Assessment and rehabilitation of neglect with a VR serious game (HEMIRehApp)

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Aims. Previous neglect treatments often relied on contralesional cueing, but not in a patient-tailored, nor head-contingent way. We designed HEMIRehApp, an app that trains spatial orientation using audiovisual head-contingent patient-tailored cueing in immersive virtual reality (VR). In our ongoing study, we aim to (1) validate the VR head-contingent measurement of visuospatial attention, (2) assess the feasibility of VR in stroke patients and (3) evaluate the effect of patient-tailored cueing on neglect recovery.
Method. Stroke patients in rehabilitation hospital UZ Leuven Pellenberg have been consecutively recruited since May 2021. The study protocol (pre-registration: https://osf.io/b4xfg) consists of two phases: (A) adult stroke patients are screened for neglect with multiple tests in and outside VR, (B) stroke patients with left-sided neglect (and no risk of seizures) are enrolled in a 4-week training.
Results. A total of 92 stroke patients enrolled in our study of which 43 patients completed the VR neglect assessment. Head orientation biases in VR were more pronounced in patients who showed neglect on three pen-and-paper tests (M = 38°, SD = 12.14°) than in patients who showed neglect on one or two tests (M = 10.3°, SD = 10°), and than patients not showing neglect on any of the pen-and-paper tests (M = 4.0°, SD = 3.8°). Cybersickness was low and was significantly lower after VR than before VR exposure. The majority of patients gave HEMIRehApp positive ratings on a user experience questionnaire (88%) and were able to operate HEMIRehApp independently after a tutorial (85%). Five patients enrolled in VR training of which two completed the training protocol.
Discussion. Our results provide evidence that head orientation biases assessed in VR are a marker of neglect and that VR can be applied in a safe and enjoyable way in stroke patients. The results also suggest that high-powered mono-centre studies evaluating treatment efficacy at the group level are not feasible.