectantly at the child
Open-Ended Mand	Interventionist provides a verbal prompt for child communication in the form of an open-ended question.	"What do you want to put in the water?"
Choice Mand	Interventionist provides a verbal prompt with for the child to choose an object or activity.	"Do you want the lobster or the octopus in the water?"
Mand Model	Interventionist prompts the child to use specific language to acquire the desired object/activity.	"Say, 'I want the octopus in the water.'"

had to use the restroom, classroom issue that needed teacher attention) that were not measured during the fidelity recording. All sessions were included to increase the sample size as the starting sample was small.

Coding

All adult and child utterances in the selected teacher–child interaction sessions were transcribed using the Systematic Analysis of Language Transcripts (SALT; Miller & Iglesias, 2008) protocol and coded using the TELL KidTalk Code (Roberts & Kaiser, 2009). All adult utterances were assigned a code to indicate whether the turn was related or unrelated to the child's utterance or action. Each instance of a target vocabulary word or sophisticated vocabulary word was coded and included a code to indicate whether the target or vocabulary word was unique or repeated. Vocabulary support codes were added to adult utterances when these strategies were identified. See Table 3 for definitions and examples of vocabulary supports. Due to the short sessions and the many vocabulary supports (described in Table 3), there were minimal examples of each support. Therefore supports were combined into one category for analysis. When two or more vocabulary strategies occurred for one utterance, each strategy was included in the analysis. Child utterances were coded to indicate when a vocabulary word was present, the type of vocabulary word (i.e., unique or repeated target or sophisticated vocabulary word), and level of independence in producing the utterance (i.e., independent, imitated, or prompted). SALT was used to automatically count and summarize the coded utterances. Similar coding schemes and use of SALT to calculate and summarize have been used in a variety of EMT and language studies (e.g., Hancock et al., 2002; Kaiser & Roberts, 2013).

Measures

Teacher measures. Four teacher vocabulary measures were collected for the analyses: (a) total number (tokens) of teacher uses of target words, (b) total number (tokens) of teacher uses of sophisticated words, (c) total number of teacher uses of vocabulary teaching strategies, and (d) total number of vocabulary words used during related turns (i.e., while following the child's lead). In addition, measures of teacher number of different words (NDW), mean length of utterance in morphemes (MLUm), number of total words (NTW), number of different target words, and number of different sophisticated words were collected for descriptive purposes. Sophisticated words were defined, similar to previous studies (Dickinson & Tabors, 2001), as words not included on the Dale–Chall word list; a word list is comprised of 3,000 words that the average fourth grader understands (Chall & Dale, 1995). Although teachers were not trained to use sophisticated words, the measure was used here to provide a better description of the language environment of the child participants and the language input of the teachers as well as to mirror other studies that measure teacher language use. An extended version of the Dale–Chall list including word endings (e.g., s, ing, ed) was used in the analysis. Examples of sophisticated words used by teachers in sessions include *sprout, costume, dough, balcony, purpose*, and *splinter*. As the sophisticated word analysis was planned and completed postintervention, inclusion or noninclusion of sophisticated words were not considered when developing the target word lists. As a result, 12% (28 of 238) of target words for across the sets of materials for the intervention year were also identified as sophisticated. Thirty-two percent (77 of 238) of the words across all sets of EMT materials were also identified as relevant

Table 3. Vocabulary Supports Definitions and Examples.

