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PREDITORES DA VELOCIDADE DE MARCHA EM IDOSOS COMUNITÁRIOS PÓS ACIDENTE VASCULAR ENCEFÁLICO

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resumo

Introdução: as medidas de desempenho da função física podem prever incidência futura de incapacidade, dependência em atividades

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de vida diária, institucionalização e morte em idosos após Acidente Vascular Encefálico. Embora existam estudos verificando o efeito da idade na velocidade de marcha e na incapacidade, ainda existem lacunas significativas na literatura com idosos após Acidente Vascular Encefálico. Objetivo: verificar quais são os possíveis preditores da velocidade de marcha em idosos após Acidente Vascular Encefálico. Métodos: estudo transversal, em que foi avaliada: velocidade de marcha (teste de caminhada de 10 metros – TC10m), força de flexores plantares e extensores de joelho do lado parético (Teste do Esfigmomanômetro Modificado – TEM), mobilidade (Time up and Go – TUG) e depressão (Escala de Depressão Geriátrica – GDS). Foi utilizada a regressão linear para verificar quais preditores explicariam a velocidade de marcha. Resultados: 60 indivíduos foram incluídos, idade média de 71 ± 7 anos, com TC10m de 0,7 ± 0,3 m/s, força de flexores plantares de 133 ± 66 mmHg e força de extensores de joelho de 198 ± 62 mmHg, TUG de 19 ± 10 s e GDS 6 ± 3 pontos. A força de flexores plantares do lado parético explicou 33% da variação da velocidade de marcha. Quando a mobilidade foi incluída, a variância aumentou para 43%. Conclusão: a força dos flexores plantares do lado parético e a mobilidade são preditores e influenciam diretamente a velocidade de marcha nos idosos após o Acidente Vascular Encefálico.

palavras-chave

Acidente Vascular Cerebral. Idoso. Velocidade de Caminhada. Força Muscular. Limitação da Mobilidade. Depressão.

1 Introduction

Stroke is one of the most important causes of death and the first cause of physical and mental disability, with a high prevalence in older people (KATAN; LUFT, 2018). Aging is an important non-modifiable risk factor for incident stroke, which doubles every decade after the age of 55 years (YOUSUFUDDIN; YOUNG, 2019). Most of the individuals after stroke develop with disability and sensory-motor impairments, resulting in a significant impact on their level of functional independence. Clinical manifestations after stroke can be diverse, including motor impairment, especially related to the gait (LIU *et al.*, 2006).

The older people, naturally, have a slower walking speed when compared to the younger individuals, with a mean of 0.98m/s among women and 0.85m/s among men over 60 years of age (NOVAES; MIRANDA; DOURADO, 2011). The increase in age leads to the loss of muscle fibers, consequently, the force, especially the plantar flexors and the knee extensors, decrease of the length of stride size, gender, and the higher prevalence to neuromotor, mental. Also, hospitalizations limitations are the factors that directly influence the gait speed and community ambulation in older people (BROWN; FLOOD, 2013). Thu s, it is expected that older people after stroke present even lower walking speeds (<0.8m/s), which can prevent their full social participation (LUI; NGUYEN, 2018).

After a stroke, hemiparesis is frequently observed, altering the isometric and isokinetic torque (SHARP; BROUWER, 1997), besides poverty to generate the torque (CANNING; ADA; O'DWYER, 1999), impairing the gait. This can negatively influence the execution of several daily activities, such as getting up alone, managing stairs, and walking in public (COHEN *et al*., 2018). Also, the mobility of the individuals after stroke is frequently affected. Although approximately 60%-80% of stroke survivors can walk independently at 6 months after onset (KWAKKEL; KOLLEN, 2013), 20.7%-82.3% of these survivors are limited to ambulation in the community setting (JOA *et al*., 2015; PERRY *et al*., 1995). Depression is also a disease with a high prevalence in older people, 33.5% in Japan, 17.6%, and 14.6%-17.2% in the United Kingdom and the United States, respectively (ZHANG; CHEN; MA, 2018). It´s common to associate depression with walking speed since it was supposed to be related to the difficulty of walking in the community, the slowing of the walking speed, and the decrease in the quality of life of the individual (AYERBE *et al*., 2015). So, if mobility, which is related to walking speed, could impact the functions, activity, and participation of the individuals after stroke, knowing the factors that affect the walking speed could direct rehabilitation.

