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The Effects of Play-Based Intervention on Vocabulary Acquisition by Preschoolers at Risk for Reading and Language Delays

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Abstract

Closing the vocabulary gap for young children at risk for reading and language delays due to low socioeconomic status may have far reaching effects, as the relationship between early vocabulary knowledge and later academic achievement has been well-established. Vocabulary instruction for young children at risk for reading and language delays during classroom play is understudied, but appears to be a useful context for such interventions. A multiple probe design across behaviors replicated across participants was conducted to evaluate the effects of Enhanced Milieu Teaching (EMT) techniques embedded in play sessions on target vocabulary word acquisition for preschool participants. Participants acquired target word sets in an average of 14 sessions, which, in addition to a book with target vocabulary, included interventionist's use of the words in conversation and prompts to use target words in play routines. Implications for vocabulary instruction during play and future research are included.

Keywords

vocabulary instruction, preschool, naturalistic intervention, at risk

Introduction

Vocabulary development in early childhood is strongly predictive of later reading and academic skills (Biemiller, 2004; Snow, Burns, & Griffin, 1998; Tabors, Snow, & Dickinson, 2001). Because of the links to later reading, promoting children's vocabulary acquisition is a necessary goal of preschool classroom activities (Biemiller, 2004). Many children from low-income backgrounds and children with developmental disabilities enter preschool with vocabulary knowledge that is markedly below that of their peers (Hart & Risley, 1995; Hindman, Skibbe, Miller, & Zimmerman, 2010; Walker, Greenwood, Hart, & Carta, 1994). In the growing literature on vocabulary interventions for young children at risk, the majority of research has been conducted during book readings or a combination of book readings, and there is little guidance on how to support vocabulary development in play contexts (Neuman, 2011).

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Effects of Persistent Delays in Vocabulary

Persistent vocabulary deficits in early childhood have been linked to poorer outcomes in later grades. Vocabulary knowledge in preschool has been linked to later reading comprehension (Biemiller, 2004; Snow et al., 1998). Specifically, oral language, including vocabulary, in preschool is significantly related to reading comprehension in elementary and secondary grades (Kendeou, Van den Broek, White, & Lynch 2009; Tabors et al., 2001). Similarly, kindergarten vocabulary explains significant variance in third grade reading comprehension when controlling for parent education, parent literacy level, and child reading comprehension in first grade (Sénéchal, Ouellette, & Rodney, 2006). Children who enter the primary grades below their peers in vocabulary knowledge are at risk for later reading problems; thus, interventions to increase the vocabulary knowledge of children at risk for these deficits in preschool and kindergarten are critical.

Preschoolers at Risk for Reading and Language Delays

Children from low-income households are considered at risk for language and reading delays due to a variety of factors that affect general academic outcomes, including parent education, parental income, and parental involvement (see Froiland, Powell, Diamond, & Son, 2013, for a review). More specifically, income status is related to the home literacy environment (HLE), which has been shown to predict later reading achievement. HLE includes access and exposure to literacy materials and parent–child reading practices (Buckingham, Beaman, & Wheldall, 2014). These early experiences have lasting effects on language and literacy.

Children entering preschool from low-income or poverty backgrounds score below the national norm on measures of vocabulary knowledge (Tarullo, West, Aikens, & Hulsey, 2008). In a seminal work, Hart and Risley (1995) reported that children from low-income families were exposed to remarkably fewer words and received less language input than their peers from middle- to high-income homes. For example, in high socioeconomic status (SES) households, by the age of 3, children were exposed to 35 million words by their parent. In comparison, children from the low-SES households were exposed to only 10 million words. More recently, Farkas and Beron (2004) found that increases in SES were strongly correlated to increases in receptive vocabulary scores. Multiple studies have found that children from low-SES homes had consistently lower standardized vocabulary scores than their more economically advantaged peers (Hoff, 2003; Washington & Craig, 1999; Whitehurst, 1997).

Vocabulary Learning for Preschool-Aged Children

Vocabulary learning is inherently a social process and, therefore, child–adult interactions are an important component of providing support for learning vocabulary. For example, studies of interactive book reading interventions implemented by teachers in preschool settings indicate that increased adult vocabulary input has consistent positive effects on child vocabulary outcomes (see Mol, Bus, & de Jong, 2009, for a meta-analytic review). Dickinson and Porche (2011) found that the number of rare words used by participants' preschool teachers in free-play settings was significantly related to receptive vocabulary in fourth grade. Rare words were defined as words that were not included in or derived from the Dale-Chall list of the most common words (Chall & Dale, 1995). In addition, Wasik and Hindman (2011) found that teacher use of trained strategies, including support for vocabulary, was related to standardized receptive vocabulary outcomes for children.

