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Teaching two teenagers with autism spectrum disorders to request the continuation of video playback using a touchscreen computer with the function of automatic response to requests

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ABSTRACT

This study used a standard touchscreen computer with a newly developed Communication Request and Automatic Response Assistive Program (CRARAP) software package to evaluate whether two people with autism spectrum disorders (ASDs) would be able to actively perform communication requests to continue their preferred environmental stimulation. The CRARAP software was specifically developed for this study to combine the functions of a standard touchscreen computer with a speech-generating device (SGD) and the feature of automatic response to requests. A multiple probe design across participants was adopted in this study. The results show that both participants significantly improved their target responses in terms of performing the correct alternative communication request during the intervention phase, and retained this effective performance in the maintenance phase. The practical and developmental implications of the findings are discussed.

1. Introduction

Communication is one of the most common activities among people, and represents the means by which information and ideas are shared. The ability to communicate allows people to interact with others to express their wants and feelings. However, children with autism spectrum disorders (ASDs) may encounter problems with communication and social interaction due to their developmental disability (Brosnan & Healy, 2011; DiGennaro Reed, Hirst, & Hyman, 2012; Matson & Shoemaker, 2009). Some ASD sufferers have stereotyped or repetitive behaviors and cognitive delays. Autistic children seem to exist in their own world, and are often more interested in environmental sounds than the sounds of people talking. Due to the dearth of interaction with other people, children with ASD often have difficulty using language to communicate, as well as difficulty understanding what people say to them.

Social interaction and communication are the most important issue for children with ASD. Hence, it is essential to teach them to have socially acceptable communication skills (Matson et al., 2011, 2012; Warren et al., 2011). For this reason, a

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number of studies have developed instructional procedures that are effective and make it feasible for children with ASD or other developmental disorders to learn these communication skills (Fitzer & Sturmey, 2008; Kagohara et al., 2012; Sigafoos et al., 2013). The specific instructional procedures are intervention strategies including: (a) behavior chain interruption – momentarily interrupting a child's preferred stimulation in order to create the motivation to communicate a request, (b) communication request – prompting a child to perform a communication request, (c) various response prompting – an instructor provides prompts to tell, show or guide children how to respond, (d) time delay – there is a waiting period before a prompt is provided, and (e) differential reinforcement – reinforcing the appropriate behavior for the purpose of reducing other inappropriate responses (Duker, Didden, & Sigafoos, 2004).

The advancement of technology makes everything more convenient and improves the quality of people's daily life. With the aid of technology, people with disabilities are able to live independently, enhance their learning, interact with other people and increase their social activities. Therefore, making good use of technology can benefit disabled people and provide them with many advantages (Agree & Freedman, 2011; Brodwin, Star, & Cardoso, 2004).

Based on aforementioned procedures and ideas, the purpose of this study was to apply the instructional procedures (Fitzer & Sturmey, 2008) to teach two teenagers with ASD who have limited speech ability to spontaneously express their communication requests by using a high-tech device.

In general, compared to standard commercial devices, assistive technology (AT) devices are more expensive, not widely available, require training, and are more difficult to maintain due to their customized design, thus restricting their widespread use by people with disabilities. Recently, some studies have proposed a solution whereby software technology is adopted to modify the functions of high-tech standard products, thereby turning them into high performance AT devices (Chang & Shih, 2014; Shih, 2011a, 2013a, 2013b; Shih & Chang, 2012; Shih, Chen, & Shih, 2012; Shih, Wang, Chang, & Kung, 2012; Shih, Shih, & Luo, 2013). These high-tech products are cheap, easily accessible, and in widespread use. They also possess precise sensors and special functions that make them especially suitable for application in the field of special education or rehabilitation.

The application of high-tech products in the field of special education and rehabilitation to assist people with disabilities has been the research focus of the author (Shih, 2011b; Shih, Chen, et al., 2012; Shih, Chung, Shih, & Chen, 2011; Shih, Shih, & Shih, 2011; Shih, Yeh, Shih, & Chang, 2011; Shih et al., 2013). This study extended this concept to turn a standard high-technology product into a high performance AT device. The high-tech device used in this study was a standard touchscreen computer and not a specially designed AT device. Any computer can be used like the one in this study, as long as it has a touchscreen.

In this study, a new Communication Request and Automatic Response Assistive Program (CRARAP) software was developed to experiment with turning a standard touchscreen computer into a high performance AT device in order to assist subjects to independently express their requests (i.e. touch the symbol "I want to continue watching videos" on the touchscreen to convey their desire to continue watching videos).

CRARAP software includes many functions that allowed the whole experimental process to operate automatically, namely, a behavior chain automatic interruption function, a speech-generating device (SGD) function, an automatic prompt function and an automatic response to requests function.

With CRARAP software, the process of the instructional training in this experiment was totally controlled by the touchscreen computer, allowing the researcher to investigate whether a widespread touchscreen computer can be applied as a high-tech AT device to assist and teach two teenagers with ASD, who have almost no ability to speak, to spontaneously express a communication request in a socially acceptable manner.

2. Methods

2.1. Participants

Two subjects (Wang and Liu) took part in this study. Both were male, 17 years old, and had been diagnosed with ASD. Both were vocational senior high school students and studied in a special education school. Wang and Liu were recommended for the study by their tutors, and their parents were informed of and agreed to allow their children to participate in this experiment.

Wang's sensory abilities were normal, and his body movement and fine motor control were good. However, he had poor communication skill which was ranked in severe level, and he rarely spoke. He was able to recognize photos of everyday objects, but could not recognize abstract symbols and texts. He could complete simple tasks in response to a voice prompt. He liked jigsaw puzzles, and was able to operate the computer. He exhibited self-injurious behavior (i.e. biting his wrist) when he could not effectively express his needs.

Much like Wang, Liu had good sensory ability and fine body movement, but his oral communication skills were severely impaired, to the extent that he had almost no ability to speak. He rarely interacted with his classmates, and seldom smiled. He was unable to recognize abstract symbols and texts, and also had some difficulty identifying photos of objects. His fine motor control was good, allowing him to operate the computer with a mouse without problems. He was capable of understanding basic oral instructions, and could complete tasks one at a time. If he was given multiple tasks at one time, he could not complete any of them. His preferred means of communicating was to point out objects or seize objects directly.