Support	Definition	Example
Physical support		
Point	Adult points to an object or person, the point is quick and the adult does not gain possession of the object/person OR Adult extends index finger toward an object. Point is maintained, persistent, and may include rotating from a point to an open palm up.	An {points to apple} apple.
Show	A brief presentation of an object, directed to the child's face, with the adult maintaining possession of the object.	A {shows car} car.
Give	Adult extends object and maintains the gesture until the child takes possession of the object.	A {gives baby} baby.
Other gesture	The adult does another communicative gesture other than the specific point, show, or give (e.g., touching the object without using the index finger). This is different than imitating an action. This gesture must indicate communicative intent.	
Act out action	The adult is modeling the action they are saying.	A{drives car}drive
Verbal support		
Word association	The adult references another word to compare to the child's word or to expand the child's understanding.	C couch. A sofa OR A a couch is a sofa
Connection to child's life	The adult connects the child's previous utterance with life outside the session.	C ball. A you play ball with your sister Mary
Definition	The adult defines a word the child said or referred to in the preceding utterance.	C hat. A a hat is something you wear on your head
Expansion	The adult repeats the child utterance and adds information.	C Hat A Hat on head
Prompt	Prompt: The adult uses one of the following language prompts to elicit language: a. Open question/mand b. Choice question/mand c. Yes/no question d. Model e. Cloze prompt	C hat. A say big hat

Note. A = adult; C = child.

vocabulary words in one or more of the OWL curriculum activities (e.g., story time, small groups, etc.) from the teacher's manual. The total number of vocabulary support strategies, the number of different vocabulary support strategies, and teacher use of target and sophisticated words in related utterances were also calculated.

Child measures. Child vocabulary outcomes included the following: (a) child total number of target and sophisticated vocabulary words (i.e., tokens) used during the same EMT session in which teacher data were collected, (b) child NDW in the first 50 utterances selected from a 20-min language sample administered at the end of the intervention; and (c) raw scores from two standardized measures—the PPVT-4 (Dunn & Dunn, 2007) and the EVT-2 (Williams, 2007). MLUm and NDW were used as descriptive measures of child language use in the EMT sessions.

Language samples were conducted with children pre and post intervention. Language samples were administered by trained graduate students who were not involved in the intervention. During the language sample, the assessor first shared a wordless picture book with the child and, once all pages of the picture book had been viewed, engaged the child in play with a set of materials. The book and materials were standardized for all language samples. Assessors used only nonverbal cues (e.g., pointing and looking expectantly at the child during book reading or modeling a play routine with the play materials), minimal verbal cues (e.g., "Hmm" or "Wow"), and open-ended questions (e.g., "What should I do?") to encourage language.

The PPVT-4, which assesses the child's receptive vocabulary skills, and the EVT-2, which measures expressive vocabulary skills, were administered to children individually at the beginning and ending of the preschool year.

PPVT-4 test–retest reliability was .93 for the Total Score and validity was assessed through correlations with other field tested measures including the Clinical Evaluation of Language Fundamentals 4 Screening Test (CELF-4; Semel, Wiig, Secord, & PsychCorp, 2004) with $r = .73$ for Core Language, $r = .67$ for Receptive Language, and $r = .72$ for Expressive Language. The EVT-2 test–retest reliability was .95 for the Total Score. The tests were given by trained graduate students, and 20% of the tests were scored simultaneously by a second tester to assess fidelity of testing procedures and reliability of scoring. PPVT-4 and EVT-2 raw scores were used as the outcome measure, because the raw scores show actual change in child vocabulary (number of words understood or used) rather than the change based on a standardization sample (Kerns, Eso, & Thomson, 1999) and is more appropriate to assess change in child ability particularly for children who are at risk for delays (Sullivan, Winter, Sass, & Svenkerud, 2014).

Interobserver agreement (IOA). Two trained graduate students coded the transcripts of the EMT sessions using the TELL KidTalk Code. Prior to coding the study data, coders coded practice samples until they reached 80% agreement on all codes on three consecutive samples. Each coder coded approximately half of the 53 samples independently. Eleven transcripts (20.7%) were coded by both coders to determine the IOA. The IOA was determined by comparing the transcript line by line and code by code, and determining whether the coders agreed or disagreed on each code. IOA was calculated by dividing the number of agreements by the number of agreements plus disagreements × 100 to yield the percentage of agreement.