Although there has been a great deal of emphasis on supporting vocabulary in preschool classrooms, little intervention research has been conducted on strategies for supporting vocabulary

Table 1. EMT Strategies.

Strategy type	Definition	Example
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'"

Note. EMT = Enhanced Milieu Teaching.

learning in play contexts in the classrooms. Rather, much of the research on vocabulary interventions in preschool has been embedded in book readings (Neuman, 2011). Multiple contexts for exposure to vocabulary and multiple opportunities to hear and use vocabulary have also been identified as evidence-based practices for vocabulary instruction (Harris, Golinkoff, & Hirsh-Pasek, 2011). There is preliminary evidence that play can be an effective context for vocabulary instruction. Preschool children who participated in an explicit book-based vocabulary instruction with an additional play component scored significantly higher on receptive and expressive vocabulary measures after an academic year of instruction than their counterparts that received only the explicit instruction (Han, Moore, Vukelich, & Buell, 2010). In addition, preschool children who received explicit book-based vocabulary instruction and participated in vocabulary-reinforcing center activities scored significantly higher on standardized measures of receptive vocabulary as well as measures of target vocabulary (Wasik & Bond, 2001). As play comprises 30% of the preschool day (Early et al., 2010), it seems to be an ideal context for supporting vocabulary learning.

Enhanced Milieu Teaching (EMT)

EMT is a naturalistic play-based method for supporting language development that has been thoroughly researched and found effective in promoting oral language and increasing vocabulary diversity (see Kaiser & Trent, 2007, for a review of the literature). EMT has been successfully taught to teachers to use in individualized sessions and across the day (Christensen-Sandfort & Whinnery, 2013; Yoder et al., 1995). EMT interventions rely on following the child's lead in play in brief teaching episodes with positive adult affect and responsiveness to child attempts to communicate. Interventionists follow the child's lead by mirroring the child's actions, mapping language onto child actions, and allowing the child to direct the play. In EMT, the system of least prompts is used to elicit target language. The following prompts may be delivered until the child uses target language: time delays, open-ended questions, choice questions, and mand models. See Table 1 for definitions and examples of EMT strategies. Correct responses from children are reinforced through natural consequences related to the play (e.g., access to materials, completing a specific action as requested). Although results from EMT studies indicate an effect on child vocabulary diversity, this is typically measured as number of different words within sessions or on language samples and not specific vocabulary targets (Kaiser & Trent, 2007). In addition, no

Table 2. Measures of Pre- and Postintervention Language Skills (Standard Scores).

Participant	PLS-4		PPVT-4		EVT-2	
	Pre	Post	Pre	Post	Pre	Post
Caleb	102	103	91	98	108	105
Jacorius	87	115	103	93	106	103

Note. PLS-4 = Preschool Language Scale, 4th edition; PPVT-4 = Peabody Picture Vocabulary Test, 4th edition; EVT-2 = Expressive Vocabulary Test, 2nd edition.

studies have been published which include vocabulary exposure in book reading coupled with reinforcing vocabulary through EMT sessions with children at risk for reading and language delays.

The purpose of this study is to extend the literature on targeted vocabulary word instruction in early childhood settings by focusing primary instruction during EMT sessions and book readings. The research question addressed was the following:

Research Question: Does use of specific vocabulary embedded in book readings followed by EMT sessions increase unprompted use of target vocabulary?

Method

Participants

Teachers in 3- and 4-year-old classrooms identified children who they believed would benefit from additional language support. Teachers were asked to identify one to two children who were using less language in their classrooms compared with peers, were not labeling objects or actions similarly to peers, and appeared to have difficulty learning new words.

To participate, children were also identified as at risk due to economic status (i.e., receiving free and reduced price lunch). Two African American boys participated. Caleb and Jacorius were 3 years 4 months and 3 years 6 months, respectively, at the beginning of the study. Although not an inclusion criterion, neither participant was identified as having a disability. See Table 2 for pre- and post-intervention measures of the participants' language skills.

