Can patients with central field loss perform head pointing in a virtual reality environment?

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Abstract

Introduction: Virtual Reality (VR) headsets are raising more and more interest from the low-vision research community since they offer a promising framework for low-vision aids and rehabilitation protocols. However, the study of VR accessibility to low vision is still in its early stages and designing efficient user interfaces for low-vision users remains an open challenge. Head pointing (a common way to interact with the world in VR environments) may represent a promising option for patients with Central Field Loss (CFL) who lose the ability to direct their gaze efficiently towards a target. Yet, little is known about the actual head-pointing capacities of CFL patients.

Discussion: The purpose of the current study is to evaluate whether patients with CFL are able to perform precise head-pointing tasks in VR. 49 patients with binocular CFL, aged 34 to 97 (mean = 77±13), were tested with an Oculus Go headset in a very simple VR environment (grey background). At the beginning of each block, a head-contingent reticle was displayed in a specific location in front of the patient. A total of 9 reticle locations were tested either in the center of the visual field or with a 7° offset. At each trial, a target appeared in the visual field and patients were instructed to move their head to position the reticle precisely onto the target. Targets were black circles (1° to 3° diameter) randomly presented in five fixed positions (center or top, right, bottom, left at 18° of eccentricity). On average, patients were able to use their head to position the reticle precisely onto the target 94% of the time. Individual differences emerged, with a significant drop in pointing speed performance for specific reticle locations.

Conclusions: Our preliminary results show that patients with CFL are able to perform accurately precise head-pointing tasks. This represents a fundamental step towards the design of efficient and user-friendly visual aids and rehabilitation tools using VR. For instance, head pointing could provide an ergonomic framework to design user interfaces that require precise pointing abilities to perform item selection. Similarly, one can imagine designing head-contingent pointing exercises that will drive the rehabilitation process while limiting straining of the eyes.