To the best of our knowledge, no cross-sectional study has addressed the influence of the predictors of walking speed in older people after chronic stroke. This study is useful to scientific knowledge because it is specifically applied to the elderly population. Other studies have a broad sampling of the age range, such as early adulthood to old age (KARAGEORGE *et al*., 2020). So, the present study aimed to investigate the association of multiple predictors (mobility, muscle strength of ankle plantar flexors and knee extensors of the paretic side, and depression) with walking speed in older people after chronic stroke.

3 Methods

3.1 Study design and participants

A cross-sectional analytical study was carried out. It was included community older people, aged over 60 years, with chronic stroke (>six months of the onset), walking speed between 0.3 m/s and 1.2 m/s, and with a good cognitive function, as assessed by the education-adjusted cut-off scores on the Mini-Mental Status Examination (BERTOLUCCI *et al*., 1994). Participants were excluded from cardiovascular, orthopedic, or neurologic conditions other than stroke, and bilateral hemiplegia that interfered with balance and gait.

The sample size was determined to guarantee the variability among the participating elders concerning the walking ability and considering the assumptions established by Dohoo, Martin and Stryhn (2009) for multiple regression analysis, considering four independent variables as possible predictors:

N = 10x (P + 1), where P indicates the number of independent variables.

N = 10x (4 + 1)

N = 50 participants

All participants who agreed to participate signed an informed consent form. This study was approved by the Research Ethics Committee (#58866416.0.0000.51340).

3.2 Outcomes

3.2.1 Dependent Variable

Walking speed was evaluated with the 10-meter walking test (10mWT), in m/s. The individual was instructed to walk on a straight track of 14 meters disregarding the initial and final two meters (SALBACH *et al*., 2001). The needed time to cross the intermediate ten meters performing habitual speed was registered by a chronometer. The commands were standardizer according to Nascimento *et al.* (2012), so participants were asked to walk at their comfortable and habitual speeds. This test has adequate properties of measures for individuals after stroke (LEXELL *et al*., 2005).

3.2.2 Predictors

The following predictors were considered: muscle strength of ankle plantar flexors of the paretic side, and knee extensors of the paretic side (assessed using the Modified Sphygmomanometer Test), mobility (assessed using Timed Up and Go – TUG), and depression (evaluated through the Geriatric Depression Scale – GDS).

Muscle strength of ankle plantar flexors and knee extensors of the paretic was assessed with the Modified Sphygmomanometer Test (MST), which is a useful test for clinical application and research. The positions were followed according to previous recommendations (SOUZA *et al.*, 2014). TUG is a test in which the individuals were asked to stand up from a chair with arms, walk up to a line on the floor three meters away, turn around, walk back to the chair and sit down the fastest as possible without running. The time taken to complete the test once was recorded, in seconds (PODSIADLO; RICHARDSON, 1991). GDS is a brief, 30-item questionnaire in which participant was asked to respond by answering yes or no about how they felt over the past week to verify depressive symptoms (YESAVAGE *et al.*, 1982). All cited tests had adequate properties of measures for individuals after stroke (SOUZA *et al.*, 2014; BURTON; TYSON, 2015; CHAN *et al.*, 2017).

3.3 Procedures

The volunteers were recruited by research list and social media at the Belo Horizonte, MG, Brazil. Initially, the volunteers were asked to attend the assessment using comfortable clothing and their usual shoes by telephone or a personal invitation.

The individuals were submitted to the initial evaluation for the identification, characterization through the application of the instruments, collection of clinical data, and verification of inclusion and exclusion criteria by previously trained researchers. The outcome variables of the present study were collected by one researcher. The order of collection of the outcomes was randomized.

