Correlation between cognition and functional independence in male stroke patients

Correlação entre independência funcional e cognição em homens com AVC

ORIGINAL ARTICLE

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ABSTRACT: Stroke is a chronic disease that causes motor and cognitive sequelae and possible changes in functional capacity. This study aims to identify the levels of functional independence and cognition in male stroke patients and to verify the presence of correlations between them. For that, it was adopted a cross-sectional descriptive-correlational study with a convenience sample comprised by thirty (n=30) men. The Functional Independence Measure and the Mini-Mental State Examination were used for data gathering. For data analysis, the simple descriptive analysis and the Pearson correlation coefficient were adopted. The results showed the predominance of dependent subjects and high level of cognitive impairment as well as positive correlations between cognition and motor independence (r=0.827 p=0.000), cognitive independence (r=0.912 p=0.000), and total (r=0.882 p=0.000). These data demonstrate the impact of cognitive alterations in the functional independence of post-stroke subjects and suggest the need for specific interventions in occupational therapy destined to them.

KEYWORDS: Stroke; Activities of daily living; Cognition; Occupational therapy; Men.

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RESUMO: O acidente vascular cerebral é uma doença crônica que causa sequelas motoras e cognitivas e possíveis alterações na capacidade funcional. Este estudo objetivou identificar os níveis de independência funcional e cognição em homens com acidente vascular cerebral e verificar a presença de correlações entre essas variáveis. Para tanto, adotou-se um estudo transversal descritivo-correlacional com amostra de conveniência composta por trinta (n=30) homens adultos. Para a coleta de dados foram aplicados a Medida de Independência Funcional e o Mini Exame do Estado Mental. Para a análise dos dados adotou-se a análise descritiva simples e o coeficiente de correlação de Pearson. Os resultados demonstraram o predomínio de sujeitos dependentes e com altos índices de alterações cognitivas bem como correlações positivas fortes entre a cognição e a independência motora (r=0,827 p=0,000), cognitiva (r=0,912 p=0,000) e total (r=0,882 p=0,000). Esses dados demonstram o impacto das alterações cognitivas na independência funcional de sujeitos pós-AVC e sugerem a necessidade de intervenções específicas em terapia ocupacional destinadas a esses.

DESCRITORES: Acidente vascular cerebral; Atividades cotidianas; Cognição, Terapia ocupacional; Homens.

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INTRODUCTION

Strokes are caused by an interruption in the cerebral vascular flow, having ischemic or hemorrhagic origin, resulting from diverse etiology and predisposing factors[1]. The event is characterized by histopathological alterations in brain areas and consequent neuronal death, leading to changes that can be physical, cognitive or behavioral, depending on the area injured.

According to the World Stroke Organization, one in each six individuals in the world will suffer a stroke throughout their lives[2]. Around the world, about 15 million individuals suffer this kind of cerebrovascular disease, among those, about one third dies and another third is permanently incapacitated[3]. In Brazil, the disease represents the first cause of death and incapacity, with data showing an annual incidence of 108 cases per 100,000 inhabitants, besides a fatality rate of 18.5% 30 days after the injury and 30.9% 12 months after, having a recurrence index of 15.9% after the first stroke episode[2].

The incidence of the disease increases with age, given that it is about 69% in old individuals above 65 years and 34.4% in those above 75 years[4], revealing itself as a significant public health issue when considered the process of population ageing. The incidence, ischemic as well as hemorrhagic, is higher in men than women, according to the American Stroke Association[5]. On the other hand, women have half the probability of being independent of the basic activities of daily living and of returning to their activities when compared with men[6]. Thus, incapacity tends to be more frequent or severe than in the male gender.

Stroke causes sensorimotor deficiencies contralateral to the brain injury with impact on the daily motor performance, such as muscle paralysis, tonus changes, mobility loss in the joints, and diffuse pain[7]. Significant cognitive alterations are seen in about two thirds of subjects[8], and attention, memory, as well as thought organization can be affected, promoting alterations in speech, including difficulty to talk and produce words sequentially[9]. Thus, they have significant impacts on the ability of understanding written or spoken information.

Alterations caused by strokes can have temporary or permanent origins, causing functional deficits and impacting daily life, demanding long recovery periods[10] and help from a caregiver for daily activities[11]. The first semester after the stroke is the period which requires more care[12], yet after this period, a share of the subjects still show limitations, such as inability to walk without any assistance (30%) and dependence for daily activities (26%), according to a study with ischemic stroke survivors aged 65 or more[13].

Given this issue, more studies that investigate the impact of cognitive alterations on functional independence of stroke patients are necessary, however, the available studies are scarce regarding specifically male subjects. Facing these issues, this study aimed to identify the levels of functional independence and cognition in male stroke patients as well as to verify the presence of correlations between these variables.