Analysis

Random intercept linear mixed models were used for the analysis due to the nested structure of the data (Raudenbush & Bryk, 2002). In the original data set for the RCT, children were nested within teachers and assistant teachers, who were nested within classrooms, which were nested within centers, which were nested within clusters, which had been randomly assigned to treatment or control conditions. Therefore, the beginning analysis was a five-level model (i.e., Level 1 = child, Level 2 = teacher, Level 3 = classroom, Level 4 = center, and Level 5 = cluster). An unconditional model was first analyzed for each of the outcome variables. From this model, the intraclass correlation coefficient (ICC) corresponding to each nesting level was determined. Analysis of the unconditional model indicated no significant variation at any level above Level 2 (teacher) of the model. Therefore, the variation in child outcomes was not due to factors at the classroom, center, or cluster level. Outliers were identified as any values that were 3 times the interquartile range above the third quartile or below the first quartile. No outliers were identified. SPSS Statistics Version 19 (IBM Corp. Released, 2010) was used to run all linear mixed model analyses. In each analysis, variables were included to control for child age and pretest scores. Fixed effects were used in the model and variables were not centered.

Results

Descriptive Statistics

Teacher vocabulary use. Descriptive statistics were calculated for teacher vocabulary target and sophisticated vocabulary use. On average, teachers used 518.50 tokens ($SD = 161.52$; range = 236–878) and 132.42 types ($SD = 27.86$; range = 65–179) per 7-min session. Teachers used a mean of 23.38 target word tokens within a session ($SD = 14.57$; range = 0–57), although as indicated by the standard deviation and range, there was wide variability across teachers. Teachers used a mean of six target word types in a session ($SD = 2.73$; range = 0–11). On average, teachers used 8.81 sophisticated word tokens in each session. Sophisticated word types were used 3.04 ($SD = 1.83$; range = 0–9) times per session.

Teachers' percentage of vocabulary containing utterances that were related and contingent on child action or communication was similar across target and sophisticated vocabulary. In terms of all vocabulary use, teachers' utterances were related and included a vocabulary word 38.6% ($SD = 22.9\%$; range = 0%–83%) of the time. Teachers, on average, used 11.67 vocabulary supports in each session ($SD = 7.87$; range = 1–34), and 52.0% ($SD = 18.0\%$) of teacher utterances containing a target or sophisticated vocabulary word were accompanied by at least one vocabulary support. However, the percentage of words with vocabulary supports ranged from 13% to 100%, indicating great variability across teachers in their use of supports for vocabulary learning. See Table 4 for teacher and child descriptive data.

Child Language Use

Data from EMT sessions. Within the EMT sessions, children used an average of 48.80 tokens ($SD = 22.26$; range = 15–97). In addition, children used fewer vocabulary words than their teachers in the EMT sessions (48.40 vs. 132.42); children used an average of 4.16 ($SD = 3.76$) target word tokens per session with a range of 0 to 12.58. On average, children used 2.71 target word types (range = 0–8.17) in the EMT session. Although children used a smaller number of words compared with teachers, the percentages of types and tokens of target words were similar for children and teachers (5.3% vs. 4.7% for tokens; 6.5% vs. 4.7% for types). Children used an average of 1.17 ($SD = 1.47$) sophisticated word

Table 4. Teacher and Child Language Use.

	Teacher			Child		
Language Features	*M*	*SD*	Range	*M*	*SD*	Range
EMT session						
MLUm	6.33	1.02	4.77–9.69	3.41	0.79	0–5.2
NTW	518.50	161.52	236–878	97.55	56.91	18–265
NDW	132.42	27.86	65–179	48.80	22.26	15–97
NTW target	23.38	14.57	0–57	4.16	3.76	0–12.58
NDW target	6.00	2.73	0–11	2.71	2.15	0–8.17
NTW sophisticated	8.81	7.19	0–31	1.17	1.47	0–7
NDW sophisticated	3.04	1.83	0–9	0.91	1.01	0–4
Vocabulary supports	11.67	7.87	1–34			
Related target	8.42	6.36	0–23			
Related sophisticated	3.67	3.62	0–19			
Language sample						
MLUm				5.70	1.29	3.24–9.54
NTW				862.32	353.39	69–1,728
NDW				94.94	17.99	51–137

