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Comparison of sit-to-stand strategies used by older adults and people living with dementia

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ABSTRACT

Physiotherapists routinely retrain sit-to-stand (STS) during rehabilitation using strategies such as sliding forward, moving the feet backwards, leaning forward, and pushing through the armrests. It is unknown if people living with dementia use the same strategies as other older adults and if a table positioned in front alters their performance. Twenty participants 65 years or older (10 with Alzheimer's disease or mixed dementia; 10 without dementia) performed six STS trials from a standard chair with armrests, including three trials without and three with a table in front. Trials were digitally recorded and the starting position and type and order of strategies used were rated by a blinded assessor. Starting position was similar between the groups. The most common strategy was leaning forward (119 out of 120 trials) while the least used was sliding forward (four out of 120 trials). People living with dementia used significantly more strategies ($p = 0.037$), pushed through the armrests more than older adults ($p = 0.038$) and moved feet backwards more frequently in trials without the table in front ($p = 0.010$). Presence of the table had no significant effect on STS performance of older adults ($p > 0.317$). Our results demonstrated that people living with dementia had a similar starting position but used more strategies to stand up, pushing through their arms more than older adults without dementia and moved their feet backwards more often when no table was in front. People living with dementia should be provided with chairs with armrests and space to move feet backwards.

1. Introduction

Sit-to-stand (STS) is a routine task required for mobility. An inability to complete the task independently has a detrimental effect on autonomy of older adults. STS difficulties in older adults correlate with risk of falling (Yamada & Demura, 2009), can cause serious injuries (Ellis & Trent, 2001), increase need for caregiver assistance (Perry, Marchetti, Wagner, & Wilton, 2006), prolong hospital stay (Fisher, Ottenbacher, Goodwin, & Ostir, 2009), and lead to earlier institutionalisation (Fisher et al., 2009; Rothera, Jones, Harwood, Avery, & Waite, 2003; Sabol et al., 2011). Consequently, the STS task is frequently retrained by physiotherapists with the aim to improve safety with transfers and maximize independence in older adults.

During STS retraining physiotherapists address underlying impairments as well as teach specific strategies that can make the STS task easier. These strategies include using a chair with a seat height that enables the hips and knees to be positioned at at least 90 degrees (Alexander, Gross, Medell, & Hofmeyer, 2001; Alexander, Koester, & Grunawalt, 1996; Demura & Yamada, 2007; Hughes, Myers, & Schenkman, 1996; Mazza, Benvenuti, Bimbi, & Stanhope, 2004; Schenkman, Riley, & Pieper, 1996), sliding or scooting forward to sit on the edge of the chair (Barreca, Sigouin, Lambert, & Ansley, 2004; Bohannon & Corrigan, 2003; Nuzik, Lamb, VanSant, & Hirt, 1986), moving the feet backwards behind the knee line (Akram & McIlroy, 2011; Khemlani, Carr, & Crosbie, 1999; Schenkman, Berger, Riley, Mann, & Hodge, 1990; Schultz, Alexander, & Ashton-Miller, 1992; Shepherd & Koh, 1996), leaning forward (Alexander et al., 1996; Hughes, Weiner, Schenkman, Long, & Studenski, 1994; Nuzik et al., 1986; Shepherd & Gentile, 1994), and pushing through the armrests (Etnyre & Thomas, 2007; Schultz et al., 1992) up into standing position.

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Depending on peoples' individual functional abilities or the type of sitting surface, physiotherapists may need to teach all or only some of these strategies (Carr & Shepherd, 1998; Schenkman et al., 1990). Although clinical observation suggests that sliding forward and moving the feet backwards behind the knee line may be performed interchangeably as the first or second strategy followed by leaning forward and pushing up through the arms as the final strategies to complete the task, the specific arrangement or sequences of strategies involved in STS has received little empirical attention.

The STS task has been extensively studied from a bio-mechanical (Janssen, Bussmann, & Stam, 2002), and clinical measurement point of view (Bohannon, 2012). However, very little is known about which STS strategies are actually used by older adults and in what sequence, when the STS task is independently performed from a standard chair. The STS task can be performed in a variety of environments such as standing up from a lounge chair or standing up at a dining table. No existing research was found that investigated whether having a table in the front e.g. when having a meal alters the preferred STS strategies. Older community dwelling adults have reported avoiding seating surfaces that make STS difficult as their preferred strategy and identified pushing through the arms, sliding forward (scooting), and leaning forward as additional strategies that help to overcome STS difficulties (Bohannon & Corrigan, 2003).