Setting

The study was conducted in an inclusive university laboratory preschool in a southeastern urban setting. Probe sessions included only 10-min play sessions. Intervention sessions included a book reading in addition to the play session and lasted approximately 20 to 30 min. As probe sessions did not include the book reading, when possible, two of these sessions were conducted in 1 day (e.g., one morning and one afternoon session). Due to their length, intervention sessions were conducted only once per day. Sessions were conducted 5 days per week with each participant.

Probe, intervention, and follow-up sessions primarily conducted were in the classroom during centers time with the interventionist working with one participant at a small table. When requested by the teacher or when occurring during the before- or after-school program, sessions were conducted in an adjacent therapy room or secluded space in building hallways. Assessments were conducted in the therapy room as well, which was a small room with a child-sized table and chairs. The first author conducted all intervention sessions.

Table 3. Target Vocabulary Words.

Participant	Set 1	Set 2	Set 3
Caleb	Mixing bowl	Lotion	Lobster
	Icing	Shampoo	Octopus
	Spread	Shower (verb)	Cast (verb)
	Decorate	Body	Hook (verb)
	Spatula	Towel	Fisherman
Jacorius	Mixing bowl	Lotion	Lobster
	Icing	Soapy	Hook (verb)
	Ingredients	Shower (verb)	Fisherman
	Decorate	Body	Bigger
	Spatula	Towel	Smaller

Materials

Three sets of materials were used for the intervention. These three sets were selected from approximately 40 sets that were created for a previous randomized control trial (RCT) in which teachers were trained to implement EMT (Kaiser et al., 2010). These sets were chosen by the first author because, anecdotally, children appeared more engaged with and interested in these sets during the RCT. The three sets of materials were play dough baking, a water set with fishing toys, and bathing babies.

Each set of materials included five target vocabulary words, a collection of theme-based toys, and a researcher-developed book. The book included each of the target vocabulary words in the narrative based on a play schema with the theme-based toys illustrated by photographs of children playing with the material sets. For example, the bathing babies set included two dolls, two doll-sized bathtubs, baby shampoo, lotion, two washcloths, two towels, and two brushes. The book that accompanied this play set included photographs of a child bathing the dolls with similar materials and the text described the actions using the vocabulary words *lotion*, *shampoo*, *shower*, *body*, *towel*, and *soapy*. Rather than using published picture books, books were created for the purposes of this study, to ensure inclusion of the targeted vocabulary and to illustrate common play themes with the materials. During play sessions, no materials in addition to the toy set were used.

The five target vocabulary words for each student were identified from a list of 10 vocabulary words for each material set. The lists of 10 words were developed for the aforementioned RCT to complement the themes of the material sets and to reflect vocabulary categories represented in the MacArthur-Bates Communicative Development Inventories (CDI; Fenson et al., 2007), the Peabody Picture Vocabulary Test, 4th edition (PPVT-4; Dunn & Dunn, 2007) and the Expressive Vocabulary Test, 2nd edition (EVT-2; Williams, 2007). To identify the five target words from the list of 10, each participant was given a researcher-developed vocabulary test. The participant was shown a picture of each vocabulary word and asked a question such as "What is this?" or "What is he doing?" Words the participant correctly identified were removed from possible target words, and the five target words were randomly chosen from the remaining possible words. See Table 3 for target vocabulary words for each participant.

Response Definitions and Measurement

To determine language and literacy skills, pre- and post intervention, a battery of standardized language measures were administered to participants. The Preschool Language Scale, 4th edition (PLS-4; Zimmerman, Steiner, & Pond, 2002), was used to obtain a measure of total language; the

Table 4. Unprompted Vocabulary Use Examples.

Type of response	Example
Unprompted use of the vocabulary word that does not immediately (i.e., next turn or within 5 s) follow an adult prompt that includes a verbal model of the target word.	Vocabulary word: *Lobster* A: My fish is swimming. C: My *lobster* is swimming.
Child repeats the target word in the communicative turn following adult use of a word in a nonprompting utterance.	Vocabulary word: *Ingredients* A: I have all the *ingredients* for my cake. C: I have my *ingredients* too!

Table 5. Interobserver Agreement Data.

