Background: Movement kinematics are increasingly used to objectively monitor changes in motor impairment and function in patients with stroke. Recent research on motor recovery after stroke has focused on providing patients with the opportunity for repetitive, intensive and salient task practice. Virtual reality (VR) provides a multisensory environment in which the user can train during upper limb (UL) rehabilitation. Advantages of video capture VR are its ease of use and relative low-cost.

Research Hypothesis: VR is more effective than conventional therapy for stroke UL intervention.

Aims: Part A, to compare UL kinematics during reaching tasks in comparable physical and virtual environments for both stroke and healthy subjects. Part B, to compare effectiveness of a short term VR intervention for the UL of stroke patients versus conventional intervention.

Methods: In Part A, arm and trunk kinematics for reaches made with the right, dominant arm to three targets in comparable physical and virtual environments by 16 adults with stroke and by 8 healthy age-matched controls were compared using a 3-camera system. In Part B, 12 patients with chronic stroke, aged 33-80 years, were randomly allocated to VR therapy or conventional therapy. All patients participated in 4 clinical evaluation sessions and 9 45-minute intervention sessions over 3-weeks. Motor impairment, activity and participation were assessed prior to and following the intervention.

Results: Reaching movements made by both control and stroke subjects were slower, shorter, less straight, less accurate and had smaller ranges of joint excursions for target reaches in the virtual environment compared to the physical environment. Thus, there was a decrease in the overall movement quality for movements made in a 2D virtual environment. Improvements occurred in both intervention groups, but more patients in VR group improved UL clinical impairment and activity and improvements occurred earlier. Patients in the VR group reported satisfaction with the novel treatment.

Discussion: The results suggest that a 2D virtual reality environment should be used with caution when the goal of the rehabilitation program is to improve the quality of movement patterns of the upper limb. However, the advantage of VR over conventional training supports further investigation of the effect of VR or VR combined with conventional therapy in larger scale randomized, more intensive controlled studies.

Conclusions: In summary the results of this feasibility study greatly aided in laying the ground work for a clinical trial which will be able to provide clinicians with meaningful guidelines for maximally effective treatment interventions for arm motor recovery.

Key words: Virtual reality, Stroke, Upper limb therapy
Publications associated with the project:

