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Microswitch- and VOCA-assisted programs for two post-coma persons with minimally conscious state and pervasive motor disabilities

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ABSTRACT

Intervention programs, based on learning principles and assistive technology, were assessed in two studies with two post-coma men with minimally conscious state and pervasive motor disabilities. Study I assessed a program that included (a) an optic microswitch, activated via double blinking, which allowed a man direct access to brief music intervals, and (b) a voice output communication aid (VOCA) with two channels, activated via different hand-closure movements, which allowed the man to call his mother and a research assistant who provided stimulation events. Study II assessed a program that included (a) a pressure microswitch, activated via head movements, which allowed a man direct access to video-clips and music, and (b) a VOCA device, activated via prolonged eyelid closure, which allowed the man to call the caregiver (i.e., a research assistant) who provided attention and sang to him. Each of the two participants had significant increases in both microswitch- and VOCA-related responses during the intervention phases of the studies. Moreover, purposeful choice seemed to occur between the two VOCA responses in Study I. Implications of the findings for improving the situation of post-coma persons with minimally conscious state and pervasive motor disabilities are discussed.

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1. Introduction

Persons with a diagnosis of minimally conscious state and pervasive motor disabilities subsequent to brain injury and coma may present a serious challenge to professionals involved in their care and rehabilitation (Avesani, Gambini, & Albertini, 2006; Bekinschtein et al., 2005; Bernat, 2006; Bernat & Rottenberg, 2007; Chua, Ng, Yap, & Bok, 2007; Giacino, 2004; Giacino & Kalmar, 2005; Giacino & Trott, 2004). One aspect of the challenge is concerned with the arrangement of a physiotherapy program that is suited to their motor condition and helps them to be more comfortable and more adapted to their immediate environment (Keren, Reznik, & Groswasser, 2001; Leong, 2002; Noda, Maeda, & Yoshino, 2004).

A second aspect of the challenge is concerned with the arrangement of a wider intervention/rehabilitation program that is directed at enabling them to acquire an active (communication/control) role within their environment (Coleman, 2005; Elliott & Walker, 2005; Lancioni, Olivetti Belardinelli, Oliva, et al., 2008; Wales & Waite, 2005). This active role would lead them to (a) accessing preferred stimulation independently and (b) calling the caregiver(s) to obtain social attention and forms of stimulation that the caregiver(s) can bring along or mediate (Lancioni, Olivetti Belardinelli, Oliva, et al., 2008; Lancioni, Olivetti Belardinelli, Stasolla, et al., 2008).

Given the motor condition of the persons, any chance to tackle the second aspect of the challenge would depend on the availability of basic technological resources, such as microswitches and voice output communication aids (VOCAs) (Lancioni, Olivetti Belardinelli, Stasolla, et al., 2008; Naudé & Hughes, 2005). Those resources would be used within programs based on learning principles to enable the persons to obtain the aforementioned stimulation and interaction effects through their limited response repertoire (Lancioni, Olivetti Belardinelli, Chiapparino, et al., 2008; Lancioni, Singh, et al., 2007). For example, the person may learn to access presumably preferred music through repeated eyelid movements triggering a specifically designed optic microswitch linked to a music-playing device.

The practicality of those programs and technological resources has been solidly documented with persons with combinations of intellectual and motor or motor and sensory disabilities (Holburn, Nguyen, & Vietze, 2004; Lancioni, O'Reilly, Singh, et al., 2008; Lancioni, Singh, O'Reilly, & Oliva, 2005). The same programs and resources, however, have been only sporadically employed with post-coma persons with minimally conscious state and pervasive motor impairment (Lancioni, Olivetti Belardinelli, Oliva, et al., 2008; Lancioni, Olivetti Belardinelli, Stasolla, et al., 2008; Lancioni, O'Reilly, Singh, et al., 2009; Lancioni et al., in press). Given the limited evidence available, new efforts to evaluate those programs and technological resources with post-coma persons would be highly relevant and help clarify questions of applicability (adaptability) and effectiveness.

The present two studies were in line with such an objective and assessed different technology-assisted intervention programs with two participants (men). Specifically, the first study assessed a program that included (a) an optic microswitch activated via double blinking, which allowed direct access to brief music intervals, and (b) a VOCA device with two channels activated via different types of hand-closure movements, which allowed calls to two different caregivers (i.e., the mother and a research assistant) providing stimulation events (Lancioni, O'Reilly, Singh, et al., 2007; Lancioni, O'Reilly, et al., 2009). The second study assessed a program that included (a) a pressure microswitch activated via head movements, which allowed direct access to brief video-clips of sport events and music, and (b) a VOCA device activated via prolonged eyelid closure, which allowed the participant to call the caregiver (i.e., a research assistant) who provided attention and sang to him.

2. Study I

2.1. Method

2.1.1. Participant

The participant (Eddie) was a man of 32 years of age, who had been involved in a technology-assisted learning assessment, which is under investigation as a diagnostic supplement for post-coma