Application of immersive Virtual Reality for the assessment and cognitive rehabilitation of visuospatial neglect

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Immersive Virtual Reality (VR) has the potential to precisely capture real-time behavior in scenarios that simulate everyday tasks, making it an appropriate tool for assessing and rehabilitating visuospatial neglect. VR can objectively and reliably measure parameters not previously measured by traditional paper-and-pencil tests or training programs, such as such as head posture on the lateral and vertical axis, eye tracking data, and reaction times in ecologically valid situations, making it suitable for progress monitoring.

In the talk two clinical VR tasks will be presented: (1) Immersive Virtual Road-Crossing task (iVRoad) for the assessment of neglect and (2) Virtual Optokinetic Stimulation (VR-OKS) for the training of neglect. First, iVRoad was applied for the assessment of discrete neglect symptoms to chronic post-stroke patients with left-sided neglect (n=20), without neglect (n=20) and healthy controls (n=20). The task required participants to observe and cross two virtual roads, place a letter in a mailbox on either the left or right side, and return to the starting point by crossing the roads again. Results from the iVRoad task are presented, focusing on temporal parameters (e.g., reaction times), error patterns (e.g., number and type of errors), and head rotation data (e.g., yaw and roll rotation) using machine learning techniques. Second, the translation of optokinetic stimulation into VR (VR-OKS) as a training program will be presented, along with preliminary data involving five participants with neglect. The VR-OKS training program involves virtual everyday objects moving from right to left on transport bands, with real-time eye tracking used to interact with the virtual environment. The task is to follow the objects with the eyes to the left side, to look at the objects for three seconds, and maintain a straight head posture throughout the training. If the participant's behavior deviates, such as the head turning to the right or the target objects not being tracked, the program provides visual feedback immediately and automatically to help the participant adapt their behavior. On the basis of these two tasks the applicability of VR in cognitive rehabilitation will be discussed.