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Preschoolers' word learning and story comprehension during shared book reading

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ABSTRACT

Providing instruction about picture-book vocabulary is an effective way to support preschoolers' word learning. Often the instruction occurs while the book is being read, however this may increase cognitive load compared to providing vocabulary instruction before or after the book is read. If instruction provided during the story increases cognitive load, children might be more reliant on ancillary cognitive abilities to successfully learn the words and understand the storyline. Three-to-five-year-olds (N = 83) were read a storybook that included instruction on six new words. Instruction was provided either during (inside) or before/after (outside) the story. Children were then tested on their ability to identify the named items, generalize to unfamiliar exemplars, and comprehend the story. Word learning and story comprehension were above chance and similar across the inside and outside conditions. Memory skills were stronger predictors of word learning in the inside condition than the outside condition. These results suggest that interactive vocabulary instruction during the story may place more demands on preschoolers' cognitive resources and may not be equally appropriate for all children.

1. Introduction

Before children can read on their own, joint book reading facilitates the development of language and later reading skills (e.g., Biemiller, 2003; Landry et al., 2012). The effects of joint reading on children's emerging literacy behaviors are long-lasting (Bus, Van IJzendoorn, & Pellegrini, 1995) and may be especially important for preschoolers from low-income families (Dickinson & Smith, 1994). As a result, researchers have investigated which reading techniques best support vocabulary acquisition in the context of joint reading episodes. One popular technique is dialogic reading, which encourages adults to ask open-ended questions and elicit a dialogue while reading to a child (Whitehurst et al., 1988). This technique involves adding extra-textual talk to provide instruction while reading the story. However, it is uncertain whether such interjections are necessary for vocabulary learning, or if breaking up the story with instruction might be ineffective for children with less robust ancillary cognitive skills. In what follows, we investigate whether children's non-linguistic cognitive skills, such as memory, interact with the placement of instruction.

Dialogic reading was initially developed to help preschoolers be participatory during joint-reading sessions by encouraging extra-textual talk. One aspect of dialogic reading is asking children "wh-" questions such as "*what* do you think will happen" or, "*where* is she?" to elicit extended dialogue during story time which might encourage the growth of expressive vocabulary. When using dialogic reading techniques, adults respond to what children say and scaffold questions to fit children's abilities and familiarity with the book that is being read. Researchers have explored the efficacy of different aspects of dialogic reading since its development, including level of interactivity (Justice, 2002; Walsh & Blewitt, 2006), and question types (Strasser, Larrain, & Lissi, 2013; Zucker, Justice,

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Piasta, & Kaderavek, 2010). Previous intervention studies reveal that regularly engaging in dialogic reading can lead to gains in 3–6-year old children's expressive vocabulary (e.g., Lever & Sénéchal, 2011; Whitehurst et al., 1994).

Dialogic reading has inspired studies that emphasize different elements of shared-book reading and extra-textual talk. For example, some studies with 3–5-year-old children encouraged supportive dialogue centered on the storyline and social themes (Aram, Fine, & Ziv, 2013). Other studies have focused on improving the quality of shared-book reading among educators (Milburn, Girolametto, Weitzman, & Greenberg, 2013; Wilkinson & Houston-Price, 2012) and parents (Hindman, Skibbe, & Foster, 2014; Landry et al., 2012). Although these reading techniques have normally been studied within typically developing monolingual populations, researchers have also investigated whether the technique supports language skills in and 3–5-year-old children with Autism Spectrum Disorder (Fleury, Miramontez, Hudson, & Schwartz, 2014), 5-year-old children with communication impairments (Colmar, 2014; Kaderavek, Pentimonti, & Justice, 2013), and bilingual 7–8-year-olds (Jiménez, Filippini, & Gerber, 2006).

Additional research has borrowed elements of the dialogic technique for a different purpose: to ask whether preschoolers learn specific vocabulary items that are included in the story (Ewers & Brownson, 1999; Sénéchal & Cornell, 1993; Walsh & Blewitt, 2006). One common element across study procedures is the tendency to break-up the reading to ask preschoolers questions (e.g., Justice, 2002; Sénéchal & Cornell, 1993; Walsh & Blewitt, 2006). The assumption is that questioning and instruction should occur proximal to the vocabulary item in the text because it may increase children's attention to vocabulary items and associated narrative content. However, such interjections might increase children's cognitive load because they have to juggle multiple tasks during dialogic reading episodes.

