ORIGINAL ARTICLE

DUAL TASK PERFORMANCE BETWEEN ADULTS AND ELDERLY POST STROKE PATIENTS

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Abstract

Objective: Studies that assessed motor performance comparing healthy adults and old, shown age-related differences in several parameters. It is not known whether these differences remain evident when people are under stroke condition. Our aim was to describe clinical and functional characteristics and to compare a dual task performance between older and younger post stroke individuals. Methods: We evaluated hemiparetic patients with independent gait between August/2011 and August/2012. The following scales/tests were applied: NIH Stroke Scale (NIHSS), Modified Barthel Index (mBI), Timed Up and Go Test (TUG) and TUG with cognitive task (TUGcog). X2, Fisher tests or Mann-Whitney U test were used when appropriated. Results: Amongst 92 participants 54.3% were adults and 45.7% were elder adults. Adults and elder adults presented similar characteristics, although statistical difference was observed at instruction level (P = .01), hypertension (P= .02), verbal fluency (P < .01) and delta time for TUGcog (P < .01). Conclusion: Individuals post stroke in this study presented slightly clinical and functional differences, but it was possible to observe that older need more time to perform multitasking. Probably, age alone is not an important factor in differentiating independent stroke patients. However, postural instability, in elderly patients, should be evaluated more carefully taking into account the attentional demands, since dual task is used in many activities of daily life.

Keywords: Cerebrovascular accident; Elderly; Functional mobility; Dual task.

INTRODUCTION

Aging is associated with a decline of cognitive[1,2] and physical[3] functions. It is well known that motor performance requires adequate participation of various systems. Sensory,

motor, biomechanics and cognitive aspects interacts providing functions such as postural control, gait and performance on multiple tasks,[3,4] which is relevant to daily life. Studies that assessed motor performance comparing healthy adults and old, shown age-related differences in several parameters, such as muscle strength,[5] balance,[6] gait performance,[7,8,9] cognition[1] and dual task performance.[10]

What is not clear is if these differences remain evident when people are under stroke condition. After a neurological dysfunction, such as cerebrovascular accident (CVA), it is possible that clinical and functional characteristics are also influenced by age. Numerous studies have analyzed the influence of age on some parameters such as risk factors for CVA,[11] disability,[12,13] response to treatment,[14] prophylaxis.[15]

Studying functional impairments and activity limitations after stroke onset is important for rehabilitation service planning, resource allocation, and improving health outcomes. Stroke is recognized as the most common cause of dependence in activities of daily living (ADLs) among elderly people.[16] As life expectancy increases in the whole world, especially in developing countries, it is necessary to better understand age-related differences at presentation and functional aspects after stroke.[12] The aim of this study was to describe clinical and functional characteristics and to compare dual task performance between older and young post stroke individuals.

METHODS

This cross-sectional study was conducted in the Stroke Clinic of the Federal University of Bahia, between August/2011 and March/2012. Consecutive patients who presented clinical-radiological diagnosis of stroke, ischemic or hemorrhagic, were assessed and included those with ability to walk at least 6 meters without help or assistance, vision and hearing sufficient to complete the required tasks and ability to understand verbal instructions. Stroke was defined as a new neurological focal deficit with duration longer than 24 hours and confirmed by neuroimaging (computed tomography or magnetic resonance imaging).[17] Exclusion criteria were aphasia, pre-existing neurological disorder (such as Parkinson's disease) or any condition affecting ability to understand the tests (such as dementia); orthopedic condition that compromises natural gait or vestibulopathy diagnosed in medical records. The study was approved by the Ethics Committee of Federal University of Bahia. All participants signed a consent term and agreed to participate voluntarily.

All patients were assessed for demographic and clinical data such as age, sex, marital status, educational level, type of stroke, cerebral hemisphere affected, time since stroke and history of falls (within the past twelve months). The following tests/scales were applied: National Institutes of Health Stroke Scale (NIHSS), modified Barthel Index (mBI), Mini-Mental State Exam (MMSE), Verbal Fluency Test (VFT), Timed Up & Go Test (TUG), modified Timed Up & Go Test (TUGcog) and 8 tasks Dynamic Gait Index (DGI-8).