3.4 Statistical analysis

Descriptive statistics were performed by the mean and standard deviation for the continuous and percentage for categorical variables. Tests for normality (Kolmogorov-Smirnov) and equality of variances (Levene) were calculated for all outcomes. Pearson's correlation coefficients (r) were calculated to examine the relationships between the variables. The strength of the relationships was based upon Munro's correlation descriptors (very low=0.15-0.24, low=0.25-0.49, moderate= 0.50-0.69, high=0.70-0.89, and very high=0.90-1.00) (MUNRO, 2005). Stepwise multiple regression analysis was performed to identify which variables would significantly predict walking speed. Variable entry for the regression was set at 0.05, and removal was set at 0.10 (DOHOO; MARTIN; STRYHN, 2009). Before performing regression, the data were evaluated, to determine if they fulfill all requirements for regression analyses, such as linearity, homoscedasticity, independence, and normality of the residuals, as well as multicollinearity and outliers. All statistical analysis was performed using SPSS software (v23, IBM Corp, Armonk, NY) considering α = 0,05 as the level of significance.

4 Results

The sample consisted of 60 individuals, 54.5% male, a mean age of 71±7 (range 60 to 90) years, and a mean time from stroke onset of 64.8±55.2 months. The characteristics and clinical measures are summarized in Table 1.

Table 1 – Baseline characteristics of study participants (n = 60)

Characteristics	**n=60**
Age (years), mean (SD)	71,1 (7,4)
Sex (men), n (%)	30 (54.5)
Chronicity of stroke (months), mean (SD)	64,8 (55,2)
Mini Mental State Examination (score), mean (SD)	24,0 (8,2)
Ten Meters Walking Test -Habitual speed (m/s), mean (SD)	0,7 (0,3)
Strength of plantar flexors on paretic side (mmHg), mean (SD)	133 (66,8)
Strength of knee extensors on paretic side (mmHg), mean (SD)	198,4 (62,1)
Timed Up and Go (s), mean (SD)	23,6 (5,6)
Geriatric Depression Scale(points), mean (SD)	19,5 (10,3)

SD: Standard deviation.
Source: Prepared by the authors.

The regression analysis revealed that the plantar flexor strength of the paretic side alone explained 33% of the variance in the walking speed. When mobility was included in the model, the explained variance increased to 43%. Measures of plantar flexor strength of the paretic side were positively correlated, whereas the mobility was negatively correlated with the walking speed. Table 2 gives the results of the regression analysis.

Table 2 – Results of the regression analysis (n=60)

Variable	B	95% CI for β	β	R^2	*SEE*
Step 1					
Constant	0.44±0.09	0.26 to 0.61	0.43	-	-
Ankle plantarflexor muscle strength of the paretic side	0.01±0.02	0.01 to 0.04	0.01	0.33	0.24
Step 2					
Constant	0.71±0.09	0.26 to 0.61	0.71	-	-
Ankle plantarflexor muscle strength of the paretic side	0.01±0.03	0.01 to 0.05	0.02	-	-
Mobility	-0.01±0.05	-0.09 to -0.01	0.01	0.43	0.23

B: Regression coefficients, followed by the respective standard error; CI: Confidence interval; β: Standardized regression coefficient; R2: Coefficient of determination; SEE: Standard error of the estimate.
Source: Prepared by the authors.

5 Discussion

It is the first study to evaluate the association of predictors of the walking speed in older people after stroke. The findings of the present study demonstrated that the plantar flexor strength of the paretic side alone explained 33% of the variance in the walking speed. When mobility was included in the model, the explained variance increased to 43%. Measures of flexor strength of the paretic side were positively correlated, whereas the mobility was negatively correlated with the walking speed. These results indicated that individuals, who had performed the TUG faster and present higher plantar flexor strength of the paretic side were less likely to have limitations in walking speed.

It was reasonable that the find of the plantar flexor strength of the paretic side would best explain the variance of walking speed, even because the plantar flexor is the key muscle group for propulsion during walking (NADEAU *et al.*, 1999).

A previous study with individuals after stroke found that individuals after stroke have decreased plantarflexion strength, and decreased walking speed (LODHA *et al*., 2019). Also, plantar flexors were the most used muscle group at self-selected speed in individuals after stroke, with a muscular utilization ration of 64% (MILOT; NADEAU; GRAVEL, 2007). When compared with age-matched controls, individuals after stroke present 57% of the strength of the plantar flexors (DORSCH; ADA; CANNING, 2016). One study with individuals after chronic stroke with a mean age of 54.6 years demonstrated that the lower limb strength of the paretic side about the non-paretic side has moderate to strong correlations with walking speed, and the major determinants are plantar flexors and knee flexors (OZGOZEN *et al*., 2020). Those previous studies confirm our finding that the plantar flexors explained 33% of the variance of the habitual walking speed.