Note. EMT = Enhanced Milieu Teaching; MLUm = mean length of utterance in morphemes; NTW = number of total words; NDW = number of different words; Related = vocabulary words used while following the child's attentional or communicative lead.

tokens per session ranging from 0 to 7. On average, children used 0.91 (*SD* = 1.01; range = 0–4.00) sophisticated word types per sessions. As with target vocabulary, child percent use of sophisticated vocabulary approximated that of teachers, even though they used less sophisticated word tokens (1.4% vs. 1.8% of sophisticated word tokens; 2.0% vs. 2.4% of sophisticated word types).

Data from language samples. During the posttest language sample, children used an average of 94.94 different words in 50 utterances (*SD* = 17.99; range = 51–137). Their average MLUm was 5.70 (*SD* = 1.29; range = 3.24–9.54).

Standardized measures. The average raw score on the posttest PPVT-4 was 59.17 (*SD* = 13.19), and the range was 29 to 89, indicating wide variability in child performance. A standard score of 100 for a 5-year-old would be a raw score of 84. On average, children gained 14.46 (*SD* = 10.14) points from pretesting to posttesting. On the posttest EVT-2, the average raw score was 50.77 (*SD* = 7.88) with a range of 28 to 67. EVT scores were also lower than expected for a child performing as expected. (A standard score of 100 for a 5-year-old would be a raw score of 65.) On average, children gained 13.90 (*SD* = 8.44) points from pretesting to posttesting.

Relation Between Teacher Input and Child Outcomes

Within the EMT sessions, child use of target vocabulary was significantly related to teacher use of target words when controlling for the child's age at the time of the session and the NDW used on the pretest language sample. For each additional teacher target word token, child target vocabulary increased by 0.16 words (*SE* = 0.03, $p < .001$). The relation between teacher use of sophisticated words and child use of sophisticated words during the session was not significant (*SE* = .03, $p = .07$). Neither the relation between teacher target vocabulary word tokens, nor teacher sophisticated vocabulary word tokens and child word types during the posttest language sample were significant (*SE* = .17, $p = .17$; *SE* = .33, $p = .13$, respectively). There were no significant relations between the teacher target or sophisticated vocabulary tokens and the child raw scores on the posttest EVT-2 and PPVT-4. See Table 5 for the analysis results.

Teacher use of vocabulary supports was significantly related to child target word tokens within the EMT sessions. For every additional teacher vocabulary support, child target vocabulary word tokens increased by 0.25 (*SE* = 0.06; $p < .001$). There were no significant relations between teacher vocabulary supports and child sophisticated word tokens in session, child word types on the language sample, or posttest scores on the EVT-2. Teacher vocabulary supports were significantly negatively related to child PPVT-4 raw scores. For every additional teacher vocabulary support, child posttest PPVT-4 raw score decreased by 0.41 (*SE* = .16; $p < .05$). See Table 5 for the analysis results.

The number of teacher vocabulary words used in related utterances followed a similar pattern to the teachers' overall use of vocabulary. For every additional target word token used in a related utterance, child target

Table 5. Mixed Linear Models Results.

	Teacher language input														
	NTW target			NTW sophisticated			Vocabulary supports			Related target			Related sophisticated		
Child outcome	β	*SE*	*p*	β	*SE*	*p*	β	*SE*	*p*	β	*SE*	*p*	β	*SE*	*p*
NTW target	.16***	.03	.000	—	—	—	.25***	.06	.000	.39***	.07	.000	—	—	—
NTW sophisticated	—	—	—	.05	.03	.07	.04	.03	.18	—	—	—	.17**	.05	.003
NDW language sample	.23	.17	.17	.51	.33	.13	.46	.29	.13	.26	.39	.52	1.06	.64	.10
PPVT-4	−.15	.09	.11	−.30	.19	.12	−.41*	.16	.01	−.38	.21	.07	−.71*	.35	.05
EVT-2	−.05	.07	.46	−.03	.13	.81	−.01	.12	.97	−.03	.16	.85	.04	.27	.89