When children are encouraged to be participatory, they have to manage many tasks at once: following the narrative presented in the story, contributing to mini-conversations as the story is stopped and probes are introduced, and learning the new words presented in the story. Consistent with cognitive load theory, balancing these different demands may tax preschoolers' limited cognitive resources and lead to less optimal learning (Paas & Ayres, 2014; Paas & Sweller, 2012). One possibility is that such interjections will reduce story comprehension and word learning. This could occur because responding to questions during a story requires children to switch between several tasks that necessitate tracking multiple pieces of information simultaneously (e.g., listening to the story, learning words, participating in a dialogue). This requires children to participate in a dialogue while they are also tasked with holding aspects of the story in memory while also attempting to keep novel words and potential meanings in mind. In addition to loading their memory stores, children may use cognitive control, like inhibition, to switch between these tasks.

One useful model to inform this hypothesis was offered by Lee and Kinzie (2011) in an analysis of the effects of teachers' questions during a science activity with 4–5-year-olds. Their proposal was that although teacher questions scaffold children's learning, children's ability to answer the questions remains constrained by their available cognitive resources. This occurs because answering questions requires multiple components (e.g., listening to the question, understanding it, creating and producing an appropriate response). To answer questions, children must have the capacity to retain many different pieces of information at once. Therefore, questions that are meant to aid children could inadvertently overload their memory and decrease their ability to learn from the activity. Applying this to shared book reading: when questions are interjected into the text, additional cognitive skills may be necessary to enable optimal word learning and story comprehension. While there is evidence from 7 to 10-year-old children that both memory and executive function support reading comprehension (Cain, Oakhill, & Bryant, 2004; Sesma, Mahone, Levine, Eason, & Cutting, 2009), few (if any) studies have investigated how non-linguistic cognitive skills contribute to pre-literate children's word learning and story comprehension.

One possibility is that the extent to which interjections lead to increases in cognitive load may be affected by when the questioning occurs. In particular, children may have greater difficulty if questions are interjected during the story reading versus being placed before or after the reading. This might occur because when instruction occurs outside of the story context, children do not need to balance the needs of attending to story content while they are answering questions. Previous work has not addressed this question directly; although there are suggestions that the placement of interjections has little to no effect on children's overall levels of vocabulary learning (Blewitt, Rump, Shealy, & Cook, 2009) or story comprehension (Reese & Cox, 1999). The lack of overall differences in learning may indicate that load is not increased when stories are interrupted versus not. However, because previous studies have not included separate measures of cognitive skills that may be affected by increases in cognitive load it is not clear whether there are greater costs – in terms of the amount of memory necessary to be successful at learning – when stories are interrupted with questions versus having questions outside of the story context. We test this possibility in the current study.

The central goal of the current study was to determine what effect cognitive abilities have on word learning and story comprehension when questions are posed during the story versus before or after the reading. In one condition, interactive vocabulary instruction was placed within the story (the *inside* condition). In the other conditions, instruction was placed either *before* or *after* the story. Both vocabulary acquisition and story comprehension were used as measures of learning. Based on the cognitive load hypothesis outlined above, the prediction was that these abilities would be more likely to influence word learning and story comprehension in the *inside* condition. To test this possibility, we included two measures of memory (forward digit span, self-ordered pointing) and a measure of inhibition (day-night stroop, Carlson, 2005; Cragg & Nation, 2007; Montgomery & Koeltzow, 2010; Simpson & Riggs, 2005). We also included a measure of receptive vocabulary (the Peabody Picture Vocabulary Test-IV; Dunn & Dunn, 2007). We tested children between the ages of 3 and 5, because there is a great deal of variability in children's vocabulary size and cognitive skills across this age period (e.g., Carlson, Moses, & Claxton, 2004; Deak, 2000; Justice 2002; Nicolopoulou, Cortina, Ilgaz, Cates, & de Sá, 2015; Zucker et al., 2010).