	Caleb			Jacorius		
Condition	*M*	Range	%	*M*	Range	%
Probe	100	NA	25	93	80-100	25
Intervention	88	60-100	23	98	80-100	25
Follow-up	90	80-100	33	100	NA	20

PPVT-4 was used to obtain a measure of receptive vocabulary; and the EVT-2 was used to obtain a measure of expressive vocabulary. The PPVT-4 and EVT-2 took approximately 15 to 20 min each to administer, and the PLS-4 took approximately 30 to 45 min. All measures were administered in a small room in the preschool typically used for pull out therapy. Pre- and postintervention language measure scores for Caleb and Jacorius are included in Table 2.

The dependent variable measured was participant unprompted use of target vocabulary words during the 10-min play session. Unprompted use of the vocabulary word occurred when the participant used a target vocabulary word without a verbal prompt that included the vocabulary word. Unprompted use could occur after time delays or open questions which did not include the target vocabulary word. Unprompted use also occurred when the participant correctly used the target vocabulary word in a communication turn directly after the researcher used the vocabulary word but did not prompt the child. For unprompted use, the participant had to use the vocabulary word correctly in context (i.e., identifying the correct object or action). See Table 4 for examples of unprompted vocabulary use.

Interobserver Agreement (IOA)

All sessions were video recorded. Graduate students were trained to at least 80% IOA across three sessions prior to completing IOA sessions. The training consisted of written materials, discussion, and video examples of the dependent variable. Graduate assistants independently coded sessions until 80% reliability with three master coded sessions was achieved. IOA was calculated by agreements divided by agreements plus disagreements. Agreements occurred when independent coders identified the same unprompted use of a target word. Twenty-four percent of sessions were randomly selected to be independently coded by two coders to calculate IOA. At least 20% of sessions for each condition for each participant were coded for IOA. Mean IOA across conditions and children was 93.1%. See Table 5 for detailed IOA data.

Design

A multiple probe design across sets of materials was conducted and repeated across participants (Gast, Lloyd & Ledford, 2014). Experimental control was demonstrated through the staggered

introduction of the independent variable to different materials, with changes in behavior seen only after introduction of the independent variable (Gast, Lloyd, & Ledford, 2014). The design of this study allowed for three intrasubject replications per participant and two intersubject replications across participants.

At least three data points and stable probe session data were required prior to beginning intervention for each tier. Within intervention, once a participant reached the criterion of initiating or spontaneously imitating all five target words for two consecutive play sessions, probe sessions for the next set of materials and/or follow-up sessions for each set of materials were completed. Each probe and intervention session was video recorded and coded for unprompted use of vocabulary words.

Probe sessions. During probes, 10-min play sessions occurred with the same sets of play materials used for intervention. Books were not shared with participants during probe sessions, because the target vocabulary words were included in the text. Time delays and open-ended questions (see Table 1) that did not target intervention vocabulary words were used to prompt language. This provided opportunities for the participant to use language. The use of the same play materials used for intervention allowed the interventionist to determine whether the participant currently had any of the target words in his expressive vocabulary. Choice questions and mand models to elicit imitation were not used. The interventionist did not introduce any target vocabulary words, but did use language related to the play materials.

Intervention. During intervention, participants received daily sessions that included an approximately 10-min book reading and a 10-min EMT play session with a specified set of materials. In each session, the interventionist read the book verbatim with the participant. Child comments and participation during book readings were acknowledged, which contributed to variation in duration of book readings. Target vocabulary words were not prompted during book reading. Next, the interventionist or participant started the timer to begin the 10-min play session. During the play session, the interventionist followed the child's lead by allowing the child to choose the play routine within the material set. For example, if the participant chose to wash the play tub and table rather than bathing the babies (the routine included in the book), the interventionist would also wash tables and incorporate vocabulary targets within this routine. The interventionist used the five target vocabulary words in conversation (i.e., not in a prompting episode) at least twice and prompted each vocabulary word at least once so the child was exposed to the word at least 3 times per play session. The interventionist elicited the child's use of the vocabulary by using the EMT strategies of time delays, open-ended questions, choice questions, and mand models in a least-to-most prompting hierarchy. Not all prompts in the hierarchy were used each time, but the system of least-to-most prompts was consistently followed. For example, if the participant reached toward the babies, the interventionist might start with an open-ended question (e.g., "What do you want?") rather than a time delay.

Follow-up sessions. When criterion was reached for each set of materials, follow-up sessions were conducted for the set of materials while probe sessions were occurring for subsequent tiers. For the first set of materials, three follow-up sessions were conducted; for the second set, two follow-up probe sessions; and for the third set, one follow-up session. During follow-up sessions, the materials and procedures were exactly the same as intervention sessions.

