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ORIGINAL RESEARCH

Gait, dual task and history of falls in elderly with preserved cognition, mild cognitive impairment, and mild Alzheimer's disease

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Abstract
Background: Studies with functional and applicable methods and new cognitive demands involving executive function are needed to improve screening, prevention and rehabilitation of cognitive impairment and falls.
Objective: to identify differences in gait, dual task performances, and history of falls between elderly people with preserved cognition, mild cognitive impairment and mild Alzheimer's disease.
Method: A cross-sectional study was conducted. The sample consisted of 40 community-dwelling older adults with preserved cognition, 40 older adults with mild cognitive impairment, and 38 older adults with mild Alzheimer's disease. The assessment consisted of anamneses, gait (measured by the 10-meter walk test), dual task (measured by the Timed Up and Go Test associated with the motor-cognitive task of calling a phone number), and history of falls in the past year.
Results: There were no differences among all groups for all variables. However, the Alzheimer's disease Group performed significantly worse in the dual task than the other groups. No item of dual task could distinguish people with preserved cognition from those with mild cognitive impairment. The groups with cognitive impairment included more fallers, and specific characteristics in history of falls between groups were identified.
Conclusion: Dual task could distinguish Alzheimer's disease patients specifically from other cognitive profiles.

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Introduction

Cognitive impairment, including Alzheimer's disease (AD) and mild cognitive impairment (MCI) exerts an enormous impact on global society and it is one of the leading causes of disability and dependence.[1] Cognitive decline is the primary clinical marker of MCI and dementia, but some studies have reported motor deficits in gait and dual task situations in mild stages of cognitive impairment.[2,3]

A temporal disruption of gait is observed in people with AD.[4,5] Altered frontal cognitive capacities, primarily executive function (also called control of cognitive processes), reduce the allocation of attentional resources in the brain, which compromises postural stability and gait and increases the risk of falls.[4] Some studies have used gait associated with a cognitive task to distinguish elderly people with different cognitive profiles.[2,3,6] However, these studies were restricted to cognitive tasks involving verbal fluency or calculations,[2,3,6] which do not reflect a common, complex and challenging executive function task. Also, few studies compared mobility performance between the elderly with preserved cognition (PC), MCI and AD, but the AD samples in these studies were not restricted to a specific phase of the disease.[3,6]

It is known that MCI, unlike dementia, may be reversed to normal or at least delayed by using proper treatment strategies.[1] Dementia, falls and age-related health conditions are major public health problems. Therefore, the identification of clinical tests that can differentiate the three populations: PC, MCI, and mild AD, with new functional and applicable cognitive demands involving executive function, are needed to improve screening, prevention and rehabilitation.

The purpose of this study was to identify differences in gait and dual task performances and history of falls between elderly subjects with PC, MCI and mild AD. It was hypothesized that the dual task test could primarily differentiate the three groups, and there would be more falls in the elderly with cognitive impairment.

Method

Participants

The Universidade Federal de São Carlos (UFSCar) ethics research committee (São Carlos, SP, Brazil) approved the study (819.668/2014), and all participants signed an informed consent form.

Potential participants included community-dwelling older adults aged 65 years and older who could be contacted by phone or at home. Participants were recruited from health centers/units, the School Health Unit of UFSCar, and the Open University for older adults (São Carlos, SP, Brazil). Inclusion criteria were the ability to walk at least 10 meters alone without a walking aid, the availability to participate in the proposed assessments, and admission into one of the three elderly groups studied. Exclusion criteria were the presence of motor alterations after stroke, neurological disorders that interfered in cognition or mobility, severe uncorrected visual or auditory disorders, and advanced or moderate AD.

An experienced neurology professor confirmed the diagnosis of MCI, AD (mild stage) or PC. Subjects were divided into three groups based on their cognitive profile. Elderly Q2 subjects with a normal Mini-Mental State Examination (MMSE) score for Brazilian elderly population (MMSE score of 20 points for illiterates; 25 for 1–4 years of education; 26.5 for 5–8 years; 28 for 9–11 years and 29 for higher levels of education,[7] and who did not exhibit criteria for MCI or dementia were considered PC.

The following criteria were used for MCI: (1) cognitive complaint, reported by the subjects or an informant or caregiver (a person who stayed with the subject at least half a day, four days per week); (2) objective cognitive impairment not related to delirium, with a score of 0.5 on the Clinical Dementia Rating Scale (CDR)[8]; normal global cognitive function for educational level, as assessed by the MMSE[7]; (4) preserved function, as assessed using the Pfeffer Scale[9]; and (5) absence of clinical dementia.[10,11]

The diagnosis of AD used the Diagnosis and Statistical Manual of Mental Disorders (DSM-V TR).[10] Only elderly people with CDR = 1 were included in this group.

Testing procedure and falls

The subjects were instructed to wear comfortable clothing and their usual closed shoes, to have eaten at least 1 h prior to the tests, to have avoided vigorous exercise the day before the tests, and to bring any necessary visual or auditory aids before the assessment. Two trained professionals assessed the subjects. The tests were applied in a closed environment that was as free from visual and auditory stimuli as possible.

Descriptive variables were assessed using a questionnaire (with the help of caregiver if necessary), categorized by age, gender, time of diagnosis for the AD Group, body mass index, educational level, abdominal circumference, use of multi/bifocal glasses, and use of walking aids. The Geriatric Depression Scale (GDS)[12] and Minnesota Questionnaire were used to assess depression and levels of physical activity, respectively.[13,14] GDS is commonly used in clinical practice to screen for risk of depression in an elderly population. In its short version, the total score is 15 points and 5-point or more indicated risk of depression.[12] In Minnesota Questionnaire, according to data from the Cardiovascular Health Study, low weekly caloric expenditure means 383 or less Kcals/week for men and 270 Kcals/week or less for women.[13]

The subject or informant (in cases of cognitive impairment) were asked about the subject's history of falls in the last year (e.g., number, local and consequences of the last fall), using the definition of Chiu, Au-Yeung and Lo, (i.e., ''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 the following: sustaining a violent blow; loss of consciousness; sudden onset of paralysis; or an epileptic seizure'').[15]

Gait assessment

Gait was assessed by using the 10-meter walk test. The test was chosen because it is a simple and quick tool to apply in clinical practice. Furthermore, this test has been

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