The propulsive force generated from the paretic side was correlated and it is predictive to walking speed (BOWDEN *et al.,* 2006), and reduced paretic leg propulsion is a key factor to reduce walking speed after stroke (HSIAO *et al*., 2016). It is known that plantar flexors and hip flexors provide the major power generation for propulsion during walking (LIU *et al*., 2006) and had the largest contribution to walking speed (MENTIPLAY *et al*., 2019). This last study with individuals after chronic stroke with a mean age of 60 years showed that multiple lower limb muscle groups have a significant association with walking speed, but the plantar flexors and hip flexors strength have the major contribution. On top of that, plantar flexor's strength contributes to ankle power generation (MENTIPLAY *et al*., 2019), that is explains the importance of this muscle in walking speed, and it was confirmed by our study.

In a study with 412 participants, it was found that age is an isolated factor and influences the individual's step size and walking speed. Thus, the relationship of individuals after stroke with their age, in the case of the elderly, is very close, since the intrinsic limitations of stroke sequels are associated with age, which is an isolated factor (CALLISAYA *et al*., 2011). A 12-month prospective cohort study with individuals after stroke (mean age of 63 years). In this study, the main tools for assessing walking speed and risk of falls were the TUG and the Berg Balance Scale. It was found that individuals, after a stroke had their TUG time, increased over 12-month and, consequently, the highest number of falls. This fact demonstrates the importance of walking speed for greater independence, safety, and quality of life of these individuals (BOWER *et al*., 2019). That reflects a present finding that mobility explains part of the variance in the walking speed.

With our results, individuals after stroke with lower walking speed may have a new sight during rehabilitation. Because we know that plantar flexor strength of the paretic side alone explained 33% of the variance in the walking speed. And, when mobility was included in the model, the explained variance increased to 43%. So, this approach can be a new rehabilitation alternative.

Our study has strengths: a) this is the first study to evaluate the association of predictors of the walking speed in older people after stroke; b) adequate sample size and power to address all study outcomes, which allowed adjustments for potential confounders. The limitations of this study refer to the convenience sampling that restricted the participant characteristics, limiting the study external validity, and the heterogeneity of the sample.

6 Conclusion

Plantar flexor strength of the paretic side and mobility explained 43% of the variance in the walking speed. Depression symptoms have no association with walking speed. Future research should strive to determine better the relation between depression and walking speed. However, these results can't be extrapolated to other individuals with different characteristics from those studied.

PREDICTORS OF WALKING SPEED IN COMMUNITY OLDER PEOPLE AFTER STROKE

abstract

Introduction: performance-based measures of physical function can predict the future incidence of disability, dependence in activities of daily living, institutionalization, and death in older people after stroke. Although there have been previous studies examining the effect of age on walking speed and disability, significant gaps still exist in the literature with older people after stroke. Purpose: to verify the possible predictors of the walking speed in elderly individuals after stroke. Methods: cross-sectional study, where it was evaluated: walking speed (10-meter walking test – 10 MWT), plantar flexor and knee extensor strength of the paretic side (Modified Sphygmomanometer Test – MST), mobility (Time up and Go – TUG), and depression (Geriatric Depression Scale – GDS). It was used linear regression to verify which predictors would explain the walking speed (α=0,05). Results:

60 individuals were included with a mean age of 71±7 years, with 10MWT of 0.7±0.3m/s, plantar flexor strength of 133±66mmHg and knee extensor strength of 198±62mmHg, TUG of 19±10s, and GDS 6±3 points. The plantar flexor strength of the paretic side explained 33% of the variance of the walking speed. When mobility was included, variance increased to 43%. Conclusion: plantar flexors strength of the paretic side and mobility are predictors and have a direct influence on the walking speed in older people after stroke.

keywords

Stroke. Aged. Walking Speed. Muscle Strength. Mobility Limitation. Depression.

references

AYERBE, Luis *et al*. Explanatory factors for the association between depression and long-term physical disability after stroke. *Age and Ageing*, London, v. 44, n. 6, p. 1054-1058, out. 2015. Disponível em: https://pubmed.ncbi.nlm.nih.gov/26447123/. Acesso em: 1 jun. 2020.

