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Abstract

Purpose : Binocular summation of briefly-presented, central and peripheral, spatially-distributed stimuli has been investigated in numerous studies with emphasis on stimulus size, location in the visual field and state of background adaptation. This study examined the binocular threshold summation of cone- and rod-specific, flickering stimuli as a function of stimulus size and retinal location.

Methods : Flicker modulation thresholds (FMT's) were measured under monocular and binocular viewing conditions in 13 subjects with normal vision (mean age:23±3yrs, best-corrected visual acuity ≤ 0.0logMAR, stereoacuity ≤ 40arc sec and normal trichromatic colour vision). Rapid flicker thresholds were measured using the Flicker-*Plus* test (City Occupational Ltd., London) for 5 different target sizes (7, 15, 30, 45 and 60arc min) in central vision (0^o) and at an eccentricity of 5^o in each quadrant using a 5-alternative forced-choice psychophysical technique. The temporal frequency, duration, luminance and chromaticity of the flickering stimuli was optimized to favour either cone- or rod-photoreceptors. The ratio of the subject's monocular FMT (measured in the best eye) and the corresponding binocular threshold was used to quantify binocular summation.

Results : Monocular FMT's decreased monotonically with target size for both cone- and rod-optimized stimuli ($p<0.001$). Not surprising, the extreme percentage FMTs corresponded to the smallest (7') and the largest (60') stimuli with m±s values of: 9.69±1.06 and 2.35±0.20 (for cones) and 20.92±2.50 and 4.45±0.50 (for rods). Binocular FMT's followed the same trend for all viewing conditions but were smaller than their

monocular counterparts ($p<0.001$).The mean summation ratios was 1.28±0.49 for cones and 1.41±0.35 for rods. There was no indication of significant changes in binocular summation with either target size ($p<0.12$) or retinal location ($p=0.67$).

Conclusions : Detection thresholds for luminance-modulated flicker exhibit large binocular summation with both cone- and rod-enhanced stimuli. Although both monocular and binocular FMTs show large, systematic variation with target size and retinal location, the binocular summation ratio remains largely invariant of these parameters.

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