Gait adaptability evaluation in persons with a lower-limb amputation: an examination of test-retest reliability and construct validity

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Background:
Persons with a lower-limb amputation have impaired balance control and a high prevalence of falls due to partial absence of muscular control of their prosthesis. Hence, during walking persons with a lower-limb amputation experience difficulties with obstacle avoidance and visually guided stepping, especially when step adjustments need to be performed under time pressure (Figure 1).

Aim: To validate a gait adaptability evaluation protocol in terms of test-retest reliability and construct validity.

Methods:
Twenty-one persons with a lower-limb amputation (age 53.4 ± 12.8 years) participated in this study. Participants were tested twice within one week (test-retest) at one of the participating rehabilitation centers (Reade, Heliomare, INAIL-CP).

At each test, the WE-MOVE track was performed on an instrumented treadmill (C-Mill, ForceLink, Culemborg). The WE-MOVE track is a standardized walking trail in which obstacles and stepping targets appear, shift and change unpredictably during walking, requiring step adjustments under time pressure (Figure 1).

In addition, Timed Up-and-Go (TUG) and 10 meter walk tests (10MWT) were performed.

Results:
Figure 2 depicts individual WE-MOVE scores for test and retest, showing more variation between participants than within participants. WE-MOVE scores correlated significantly between test and retest ($r(19) = 0.65; p < 0.001$). In contrast, no significant correlation was observed between WE-MOVE scores and TUG and 10MWT (all $r(19) < 0.18, p > 0.44$).

Conclusion:
WE-MOVE scores were reproducible from test to retest. The absence of significant correlations between WE-MOVE and standard clinical walking assessments suggest that the gait adaptability construct captured with WE-MOVE is not captured with the TUG and the 10MWT. Hence, WE-MOVE assessments likely add value to clinical diagnosis.

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Figure 1: Snapshots from the WE-MOVE track, showing stepping target and a sudden target-to-obstacle shift.

Figure 2: Individual WE-MOVE scores for test (darker blue bar) and retest (blue bar) assessments (N = 21).