Note. NTW target = number of total target words in session; NTW sophisticated = number of total sophisticated words in session; NDW language sample = number of different words in language sample; PPVT-4 = Peabody Picture Vocabulary Test, Fourth Edition; EVT-2 = Expressive Vocabulary Test, Second Edition; Related target = number of target vocabulary in related turns; Related sophisticated = number of sophisticated vocabulary in related turns.
*$p < .05$. **$p < .01$. ***$p < .001$.

vocabulary tokens during EMT sessions increased by 0.39 ($SE = 0.07$; $p < .001$), which was more than the effect of teacher use of vocabulary in any utterance (0.16 words for each additional vocabulary word; $SE = .03$, $p < .001$). For every additional sophisticated word token used by teachers in a related turn, child sophisticated vocabulary tokens increased by 0.17 ($SE = .05$, $p < .01$) during EMT sessions. Teacher target word tokens in related utterances were not significantly related to child outcomes in the language sample. For every additional sophisticated word token used by the teacher in a related turn, child NDW on the posttest language sample was relatively large, an increase of 1.06 ($SE = .64$); however, this relation was not significant ($p = .10$). There were no significant relations between target word or sophisticated word tokens in related turns and the EVT-2 or the PPVT-4. See Table 5 for the analysis results.

Discussion

This study provides descriptive information about teacher language in individual play-based interactions with preschool children with low-language skills and evidence of the relation between teacher language and child language within these sessions. The analysis of teacher language revealed considerable variation in teacher linguistic input to children in the sessions. Significant relations between teacher input and child vocabulary use were identified. In addition, increased use of vocabulary strategies and using vocabulary in conversational turns following the child's interest related to increased vocabulary use by children. These positive significant relations between teacher target and sophisticated tokens and child vocabulary tokens were identified within sessions, but not on postintervention measures. See Table 6 for a summary of research questions, study results, and implications.

The results of this study support teaching vocabulary in conversations while following the child's lead. Words modeled in responsive and related teacher utterances were more strongly related to the child's use of these words than the words used in nonrelated utterances. Over one third of teacher uses of vocabulary were related to the child's previous utterance or action. A relation between greater use of vocabulary when following the child's lead (related turns) and child vocabulary use in sessions was evident for both target vocabulary and sophisticated vocabulary. These findings support previous research, which indicates that amount of vocabulary instruction when attending to child interest supports child vocabulary learning (Krcmar et al., 2007; Valdez-Menchaca & Whitehurst, 1992).

This study extends research on teacher vocabulary input by indicating the immediate relation between teacher use of vocabulary support strategies and child use of vocabulary. Teachers who used more vocabulary supports to teach or clarify the meanings of target words in EMT sessions had children who used more target vocabulary in sessions. Previous studies have found links between verbal support strategies such as teacher talk about vocabulary (Wasik & Hindman, 2014), elicitations and elaborations of vocabulary (Cabell et al., 2015), and child end-of-intervention outcomes. This study provides a more immediate picture of the relation between teacher and child use by demonstrating the relation between the immediate use of physical and verbal references rather than delayed association. This immediate effect on child language is promising and indicates that supporting teachers to use vocabulary words in play may increase child use of vocabulary.

These findings support the use of play-based activities in the classroom (e.g., free play, centers) as ideal contexts for supporting vocabulary development for young children with low-language skills. Play is an ideal context for following the child's lead and having child-focused conversations to

Table 6. Research Questions, Study Results, and Implications.

