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Review

Facilitating requesting skills using high-tech augmentative and alternative communication devices with individuals with autism spectrum disorders: A systematic review

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ABSTRACT

We conducted a systematic review to identify research studies that utilised high-tech devices (e.g., smartphone technology) to teach functional requesting skills to individuals under the age of 16 with a diagnosis of autism spectrum disorder (ASD). We identified 16 studies that included a total of 46 participants. Speech generating devices were the most frequently employed mode of communication, the most frequently requested items were preferred food or toys, and the maximum number of target-requesting skills taught was eight. Research has tended to utilise the multiple baseline design or a variant thereof (e.g., a multiple-probe design). Overall, the intervention results were largely positive, suggesting that high-tech devices can be successfully implemented as augmentative and alternative communication (AAC) devices for individuals with autism. Further research is needed to evaluate the claims made about high-tech AAC devices in facilitating requesting skills in children with ASD.

Contents

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1. Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterised by persistent impairments in social communication and social interaction, and restricted, repetitive patterns of behaviour, interests, or activities (American Psychiatric Association, 2013). One of the impairments in social communication commonly manifests as a delay in the onset of spoken language: up to 25% of children with ASD are estimated to never fully acquire speech (Klinger, Dawson, & Renner, 2002). Children with ASD and speech delay often come to rely on the use of an augmentative and alternative communication (AAC) device as their primary mode of communication (Mirenda & Iacono, 2009). Such devices were originally intended to address the expressive communication needs of non-vocal populations who lacked manual dexterity and had significant difficulties using a keyboard or writing by hand (Shane et al., 2012). In the late-1980s and early-1990s, individuals with ASD began to use AACs (Shane et al., 2012). At present, AACs are widely used as a platform for communication for those who do eventually learn to speak (Charlop & Haymes, 1994; LeBlanc, Dillon, & Sauter, 2009) and for children with ASD and delayed language development (Mirenda & Iacono, 2009).

In AAC systems, the use of symbols or images either supplements, or substitutes, for existing speech as a method for communicating with caregivers (Murray & Goldbart, 2009; Nunes, 2008). One of the most widely used AACs is the Picture Exchange Communication System (PECS; Frost & Bondy, 2002). In the initial stages of learning to use PECS, individuals are taught to exchange small photographs or symbols with a communicative partner in order to obtain desired items or activities. These pictures are usually laminated and stored in a portable ring binder which is carried around by the user. As the learner progress through the stages of the PECS, the pictures are used for more complex interactions such as constructing sentences, making comments and responding to questions. Generally, the evidence suggests that the PECS is an effective AAC system for individuals with ASD (Bondy & Frost, 1994; Chambers & Rehfeldt, 2003; May & Dymond, 2014; Lancioni et al., 2007; Magiati & Howlin, 2003; Schwartz, Garfinkle, & Bauer, 1998).

Although the PECS is a widely used and effective system (e.g., Charlop-Christy, Carpenter, LeBlanc, & Kellet, 2002), it is, along with other picture exchange systems, rather time- and labour-intensive (De Leo, Gonzales, Battagiri, & Leroy, 2011), which represents a significant practical challenge for parents and practitioners (Hayes et al., 2010; Leroy & De Leo, 2008). For instance, in order to use and maintain the system, caregivers must have the device available (i.e., not forgotten or left at home or school), select objects and take photographs, print, laminate, cut, and apply Velcro™, which takes a considerable amount of time. In addition, it is impossible for young children to be active initiators of this process due to the dangerous nature of the apparatus needed (i.e., hot laminators and sharp scissors). For young children then, the independence achieved by learning to communicate via the PECS is tempered somewhat by the set up and operation requirements of the system.

Other forms of AAC systems such as sign language and Makaton signs have potential limitations that necessitate caution when selecting them as a mode of communication intervention. For instance, a weakness with manual signing is that all communicative partners must be trained to use the system and this clearly restricts the verbal community with which individuals with developmental disabilities may interact. Unfamiliar listeners or potential communicative partners require training in the effective use of manual signing if they are to interact with a person with ASD using such an AAC system. Another limitation of other forms of AAC like manual signing is that such systems may not be a good fit for all children with ASD because of the fine motor skills involved. ASD is often highly comorbid with motor impairments (e.g., Green et al., 2009), and thus the fine movements, sequences and repetitions required to sustain a communicative exchange between two signers are often beyond the capability of many potential users. The development and validation of alternative AAC systems is therefore needed as a means of overcoming some of the limitations of existing methods.

Recent developments in communication technology have led to exciting advances in AACs (Sennott & Bowker, 2009). Portable electronic devices such as the iTouch™ (Apple Inc., Cupertino, CA) or Speech Generating Devices (SGDs) can simultaneously and substantially increase the size of the 'vocabulary store' (i.e., the number of pictures or symbols a device can hold) and decrease the size of a device (the PECS book is 25.5 cm by 23 cm, whereas the iTouch™ is 12.3 cm by 5.9 cm). In addition, new devices such as the iTouch™ require considerably less time to set up and maintain. Unlike picture exchange systems, there is no lengthy process to expand vocabulary stores, which can be as simple as taking a photograph with the device itself. Portable electronic devices also have the potential to facilitate child-led expansion of vocabulary stores by allowing the user to take the photos (although research is needed in this area to determine its' feasibility). Moreover, the widespread availability of small, socially acceptable devices such as the Apple iPad® (Apple Inc., Cupertino, CA) and the Google Android™ (Google Inc., Mountain View, CA) with the use of applications ('apps') have rapidly expanded the possibilities for AAC development. Between 2011 and 2013, the proportion of children (aged 8 and under) with access to some type of mobile device with Internet access at home (e.g., smartphone, tablet) has increased from half (52%) to three-quarters (75%; Common Sense Media & Rideout, 2013). Almost as many children (aged eight and under) now own their own tablets (7%) as their parents did two years ago (8%; Common Sense Media & Rideout, 2013). Additionally, SGDs and other