Relative Contribution of Walking Speed, Ataxia and Gait asymmetry to the Composition of Gait in Multiple Sclerosis

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Introduction - Objective: Walking speed measured according to the T25FW is the most widely used descriptor of gait in MS clinical research and practice but other dimensions influencing gait variance exist according to alternative gait analysis methods. The relative importance of these different dimensions of gait relatively to its variance is unknown.

Methods: We measured the performances of persons with MS and healthy subjects on the T25FW and the Timed 20-Meter Walk (T20MW) performed in tandem with a new gait analysis system (GAIMS). We performed a factorial analysis of variance to underline the main dimensions influencing gait variance and observed their composition.

Findings - Conclusion: The main factor influencing gait variance in conventional walk tests is mostly composed of features related to walking speed. Balance, gait asymmetry and variability also participate to this variance but to a lesser extent. The inverse is observed in tests performed in tandem gait.

Findings

Demographic characteristics (Table 2):
- pwMS were around 11.3 yo older than HV (p<0.001), with a higher female representation
- no other significant differences were observed between groups pwMS and HV

Factorial Analysis of variance (FA, Fig 2)
We performed a FA of our data set (considering both pwMS and H) and kept for analysis the first 3 factors. For the T25FW performed as fast as possible and the T20MW performed in tandem, we observed a clear predominance of the first factor (11.79% and 8.53%, respectively) over the second (3.02% and 5.65%, respectively) and third (2.81% and 3.95%, respectively) ones (Fig 2).

Observation of individual GDs participation (Fig 3), showed that:
- when examining the 1st factor:
  - most GDs obtained from the T25FW performed AFAP were conceptually related to Walking Speed (fig 3A),
  - while in the T20MW performed in tandem gait these were mostly related to ataxia, asymmetry and variability of gait (fig 3A)
- when examining the 2nd and 3rd factors together, we observed that
  - most GDs obtained from the T25FW were related to ataxia, asymmetry and variability of gait (fig 3A)
  - while those obtained from the T20MW were mostly related to Walking speed (fig 3B)

Conclusion – Discussion – Perspectives
1. In a population of persons with multiple sclerosis and healthy controls, the main features influencing the variance of gait evaluated with conventional walk tests are related to walking speed
2. Features related to balance and other qualitative alterations of gait also participate to the variance of gait, but clearly to a lesser extent
3. Evaluation of gait according to the "heel-to-toe" paradigm allows to better delineate features related to ataxia

Further work will imply the development of new gait features and evaluation of how these may help to distinguish pwMS from HV and pwMS with different levels of disability.