Validity of performances measured on complex walking tests in virtual conditions compared to those in real conditions : a transversal study.

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Résumé

Background: Falls in the elderly are a major public health issue. They often occurring in complex walking situations, with or without associated cognitive tasks. Current clinical assessments for detecting people at risk of falling remain limited because they don't consider complex walking scenarios. Mixed reality (MR) appears to be a promising solution for simulating these complex cognitive walking situations in a controlled and safe way. However, the literature has identified differences between behaviors observed in MR and in real life.
Objective: The aim is to assess the convergent and concordant validity of performances measured during complex walking tests in MR compared to real-life condition.

Method: The study included 35 young adults (18 to 30 years), who performed 4 walking tests (simple walking, figure-of-8 walking test, timed up and go, obstacle crossing) with and without cognitive tasks (i.e., arithmetic task) in real-life and MR conditions, repeated 3 times each. Performance have been assessed by execution time, number of motor errors, cognitive performance and number of steps. Sense of presence have been measured by the Presence Questionnaire and usability by the System Usability Scale. Correlation analysis and a Bland-Altman analysis have been used to compare performances between the 2 environments.

Results: There is a significant ($p < 0,05$) strong correlation ($r > 0,7$) between real tests and MR tests with low risk of bias and narrow limits of agreement.
Conclusion: Our study demonstrates the validity of performances between real and MR complex walking tests in healthy young adults. Future studies are needed on healthy target population to assess the convergent and concordant validity.

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