DEVELOPMENT AND IMPLEMENTATION OF AN INSTRUMENTED TREADMILL WITH VISUAL CONTEXT FOR FUNCTIONAL GAIT REHABILITATION

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Background and aim: Gait adaptability, including the ability to avoid obstacles, to change speed and to make visually-guided steps, is essential to move safely through our cluttered world. This aspect of walking ability is often impaired in pathological gait. However, safe and controlled rehabilitation environments for gait adaptability training are scarce, which is unfortunate because the ability to modify gait is important for regaining independent mobility and confidence. We aim to develop and implement an innovative rehabilitation treadmill to help fill this lacuna.

Methods: We used an instrumented treadmill with a large force platform embedded, allowing for online detection of gait events and characteristics (e.g., heel-strike, step length; Roerdink et al. 2008). A projector was connected to this treadmill for presentation of meaningful visual context on the belt’s surface (e.g., obstacles or stepping targets) in a movement-dependent manner (Roerdink & Beek 2010). For the so-obtained C-Mill (C for Context; ForceLink, Culemborg, the Netherlands), several gait adaptability training interventions with immediate feedback on performance were developed. Technical feasibility and clinical applicability of C-Mill therapy were evaluated and optimized through an implementation in rehabilitation practice.

Results: We succeeded to develop a safe, functional and therapy-friendly rehabilitation device for high-intensity, repetitive and task-specific gait adaptability training with feedback on performance, thereby adhering to the general recommendations for effective rehabilitation. Various patient groups (e.g., stroke, amputee, fall-prone elderly, CP-children) with different levels of walking ability successfully completed C-Mill therapy interventions, including visually-guided stepping, speeding-up/slowing-down, obstacle negotiation and gait-adaptability games. Both therapists and patients were enthusiastic about C-Mill therapy.

Conclusion: C-Mill therapy –treadmill training with visual context to practice gait adaptability– is technically feasible and applicable as viable part of gait rehabilitation practice.

References