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Toddler learning from video: Effect of matched pedagogical cues

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ABSTRACT

Toddlers learn about their social world by following visual and verbal cues from adults, but they have difficulty transferring what they see in one context to another (e.g., from a screen to real life). Therefore, it is important to understand how the use of matched pedagogical cues, specifically adult eye gaze and language, influence toddlers' imitation from live and digital presentations. Fifteen- and 18-month-old toddlers (N = 123) were randomly assigned to one of four experimental conditions or a baseline control condition. The four experimental conditions differed as a function of the interactive cues (audience gaze with interactive language or object gaze with non-interactive language) and presentation type (live or video). Results indicate that toddlers' successfully imitate a task when eye gaze was directed at the object or at the audience and equally well when the task was demonstrated live or via video. All four experimental conditions performed significantly better than the baseline control, indicating learned behavior. Additionally, results demonstrate that girls attended more to the demonstrations and outperformed the boys on the imitation task. In sum, this study demonstrates that young toddlers can learn from video when the models use matched eye gaze and verbal cues, providing additional evidence for ways in which the transfer deficit effect can be ameliorated.

1. Introduction

In the late 1990's, television programs and DVDs directed towards infants and toddlers emerged (Anderson & Pempek, 2005) and reports demonstrate that children under age 2 are consistently watching nearly 2 h of screen media per day (Barr, Danziger, Hilliard, Andolina, & Ruskis, 2010; Rideout & Hamel, 2006; Rideout, 2013). Despite the amount of time with screen media, many studies have demonstrated that very young children still learn better and more quickly from a live demonstration than a video presentation (see Barr, 2013 for review). This concept was originally termed the video deficit (Anderson & Pempek, 2005). It was recently reframed as the transfer deficit effect (Barr, 2010) as a result of the research demonstrating the challenges young children face when transferring learning from one context to another (e.g., 2D to 3D) rather than strictly from a screen to a real life experience.

Given the near half-century of research that has demonstrated successful learning from educational preschool television programming (e.g., Fisch & Truglio, 2001), research has begun to evaluate which features can support infant and toddler learning from screen presentations. To date, researchers have demonstrated that social factors including character famil-

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iarity (Calvert, Richards, & Kent, 2014; Gola, Richards, Lauricella, & Calvert, 2013; Lauricella, Gola, & Calvert, 2011), social contingency (Krcmar, 2010; Troseth, Saylor, & Archer, 2006), and observation of other's social interaction (O'Doherty et al., 2011) can help infants and toddlers overcome the transfer deficit. The intent of this study is to assess the effect of interactive eye gaze and language, social features that are common in children's educational television programs (e.g., *Dora the Explorer*), on toddlers learning from a video presentation.

1.1. Infant and toddler development

One of the key ways in which infants and toddlers learn about the world around them is through social interaction with adults (Vygotsky, 1978), both verbally and through interactive cues like gaze following and pointing. While language is a key feature of social interaction and plays a powerful role in child linguistic and verbal skills (e.g., Hart & Risley, 2003), other social cues also play an influential role in development and learning. It has been well documented that by 12 months of age, infants can successfully follow an adult's eye gaze (e.g., Brooks & Meltzoff, 2005; Gredeback, Theuring, Hauf, & Kenward, 2009) and engage in joint attention (Carpenter, Nagell, & Tomasello, Butterworth, & Moore, 1998), key social cues that help direct a child's attention and support learning. Beginning in the first year of life, children learn through imitation and are good at imitating actions performed by others, even with novel objects (Barr, Dowden, & Hayne, 1996; Carpenter et al., 1998). Furthermore, research demonstrates that infants are more likely to imitate behaviors when the model uses ostensive cues, including eye gaze and child-directed speech (e.g., Brugger, Lariviere, Mumme, & Bushnell, 2007; Nielsen, 2006). The ability to perceive and utilize these social cues continues to develop during the toddler years and has a strong impact on learning from events in the real world; however, we have yet to examine how these social cues influence learning when material is presented in 2D video form.