Research question	Study results	Implications
RQ1. What types of vocabulary words and strategies are teachers using during sessions?	Teacher use of target and sophisticated vocabulary was variable.	Children receive variable vocabulary input across classrooms, which may be related to later vocabulary, reading, and academic outcomes.
	Teacher target vocabulary use was greater than teacher sophisticated vocabulary use.	Training teachers to use specific vocabulary may increase this vocabulary use.
	Teacher use of vocabulary supports were variable.	Children receive variable supports for vocabulary acquisition, which may relate to later vocabulary, reading, and academic outcomes.
RQ2. What is the relation between teacher vocabulary input during sessions and child vocabulary use within the session and at the end of intervention?	Teacher vocabulary use was significantly related to child vocabulary use in sessions.	Training teachers to use vocabulary in play may promote child vocabulary use in those play contexts.
RQ3. What is the relation between teacher use of strategies to support vocabulary development during sessions and child use of vocabulary within sessions and at the end of intervention?	Teacher use of physical or verbal supports for vocabulary was related to child use of vocabulary in session.	Supporting teachers to use specific vocabulary with supports for understanding and/or using vocabulary may support child vocabulary outcomes.
RQ4. What is the relation between teacher's vocabulary use in related turns during sessions and child vocabulary within sessions and at the end of intervention?	Teacher vocabulary use when following the child's attentional or communicative lead was significantly related to child vocabulary use in session.	Teaching teachers to respond to child focus and embed vocabulary modeling may support child vocabulary use.

encourage vocabulary development (Girolametto et al., 2000; Han et al., 2010). Although literature has supported the play as a context for supporting vocabulary development, this study provides further insight into the specific behaviors (i.e., naturalistic language strategies, vocabulary strategies, following the child's lead) that are related to immediate child vocabulary use.

In addition to the findings of immediate significant relations between teacher and child vocabulary during play, the descriptive analysis of teacher vocabulary tokens indicated great variability in both target and sophisticated vocabulary use, which mirrors previous literature on teacher vocabulary use (Dickinson & Tabors, 2001). The range was from 0 to twice the average and from 0 to triple the average for target and sophisticated vocabulary tokens respectively across teachers in the sample. The variability in teacher vocabulary supports was also evident as the range was from 1 support to more than 3 times the average. On average, more than one third of teachers' utterances containing vocabulary were delivered contingent on child language and/or activity focus. Although there are significant relations between teacher vocabulary and child vocabulary use, this variability indicates that children are receiving inconsistent input across classrooms.

Despite the demonstration of a relation between teacher vocabulary and immediate child outcomes, the question remains of how teacher vocabulary use relates to child vocabulary development beyond the direct teacher–child interaction. The nonsignificant relation between teacher input and end-of-intervention observational and standardized measures of vocabulary raises concerns about the effectiveness of teacher vocabulary input for effecting changes in general vocabulary outcomes, especially for children with low-language skills. Previous research has shown a significant correlation between teacher word types and child vocabulary outcomes (Bowers & Vasilyeva, 2011) and, more specifically, teacher sophisticated word types and child vocabulary performance on the PPVT (Dickinson & Tabors, 2001). The positive relation between adult use of vocabulary and standardized receptive vocabulary scores that was found in these previous studies was not replicated in this study. One possible reason is the population sampled in this study consisted of children identified as having low-language skills. The minimal sampling of sessions for this study may not have provided enough information about the teacher input to discern the characteristics that relate to distal child outcomes for this population. In addition, sessions were expected to be 10 min of play 3 times per week for approximately 20 weeks. A higher dosage of intervention may be necessary to impact global vocabulary development.

Limitations

There are a number of limitations in this study primarily related to the sampling of teacher–child interactions that

may have affected the ability to detect distal relations. First, only one sample of the child–teacher interaction was analyzed. One session of the 60 that were completed by the teacher–child dyad may not adequately capture the behavior of either the teacher or the child, which limits the analysis of the relation between teacher linguistic input and child vocabulary outcomes. Second, there was variability in the sessions sampled, and it is unclear how representative the sessions sampled are of the intervention. Teachers were expected to complete three sessions with each set of materials, but it is unclear which session in that sequence was sampled. Some of the variability in teacher and child language may be due to the session number and hence the comfort and exposure to vocabulary and materials. A third limitation is that the sample only consisted of children with low language who were economically disadvantaged, so the relation between teacher input and child outcomes may be different for children who have limited language skills due to disabilities and who come from other socioeconomic groups.