METHODS

Kind of research and place

It is a cross-sectional descriptive-correlational research, having a quantitative approach. Data were gathered in two public services that offer ambulatory and home care to individuals with physical deficiencies of a medium sized city in the countryside of the State of São Paulo – Brazil, with an average population of 400,000 to 500,00 inhabitants.

Sample and selection criteria

It consists on a convenience sample comprised by thirty subjects (n=30) who had stroke diagnoses, and that presented the following inclusion criteria: male individuals, aged from 18 to 90 years-old, who suffered a single stroke episode, without other neurological or disabling associated diseases and who had gone through a rehabilitation process for at least six months. The choice for male individuals and who had a minimum injury time of six months can be justified, respectively, by the fact of stroke occurring more to men[5] and by the gender variable having influence on the independence issue[6], and by the first 6 months being the period of most dependence[12].

Procedures

The procedures for data gathering were divided into four phases: (1) subject indication; (2) triage; (3) data gathering; (4) statistical counselling.

In Phase 1, meetings with the public services of ambulatory and home care were done aiming

to guide the teams on the goals and procedures to be performed. The teams were responsible for indicating subjects in rehabilitation process or who already had medical discharge in the last year, having indicated a total of 108 subjects according to the aforementioned inclusion criteria.

In Phase 2, all records of the indicated subjects were consulted for patient's triage booking, to be done in the own institution or by telephone, according to the availability of each patient. The triage was performed by the researchers to verify if the inclusion criteria for this study were fulfilled, being excluded 83 subjects, totalizing 31 participants.

In Phase 3, data were gathered in the ambulatory or home service, according to the patient's availability, lasting about an hour.

In Phase 4, a statistical counselling was done, aiming to assess the sample and patients' profile adequacy. During this phase, one of the subjects had a longer injury time than the others, above 72 months, and for that reason the patient was excluded from the study. From that moment on, the sample had 30 stroke patients according to this study's inclusion criteria.

All procedures described above lasted six months, being done between November 2013 and May 2014.

Data gathering tools

The tools used in this research were: the Subject Characterization Form, the Functional Independence Measure (FIM) and the Mini-Mental State Examination (MMSE), which will be briefly described below:

a) Subject Characterization Form

This tool aimed to gather patients' personal data, as age, education, professional qualification, marital status, injury time, kind, stroke topography and rehabilitation time.

b) Functional Independence Measure (FIM)

FIM was developed in the late 1980s by the American Academy of Physical Medicine and Rehabilitation and the American Congress of Rehabilitation Medicine and it was validated in Brazil by Riberto and collaborators[14], with individuals with medullae and brain injury. This tool evaluates quantitatively the independence level for the realization of a series of motor and cognitive daily life tasks, according to the items: selfcare, transferences, locomotion, sphincter control, social communication and cognition, memory, social integration and problem solving. The full score can vary from 18 to 126, indicating the individual's functional status, given that 18 points correspond to complete dependence, 19 to 103 points to modified dependence, 104 to 126 points to complete/modified independence.

c) Mini-Mental State Examination (MMSE)

The MMSE was created by Folstein et al. and validated in Brazil by Bertolucci et al.[18] in 1994. Its goal is to determine the cognitive level of old people using questions groups into seven categories: time orientation; spatial orientation; registry; attention and calculus; evoking memory, speech; and visual constructed capacity. The score varies from 0 points – major cognitive impairment level – to 30 points – better cognitive capacity. To categorize the scores, the minimum scores suggested by Brucki et al.[17] for Brazilian population we used: 20 points for illiterate individuals; 25 for subjects that studies from 1 to 4 years; 26.5 points for having studied for 5 to 8 years; 28 points for 9 to 11 years in school and 29 points for those that have studied for more than 11 years.

Data Analysis

Collected data were submitted to the quantitative analysis approach, through the descriptive analysis and Pearson correlation coefficient.

First, the variables concerning socio-demographic data, functional independence and cognition were inserted in Microsoft Excel® 2010 spreadsheets for the calculus of the minimum, maximum, average and standard deviation of each variables.

Later, the functional independence and cognition data were submitted to the calculus of Pearson correlation coefficient by the R Core Team Software. To interpret the correlations' intensity, the following values were adopted as references: r=0.7 – strong correlation; r=0.3 to 0.7 – moderate correlation; r=0.3 – weak correlation[18]. The significance level adopted in the whole study was 5%, thus, it is rejected the hypothesis that the correlation between variables is zero at 5% level when $p \leq 0.0519$.

This study was performed in agreement to the principles in the Declaration of Helsinki by the World Medical Association in 1964, reformulated in 1975, 1983, 1989, 1996 and 2000, being submitted to the approval of the Committee of Ethics in Research (CEP) with Human Beings of the Universidade Federal de São Carlos, being approved by the license number 407.176/2013. Data gathering happened after all subjects signed the Informed Consent Form.