The severity of stroke was measured by the NIHSS, which offers a quantitative evaluation of neurological disability.[18,19] To access patients' functional capacity, we applied the mBI, which categorized them in groups of independence. A total mBI score of 50 is interpreted as complete independence, 46-49 slight dependence, 31-45 moderate dependence, 11-30 severe dependence and 0-10 complete dependence; but in this study we used mBI as a continuous variable, which score range 10 to 50.[18] To measure global cognitive state, MMSE was applied for all patients1.[20] Participants were also asked to perform semantic VFT, where they have to say as many words as possible from animals' category within one minute.[21]

TUG was used to assess basic functional mobility. It quantifies the time in seconds which takes the individual to stand up from a standard chair, walk three meters, return and sit down. This task was considered as a single task in this study. The individual is required to walk on his ordinary gait, with or without aid gait.[22] To evaluate the influence of attentional demands on postural control (dual task), we used a modified version of

the TUG - cognitive TUG (TUGcog), which addition of a cognitive task (evoking the names of animals).[23]

DGI evaluates the ability to modify gait in response to environment's demands. This instrument consists of eight functional tasks that include, for example, walking with speed changes and walking with horizontal and vertical head movements. The maximum score is 24, and scores less than 19 points is associated with impaired gait and fall risk.[4,24,25]

People aged 60 years or over, as defined by the World Health Organization (WHO) for developing countries,[26] were considered as elder adults and those aged less than 60 years constitute the adult group.

Statistical analysis was performed with the Statistical Package for the Social Sciences (SPSS) version 13 for Windows. In bivariate analyses, Fisher exact test or Pearson qui-square test were used for categorical variables and the Mann-Whitney U test was used for non-categorical variables. Results with p-value < .05 were considered significant.

RESULTS

Amongst 92 patients 50 (54.3%) were adults and 42 (45.7%) elder adults, with average age of 45(10) and 70(7) years respectively. In both groups patients were more commonly females (64% and 57%). The socio-demographic characteristics of the study population are presented in Table 1. Groups are fairly homogeneous, except for educational level, which was higher in adults (P< .01).

Table 1 - Socio-demographic data of 92 post stroke subjects from a stroke clinic in Salvador, Bahia, Brazil

	Adults (50)	Elder adults (42)	P-value
Gender, (%)o" " studo apresentaram-se n (%)			0.50
Males	18 (36)	18 (42.9)	
Females	32 (64)	24 (57.1)	
Marital status, n (%)			0.38
Married	29 (58)	20 (48.8)	
Not married	21(42)	21(51.2)	
School Education, n (%)			**<0.01**
No formal education	0	9 (22)	
Primary	22 (44)	27 (64)	
High school	25 (50)	6 (14)	
University	3 (6)	0	

SD: standard deviation

Table 2 shows clinical and functional data of participants. In both the majority had an ischemic stroke, and the two groups were well balanced with regard to the injured hemisphere. The median (range) of time since stroke onset in the general population was 24 months (1 to183 months). Analyzing together, most patients were mildly affected indicated by the score of the NIH Stroke Scale (2; 0 to 8), and were considered independent in accordance with mean mBI (48 3.2).

Table 2 - Clinical and functional characteristics of stroke subjects from a stroke clinic in Salvador, Bahia, Brazil

	Adults (50)	Elder adults (42)	P-value
Months since stroke, median (range)	15,5 (3-132)	26 (1-183)	0.34
Stroke type, n (%)			0.62
Isquemic	39 (88.6)	34 (88.6)	
Hemorragic	5 (11.4)	3 (8.1)	
Hemisphere, n (%)			0.41
Right	27 (56.3)	18 (47.4)	
Left	21 (43.8)	20 (52.6)	
Comorbities, n (%)			
Hypertension	33 (67.3)	36 (87.8)	**0.02**
Dyslipidemia	11 (22.4)	13 (31.7)	0.32
Diabetes mellitus	8 (16.3)	12 (29.3)	0.14
Chagas disease	4 (8)	2 (4.9)	0.68
Use of gait aids, n (%)	16 (32)	9 (21.4)	0.25
Report of falls, n (%)	12 (24)	14 (34.1)	0.28
Recurrent falls (·2), n (%)	7 (14)	9 (22)	0.32
Scores, median (range)			
NIHSS	2 (0-8)	1 (0-5)	0.08
mBI	50 (32-50)	49 (43-50)	0.59
MMSE	24 (14-29)	22 (13-29)	0.23
VFT	11 (4-19)	9 (2-15)	**<0.01**

NIHSS: Stroke Scale of National Institute of Health; mBI: Modified Barthel Index; MMSE: Mini-Mental State Exam; VF: Verbal Fluence Test.

