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Fatigue and Gait Variability in Hemiplegic Patients. A Feasibility Study for a Research Protocol

Topic: Biomechanics

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BACKGROUND

Post-stroke fatigue is common. Perceived fatigue, a subjective sensation of lack of energy, should be distinguished from motor fatigue, a decline of physical performance over time. The six-minute walk test (6MWT) is commonly used to assess physical capacity in various pathologies. Fatigability is evaluated by measuring the decrease in walking speed over time. Fatigue is likely to be accompanied by an alteration in gait quality, particularly an increased step variability, which is an early sign of fall risk. Several mathematical formulas have been proposed to study this variability. We want to assess the fall risk associated with fatigue in hemiplegic patients during walking.

METHODS

Our study aims to examine the relationship between perceived fatigability, objectified fatigability, and stride variability in hemiplegic patients. The patient performs a 6MWT while wearing inertial sensors (one on each foot and one on the sacrum). Fatigue is self-assessed every two minutes using the modified Borg scale. Motor fatigue is objectified using the Stookey index (average walking speed over the entire 6MWT divided by walking speed during the first minute). Gait variability is calculated using two methods: root mean square (RMS) of acceleration and harmonic ratio (HR) of the trunk in the anteroposterior, mediolateral, and vertical directions.

RESULTS

We present the results of a case study patient: Male, 71 years old, left hemiparetic with eight months of follow-up, able to walk without a cane, having experienced several falls at home.

Distance measured in 6 minutes: 192 m.
The modified Borg scale scores were 4 at start, 5 at 2 mn, 6 at 4 mn, 6 at 6 mn
Stookey index: 4,85 (N: 1.73±0.8)
244 walking cycles were analyzed.
An increase of stride variability is found by RMS and HR methods.
RMS vertical: 0.45 (N 0.77 ± 0.04), RMS medio-lateral :0.68 (N 0.38 ± 0.05), RMS antero-posterior: 0.60 (N 0.51 ± 0.05)
HR vertical: 1.38 ± 0.46 (N 3.46 ± 1.28), HR medio-lateral: 0.73 ± 0.20 (N 0.57 ± 0.20)
HR anteroposterior: 1.56 ± 0.48 |(N 3.20 ± 1.18)
These results confirm the existence of fatigability in this hemiplegic patient associated with a greater stride variability.

CONCLUSION

This initial trial appears to validate our protocol, that is now registered, and reinforces the hypothesis of increased stride variability with fatigue. Knowledge of this gait alteration through a simple method could improve the choice of exercises during rehabilitation sessions, especially if these gait changes precede the feeling of fatigue.

Statement of Disclosures

None

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