OPEN ACCESS

ARVO Annual Meeting Abstract | July 2019

Prehension planning deficits in adults with amblyopia

Simon Grant; Miriam Louise Conway

+ Author Affiliations & Notes

Investigative Ophthalmology & Visual Science July 2019, Vol.60, 1027. doi:https://doi.org/

Abstract

Purpose : Adults with persistent amblyopia show performance deficits on a range of visuomotor behaviours, including reach-to-grasp (prehension) movements. We examined whether these deficits arise more from difficulties with feedforward planning of these movements or with their on-line control

Methods : Subjects were 21 adults with mild-to-severe amblyopia (interocular acuity differences, logMAR 0.20-1.58) and reduced or nil binocular stereovision and 21 age-matched controls. Movements of the preferred hand were recorded via a 3D motion capture system while subjects reached, precision grasped and placed to one side cylindrical objects (2 sizes, 2 locations) using both eyes together or just their dominant eye or non-dominant/amblyopic eye alone to program and execute the movements or only to plan them with visual feedback removed just before movement onset. Kinematic parameters and errors associated with the reach and grasp were quantified and compared by ANOVA and correlation analyses

Results : Control subjects produced shorter movement times, faster reaches and more accurate grasps when using binocular rather than monocular vision to plan and execute their movements, but these normal binocular advantages were reduced or lost in the absence of visual feedback when their movements slowed and their grasping was less accurate across all 3 views. The amblyopic adults showed typical deficits compared to controls, with prolonged reach and grasp durations and higher error-rates across all 3 views when vision was fully available, and with further deteriorations in performance speed and accuracy when vision was only available at the planning stage. These latter effects were generally more marked than in the controls and were especially pronounced when the amblyopic eye alone was used to plan the reach and grasp, but with no consistent correlations with its degree of visual acuity loss

Conclusions : Adults with amblyopia seem to have problems generating reliable spatial representations (i.e., internal models) for the feedforward programming of object-directed prehension movements, particularly with their affected eye, so that their performance relies more on continuous – but degraded – on-line vision than in normally-sighted subjects

This abstract was presented at the 2019 ARVO Annual Meeting, held in Vancouver, Canada, April 28 - May 2, 2019.