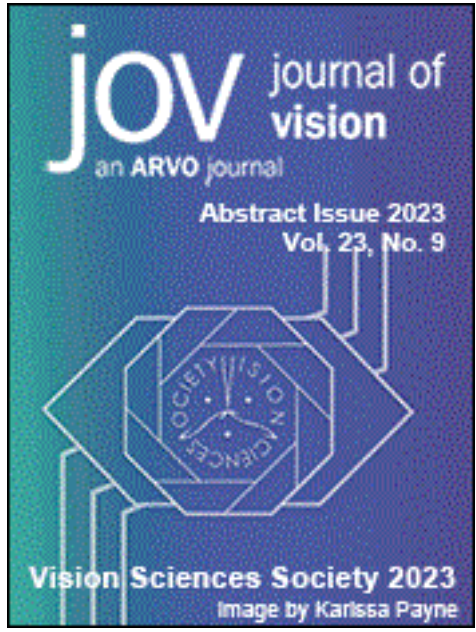




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Increment and decrement threshold vs. intensity curves for achromatic and L-cone tests.

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Abstract

The desensitization of the visual system as a function of the increasing luminance of a background field yields threshold vs. intensity (tvi) curves, classically measured using increment tests. Here we use a new, high-brightness display system to measure both increment and decrement thresholds. Our display system is based upon a PROPixx three-chip DLP LED color projector (VPixx Technologies, Saint-Bruno, Canada), with light from the projector collected into a field lens and focused onto a high gain rear projection screen. This display combines the brightness of traditional optical systems with the flexibility of control provided by modern displays; in particular, it is simple to use the silent substitution method to isolate single cone types. Here we report tvi curves for achromatic and (L-)ong wavelength sensitive cone isolating tests, measured using method of adjustment. Selected thresholds were verified with a spatial, two-alternative forced-choice procedure. The adapting background was white, with luminances ranging from 0.6 to 4.0 log Trolands (a maximum near 3200 cd/m2, bleaching about 1/3 of the L and M cone pigment). Our observers are slightly more sensitive to decrements than increments (about 0.1 log units), for both achromatic and L-cone tests, and to L-cone tests than to achromatic tests (about 0.6 log cone contrast units), over the entire adapting range. Both increment and decrement thresholds follow the Stiles template, approximating Weber’s law except at the lowest adapting levels. The achromatic tvi’s, for both increment and decrement tests, are, on average, slightly steeper than the L-cone tvi’s. In addition, decrement tvi’s are steeper than the increment tvi’s, indicating greater effects of light adaptation for the decrements, which may be due to differences in the effects of light adaptation in ON and OFF pathways.

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