Mobility assessment (TUG) revealed similar performance between adults and elder adults however there was evident greater delta time to complete TUG while speaking the names of animals in the elderly compared to young adults (P< .01). Balance during gait (DGI total scores) did not differ between groups, although in absolute number is higher score on younger's total DGI (Table 3). Some items of DGI analyse the dual task performance, such as item 3 (gait with horizontal head turns) and item 4 (gait with vertical head turns). Statistical analyses of each DGI item score showed no difference (P = .06) between groups for those items. The cognitive performance evaluated by MMSE also did not differ between groups, but the elderly showed poorer performance in VFT (P < .01).

Table 3 - Single and dual task performance of young and old stroke subjects from a stroke clinic in Salvador, Bahia, Brazil

	Adults (50)	Elder patients (42)	P-value
TUG (sec) mean (range)	13,92 (6-47)	15,42 (8-52)	.22
TUGcog (sec) mean (range)	17,67 (8-55)	21,27 (12-68)	**.05**
Dtime TUGcog-TUG*, mean (range)	3,75 (0-11)	5,85 (1-16)	**< .01**
Dynamic Gait Index**,median (range)	20,5 (7-24)	18,5 (5-24)	.30

* absolute number in seconds; **total score;
TUG: Timed Up and Go Test; TUGcog: Timed Up and Go Test with cognitive task.

DISCUSION

Comparing adults and elder adults in this sample, we observed that the most important difference was in the delta time between single and dual task performance. People with no neurological deficits present age-related differences regarding multitasking performance.[27] This may be explained by modifications in neural networks with aging, so that older had a greater demand for activation of many different areas in the brain when executing multiple tasks.[28,29]

Despite the differences among adults and elder adults in many functional parameters, studied subjects were very similar functionally. Balance while walking assessed by 8-DGI, does not show significant difference between groups neither for total score, not for some items that use dual tasks (walking moving the head). But, when the second task is a cognitive one, like talking, it may be more difficult for elderly, corroborating with literature.[27,28] Age alone does not play a principal role in determining the worst performance in postural control in simple balance tests, however when executing tasks simultaneously, older presents decreased performance mainly when one of them is a cognitive task, just as talking.[29]

Although no significant difference was found between groups about history of falls, in absolute numbers more old patients had fallen in the last year. Falls are more frequently observed in old adults even in healthy ones.[29] However, after a stroke, taking together cognitive, sensory and motor impairments, younger or older adults are both prone to fall.[30] In our population, younger more commonly utilize assistive walking devices. It is possible that these individuals are more likely to be exposure to different enviroments and the assistive device represents an important security feature to enable early mobilization after stroke.[31]

About comorbities presented among studied patients as dyslipidemia, hypertension, Chagas disease and diabetes mellitus we found some difference. As expected, hypertension frequency was more common in elderly, and it is known that increased systolic blood pressure related to the aging is the major factor that contributes to this data.[32]

The higher average number of years of schooling in young adults may be explained by improved access to education in Brazil in recent decades.[33] We found that young patients showed better performance in VFT. However, it should be noted that a lower educational level in elderly patients may have hindered the implementation of VFT, as well as their performance in TUGcog, and may have influenced our results. As showed in a previous research, age was not a predictor of fluency scores but educational level is a strong factor.[21]

Our results suggest that although there are recognized differences between healthy young and old adults, individuals after stroke in this study presented slightly clinical and functional differences, probably showing that age alone is not an important factor in differentiating independent stroke patients.

CONCLUSION

As older individuals needed more time for performance of the TUGcog in this study, they are more likely to become unbalanced and fall while performing different activities involving dual task. Postural instability, in elderly patients, should be evaluated more carefully taking into account the attentional demands, since dual task is used in various activities of daily life. Considering this issue, the treatment plan for the rehabilitation of patients after stroke should include exercises with simultaneous motor and cognitive tasks.

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