Data analysis. Data were analyzed primarily through the use of visual analysis, with attention given to shifts between conditions in level, trend, and immediacy of change. Percentage of nonoverlapping data was also examined (Scruggs & Mastropieri, 1998) to provide a measure of differences in data between adjacent conditions (Gast & Spriggs, 2014; Ledford, Wolery, & Gast,

2014). Data were analyzed to determine the presence or absence of a functional relation for each participant.

Procedural Fidelity

For procedural fidelity, a trained coder viewed the 10-min play session and rated the fidelity to the intervention protocol. During baseline, the coder assessed the adherence to nonuse of target vocabulary words. During intervention and follow-up sessions, the procedural fidelity coder assessed whether the researcher adhered to modeling the vocabulary word at least twice in the session and prompting each vocabulary word at least once during play. Procedural fidelity was assessed on 25.2% of all sessions, 26.2% of sessions with Caleb were analyzed, and 24% of sessions with Jacorius were analyzed. Baseline procedural fidelity was 100%; intervention mean procedural fidelity was 89.7% across intervention and follow-up for both participants.

The interventionist was trained to fidelity on the EMT procedures and was participating in another study in which procedural fidelity to EMT was assessed for each intervention session, so the interventionist was receiving ongoing support to implement EMT procedures with fidelity.

Results

Caleb

Caleb's data are presented in Figure 1. Caleb did not use any target words during the probe conditions for each set of materials. With intervention for Material Set 1, Caleb's demonstration of target words increased in level as compared with the probe condition and had an overall accelerating trend. The percentage of nonoverlapping data point values (PND) was 100% between probe and intervention conditions in Tier 1. Caleb reached criterion in 11 sessions. Prior to intervention for Material Set 2, Caleb's use of target vocabulary words remained at zero. With intervention for Material Set 2, Caleb's use of target words showed an immediate increase in level as compared with the probe condition, although there was significant variability in his data. The PND was 100% between probe and intervention conditions in Tier 2. Caleb reached criterion in 11 sessions. Prior to intervention for Material Set 3, Caleb's use of target vocabulary words remained at zero. With intervention for Material Set 3, Caleb again had an immediate increase in level as compared with the probe condition and demonstrated an overall accelerating trend. The PND was 95.24% between probe and intervention conditions in Tier 3. Caleb reached criterion in 21 sessions.

For Material Set 1, Caleb used four words without prompts at each follow-up session. Caleb used three words and five words, respectively, for the first and second follow-up sessions for Material Set 2. He used three words during the follow-up session for Material Set 3.

Jacorius

Jacorius's data are presented in Figure 2. Jacorius did not use any target words during the probe conditions for each set of materials. With intervention for Material Set 1, Jacorius's use of target words showed an overall accelerating trend, although there was some variability in the data. The PND was 75.00% between probe and intervention conditions in Tier 1. Jacorius reached criterion in 12 sessions. Prior to intervention for Material Set 2, Jacorius's use of target vocabulary words remained at zero. With intervention for Material Set 2, Jacorius's use of target words increased immediately in level as compared with the probe condition and showed an overall accelerating trend, again with variability present. The PND was 100% between probe and intervention conditions in Tier 2. Jacorius reached criterion in 15 sessions. Prior to intervention for Material Set 3,