1.2. Learning from television

While infants are quite capable of learning from social situations in the real world, there is considerable evidence that learning information from a 2D screen presentation (e.g., television) may be significantly more challenging than a live presentation, particularly for children under age 4 years (see Anderson & Pempek, 2005; Barr, 2010, 2013). More specifically, imitation of behaviors demonstrated on television is poorer for children between the ages of 12- and 42-months compared to when the actions are demonstrated live (Barr & Hayne, 1999; Dickerson, Gerhardstein, Zack, & Barr, 2013; Hayne, Herbert, & Simcock, 2003). Over the years, this transfer deficit (Barr, 2010) has been demonstrated in a range of learning tasks and a variety of contexts (e.g., Barr & Hayne, 1999; Lauricella, Pempek, Barr, & Calvert, 2010; Meltzoff, Kuhl, Movellan, & Sejnowski, 2009; Simcock & DeLoache, 2006; Zack, Barr, Gerhardstein, Dickerson, & Meltzoff, 2009), providing concern that infants and toddlers could not learn from video experiences.

Recently researchers have documented that developmental constraints on information processing contribute to the transfer deficit from media during very early childhood (for review see, Barr, 2013; Hipp et al., in press; Kirkorian, Pempek, & Choi, in press; Fisch, 2000). By the preschool years, however, children have consistently demonstrated their ability to learn from educational television programs (e.g., Anderson et al., 2000; Fisch & Truglio, 2001). A number of factors contribute to strong and consistent effects of educational media learning in preschoolers. First, content developers consider preschool development across multiple cognitive domains including attentional processing, memory capacity (both short-term and long-term), and language when developing content (Anderson, 2013; Linebarger, Brey, Fenstermacher, & Barr, in press). Second, preschoolers have accumulated extensive daily exposure to the formal features of television (e.g., scene changes involving cuts and pans; Alwitt, Anderson, Lorch, & Levin, 1980; Calvert, Huston, Watkins, & Wright, 1982.). Third, producers have systematically implemented educational curricula into preschool content (Linebarger et al., in press). These same parameters have not yet been systematically investigated for infant and toddler media.

Despite the questions remaining about *why* young children face a deficit in learning from screen media, researchers have begun to examine specific features and instances in which this transfer deficit effect can be ameliorated. Recent research demonstrates that factors related to the presentation of the media content, such as repetition (Barr, Muentener, Garcia, Fujimoto, & Chavez, 2007), language prompts (Barr & Wyss, 2008; Barr, 2010; Seehagen & Herbert, 2010), use of closed-circuit television (Troseth, 2003a), and the meaningfulness or the social contingency of the character (Calvert et al., 2014; Gola et al., 2013; Krcmar, 2010; Lauricella et al., 2011; Troseth et al., 2006) can improve young children's learning from video. Furthermore, factors related to the child, specifically age (Barr & Hayne, 1999) and experience using television as a source of information (Troseth, 2003b) also play a role in children's successful learning from a video. While each of these instances provides a glimpse into the opportunity for children to learn from screen media, many of these features are not feasible for mass TV production (e.g., Krcmar, 2010; Troseth et al., 2006; Troseth, 2003a).

For more than 40 years, researchers have studied preschool-directed television programs and consistently find that preschool-aged children can learn from quality educational media content (e.g., Anderson et al., 2000; Fisch & Truglio, 2001). Recently, programming for preschoolers and younger children has begun to use interactive techniques in which the characters look directly out at the audience and use language that invites the audience to participate with the characters (e.g., *Blue's Clues*, *Dora the Explorer*, *Super Why, Daniel Tiger's Neighborhood).* Programs like *Blues' Clues,* in which the main character utilizes these interactive techniques, have a positive impact on preschooler's cognitive development, including performance on pattern perception, creative thinking, and general problem solving skills (Anderson et al., 2000). Further,