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IS TREADMILL WALKING WITH VIRTUAL REALITY AN ACCEPTABLE AND PLAUSIBLE TRAINING MODALITY FOR STROKE SURVIVORS?

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Introduction and Objectives: For many stroke survivors recovering independent walking is an important objective, however, although most survivors recover some walking ability it is often insufficient to meet the challenges of community walking[1]. Treadmill walking, through forced use of the paretic side, has some evidence as an intervention but lacks transfer to community walking[2]. With the rationale of providing a more realistic, variable walking experience, the addition of virtual reality (VR) to treadmills is a recent, promising, development. This aim of this study, therefore, was to investigate the credibility and acceptability of treadmill training with VR among stroke survivors.

Methods: This was a feasibility study testing the validity of treadmill training with and without VR through comparison with overground walking. User acceptability was assessed through independent interviews. Six ambulant stroke survivors (aged 56.5±10.6years, 116±93.3months post stroke) were recruited from local stroke clubs. They attended an introductory session for baseline measurements (over ground gait biomechanics, functional mobility and cognition) and familiarisation with the treadmill VR system (MOTEKMedical, Netherlands) including wearing a harness. They then participated in two training sessions, one week apart, each session included treadmill walking without VR (TW) and treadmill walking with VR (TWVR) e.g. road and forest paths visualisations. The final session included a second measurement of gait biomechanics which provided the data for statistical comparison. Each individual was independently interviewed before and after their participation.

Results: In general minor, non-significant, differences were observed for TM, TMVR and overground walking. There was, however, a consistent, and statistically significant ($p = 0.032$) finding of greater hip flexion for TWVR, see table for details. Universally, participants found the experience acceptable and enjoyable, although "challenging".

Conclusion: This feasibility study found treadmill walking (with and without VR) to be similar enough to overground walking to justify it as a training modality for chronic stroke survivors who had already attained some independence in walking. One possible difference, greater hip flexion during treadmill walking, may be a product of harness wearing, and/or relate to the setup of the visualisations. Participants found the experience of treadmill walking acceptable. Although they preferred walking with the visualisations there were few biomechanical differences to simple treadmill walking. Further exploration of individual variability, however, should be undertaken as this may be a factor in translating gains from treadmill training to community walking. In conclusion, similarities between overground and treadmill walking (with and without VR) support its use as a training modality in stroke rehabilitation. No great advantage was evident from the use of visualisation other than participant's preference, however these findings require further testing.

Table:

Gait variable	Overground Mean (sd)	TW Mean (sd)	TWVR Mean (sd)
Preferred speed (m/s)	0.95 (0.43)	0.72 (0.47)	0.79 (0.39)
Stride length (m)	1.07 (0.39)	0.93 (0.50)	0.95 (0.39)
Step width (m)	0.08 (0.04)	0.10 (0.03)	0.09 (0.02)
Hip angle at initial contact (degrees)	23.43 (14.07)	28.86 (11.50)	31.28 (8.51)
Knee angle at initial contact (degrees)	8.83 (7.72)	13.83 (10.56)	12.39 (10.14)
Hip max flexion angle (degrees)	28.82 (14.84)	35.72 (8.68)	37.37 (7.17)

Caption: Comparison of gait variables during overground, treadmill and treadmill walking with VR

References: [1] Baer et al., Physiotherapy Research International, 6:135-144, 2001.

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