One possible confounding variable in analysis of teacher use of target and sophisticated words is the use of the EMT strategies. To explore this relation, fidelity of EMT by the teachers included in this study was measured and analyzed. EMT fidelity expectations were that teachers would (a) follow the child's lead (e.g., respond to child language or action) with each teacher utterance, (b) match child turns with their utterances, (c) expand on the child's language, and (d) follow the milieu prompting protocol. Within each session, teachers were rated on their percentage correct for each of these measures. An average across the study sessions yielded 51% fidelity to the EMT expectations. However, 99% of the time teachers were responsive to children (range = 90%–100%). The average adherence to the milieu prompting protocol was 52% with a wide variation (range = 0%–100%). These individual fidelity measures and an overall fidelity score was correlated with each of the vocabulary measures of interest, and no significant relations were identified. With this information, it is difficult to attribute the relations between teacher vocabulary use and child vocabulary use to accurate use of EMT strategies. Rather, the EMT strategies embedded in the play sessions and with the support materials provided can be seen as the context for the vocabulary use by teachers and children.

Implications for Practice and Research

The immediate relation between child vocabulary use and teacher vocabulary inputs when following the child's lead supports the teaching of vocabulary in play contexts in preschool classrooms. Research indicates that teachers spend minimal time interacting with children in free-play settings and few interactions include extended conversations (Dickinson & Tabors, 2001; Winton & Buysse, 2005). With play contexts comprising approximately one third of the preschool day (Winton & Buysse, 2005), there is a missed opportunity for advancing vocabulary development for young children with low-language skills. The number of target tokens in the EMT sessions indicate that providing explicit supports to teachers for using these words may be effective in increasing opportunities for children to hear and use specific vocabulary in play. The variability in the teacher use of vocabulary and strategies indicates that training and support for teachers to use evidence-based language teaching practices is needed to ensure that there is consistency in use of strategies that support children's language development.

Additional studies are needed that explore the selection of vocabulary words for instruction for young children with relatively limited vocabulary. No matter the selection of vocabulary, supporting teachers to use these words with children in meaningful conversations focused on the child's actions and/or language has been demonstrated to relate to child outcomes. Systematic training of teachers in language teaching strategies and vocabulary use may have immediate effects on child vocabulary use.

Future research is needed to more fully understand how the multiple aspects of teacher linguistic input affect child language outcomes. The analyses in this study indicated an immediate relation between teacher language input and child outcomes in vocabulary for this population. This relation may be bidirectional with the child's language influencing the teacher's language in addition to the teacher influencing the child's language. To explore this possibility, correlations between child pretest measures of language (i.e., NDW on the pretest language sample, PPVT-4 raw score, and EVT-2 raw score), teacher language use (i.e., target vocabulary, sophisticated vocabulary, and vocabulary supports), and teacher use of language in the EMT sessions were examined. Although there were no significant correlations between teacher language in the EMT sessions and child pretest scores, this does not rule out a bidirectional relation between teacher and child language. In addition, better measures of the teachers' global language skills may provide useful information for supporting teachers' use of evidence-based language strategies.

Given these preliminary findings, it is recommended that professionals working with early childhood teachers support teachers in using diverse and complex vocabulary in interactions with young children at risk for language and literacy delays. Providing lists of vocabulary words, demonstrating strategies for supporting learning the meaning of words, choosing curricula that incorporate vocabulary learning opportunities in multiple classroom activities, and training teachers to be responsive in their interactions with children are potential strategies. Additional research needs

to be conducted to better understand how teachers' linguistic input, particularly their vocabulary and syntax use, affects children with low and typical language skills as measured in both proximal and distal contexts.

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