STS difficulties in older adults are often the result of physical limitations related to acute illness (Britton, Harris, & Turton, 2008; Fisher et al., 2009), hospitalisation (Graf, 2006), and comorbid illnesses or injuries (Brodin, Ljungman, & Sunnerhagen, 2008; Turcot, Armand, Fritschy, Hoffmeyer, & Suva, 2012; Vincent, Vincent, & Lamb, 2010). Cognitive decline, as seen in an increasing number of older adults living with dementia, has potentially an additional detrimental effect on STS task performance due to disturbances in motor planning and programming, problem solving, and decreased ability to follow instructions (Finlay, Bayles, Rosen, & Milling, 1983; Tappen, Roach, Buchner, Barry, & Edelstein, 1997; Wangblad, Ekblad, Wijk, & Ivanoff, 2009). However, it is not known whether cognitive decline as seen in dementia leads to differences in preferred STS strategies and their sequence as compared to older adults.

Therefore, this study investigated the STS task performed from a standard chair with armrests in community dwelling older adults without suspected cognitive decline and people living with dementia. Specifically, this study aimed to determine the most common starting position, type, and number of STS strategies used and their sequence, and if the presence of a table in front changed the preferred starting position and the strategies. Additionally, consistency of the starting position and the type, number, and sequence of the strategies used in the STS task between the trials were investigated.

2. Methods

2.1. Study Design

An observational study involving two groups of participants, community-dwelling older adults without suspected cognitive decline, and people living with dementia was conducted. Digital audio-visual recordings were made of participants standing up from a standard chair, with and without a table in front. Digital files were de-identified, randomized, and assessed by an independent assessor blinded to the cognitive status of the participants.

2.2. Participants

Men and women aged 65 years or older were eligible for recruitment to the study, if they met criteria for one of two groups; Dementia Group (DG) and Non-Dementia Group (N-DG). DG participants consisted of older adults living with dementia admitted to the Internal Medicine Unit of a tertiary hospital in Brisbane, Australia. Patients who had an established diagnosis of either Alzheimer's disease or mixed dementia, were medically and cognitively stable (i.e. deemed not to be experiencing delirium or reversible causes of cognitive impairment) and had a documented Standardized Mini Mental State Examination (Folstein, Folstein, & McHugh, 1975; Molloy, Alemayehu, & Roberts, 1991) score of 25 or less (Perneczky et al., 2006), were identified by treating physiotherapists. The N-DG consisted of a convenience sample of older adults living in the community who did not report cognitive problems and scored a minimum of 28 on the Standardized Mini Mental State Examination (O'Bryant et al., 2008). Participants in this group were recruited from hospital visitors or were older adults living independently in a retirement village. All participants were required to meet additional inclusion criteria of being able to stand up six times independently from a standard chair, speak English as their primary language, and have adequate receptive communication skills to follow instructions. Participants with any comorbidity that would limit their ability to stand up from a standard chair such as lower or upper limb pain, history of lower limb surgeries, or severe osteoarthritis or rheumatoid arthritis leading to decreased joint range of motion such as limited ankle dorsiflexion, less than 100 degrees of hip and knee flexion, were not eligible for the study. Participation in the study was voluntary. N-DG participants provided written consent and substitute decision makers' consent was sought for DG participants. Institutional ethics committees approved this study.

2.3. Procedures

All STS trials were conducted in a similar environmental setting for all participants using a standard chair that had a seat height of 46 cm from the floor, full length armrests, and an upright back rest. For trials involving a table, the table had height of 76 cm and it was positioned 30 cm in front of the chair. A video-camera was positioned on a tripod (333 cm from the chair and 126 cm above the floor) to allow capture of the full left lateral view of participants during STS trials.

All participants were video recorded performing six STS trials from a standard chair with armrests in the following order; three trials without and three trials with a table. For all trials, participants started in a position that comprised sitting with hips and knees flexed approximately 90 degrees. However, trunk, hips, hands, and feet positions were not specified allowing participants to adopt their preferred starting position. All participants were given the same command "please stand up" followed by a command "please sit down".

Demographic data, clinical information, and measures were recorded for all participants and included age, gender, current accommodation, medical and falls history, and current Standardized Mini Mental Examination scores. Additional information recorded for DG participants from their medical chart included type of dementia, reason for hospital admission and discharge destination. Clinical mobility measures were recorded for all participants using de Morton Mobility Index (DEMMI) and timed 10 m walk test (10MWT). DEMMI has been validated for older patients in acute medical wards (de Morton, Davidson, & Keating, 2008, 2010) and older adults living in the community (Davenport & de Morton, 2011). The index consists of 15 tasks of increasing difficulty, ranging from the easiest of bridging in bed to the most