Efficacy and safety of non-immersive virtual reality exercising in stroke rehabilitation (EVREST): a randomised, multicenter, single-blind, controlled trial.

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OBJECTIVE

The use of non-immersive virtual reality (NIVR) may be an economical solution to promote recovery for upper limb (UL) motor deficits after stroke. The aim of this study was to investigate the effect of NIVR versus recreational activity (RA) for UL motor control therapy in acute stroke.

METHODS

A single-blind randomised control trial was undertaken throughout 14 rehabilitation centres in four countries. Participants (n=141) aged 18-85 years, who had suffered a first ischaemic stroke within the last 3 months and had mild to moderate UL impairment (Chedoke McMaster Stroke Assessment >3), were randomised to NIVR (Nintendo Wii) or RA (card playing, Jenga). Participants underwent two weeks of one-to-one therapist administered intervention (10 x 60 minute sessions). Upper limb motor control was measured using the Streamlined Wolf Motor Function Scale (SWMFS) at baseline, two weeks (intervention cessation) and four weeks.

RESULTS

There were no significant differences between groups at two (p=0.346; CI -14.2s to 22.6s) or four (p=0.346; CI -52.0 to 23.7s) weeks. At two weeks SWMFS improvements were observed in the NIVR and RA groups, a decrease of 14 sec and 10.9 sec respectively. At four weeks, a decrease of 17.7 sec (NIVR) and 15.2 sec (RA) was observed.

CONCLUSION

Both NIVR and RA are equally effective therapies for improving motor control in acute stroke. They enhance treatment intensity and this may be more important than the type of intervention for improving motor performance. Recreational activity however may be more cost effective and more easily implemented than NIVR.

COMMENTARY

Current evidence suggests that stroke rehabilitation requires "repetitive, task-specific, motivating and intensive" therapy (Saposnik & Levin, 2011). However, many places lack the resources to provide this (Saposnik & Levin, 2011; Saposnik et al., 2016). Potential solutions include using NIVR in conjunction with conventional treatment. Virtual reality technology, such as Nintendo Wii, provides instant feedback on performance, includes high repetitions, and enables practice of simulated real-life activity unavailable in hospitals (Saposnik & Levin, 2011; Laver, George, Thomas, Deutsch, & Crotty, 2015). Technology may increase patient motivation leading to increased therapy time (Laver, et al., 2015).

Prior to 2013 the quality of research for virtual reality therapy to enhance UL motor recovery post-stroke was relatively low (Laver, et al., 2015). Some promising results had been reported but, as outlined in a meta-analysis (Saposnik & Levin, 2011), most trials compared conventional therapy plus virtual reality technology to conventional therapy alone. This approach creates bias towards treatment effect because intervention groups have increased treatment duration which is known to enhance neuroplasticity (Saposnik & Levin, 2011; Saposnik et al., 2016). In this RCT, Saposnik et al. (2016) accounted for treatment duration bias by ensuring that all participants underwent conventional rehabilitation in addition to either NIVR or RA. Recreational activity is not considered standard care and is a common active control. To account for multiple personal and contributing factors, including baseline function and stroke severity, stratified randomisation was undertaken.

Motor recovery was assessed using the SWMFS which is a reliable measure of UL motor function in chronic stroke (Saposnik et al., 2016; Chen et al., 2014). As no data are available for the SWMFS as an outcome measure in acute stroke, there is an element of uncertainty when interpreting the findings of this study. Further, the inter-rater reliability of the SWMFS does not appear to have been assessed, but the reproducibility of the full version is good (Wu et el., 2011). While the SWMFS has better clinical utility than the complete test it does require training before use (Wu et el., 2011) which may impact on its translation into daily clinical practice. Training for use of this measure would be beneficial if research proves it to be as valid and reliable as the full version. This test could be quickly completed in clinical practice and give important information on the effectiveness of treatment with regard to both quality and level of UL motor function

There were no significant differences between groups at two or four weeks, but both groups showed a decrease in the time to complete the SWMFS. This shows that NIVR and RA are equally effective at enhancing motor performance in acute stroke. The results of this study suggest that conventional therapy for acute stroke patients should continue but that either NIVR or RA may be implemented to increase therapy time in an efficient, cost effective manner. This may be particularly useful during transition preparation (typically two to three weeks) for inpatient stroke patients being discharged to community rehabilitation. Many of these individuals would share similar demographics (late stage acute post-stroke and with mild-moderate UL impairment) to Saposnik et al.'s (2016) study population. Time is limited to provide these services, therefore efficient solutions are required. Community rehabilitation services usually have access to both RA resources and Nintendo Wii, and these are simple, effective and safe interventions to implement in this setting. Both therapies appear equally effective, therefore based on patient preference either could be used to increase motivation and compliance (Saposnik et al., 2016). The interventional protocol was thoroughly described making it replicable in clinical practice, and it is plausible that rehabilitation assistants could be trained to provide the additional therapy with individual clients.

Addition of a conventional therapy control group in future studies would be beneficial (Saposnik et al., 2016) to compare to the value of NIVR and RA. Further research should investigate NIVR and RA in post-acute stroke populations, as this would provide evidence for therapy that may be used consistently pre- and post-discharge.

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