BERTOLUCCI, Paulo Henrique Ferreira *et al*. O Mini-Exame do Estado Mental em uma população geral: impacto da escolaridade. *Arquivos de Neuro-psiquiatria*, São Paulo, v. 52, n. 1, p. 1-7, mar. 1994. Disponível em: https://www.scielo.br/scielo.php?pid=S0004-282X1994000100001&script=sci_abstract&tlng=pt. Acesso em: 1 jun. 2020.

BOWDEN, Mark *et al*. Anterior-posterior ground reaction forces as a measure of paretic leg contribution in hemiparetic walking. *Stroke*, Gainesville, v. 37, n. 3, p. 872-876, mar. 2006. Disponível em: https://pubmed.ncbi.nlm.nih.gov/16456121/. Acesso em: 1 jun. 2020.

BOWER, Kelly *et al*. Dynamic balance and instrumented gait variables are independent predictors of falls following stroke. *Journal of Neuroengineering and Rehabilitation,* Melbourne, v. 16, n. 1, p. 3, jan. 2019. Disponível em: https://pubmed.ncbi.nlm.nih.gov/30612584/. Acesso em: 1 jun. 2020.

BROWN, Cynthia Jane; FLOOD, Kellie. Mobility limitation in the older patient. *Jama*, Birmingham, v. 310, n. 11, p. 1168, set. 2013. Disponível em: https://pubmed.ncbi.nlm.nih.gov/24045741/. Acesso em: 1 jun. 2020.

BURTON, Louisa-Jane; TYSON, Sarah. Screening for mood disorders after stroke: a systematic review of psychometric properties and clinical utility. *Psychological Medicine*, Manchester, v. 45, n. 1, p. 29-49, fev. 2015 Disponível em: https://pubmed.ncbi.nlm.nih.gov/25066635/. Acesso em: 01 jun. 2020. DOI: 10.1017/s0033291714000336.

CALLISAYA, Michele *et al*. Gait, gait variability and the risk of multiple incident falls in older people: a population-based study. *Age and Ageing*, Melbourne, v. 40, n. 4, p. 481-487, maio 2011. Disponível em: https://pubmed.ncbi.nlm.nih.gov/21628390/. Acesso em: 1 jun. 2020.

CANNING, Colleen Grace; ADA, Louise; O'DWYER, Nicholas. Slowness to develop force contributes to weakness after stroke. *Archives of Physical Medicine and Rehabilitation*, Sydney, v. 80, n. 1, p. 66-70, jan. 1999. Disponível em: https://pubmed.ncbi.nlm.nih.gov/9915374/. Acesso em: 1 jun. 2020.

CHAN, Peggy *et al*. Reliability and validity of the timed up and go test with a motor task in people with chronic stroke. *Archives of Physical Medicine and Rehabilitation*, Hong Kong, v. 98, n. 11, p. 2213-2220, nov. 2017. Disponível em: https://pubmed.ncbi.nlm.nih.gov/28392324/#:~:text=A%20TUGmotor%20cutoff%20time,functional%20mobility%20after%20a%20stroke. Acesso em: 1 jun. 2020.

COHEN, Joshua *et al*. Do performance measures of strength, balance, and mobility predict quality of life and community reintegration after stroke? *Archives of Physical Medicine and Rehabilitation*, London, v. 99, n. 4, p. 713-719, abr. 2018. Disponível em: https://pubmed.ncbi.nlm.nih.gov/29317222/. Acesso em: 1 jun. 2020.

DOHOO, Ian; MARTIN, Wayne; STRYHN, Henrik. *Veterinary Epidemiologic Research*. 2. ed. Canada: Hardcover, 2009.

DORSCH, Simone; ADA, Louise; CANNING, Colleen Grace. Lower limb strength is significantly impaired in all muscle groups in ambulatory people with chronic stroke: a cross-sectional study. *Archives of Physical Medicine and Rehabilitation*, Sydney, v. 97, n. 4, p. 522-527, abr. 2016. Disponível em: https://www.archives-pmr.org/article/S0003-9993%2815%2901426-4/abstract. Acesso em: 1 jun. 2020.