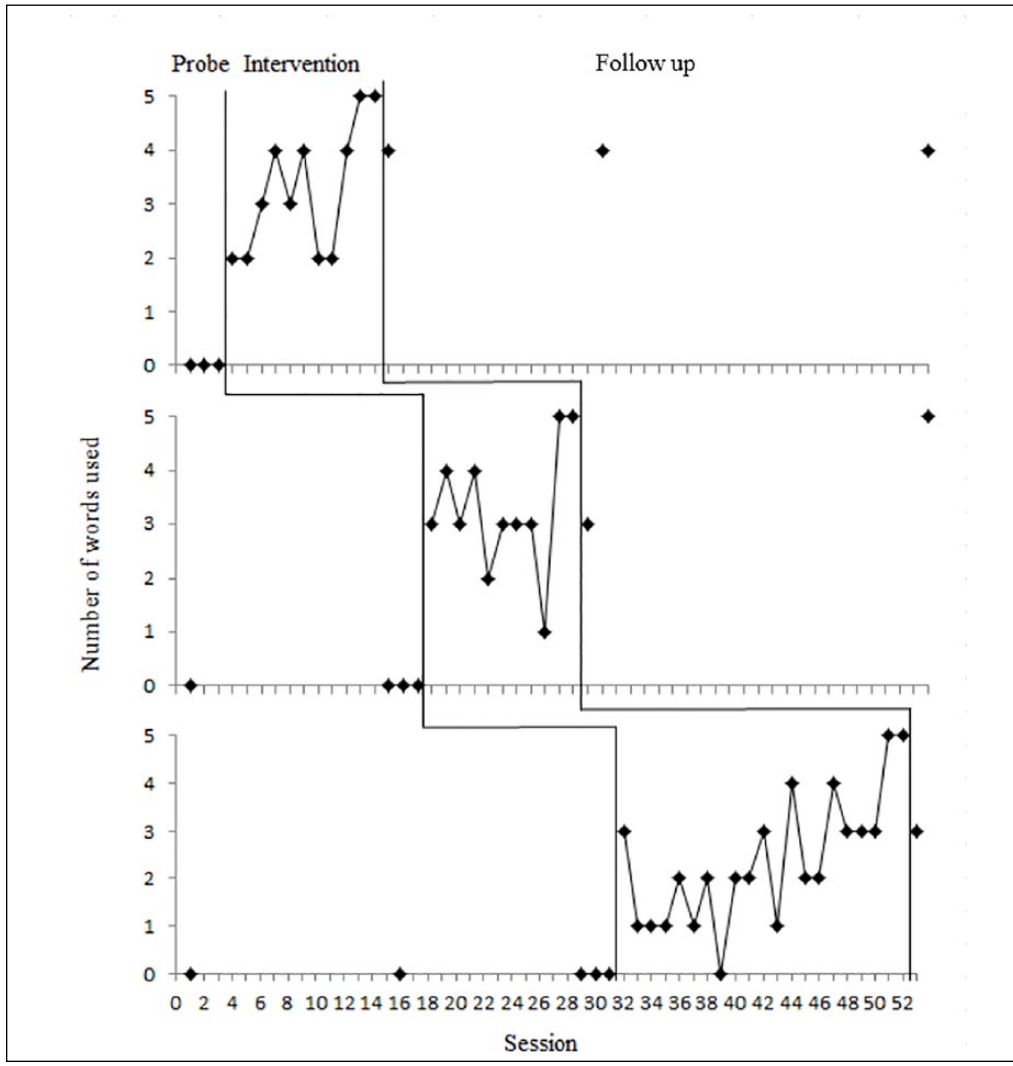

Figure 1. Graph of Caleb's vocabulary use. Each data point represents the number of unprompted words used in the session.

Jacorius's use of target vocabulary words remained at zero. With intervention for Material Set 3, Jacorius's use of target words had a rapid increase in level as compared with the probe condition, as well as an accelerating trend, with little variability in the data. The PND was 92.31% between probe and intervention conditions in Tier 3. Jacorius reached criterion in 13 sessions.

For the first set of materials, Jacorius used three words without prompts during each of the follow-up sessions. He used two words without prompts in the follow-up sessions for both the second and third sets of materials. Due to a procedural error, video of the second follow-up session is not available.

Discussion

The purpose of this study was to evaluate the effects of EMT with book reading on unprompted use of target vocabulary words. With intervention, both participants exhibited unprompted use of

