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Persons with Alzheimer's disease engage in leisure and mild physical activity with the support of technology-aided programs



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ABSTRACT

Three studies were conducted to assess technology-aided programs to promote leisure engagement and mild physical activity in persons with Alzheimer's disease. Specifically, Study I assessed a program aimed at enabling three patients with mild or moderate Alzheimer's disease to choose among different music options and activate the preferred ones. Studies II and III were directed at patients in the low moderate or severe stages of the Alzheimer's disease who were no longer capable of ambulating and spent their time generally inactive, sitting in their wheelchairs. In particular, Study II used a program to help three patients exercise an arm-raising movement. Study III used a program to help three patients exercise a leg-foot movement. Each study was carried out according to a nonconcurrent multiple baseline design across patients. Results were very encouraging. The patients of Study I learned to choose and activate their preferred music pieces. The patients of Studies II and III enhanced their performance of the target movements and increased their indices of positive participation (e.g., smiles and verbalizations) during the sessions. The applicability of the programs in daily contexts and their implications for the patients involved are discussed.

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1. Introduction

Alzheimer's disease is a neurodegenerative condition, which mostly affects persons older than 65 years of age and causes those persons an increasingly greater loss of independence in daily functioning (Ambrose, 2012; Bernick, Cummings, Raman, Sun, & Aisen, 2012; Melrose et al., 2011; Perry, Monaco, Fadda, Caltagirone, & Carlesimo, 2014; Sikkes et al., 2013; Soto et al., 2012; Spalletta et al., 2012; Wilson et al., 2012). In the early phases of the disease, the persons lose more complex functions

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such as managing time and finances and using communication means (e.g., telephone) (Campbell et al., 2012; Cotrell, Wild, & Bader, 2006; Marson et al., 2000; Perilli et al., 2012). Subsequently, they also become affected in their performance of basic daily activities, such as preparing food or listening to music (Lancioni et al., 2010, 2012, 2014; Martyr & Clare, 2012). Eventually, they may become very passive/detached with no real occupational engagement or communication (Buettner & Fitzsimmons, 2002; Colling, 2004; Lancioni, O'Reilly et al., 2013; McHugh, Gardstrom, Hiller, Brewer, & Diestelkamp, 2012).

While no strategies exist to prevent or stop the disease, pharmacological and behavioral interventions have been employed to alleviate some of its consequences and/or slow down its progress (Ferrero-Arias et al., 2011; Hoffmann et al., 2013; Rao, Chou, Bursley, Smulofsky, & Jezequel, 2014; Versijpt, 2014). Pharmacological interventions have included, among others, the use of antioxidants, memantine, and acetylcholinesterase inhibitors (Darreh-Shori & Soininen, 2010; Ferris & Farlow, 2013; Konrath, Passos Cdos, Klein, & Henriques, 2013; Massoud & Léger, 2011; Rive et al., 2012; Tayeb, Yang, Price, & Tarazi, 2012). Behavioral interventions have included, among others, the use of reality orientation exercises and technology-aided programs for promoting activity engagement and independent music choice and access (Bier et al., 2008; Boller, Jennings, Dieudonné, Verny, & Ergis, 2012; Cotelli, Manenti, Zanetti, & Miniussi, 2012; Lancioni et al., 2012, 2014; Silverstein & Sherman, 2010; Small, 2012; Takeda, Tanaka, Okochi, & Kazui, 2012; Zanetti et al., 2001).

The program designed for promoting independent music choice and access was evaluated with four participants who were (a) presented different music options and (b) allowed to select and activate the ones they preferred via microswitch responses (Lancioni et al., 2014). The results were highly encouraging with all four participants achieving independent, successful performance. The first of the present three studies was aimed at extending the evaluation of the aforementioned program for music choice and access with three new patients. This extension was considered important to further assess the dependability of the program and thus its suitability for daily contexts (Barlow, Nock, & Hersen, 2009; Kennedy, 2005). The other two studies were aimed at assessing basic technology-aided programs to support mild physical activity (exercise) for patients who had lost their ambulation skills and were largely inactive and detached (Eggermont et al., 2010; Winchester et al., 2013). Specifically, Study II used a program to help three patients exercise an arm-raising movement. Study III used a program to help three patients exercise a leg-foot movement. Helping these persons engage in mild physical activity was considered important to counter their weakening/deterioration, with possibly positive implications for their general status and mood (Christofolletti et al., 2011; Farina, Rusted, & Tabet, 2014; Fischer, Langner, Birbaumer, & Brocke, 2008; Lancioni, O'Reilly et al., 2013; Rolland, Abellan van Kan, & Vellas, 2008). To ascertain this last aspect, the patients' indices of positive participation (e.g., smiles and verbalizations) (Dillon & Carr, 2007; Lancioni, O'Reilly et al., 2013; Lancioni, Singh, O'Reilly, Green, et al., 2013) were recorded together with their target movements during all sessions.

2. Study I

2.1. Method

2.1.1. Participants

Three patients (Donna, Ruben, and Phyllis) of 67, 85, and 65 years of age participated. They were considered to function at a mild or moderate level of Alzheimer's disease, with scores of 19, 22, and 21 on the Mini-Mental State Examination (Folstein, Folstein, & McHugh, 1975) and attended a center for people with Alzheimer's disease and other dementias. Pharmacological treatment for the Alzheimer's condition was prescribed for Donna and Ruben and consisted of acetylcholinesterase inhibitors. Their selection for the study was based on the following observations. They had great interest in popular/folk music of their times and classical music, but depended on staff to have their music played, given their inability to operate a computer or record player. They were capable of discriminating and responding to brief verbal questions and instructions and recognized photos related to music genre and/or singers. Also, they (a) were able to operate a computer-linked pressure microswitch for selecting/activating music, and (b) were eager to use computer technology for managing independent music choice and activation. Their families had provided informed consent for this study, which was approved by a scientific and ethics committee.

2.1.2. Sessions and data collection

Sessions were conducted in a quiet room of the center that the patients attended. They lasted 5 min or until any music piece activated before the 5-min mark had ended, and involved the patients individually. Data collection consisted of research assistants recording the music pieces (i.e., number and types) activated within the sessions. Interrater agreement (requiring that the two research assistants scoring the sessions recorded the same music pieces) was checked in about 25% of the sessions and was reported in more than 90% of those sessions.

2.1.3. Technology for music selection and activation

The technology used for music selection and activation included a laptop computer with sound amplifier, a microswitch, and basic software. The patients were provided with three-step choice sequences. At each step, four options were presented. Their first step involved classical music, folk music, male singers, and female singers. The options appeared as specific picture–word combinations in separate cells of the computer screen and each of them was scanned (lit) for about 4 s and verbally identified in the process. The patients could select any option by activating the microswitch (a pressure device in front of them) while it was being scanned. After this selection, a second step with four new options was presented. For

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