RESULTS

The sample with stroke patients was comprised exclusively by male individuals and it was mostly of elders, married people or in common-law marriage, retired individuals and who had low levels of education. The most seen stroke in patients was the ischemic one, and the brain hemisphere most affected was the right one, having an average injury period of 12.5 months and for rehabilitation, 9.1, which demonstrates the beginning of rehabilitation around the third month of injury (Table 1).

Table 1 – Description of the participants' socio-demographic characteristics (n=30)

Socio-demographic characteristics	Average (Standard Deviation)
Age (years)	70.27 (11.48)
Education (years)	3.16 (1.96)
Injury period (months)	12.50 (15.31)
Rehabilitation period (months)	9.10 (10.63)
Category Variables	**Frequency (%)**
Marital status	
Married/Common-law	23 (77)
Divorced	3 (10)
Widower	3 (10)
Single	1 (3)
Stroke type	
Ischemic	17 (57)
Hemorrhagic	6 (20)
Not specified	7 (23)
Injured Brain Hemisphere	
Right	15(50)
Left	14(47)
Not specified	1(3)

It was possible to observe a great variance of points concerning the motor independence, cognitive and total values, showing different independence levels among the sample. All FIM items showed averages that indicated functional dependence, varying from 3.1 to 5.7, with lower values in the items *Go up and down stairs, Lower clothing and Shower* and higher in the items *Understanding* and *Expression*. The sample was mostly functionally dependent (63%) (Table 2).

Regarding cognition, a great variance was observed in MMSE items, showing different performance levels among the sample. The average scores of all cognitive domains evaluated by the tool are below expected, with lower scores in the items *Visual constructive capacity* and *Attention and calculus*. The education averages are lower among illiterate patients and subjects who studied from 1 to 4 years, showing the presence of cognitive alterations in these groups. On the other hand, those who have studied from 5 to 8 years and more than 8 years showed averages higher than what was expected for both. The general classification shows high cognitive alterations rates among the sample (77%) (Table 3).

The calculus of the Pearson correlation coefficient showed a strong intensity positive correlation between cognition and the variables motor independence (r=0.827), cognitive (r=0.912) and total (r=0.882).

Table 2 – Functional independence descriptive data (n=30)

Independence	Average (Standard Deviation)	Minimum/ Maximum
Motor	56.83 (±24.99)	13/91
Cognitive	25 (±11.17)	5/35
Total	81.83 (±34.96)	18/126
FIM items	**Average**	
Eating	4.9	
Personal care	4.3	
Shower	3.8	
Superior clothing	4	
Lower clothing	3.7	
Toilet use	4.3	
Vesical control	4.3	
Intestine control	5.4	
Bed/chair transferences	4.8	
Toilet seat transferences	4.6	
Shower transferences	4.4	
Pace	4.7	
Stairs	3.1	
Understanding	5.7	
Expression	5.2	
Social interaction	4.9	
Problem solving	4.5	
Memory	4.5	
Functional levels	**Frequency (%)**	
Complete/modified independence	11(37)	
Modified dependence	17(56)	
Complete dependence	2(7)	

Table 3 – Cognition descriptive data (n=30)

Variable	Average (Standard Deviation)	Minimum/ Maximum
Cognition	**16.63 (±9.89)**	**0/29**
Cognitive domains (Score)	**Average**	
Time orientation (5)	2.7	
Spatial orientation (5)	3.1	
Registry (3)	2.1	
Attention and calculus (5)	1.6	
Memory and evocation (3)	1.6	
Speech (8)	4.8	
Visual constructive Capacity (1)	0.2	
Education (Minimum score)	**Average**	
Illiterate (20)	10	
1 to 4 years studying (25)	15.9	
5 to 8 years studying (26,5)	27.3	
More than 11 years studying (29)	29	
Cognitive Deficit	**Frequency (%)**	
Presence	23(77)	
Lack	7(23)	

Table 4 – Correlations between variables (n=30)

Variables	Cognition	
	r	P-value
Motor Independence	0.827	0.000*
Cognitive Independence	0.912	0.000*
Total Independence	0.882	0.000*

Legend: * indicates significance for p<0.05, n=number of participants, r=Pearson correlation coefficient

DISCUSSION

The sample was mostly comprised by elderly people, confirming the disease's predominance among subjects belonging to this age group[4]. The profile of elderly people, married or in a common-law marriage, retired and who have low education levels is also seen in other international and national studies[19,20] with stroke patients from both genders[10,11,12].

The values concerning total independence were higher than the study of tool validation that was performed with subjects who suffered general brain injuries (54.1)[14]. The presence of variance in this variable's scores shows different levels of functional independence among the sample, similar to other studies that also evaluated functional independence in daily life activities among stroke patients from both genders through FIM[19,20] and the Lawton and Brody Scale[21].