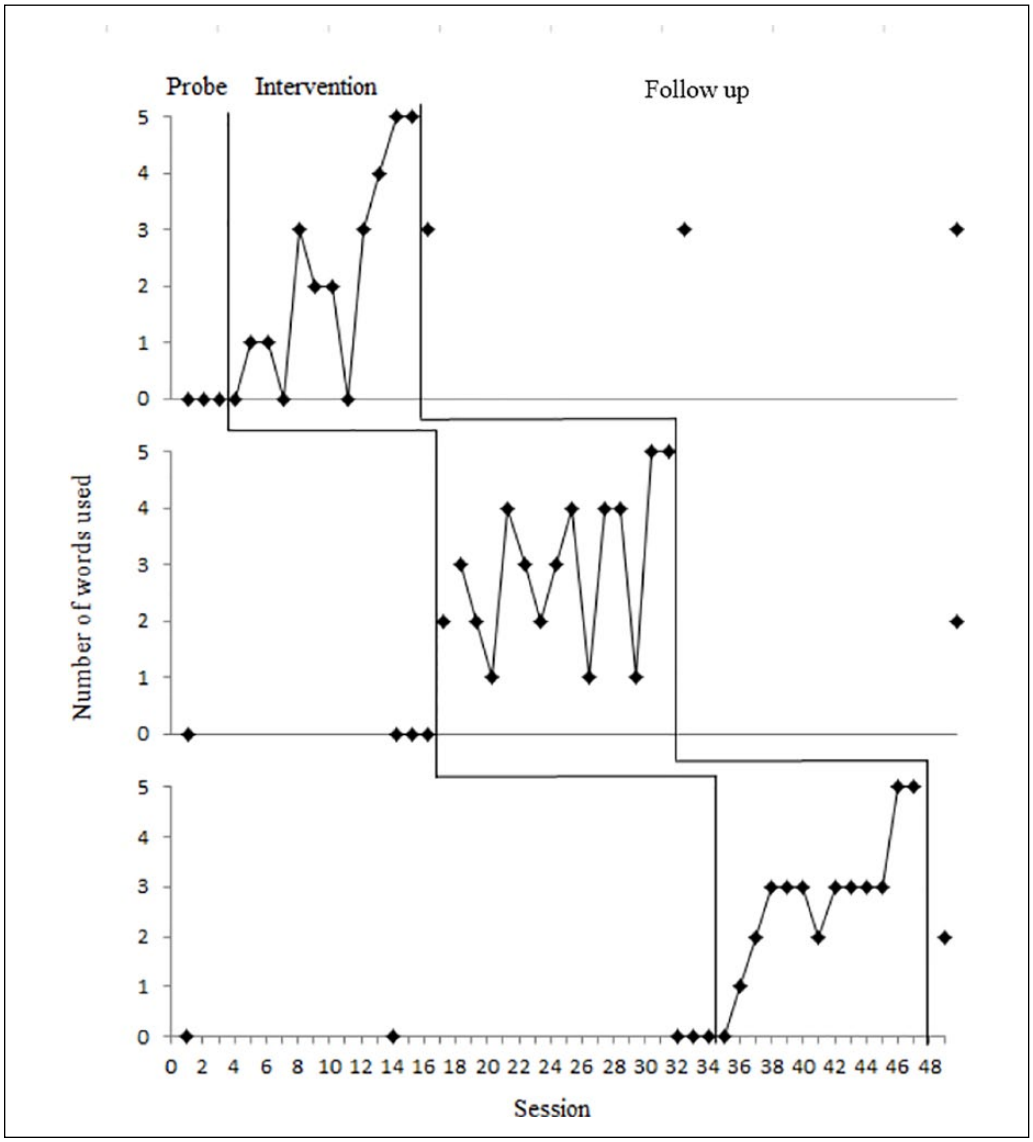

Figure 2. Graph of Jacorius's vocabulary use. Each data point represents the number of unprompted words used in the session.

all target words for each set of materials. A functional relation between the independent variable (book readings with EMT with target vocabulary) and the dependent variable (participant unprompted use of target vocabulary) is apparent with one demonstration and two intrasubject replications for each participant (i.e., three replications per participant), for a total of six replications. Participants varied in terms of their maintenance of the target vocabulary words across the three material sets, but in all cases exhibited continued use above baseline levels.

Implications for Research and Practice

These results add to the literature on vocabulary interventions for preschoolers who are at risk by providing evidence that target vocabulary can be taught during play and book reading in the

classroom using a well-established language intervention. A significant relationship between children's vocabulary knowledge and increased use of rare or sophisticated words by teachers (Dickinson & Tabors, 2001) and parents (Weizman & Snow, 2001) has been demonstrated through previous studies. Through this study, acquisition of specific target words through naturalistic play-based EMT strategies coupled with book reading to introduce the words has been demonstrated, which has implications for vocabulary teaching practices during play-based classroom activities.

Despite the strong link between vocabulary knowledge in early childhood and later reading and academic outcomes for children, teachers are provided with few specific strategies to support vocabulary learning during classroom choice or free-play time, which accounts for approximately 30% of the preschool day (Early et al., 2010). In fact, teachers have difficulty supporting vocabulary in contexts other than book reading (Schwanenflugel et al., 2005). Common preschool curricula often provide specific vocabulary words and child-friendly definitions for book readings but provide little support for using vocabulary during centers. With the knowledge that this one-on-one intervention can be used to promote specific target words introduced during a book reading, promoting teacher's use of these strategies during free-play times may be beneficial. Providing structured opportunities during engaging, meaningful play for children to observe and use vocabulary words in action that have been introduced through books may support expressive vocabulary development.

