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ORIGINAL RESEARCH

Dual-task as a predictor of falls in older people with mild cognitive impairment and mild Alzheimer's disease: a prospective cohort study

Q1 Jessica Gonçalves[a], Juliana Hotta Ansai[b,*], Fernando Arturo Arriagada Masse[a], Francisco Assis Carvalho Vale[c], Anielle Cristhine de Medeiros Takahashi[a], Larissa Pires de Andrade[a]

[a] Departamento de Fisioterapia, Universidade Federal de São Carlos (UFSCar), São Carlos, SP, Brazil
[b] Curso de Fisioterapia, Instituto Integrado de Saúde, Universidade Federal de Mato Grosso do Sul (UFMS), Campo Grande, MS, Brazil
[c] Departamento de Medicina, Universidade Federal de São Carlos (UFSCar), São Carlos, SP, Brazil

Abstract

Background: A dual-task tool with a challenging and daily secondary task, which involves executive functions, could facilitate the screening for risk of falls in older people with mild cognitive impairment (MCI) or mild Alzheimer's disease (AD).

Objective: To verify if a motor-cognitive dual-task test could predict falls in older people with MCI or mild AD, and to establish cutoff scores for the tool for both groups.

Methods: A prospective study was conducted with community-dwelling older adults, including 40 with MCI and 38 with mild AD. The dual-task test consisted of the Timed up and Go Test associated with a motor-cognitive task using a phone to call. Falls were recorded during six months by calendar and monthly telephone calls and the participants were categorized as fallers or non-fallers.

Results: In the MCI Group, fallers presented higher values in time (35.2 s), number of steps (33.7 steps) and motor task cost (116%) on dual-task compared to non-fallers. Time, number of steps and motor task cost were significantly associated with falls in people with MCI. Multivariate analysis identified higher number of steps spent on the test to be independently associated with falls. A time greater than 23.88 s (sensitivity = 80%; specificity = 61%) and a number of steps over 29.50 (sensitivity = 65%; specificity = 83%) indicated prediction of risk of falls in the MCI Group. Among people with AD, no differences in dual-task between fallers and non-fallers were found and no variable of the tool was able to predict falls.

Conclusion: The dual-task predicts falls only in older people with MCI.

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* Corresponding author at: Universidade Federal de Mato Grosso do Sul, Curso de Fisioterapia, Instituto Integrado de Saúde, Cidade Universitária, CEP 79070-900 Campo Grande, Mato Grosso do Sul, Brazil.   *E-mail:* juliana.h.ansai@ufms.br (J.H. Ansai).

Introduction

A fall is defined as ''an event which results in a person coming to rest inadvertently on the ground or floor or other lower level and other than as a consequence of such things as: sustaining a violent blow; loss of consciousness; sudden onset of paralysis; or an epileptic seizure''.[1] Falls in older people are a challenge to international health systems, since falls can lead to fractures, fear of falling, reduced quality of life, institutionalization, hospitalization and death.[2]

People with cognitive impairment experience falls up to two times greater than older people with preserved cognition often resulting in more serious consequences.[2,3] Although reasons for the higher prevalence of falls are still not clear, neurodegenerative changes in mild cognitive impairment (MCI) and dementia result in cognitive, physiological and functional deficits, which contribute to risk of falls.[4] Furthermore, cognitive deficits in older adults with MCI and Alzheimer's disease (AD) may increase risk of falls because of changes in executive functions and ability to solve problems, to make decisions and to perform simultaneous tasks.[4,5]

The screening for risk of falls in older adults with cognitive impairment is needed to better prevent falls. Among several tools, dual-task tests have been used to predict falls in older people with preserved cognition[6,7] and cognitive impairment.[4] In dual-task situations, individuals who prioritize the secondary cognitive task seem to show increased risk of falls during walking.[6]

Although dual-task tests are promising for screening falls,[6–8] there is a lack of prospective longitudinal studies assessing prediction of falls in people with MCI and separately in people with AD in its mild stage. New dual-task tests which are composed of walking while performing a motor-cognitive task (calling a phone number in this case) were used to assess mobility in older people without cognitive impairment,[9] with MCI or mild AD.[10] In this sense, the use of a dual-task tool (walking with a challenging and daily secondary task), which involves executive functions, could facilitate the screening for risk of falls in older people with MCI or mild AD. Also, different measures might involve specific neural areas and cognitive functions. Thus, it is important to use measures other than time when assessing dual-task tests.[11]

The purpose of this prospective cohort study was to verify whether a motor-cognitive dual-task test could predict falls in community-dwelling older people with MCI or mild AD and to establish cutoff scores for the tool applied in each group. We hypothesized that the dual-task test would predict falls in older adults with MCI and mild AD, since it required greater cognitive and motor interaction and it approached to real situations of falls.

Methods

Study design and setting

This study was a 6-month prospective cohort study at the Universidade Federal de São Carlos (São Carlos-SP, Brazil) from 2015 through 2016.

Participants

Community-dwelling people aged 60 and over who lived in São Carlos (Brazil) were eligible for the study. Inclusion criteria were the ability to walk at least 10 m alone without a walking aid, availability to participate in the proposed assessments, and admission to one of the groups studied (MCI or mild stage AD). Exclusion criteria were motor sequel after stroke, mixed dementia and other types of dementia without being AD, other neurological diseases that interfered in cognition or mobility, severe uncorrected visual or auditory disorders, and people with AD in moderate or advanced stages.

The diagnosis of MCI or mild AD was confirmed by an experienced neurology professor. Criteria for diagnosis of MCI were: (1) cognitive complaint reported by the volunteer or a care giver (i.e., a person who stayed with the volunteer subject at least half a day, four days per week); (2) objective cognitive impairment not related to delirium (i.e., Clinical Dementia Rating Scale-CDR = 0.5 point)[12]; (3) normal global cognitive function for educational level[13] achieved; (4) preserved functionality[14]; and, (5) absence of clinical dementia.[15] The diagnosis of AD followed the Diagnosis and Statistical Manual of Mental Disorders (DSM-V TR),[15] and only individuals with CDR = 1 (mild stage) were included in the AD Group.[12]

The study was carried out in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Universidade Federal de São Carlos (São Carlos-SP, Brazil) (819.668/2014). All participants were informed about the research objectives, risks and benefits and they provided a written informed consent.

Measurement

All participants were instructed to wear comfortable clothing and their usual closed shoes, to eat at least one hour prior to testing, not to practice vigorous exercises the day before the testing and to bring any necessary eyeglasses or hearing aid to the test. The tests were applied in a closed environment and all instructions were explained in a simple, clear and objective way.

Clinical and sociodemographic data were collected, including age, gender, years of schooling, use of drugs, and presence of diseases, The Minnesota Leisure Time Activities Questionnaire was used for weekly caloric expenditure[16] and the Geriatric Depression Scale was used for risk of depressive symptoms.[17]

Dual-task

The dual-task was evaluated using the Timed Up and Go test (TUG)[18] associated with a motor-cognitive task (TUG-DT).[10] Before the dual-task test, the subjects performed both tasks separately. Each test was demonstrated once by the assessor and one practice trial was performed by each subject. If the subject did not perform the practice trial correctly, one more trial was done.

For the isolated motor-cognitive task, a drawn raffled card containing a sequence of eight numbers was fixed in a wireless phone (15.1-cm high × 4.7-cm width × 2.2-cm depth; Motorola® FOX 1000 model) and placed on a table