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## Toddlers' word learning and transfer from electronic and print books



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### ABSTRACT

Transfer from symbolic media to the real world can be difficult for young children. A sample of 73 toddlers aged 17 to 23 months were read either an electronic book displayed on a touchscreen device or a traditional print book in which a novel object was paired with a novel label. Toddlers in both conditions learned the label within the context of the book. However, only those who read the traditional format book generalized and transferred the label to other contexts. An older group of 28 toddlers aged 24 to 30 months did generalize and transfer from the electronic book. Across ages, those children who primarily used screens to watch prerecorded video at home transferred less from the electronic book than those with more diverse home media experiences.

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### Introduction

Shared reading has long been a popular activity for parents and young children. Parents report that they begin reading with children when they are around 7 to 9 months of age (Debaryshe, 1993) and the practice of shared reading with infants and toddlers is linked to children's vocabulary growth (Debaryshe, 1993; High, LaGasse, Becker, Ahlgren, & Gardner, 2000; Karrass & Braungart-Rieker, 2005). The advent of technologies such as touchscreens and smartphones has increased the popularity of electronic reading (e-reading). According to a 2014 report by the Joan Ganz Cooney Center, 31% of parents reported that their children aged 2 to 10 years read electronic books (e-books) (Rideout,

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2014). There were no differences in e-book use depending on age; younger children used e-books just as frequently as older children. At that time, an additional 38% of children did not have access to devices on which to read e-content. With the increasing ownership of smartphones and tablets (Anderson, 2015), e-books are becoming available to, and presumably embraced by, even greater numbers of children. In fact, Overdrive, a popular e-book provider for libraries, reported a 30% increase in children's e-book borrowing between the first quarters of 2015 and 2016 (Overdrive, 2016).

Research has found electronic books to be both supportive of (Takacs, Swart, & Bus, 2015; Zucker, Moody, & McKenna, 2009) and detrimental to (Chiong, Ree, Takeuchi, & Erickson, 2012; Krcmar & Cingel, 2014) children's learning. Differences in the way in which electronic stories include and incorporate interactive features have been identified as one likely explanation for the discrepant findings (Bus, Takacs, & Kegel, 2015). However, preschoolers' comprehension of book content differs from print and electronic media even when the content is closely matched across formats and interactive features are excluded (Krcmar & Cingel, 2014). Thus, interactive features do not completely explain medium-related differences in learning.

Another important factor in children's learning from electronic books may be differences in experience. There is evidence that parent-preschooler interactions with electronic and print formats are different. Children may initiate more overall comments in electronic reading contexts (Korat & Or, 2010); however, they may be more communicative about book content when reading in print. The distinction between overall language and interaction around content may be important. For example, a variety of studies have shown that parents engage in more non-content talk, such as talk about manipulating the device, when reading electronic-format books and provide a higher density of content-related comments and questions in traditional-reading formats (Chiong et al., 2012; Korat & Or, 2010; Krcmar & Cingel, 2014; Parish-Morris, Mahajan, Hirsh-Pasek, Golinkoff, & Collins, 2013). When adult-child interactions during reading differ between print and electronic books, it may result in learning differences between the two media.

An additional and untested possibility is that children come to the book-reading situation with different expectations regarding print and electronic contexts. In this study, we extended the current body of research on reading in different formats by addressing whether learning differences occur even when both built-in interactive features and adult-child interactions during reading are matched. We investigated whether screen media are a good venue for learning and transfer of learned information relative to the well-established activity of book reading. For this purpose, we created a picture book that could be copied exactly in both electronic and print contexts so that we could directly compare word learning from screens versus word learning from physical pages. The book was created to take advantage of the way in which children learn words; a novel object with slight variations in shape and color and a novel label were repeated across multiple pages in the book to give children a variety of exemplars for the novel label. The goal of the book (in both formats) was to give children repeated exposure to different exemplars of the novel object to facilitate children's ability to form a category for the labeled object and, thus, to enable generalization and transfer to new real exemplars (Geraghty, Waxman, & Gelman, 2014). In addition, the novel exemplars were paired alongside objects familiar to children so that they could use mutual exclusivity (the assumption that the label would apply to the whole novel object rather than the familiar object; Markman, 1990) to support their mapping of the new label to the novel object. The researcher also directed children's gaze and pointed at the objects during labeling to support children in learning the label (Baldwin, 1993; Grassmann & Tomasello, 2010; Moore, Angelopoulos, & Bennett, 1999).

Research has linked children's vocabulary growth with exposure to picture books during the early years (e.g., Bus, van IJzendoorn, & Pellegrini, 1995; Sénéchal, Pagan, Lever, & Ouellette, 2008), and print picture books have been used in a variety of word learning studies to teach novel labels to children in research contexts (Ganea, Allen, Butler, Carey, & DeLoache, 2009; Ganea, Pickard, & DeLoache, 2008; Horst, Parsons, & Bryan, 2011; Tare, Chiong, Ganea, & DeLoache, 2010; Walker, Walker, & Ganea, 2013). Children as young as 15 months have been shown to learn novel labels from these specially designed picture books after a single reading, and children as young as 18 months also generalized the label to a new real-world exemplar. We do not know whether the same pattern of performance is obtained when children are exposed to electronic picture books. There is reason to expect that dif-

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