HSIAO, Haoyuan *et al*. Contribution of paretic and nonparetic limb peak propulsive forces to changes in walking speed in individuals poststroke. *Neurorehabilitation and Neural Repair*, Newark, v. 30, n. 8, p. 743-752, jul. 2016. Disponível em: https://pubmed.ncbi.nlm.nih.gov/26721869/. Acesso em: 1 jun. 2020.

JOA, Kyung-Lim *et al*. Classification of walking ability of household walkers versus community walkers based on K-BBS, gait velocity and upright motor control. *European Journal of Physical and Rehabilitation Medicine*, Korea, v. 51, n. 5, p. 619-625, out. 2015. Disponível em: https://pubmed.ncbi.nlm.nih.gov/25311883/. Acesso em: 1 jun. 2020.

KARAGEORGE, Aspasia; VARGAS, Janine; ADA, Louise; KELLY, Patrick; MCCLUSKEY, Annie. Previous experience and walking capacity predict community outings after stroke: An observational study. *Physiotherapy Theory and Practice*, United Kingdom, v. 36, n. 1, p. 170-175, 2020.

KATAN, Mira; LUFT, Andreas. Global burden of stroke. *Seminars in Neurology*, Zurich, v. 38, n. 2, p. 208-211, abr. 2018. Disponível em: https://pubmed.ncbi.nlm.nih.gov/29791947/. Acesso em: 1 jun. 2020.

KWAKKEL, Gert; KOLLEN, Boudewijn. Predicting activities after stroke: what is clinically relevant? *International Journal of Stroke*, Amsterdam, v. 8, n. 1, p. 25-32, dez. 2013. Disponível em: https://pubmed.ncbi.nlm.nih.gov/23280266/. Acesso em: 1 jun. 2020.

LEXELL, Jan *et al*. Reliability of gait performance tests in men and women with hemiparesis after stroke. *Journal of Rehabilitation Medicine*, Lund, v. 37, n. 2, p. 75-82, mar. 2005. Disponível em: https://pubmed.ncbi.nlm.nih.gov/15788341/. Acesso em: 1 jun. 2020.

LIU, May *et al*. Muscles that support the body also modulate forward progression during walking. *Journal of Biomechanics*, Stanford, v. 39, n. 14, p. 2623-2630, jan. 2006. Disponível em: https://pubmed.ncbi.nlm.nih.gov/16216251/#:~:text=The%20gluteus%20medius%20was%20important,support%20needed%20for%20normal%20walking. Acesso em: 1 jun. 2020.

LODHA, Neha *et al*. Strength or motor control: what matters in high-functioning stroke? *Frontiers in Neurology*, Fort Collins, v. 9, n. 1, p. 1160-1160, jan. 2019. Disponível em: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6333669/. Acesso em: 1 jun. 2020.

LUI, Siew Kwaon; NGUYEN, Minh Ha. Elderly stroke rehabilitation: overcoming the complications and its associated challenges. *Current Gerontology and Geriatrics Research*, Singapore, v. 2018, p. 1-9, jun. 2018. Disponível em: https://pubmed.ncbi.nlm.nih.gov/30050573/. Acesso em: 1 jun. 2020.

MENTIPLAY, Benjamin *et al*. Gait velocity and joint power generation after stroke. *American Journal of Physical Medicine & Rehabilitation*, Melbourne, v. 98, n. 10, p. 841-849, out. 2019. Disponível em: https://pubmed.ncbi.nlm.nih.gov/30601159/. Acesso em: 1 jun. 2020.

MILOT, Marie-hélène; NADEAU, Sylvie; GRAVEL, Denis. Muscular utilization of the plantarflexors, hip flexors and extensors in persons with hemiparesis walking at self-selected and maximal speeds. *Journal of Electromyography and Kinesiology*, Montréal, v. 17, n. 2, p. 184-193, abr. 2007. Disponível em: https://pubmed.ncbi.nlm.nih.gov/16516495/. Acesso em: 1 jun. 2020.

MUNRO, Barbara Hazard. *Statistical methods for health care research*. 5. ed. Philadelphia: Lippincott Williams & Wilkins, 2005.