All FIM items had averages that indicate functional dependence. Compromising in transfers, mobility, and activities as lower clothing and shower were expected given that a significant share of stroke patients tends to have limitations in the development of functional mobility[13]. Difficulty in activities such as clothing, eating, personal care and toilet use were also expected to the detriment of the deficits in post-stroke manual function, specially in case of damage to the dominant limb, with limitations to the bi-manual use[22]. Similarly, the presence of compromising in the FIM cognitive items was also a factor foreseen by this study, considering the presence of cognitive alterations in more than half of the sample.

The presence of variance on FIM scores confirms the variance in MMSE as well as the presence of low scores in cognitive domains assessed by the tool. A possible reason for such findings can be the brain injury topography, since milder cognitive compromising are most frequent in the right hemisphere brain injuries, while more severe are common in left hemisphere injuries[23], which presumes different levels among the sample.

The cognition average (16,63) was below the one shown by a study with stroke patients from both genders that used the same tool (23)[21]. These differences can be explained by the difference in the studies participants' education average, respectively, 4 years and 12 years, since this is considered a determining factor for a worse performance of cognitive and functional aspects as well as for the return to daily activities[5].

The scores according to the MMSE minimum scores indicated high levels of cognitive alterations, as well as in other studies with the same tool[19,20]. These findings confirm the high rate of cognitive alterations in stroke patients[8]. Averages of the subjects with lower education levels were lower than expected; while scores of the ones with higher education levels were superior. A possible explanation for these findings concern the high number of elderly people, since it is considered that some essential abilities of cognitive processing design tend to reduce linearly throughout adulthood, such as the codification of new memories, process speed, short-term and executive process memory[24].

The high rate of cognitive alterations and functional dependence among the sample support the presence of correlation between cognition and motor, cognitive and total independence. Similar to these findings, a study that used the same tools[20], and another that used the Modified Barthel Index (MBI), the MMSE and the Loewenstein Occupational Therapy Cognitive Assessment for Geriatric Population (LOTCA-G) found correlations between higher dependence and lower cognitive rates[25]. Contrary to these

findings, another study that used MMSE and the Lawton and Brody Scale did not identify significant correlation between cognition and independence in daily activities. The divergence between findings can be explained by the difference in the tools, since the Lawton and Brody Scale is not specific for the evaluation of independence in basic activities of daily life[21].

These correlations were expected given that cognitive commitment can interfere with the attention, memory and thought organization, speech alterations, including difficulties in talking and producing words sequentially[9], creating impacts in the development of daily life activities. These alterations also impact rehabilitation[26] since they are considered predictors of functional recovery, specially due to the need of cognitive performance components in the execution of the exercises and interventions commonly used in treatment.

These outcomes in the rehabilitation process can justify the long treatment periods in rehabilitation services, since a study has already identified correlations between these and motor independence levels in stroke patients[10]. These facts added to the sample's low education level impact rehabilitation even more, given that it is considered a determining factor for lower success rates in this process[5]. Thus, it is considered that these individuals require an individualized care plan[7], which makes us reflect on the importance of actions oriented towards rehabilitation in the occupational therapy scope.

Higher dependence and cognitive alterations in stroke patients also lead to a greater need of help by a caregiver concerning the performance of daily life activities[11]. Evidences point out that taking care of a person in these conditions leads to commitments in the caregivers, increasing care burden and impacts on these individuals' quality of life[11,20]. Such facts reaffirm the need for public health actions destined to stroke patients, embracing also their caregivers.

CONCLUSION

This study verified that high levels of cognitive alterations were related to high level of functional dependence in basic activities of daily life among male stroke patients. These findings reiterate the importance of cognitive components in stroke patients' functionality, as well as in post-injury recovery. It is also important to consider the impact on the familiar scope, considering the need of a caregiver to help in daily activities.

This investigation shows limitations in relation to the sample number and its composition, which implies on not generalizing the results for all stroke patients, but only to the studied group. Other limitations were observed concerning the predominance elderly stroke patients, given that alterations in functionality and cognition, resulting from the ageing process, can interfere on the investigated variables.

It is highlighted the importance of new investigations that aim to better understand the relations among the stroke's kind, hemisphere and brain topography, cognitive alterations and the impact they have on the performance of daily activities and on these subjects' occupation roles. Another suggestion is to assess the current rehabilitation methods of occupational therapy oriented towards this public, in order to obtain parameters on the treatments' efficiency, as well as to quantify the gain during the rehabilitation process.

Hopefully, this study can contribute to the understanding of the functional and cognitive profile of stroke patients, as well as of the relations between these variables considering the evidence found. It is also expected that the data shown can promote guidance for the new actions in the occupational therapy context in relation to stroke patients with cognitive alterations, as well as to the development of new rehabilitation techniques oriented towards the clinical practice with this public.

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