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Effects of dioptric blur on foveal acuity and contour interaction for noisy Cs

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Abstract

Contour interaction for visual acuity has been found to dissipate with imposed dioptric blur of +1.50D using standard luminance letters and bars (Simmers et al, 1999). It is unclear how dioptric blur affects visual acuity or contour interaction for letters imbedded in noise. We examined the effects of dioptric blur on luminance-modulated and contrast-modulated noise Cs with and without surrounding contours. Stimuli were constructed from random dot dynamic noise, added or multiplied to a square-wave profile. We measured foveal acuity for a square-shaped C with and without four flanking bars separated by 0 to 2 letter widths under different levels of dioptric blur (0-2D with flanks; 0-4D without). Acuity was measured using a method of constant stimuli and 4AFC paradigm for approximately equally visible luminance-modulated and contrast-modulated noisy Cs. Acuity thresholds for isolated contrast-modulated Cs are about 0.3 logMAR higher than for luminance-modulated Cs at all blur levels. The effect of increasing blur on acuity is ~0.3 logMAR/D (from 0 to 4D). The relative peak magnitude of contour interaction for the contrast-modulated C is greater (by ~0.1 logMAR) and more extensive, than for the luminance-modulated C. Dioptric blur up to 2D raises both types of isolated C acuity thresholds similarly, but affects their contour interaction parameters differently. The magnitude of the peak effect is directly related to the unflanked logMAR threshold (or letter size). However with increasing blur, the extent of interaction is maintained for the contrast-modulated C, but reduced significantly for the luminance-modulated C (as for standard luminance letters; Simmers et al, 1999). For these blur levels, contrast-modulated Cs are more subject to contour interaction effects than luminance-modulated Cs. This could be a result of larger integration areas for contrast-modulated stimuli and a differential effect of blur on contrast and luminance modulation sensitivity functions.

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Footnotes

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