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The effect of instructional use of an iPad® on challenging behavior and academic engagement for two students with autism

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ABSTRACT

iPads® are increasingly used in the education of children with autism spectrum disorder. However, few empirical studies have examined the effects of iPads® on student behaviors. The purpose of this study was to compare academic instruction delivered with an iPad® to instruction delivered through traditional materials for two students with autism spectrum disorder who engaged in escape-maintained challenging behavior. An ABAB reversal design was utilized in which academic instruction with an iPad® and academic instruction with traditional materials were compared. Both participants demonstrated lower levels of challenging behavior and higher levels of academic engagement in the iPad® condition and higher levels of challenging behavior with lower levels of academic engagement during the traditional materials condition. These results suggest that the use of an iPad® as a means of instructional delivery may reduce escape-maintained behavior for some children with autism. Suggestions for future research directions are discussed.

1. Introduction

With rapid technological advances, there has been a recent paradigm shift towards the use of technology in classrooms (Murray & Olcese, 2011) and in educating individuals with autism spectrum disorder (ASD) (Kagohara, Sigafoos, Achmadi, O'Reilly, & Lancioni, 2012; Kagohara, van der Meer, et al., 2012; Ramdoss, Lang, et al., 2012; Ramdoss, Machalicek, et al., 2012). Educational technology has been extensively researched and utilized to address core deficits faced by individuals with ASD. Previous research has identified technology as a viable tool to teach social and emotional skills (Ramdoss, Lang, et al., 2012; Ramdoss, Machalicek, et al., 2012; Wainer & Ingersoll, 2011), face recognition skills (Tanaka et al., 2010), adaptive behaviors (Ayres, Maguire, & McClimon, 2009; Ramdoss, Lang, et al., 2012; Ramdoss, Machalicek, et al., 2012), vocational behaviors (Burke, Anderson, Bowen, Howard, & Allen, 2010), academic skills (Pennington, 2010), and communication skills (Ramdoss et al., 2011) with individuals with ASD. In addition to traditional desktop computers, other technologies, such as gaming systems (Murray & Olcese, 2011), Smart Boards (Mechling, Gast, & Krupa, 2007; Xin & Sutman, 2011), and portable technologies, such as Apple iPods® and Apple iPads® (Kagohara, Sigafoos, et al., 2012; Kagohara, van der Meer, et al., 2012) are becoming more widely utilized in educational settings.

In recent years, the Apple® iPad® has emerged as a popular educational technology for individuals on the autism spectrum. iPads® popularity in educating students with ASD may be due to their portability (Shah, 2011; van Laarhoven, Johnson, van Laarhoven-Myles, Grider, & Grider, 2009), large touch screen layout (Shah, 2011), ease in individualizing

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educational materials (Harrell, 2010), a multitude of educational applications (Kagohara, Sigafoos, et al., 2012; Kagohara, van der Meer, et al., 2012; Shah, 2011), and a lack of social stigma due to their frequent use by neurotypical individuals (van Laarhoven et al., 2009). Although iPads® are widely used, there is limited research to support their learning benefits (Kagohara, Sigafoos, et al., 2012; Kagohara, van der Meer, et al., 2012), with only anecdotal evidence on the iPad's® effects on challenging behavior for individuals with ASD (Quillen, 2011).

However, recent studies have begun to attend to the use of iPods® and iPads® as interventions for individuals with disabilities. Studies have investigated the use of the iPod® and iPad® to improve the transitioning behavior of individuals with ASD (Cihak, Fahrenkrog, Ayres, & Smith, 2010), to access leisure activities (Hammond, Whatley, Ayres, & Gast, 2010; Kagohara et al., 2011), as way to deliver video-modeling instruction (Kagohara, Sigafoos, et al., 2012; Kagohara, van der Meer, et al., 2012), and as a prompting method for employment settings (van Laarhoven et al., 2009). However, to date, no studies have addressed the use of iPads® to decrease challenging behaviors for individuals with ASD during academic demands. Therefore, the purpose of this study was to evaluate the effects of delivering academic instruction through an iPad® versus traditional materials (pencil/paper and flashcards) on the occurrence of challenging and academic engagement behavior for children with ASD.

2. Method

2.1. Participants and setting

Elton, a seven-year-old boy diagnosed with Asperger's Disorder, attended a general education third grade classroom. Elton had been referred to this study by his parent because he displayed aggressive behaviors, screaming, and verbal protesting during academic demand. Elton communicated in complete sentences using grade-level vocabulary, and was generally performing on grade level in his subjects. All sessions took place within his home and were conducted on the floor of his room. Elton's room was a 5 m × 4 m carpeted bedroom, and contained a bed, desk, chair, and toys (which were contained in the two closed closets). Only the participant and the researcher were present for each session. The targeted academic demand for Elton was double-digit subtraction with regrouping. At the time of the study, Elton's mother reported that the iPad® had recently been introduced as a reinforcer to Elton, and had been utilized for approximately one week. All sessions were videotaped for data collection purposes, occurred twice weekly after school for eight weeks, and were implemented by a first year doctoral student (first author) with two years of experience conducting single-case research studies.

Dan, a three-year-old boy diagnosed with PDD-NOS, communicated using the Picture Exchange System (PECS) Level 3 by identifying and exchanging a picture of a desired item for the item pictured (Bondy & Frost, 1994). Dan attended an early childhood center for children with autism, and had been referred to this study by his lead teacher because he displayed aggression and screaming during academic demands. All sessions for Dan occurred within a 3 m × 4 m classroom at the early childhood center that contained a child size rectangular table and two small red children sized chairs. Only the researcher, participant, and data collectors were present. All of the sessions for Dan were implemented by a third year doctoral student (third author) with three years of experience conducting single-case research studies. At the time of the study, Dan had no previous learning or reinforcement history with the iPad®, however, his lead teacher had identified a desktop computer as a preferred reinforcer for Dan. The targeted academic skill for Dan was matching color cards. Sessions occurred twice a week for eight weeks.

2.2. Experimental design

A reversal (e.g., A–B–A–B) design was implemented to deliver instruction using traditional materials in the first phase (e.g., A), and instruction via the iPad® in the second phase (e.g., B). With the introduction and removal of iPad® instruction, experimental control was demonstrated throughout the study (Kennedy, 2005). The traditional materials condition consisted of having the participant complete an academic demand using a pencil and paper (Elton) or paper flashcards (Dan). The iPad® condition consisted of the participant using an iPad® to complete the same academic demand that was presented during the traditional materials condition.

2.3. Pre-assessment

Both participants were referred to this study, Elton by his parent, and Dan by his lead teacher, as they tended to engage in challenging behavior during academic demand. Prior to beginning the experiment, the researcher met with the participant's parent (Elton) or lead teacher (Dan) in order to determine an educational demand that the participant could perform, and had previously mastered, but which tended to evoke the targeted challenging behavior. A previously mastered skill was selected in order to control for learning effects, such as acquisition of the skill during the course of the study, however, the participants' challenging behavior during demands was not limited to the identified demands.

The parent/teacher also completed the Questions About Behavioral Function (QABF) (Matson & Vollmer, 1995) in order to develop a hypothesis for the function of each participant's challenging behavior. The QABF is an indirect assessment, consisting of 25 questions, which assesses the function of a behavior in five categories: attention, escape, non-social,