NADEAU, Sylvie *et al*. Plantarflexor weakness as a limiting factor of gait speed in stroke subjects and the compensating role of hip flexors. *Clinical Biomechanics*, Quebec, v. 14, n. 2, p. 125-135, fev. 1999. Disponível em: https://pubmed.ncbi.nlm.nih.gov/10619100/. Acesso em: 1 jun. 2020.

NASCIMENTO, Lucas Rodrigues *et al*. Different instructions during the ten-meter walking test determined significant increases in maximum gait speed in individuals with chronic hemiparesis. *Brazilian Journal of Physical Therapy*, Belo Horizonte, v. 16, n. 2, p. 122-127, abr. 2012. Disponível em: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-35552012000200007. Acesso em: 1 jun. 2020.

NOVAES, Rômulo Dias; MIRANDA, Aline Silva de; DOURADO, Victor Zuniga. Usual gait speed assessment in middle-aged and elderly Brazilian subjects. *Revista Brasileira de Fisioterapia*, Viçosa, v. 15, n. 2, p. 117-122, abr. 2011. Disponível em: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-35552011000200006. Acesso em: 1 jun. 2020.

OZGOZEN, Selen *et al*. Residual deficits of knee flexors and plantar flexors predict normalized walking performance in patients with poststroke hemiplegia. *Journal of Stroke and Cerebrovascular Diseases*, Adana, v. 29, n. 4, p. 104658, abr. 2020. Disponível em: https://pubmed.ncbi.nlm.nih.gov/32037268/. Acesso em: 1 jun. 2020.

PERRY, Jacquelin; GARRETT, Mary; GRONLEY, JoAnne; MULROY, Sara. Classification of walking handicap in the stroke population. *Stroke*, United States, v. 26, n. 6, p. 982-989, 1995.

PODSIADLO, Diane; RICHARDSON, Sandra. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *Journal of the American Geriatrics Society*, Quebec, v. 39, n. 2, p. 142-148, fev. 1991. Disponível em: https://pubmed.ncbi.nlm.nih.gov/1991946/. Acesso em: 1 jun. 2020.

SALBACH, Nancy *et al*. Responsiveness and predictability of gait speed and other disability measures in acute stroke. *Archives of Physical Medicine and Rehabilitation*, Quebec, v. 82, n. 9, p. 1204-1212, set. 2001. Disponível em: https://pubmed.ncbi.nlm.nih.gov/11552192/. Acesso em: 1 jun. 2020.

SHARP, Shelley; BROUWER, Brenda. Isokinetic strength training of the hemiparetic knee: effects on function and spasticity. *Archives of Physical Medicine and Rehabilitation*, Ontario, v. 78, n. 11, p. 1231-1236, nov. 1997. Disponível: https://pubmed.ncbi.nlm.nih.gov/9365354/. Acesso em: 1 jun. 2020.

SOUZA, Lucas *et al*. Assessment of muscular strength with the modified sphygmomanometer test: what is the best method and source of outcome values? *Brazilian Journal of Physical Therapy*, Belo Horizonte, v. 18, n. 2, p. 191-200, abr. 2014. Disponível em: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-35552014000200191. Acesso em: 1 jun. 2020.

YESAVAGE, Jerome *et al*. Development and validation of a geriatric depression screening scale: a preliminary report. *Journal of Psychiatric Research*, Stanford, v. 17, n. 1, p. 37-49, jan. 1982. Disponível em: https://www.sciencedirect.com/science/article/abs/pii/0022395682900334. Acesso em: 1 jun. 2020.

YOUSUFUDDIN, Mohammed; YOUNG, Nathan. Aging and ischemic stroke. *Aging*, Austin, v. 11, n. 9, p. 2542-2544, maio 2019. Disponível em: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6535078/#:~:text=Of%20795%2C000%20strokes%20occurring%20annually,years%20after%20age%2055%20years. Acesso em: 1 jun. 2020.

ZHANG, Yaxin; CHEN, Yujing; MA, Lina. Depression and cardiovascular disease in elderly: current understanding. *Journal of Clinical Neuroscience*, Beijing, v. 47, p. 1-5, jan. 2018. Disponível em: https://pubmed.ncbi.nlm.nih.gov/29066229/. Acesso em: 1 jun. 2020.

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