Assessing gait adaptability in people with a unilateral amputation on a treadmill with visual context

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BACKGROUND AND AIM: Gait adaptability, including the ability to avoid obstacles and to make visually guided steps, is essential to move safely through our cluttered world. This aspect of walking ability is important for regaining independent mobility, but difficult to assess in clinical practice. The aim of this study was to investigate face and construct validity of an instrumented treadmill with visual context to assess prosthetic gait adaptability.

METHODS: A control group of able-bodied people (CO, N=12) and a convenience sample of people with a trans-tibial (TT, N=12) and trans-femoral (TF, N=12) amputation participated. Participants walked at self-selected speed on an instrumented treadmill with visual context (ForceLink, Culemborg) to evaluate their gait adaptability in terms of anticipatory and reactive obstacle avoidance performance (obstacles presented four steps and one step ahead, respectively; Figure 1A,B) and stepping accuracy to regular and irregular patterns of visual stepping stones (Figure 1C). In addition, several clinical tests were administered, including timed walking tests and fall-incidence and fear-of-falling reports.

RESULTS: Obstacle avoidance performance and stepping accuracy were significantly lower in TT and TF groups compared to the CO group (face validity). Anticipatory obstacle avoidance performance was moderately correlated to timed walking tests scores (construct validity). Reactive obstacle avoidance and stepping accuracy performance were unrelated to timed walking tests. Gait adaptability scores did not differ between groups stratified for fall incidence or fear of falling.

CONCLUSION: Gait adaptability can be validly assessed using an instrumented treadmill with visual context, even though self-selected treadmill walking speeds differed significantly between the three examined groups, which may have diminished between-group differences in gait adaptability. Moderate correlations with clinical tests imply that this assessment provides unique, objective information about walking ability in people with lower-limb amputation.

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