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People with multiple disabilities learn to engage in occupation and work activities with the support of technology-aided programs

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A R T I C L E I N F O

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A B S T R A C T

These two studies were aimed at assessing technology-aided programs to help persons with multiple disabilities engage in basic occupation or work activities. Specifically, Study I focused on teaching two participants (an adolescent and an adult) with low vision or total blindness, severe/profound intellectual disabilities, and minimal object interaction to engage in constructive object-manipulation responses. The technology monitored their responses and followed them with brief stimulation periods automatically. Study II focused on teaching three adults with deafness, severe visual impairment, and profound intellectual disabilities to perform a complex activity, that is, to assemble a five-component water pipe. The technology regulated (a) light cues to guide the participants through the workstations containing single pipe components and the carton for completed pipes and (b) stimulation events. The results of both studies were positive. The participants of Study I showed consistent and independent engagement in object-manipulation responses. The participants of Study II showed consistent and independent pipe assembling performance. General implications of the two programs and the related technology packages for intervention with persons with multiple disabilities are discussed.

1. Introduction

People with severe/profound intellectual and multiple (e.g., intellectual and sensory or motor) disabilities present a number of serious challenges to rehabilitation personnel (Belva & Matson, 2013; Bunning, Kwiatkowska, & Weldin, 2012; Bunning, Smith, Kennedy, & Greenham, 2013; Fox, Burke, & Fung, 2013; Hostyn & Maes, 2013; Lancioni, Sigafoos, O'Reilly, & Singh, 2013;

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Lima, Silva, Amaral, Magalhães, & de Sousa, 2013). For example, a challenge posed by people with minimal interaction with objects and tendency to stereotypy and sedentariness is that of finding a strategy to help them acquire constructive occupational engagement (Chantry & Dunford, 2010; Hiemstra, Vlaskamp, & Wiersma, 2007; Lancioni, Singh, O'Reilly, Sigafoos, Alberti, et al., 2013; Min, 2007). Such engagement could involve manipulation of objects and lead to the availability of stimulation contingent on the manipulation responses (i.e., to environmental events capable of motivating the performance of those responses so as to strengthen and maintain them over time) (Lancioni et al., 2008; Lancioni, O'Reilly, & Campodonico, 2001; Maes, Vos, & Penne, 2010). To make such a perspective plausible (practical) also within applied settings, one could envisage the use of technology to monitor those responses and to provide the stimulation contingent on them independent of staff (Borg, Larsson, & Östergren, 2011; Lancioni, Sigafoos, et al., 2013; Lui, Falk, & Chau, 2012; Mechling & Bishop, 2011; Shih & Chang, 2012).

One of the challenges posed by people capable of engaging in constructive object manipulation, but unable to carry out vocational activities, such as assembling multiple-component objects, might be to devise strategies for helping them manage such activities (Bellamy, Croot, Bush, Berry, & Smith, 2010; Lancioni, Singh, O'Reilly, Green, et al., 2013). To ensure the acquisition of this skill and the practical and social benefits that it could have for the participants, one might devise a technology package that (a) guides the person to collect each component of the object in the right sequence so as to facilitate the assembly process and (b) also ensures the presentation of stimulation events that may be crucial for motivating the participants and helping their engagement in terms of continuity and accuracy without the need of external intervention (Furniss et al., 2001; Lancioni, Singh, O'Reilly, Green, et al., 2013).

Research efforts to deal with the aforementioned challenges and pursue the aforementioned objectives independent of staff supervision have been rather sparse but the data reported were quite encouraging. For example, Lancioni et al. (2001) conducted a study with two men who were considered to function within the profound intellectual disability range, had limited interaction with objects and presented with severe visual impairment. The men were successfully taught constructive object manipulation (i.e., to place daily objects inside a container). The objects were initially on the same table that was fitted with the container. Subsequently, they were transferred onto an adjacent table, which was then detached and slightly distanced from the one with the container. The technology ensured that every object response was automatically detected and followed by a brief period of preferred stimulation.

Lancioni, Singh, O'Reilly, Green, et al. (2013) conducted a study with two men who presented with total blindness and profound intellectual disability. The men, who could interact with objects but were unable to carry out complex activities, were successfully taught to assemble five-component trolley wheels. Six workstations were arranged for them. Each of the first five stations consisted of a table with a container including multiple exemplars of one specific component of the wheel. The last station included a carton where each completed wheel was to be placed. The technology included verbal prompt and feedback or music boxes and optic sensors at the stations to (a) ensure that the participants were called to the first/next station following a preset time interval from their arrival at the previous station, (b) provide positive social feedback at their arrival at the stations, and (c) present preferred (reinforcing) music stimulation when they placed the completed wheel inside the carton (i.e., at the last station).

The two studies reported here were aimed at extending the evidence base described above through the use of technology-aided programs similar to those just summarized. Specifically, Study I focused on teaching two participants (an adolescent and an adult) with low vision or total blindness, severe/profound intellectual disabilities, and minimal object interaction to engage in constructive object-manipulation responses. The technology-aided program arranged for them matched that described by Lancioni et al. (2001) as to the way the participants' responses were monitored but differed as to the stimulation conditions. Study II focused on teaching three adults with deafness, severe visual impairment, and profound intellectual disabilities to perform a complex activity, that is, to assemble a five-component water pipe. Five workstations (each consisting of a table with a bowl containing multiple exemplars of one specific component of the pipe) were arranged for assisting the participants to assemble the pipe. A sixth workstation included a carton where each completed pipe was to be placed. The technology regulated (a) light cues to guide the participants through the single workstations in the right sequence, (b) optic sensors to monitor the participants' arrival at each station and thus switch off the light cue at that station and switch on the light cue at the next one or (if the participant had reached the sixth/last station) stimulation events, and (c) the devices used for stimulation.

2. Study I

2.1. Method

2.1.1. Participants

The two participants (Rick and Leroy) were 13 and 30 years old, respectively. They were diagnosed with congenital encephalopathy due to complications during the gestation and perinatal periods. They were estimated to be in the severe or profound intellectual disability range, but no IQ scores or formal testing were available for them. Rick was reported to have serious visual impairment, but this did not interfere with his ability to reach objects in his proximity and to enjoy visual stimulation such as video-clips with cartoons. He had no specific forms of expressive communication (e.g., words or signs), but seemed able to understand a few verbal instructions, and did not possess sphincteric control or self-help skills. He had a diagnosis of (a) epilepsy, which was largely controlled through medication, and (b) cerebellar ataxia that made his ambulation very uncertain.