

Effects of Virtual Reality Treadmill Training on Gait and Balance Performance of Patients with Stroke: Review

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Abstract : Background: Impairment of walking and balance skills has negative impact on functional independence and community participation after stroke. Gait recovery is considered a primary goal in rehabilitation by both patients and physiotherapists. Treadmill training coupled with virtual reality technology is a new emerging approach that offers patients with feedback, open and random skills practice while walking and interacting with virtual environmental scenes. Objectives: To synthesize the evidence around the effects of the VR treadmill training on gait speed and balance primarily, functional independence and community participation secondarily in stroke patients. Methods: Systematic review was conducted; search strategy included electronic data bases: MEDLINE, AMED, Cochrane, CINAHL, EMBASE, PEDro, Web of Science, and unpublished literature. Inclusion criteria: Participant: adult >18 years, stroke, ambulatory, without severe visual or cognitive impairments. Intervention: VR treadmill training alone or with physiotherapy. Comparator: any other interventions. Outcomes: gait speed, balance, function, community participation. Characteristics of included studies were extracted for analysis. Risk of bias assessment was performed using Cochrane's ROB tool. Narrative synthesis of findings was undertaken and summary of findings in each outcome was reported using GRADEpro. Results: Four studies were included involving 84 stroke participants with chronic hemiparesis. Interventions intensity ranged (6-12 sessions, 20 minutes-1 hour/session). Three studies investigated the effects on gait speed and balance. 2 studies investigated functional outcomes and one study assessed community participation. ROB assessment showed 50% unclear risk of selection bias and 25% of unclear risk of detection bias across the studies. Heterogeneity was identified in the intervention effects at post training and follow up. Outcome measures, training intensity and durations also varied across the studies, grade of evidence was low for balance, moderate for speed and function outcomes, and high for community participation. However, it is important to note that grading was done on few numbers of studies in each outcome. Conclusions: The summary of findings suggests positive and statistically significant effects ($p < 0.05$) of VR treadmill training compared to other interventions on gait speed, dynamic balance skills, function and participation directly after training. However, the effects were not sustained at follow up in two studies (2 weeks-1 month) and other studies did not perform follow up measurements. More RCTs with larger sample sizes and higher methodological quality are required to examine the long term effects of VR treadmill effects on function independence and community participation after stroke, in order to draw conclusions and produce stronger robust evidence.

Keywords : virtual reality, treadmill, stroke, gait rehabilitation

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