In addition to informing strategy use in play-based classroom activities, there are implications from the results regarding the amount of exposure to vocabulary targets and the relationship with expressive use of these words. It took an average of 14 sessions for children to use all five words independently, which equates to at least 28 uses in conversation and 14 prompts of the target words during play, in addition to exposure to each target vocabulary word during book reading. Researchers with school age populations have found that seven to 12 exposures to individual words are necessary for generative use of the word (Nagy, 2005). For these participants, more exposures were necessary when the vocabulary words were presented within the set of five words. This could be due to the expectation of use of all five words to meet criterion, the age and experience of the participants with regard to vocabulary learning, or the play-based nature of the intervention. Further exploration of these variables is warranted.

In addition, the number of sessions to criterion ranged from 11 to 21, indicating that some sets of words were more easily acquired than others. Expressive vocabulary knowledge was measured to identify words to target in the intervention. A measure of receptive knowledge of the target words would provide information that could guide word selection. Choosing words the child could identify receptively may expedite the acquisition of the word expressively. For Caleb, the set of words that was most difficult included words that were anecdotally more difficult to use naturally in the conversation and less relevant to the child's everyday life (e.g., fishing vs. baking a cake or taking a bath). Further research should be conducted to explore the ideal number of words to target and the effects of word selection based on child interest and background knowledge.

A foundational component of EMT is following the child's interests in play. Because of this, it often proved difficult to prompt all five words within a 10-min play sample. For example, if a child was not interested in following a routine of bathing babies, but rather wanted to soak and squeeze the sponges, target words such as *lotion* and *shower* (verb) were difficult to appropriately use and prompt. As a result, there was variability in how many uses and prompts for each word occurred beyond the minimum requirement established in the intervention. Exploration of possible play routines with the materials and identification of target words that could be appropriately used and prompted across multiple play routines would provide more appropriate target words for material sets. Further research should be conducted on how to best identify words for instruction in similar child-led contexts.

Limitations

A limitation of this intervention was the reliance on one set of materials to teach the target words. Although participants experienced the words in two contexts, book reading and play, the books were based on the materials used during play and were closely aligned with the play routines used to prompt the target words during play. The contexts were therefore closely linked and did not provide opportunities for participants to see and use the words with a variety of materials or representations. Teaching words in multiple contexts with multiple exemplars is considered best practice in vocabulary teaching in early childhood (Harris, Golinkoff, & Hirsh-Pasek, 2011). Schwanenflugel and colleagues (2005) found that the more strategies teachers used with fidelity in different contexts to teach vocabulary, the better the outcomes for the children. Future research should populate this type of play-based vocabulary instruction with vocabulary words identified, defined, and discussed during book readings.

The setting and design of the study include some limitations to interpretation of results. The interventionist was a researcher and participants were removed from the classroom as needed to conduct intervention sessions. Training classroom personnel to implement the intervention in ongoing activities would provide better evidence that this is an effective intervention for a classroom context. Maintenance and generalization measures were not included in the design. Future research should include measures of generalization to other contexts, such as classroom play and discussions with other adults and peers and maintenance of target vocabulary during play without the use of teacher prompts and models. This is necessary for ensuring children can use the vocabulary acquired in more typical contexts and beyond intervention. This is especially important because, in this study, the primary measurement context was intervention sessions, during which the first author was actively teaching the vocabulary words.

The lack of measures of fidelity of the book reading and EMT intervention is an additional limitation. Although the interventionist in this study was a trained and skilled EMT provider, data on her use of EMT procedures would strengthen the conclusion that EMT was an integral part of the intervention. Data on the fidelity to the book narrative and additional exposures to the target vocabulary (e.g., if the child and interventionist conversed about the book) would be useful to quantify the total number of exposures to each target word.

Conclusion

This study provides evidence that use of a naturalistic language intervention within the context of classroom play can be effective in supporting target vocabulary word use. Additional research is needed to refine the type and number of target words addressed in intervention and to study teacher implementation of the strategies.

Author's Note

Ragan H. McLeod is now at Department of Special Education and Multiple Abilities, University of Alabama. Jessica K. Hardy is now at Department of Special Education, University of Louisville.

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