Vision Sciences Society Annual Meeting Abstract | September 2011

Dioptric blur affects grating acuity more than letter acuity for contrast-modulated stimuli

Norsham Ahmad; Sarah J. Waugh; Monika A. Formankiewicz

+ Author Affiliations

Journal of Vision September 2011, Vol.11, 1189. doi:10.1167/11.11.1189

Abstract

It is valuable to consider the effects of blur, eccentricity and amblyopia on different measures of visual acuity, in particular grating and Snellen acuity (eg. Levi & Klein, 1982; McKee et al., 2003). For luminance stimuli, blur and amblyopia reduces grating acuity less than letter acuity. We examined the effects of dioptric blur on luminance, luminance-modulated (LM) and contrast-modulated (CM) noise gratings and C letter acuity to gain further insight into the visual processing of CM stimuli. Modulation sensitivity functions for standard luminance, LM and CM Gabor patches (0.5–32 c/deg) were measured and cut-off spatial frequencies estimated. Luminance-modulated and contrast-modulated stimuli were created from background dynamic binary noise, which was unscaled (angular size of checks constant for all frequencies) or scaled (6 checks/cycle of modulator). Square C acuity was also determined. Modulation and acuity thresholds were measured using different levels of blur (0–4D) and a method of constant stimuli with 2AFC and 4AFC paradigms. Dioptric blur reduces modulation sensitivity to LM Gabors in a similar fashion to standard Gabors. CM modulation sensitivity is much lower, and the effect of blur is greater, particularly for unscaled noise. The effect of blur on C acuity though is similar for LM and CM stimuli, although the acuity threshold for CM stimuli is about 0.3 logMAR higher at all levels of blur. When comparing grating and letter (crowded or uncrowded) acuities for different levels of blur, whereas for LM stimuli the slope falls from 0.5 to 1.0, for CM stimuli, it can be more than 2.0. That is, blur affects grating acuity more than letter acuity for CM stimuli. This finding is new and suggests that different limits affect CM than LM detection. However letter acuities are similarly affected by blur, suggesting that once extracted, letter acuity is affected by a common limit.

NA holds PhD Scholarship funded by the Government of Malaysia.