Sensitivity to binocular disparity is reduced by mild traumatic brain injury

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INTRODUCTION

- The impairment of visual functions is one of the most common complaints following mild traumatic brain injury (mTBI) (Greenwald, Kapoor, & Singh, 2012, Kapoor & Cuffreda, 2002).
- TBI-associated visual deficits include blurred vision, reading problems and eye strain.
- Previous studies have found evidence that TBI can diminish early cortical visual processing, particularly for second-order stimuli.

Aim

We aim to investigate whether cortical processing of disparity is also affected by mTBI.

METHODS

- To investigate the influence of mTBI on stereopsis, we measured the quick disparity sensitivity function (QDSF) in 22 patients with mTBI.
- Patients with manifest strabismus and double vision were excluded.
- Compared to standard clinical tests, the QDSF is unique in that it offers a quick and accurate estimate of thresholds across the whole spatial frequency (SF) range (Reynaud et al. 2015).
- QDSF parameters are peak sensitivity (gain) and peak SF.

RESULTS

- Results show that disparity sensitivity in the mTBI patients were significantly reduced compared to the normative dataset (n = 61).
- The peak spatial frequency was not affected.

DISCUSSION

- Previous studies in this field have focused on more local measures of stereo vision that likely reflect processing by early cortical areas (V1/V2).
- Unlike previous studies we did not confine our assessment to the smallest detectable disparity (i.e. stereocuity), but rather measured disparity sensitivity over the full SF range.
- The main result from this study is that mTBI patients have a small but significant reduction in disparity sensitivity compared to the control group and that this is a general loss, occurring over the full spatial frequency range.
- Correlation analysis shows that there are no significant correlations between the amount of heterophoria and the key QDSF parameters.
- Results support our initial hypothesis that the likely cause of this stereo deficit in mTBI is a sensory rather than oculomotor dysfunction.
- Results are nevertheless consistent with a hypothesis that the reduced disparity sensitivity is the result of sensory loss due to cortical damage subsequent to brain trauma (e.g. axonal shearing).

REFERENCES

Reynaud, G., & Hess, R. F., 2015, Vision Research, 111, 97-103

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