Interocular contrast suppression partially accounts for impaired stereopsis in the central visual field of individuals with and without amblyopia

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Previously we mapped stereopsis across the visual field and showed that local stereopsis is impaired in the central visual field for individuals with stereo deficits due to anisometropic amblyopia or microstrabismus. In light of studies that have demonstrated a correlation between suppression and stereopsis in normal vision and in amblyopia, we set out to examine whether visual field loci with impaired stereopsis also have increased interocular suppression. We used similar stimuli for both stereopsis and suppression tasks. A full-screen random-dot stimulus was presented dichoptically with a square target region whose size was m-scaled with eccentricity. We tested target locations along the horizontal and vertical meridians at eccentricities of 0, 2.5, 5 and 10°, while monitoring fixation with an eye-tracker. For stereopsis, the target region had a coarse disparity step of 10 arcmin, and observers indicated whether the target was in front or behind the fixation plane. For contrast suppression, the target region had a 60%-contrast decrement in one eye and 100%-contrast in the other eye, with zero disparity. The ability to detect local decrements was compared in the two eyes. In addition to contrast perimetry, we measured decrement thresholds at all the tested locations for a subset of observers. The ratio of decrement thresholds in the two eyes provided an estimate of local suppression due to dichoptic masking. Results show a general agreement between loci showing poor stereopsis and loci showing an imbalance in dichoptic masking among the 12 individuals we tested, including 6 with amblyopia or microstrabismus. The one exception was an individual with strabismic amblyopia who had poor stereopsis but excellent contrast sensitivity at all tested locations in both eyes, consistent with McKee et al. (2023). For the remaining participants, it appears that contrast suppression partially accounts for the impairment of stereopsis in the central visual field.

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