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Deficits in motor coordination limit the ability to increase walking speed after stroke

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Introduction: Despite recent advances in rehabilitation sciences, many individuals after stroke have residual walking disabilities, which include the inability to immediately increase walking speed in everyday situations, i.e., walking speed reserve. It is hypothesized that intrinsic characteristics and motor impairments may limit individuals' abilities to increase walking speed after stroke.

Objective: To explore the relationships between a range of commonly-collected clinical measures, and the ability to increase walking speed in ambulatory people with chronic stroke and to identify which measures would best predict walking speed reserve.

Method: An exploratory, cross-sectional study was conducted. Eligible participants provided written consent, based upon previous approval from the Institutional ethical review board (#CAAE 06609312.0.0000.5149). The outcome of interest was walking speed reserve, defined as the difference between individuals' comfortable and maximal walking speeds, measured during the 10m-walk test and reported as m/s. Predictors were characteristics of the participants (age, sex, time since stroke, lower limb dominance) and motor impairments (tonus – Modified Ashworth Scale, strength – manual dynamometry, and motor coordination – LEMOCOT). Pearson correlation coefficients were calculated to explore the relationships between the predictors and walking speed reserve. Step-wise multiple linear regression analysis was used to identify which measures would significantly explain the ability to increase walking speed.

Results: Participated 114 individuals, 66 men, who had a mean age of 59 (SD 11) years and a mean time since the onset of the stroke of 6 (SD 5.5) years. Their mean walking speed reserve was 0.21 m/s. The characteristics of the participants, i.e., age, sex, time since stroke, and lower limb dominance, did not significantly correlate with walking speed reserve ($-0.14 < r < 0.09$; $p > 0.13$). All measures of motor impairments, i.e., tonus, strength, and motor coordination, were significantly correlated with walking speed reserve ($-0.31 < r < 0.60$; $p < 0.01$), but only motor coordination was kept in the regression model. Motor coordination alone explained 35% ($F=61.5$; $p < 0.01$) of the variance in walking speed reserve, and the emerged regression equation was: $y = 0.094 + 0.008 \times \text{LEMOCOT score}$.

Conclusions: Individuals with stroke have reduced ability to immediately increase their walking speeds, which is related to deficits in motor coordination of the paretic lower limb. Further studies are recommended to examine whether interventions aimed at improving motor coordination would lead to benefits in walking speed reserve.

Key-words: Stroke; Gait ; Rehabilitation.

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