

Contrast Sensitivity (Threshold vision)



Observers

- Color normal observers
- 20 young participants; mean age: 33 years
- 20 older participants; mean age: 65 years

Psychophysical task

- 4AFCQUEST-based detection task
- Viewing distance: 91 cm
- Display size: 12.5 x 9.4 visual degrees

Stimuli

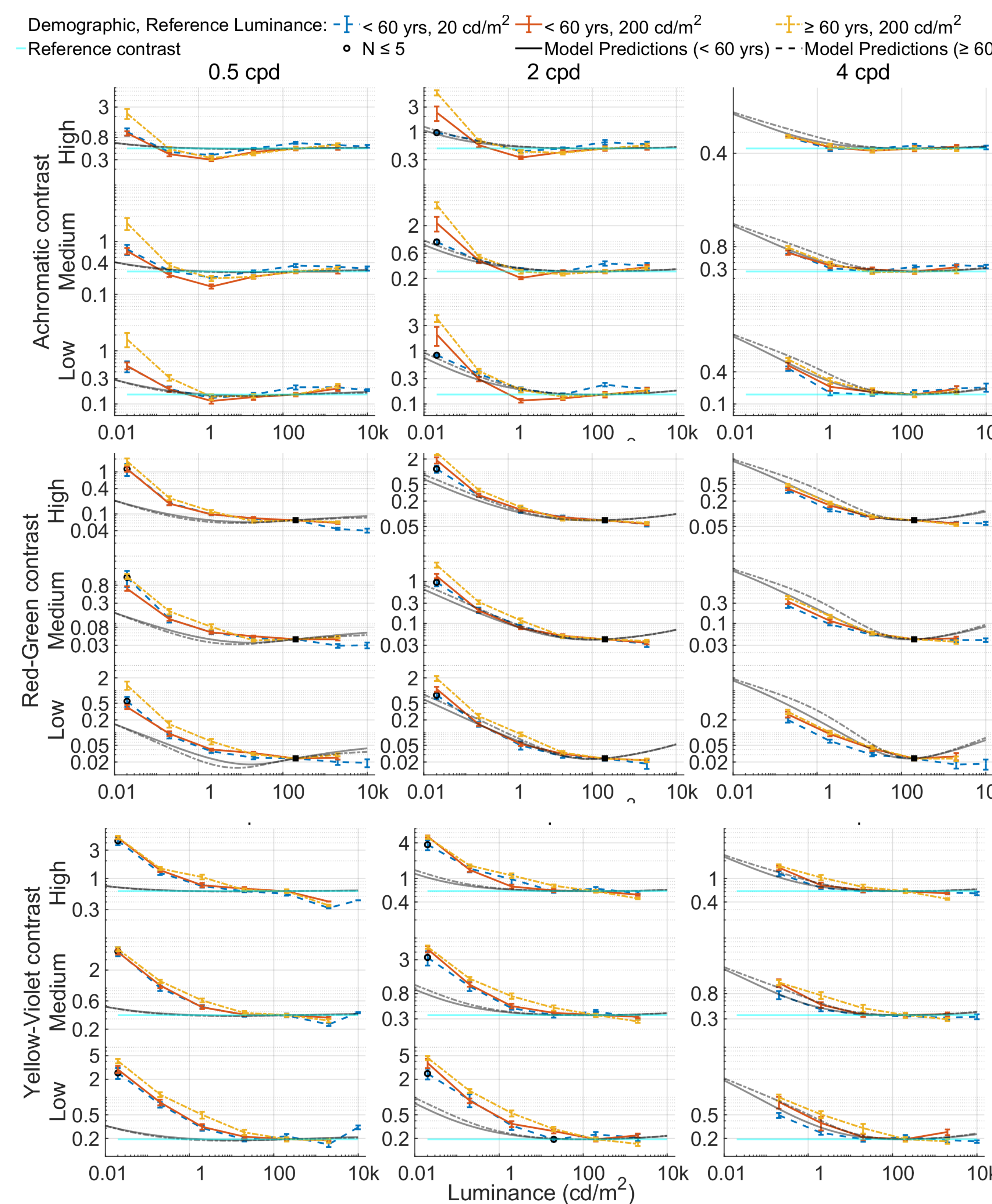
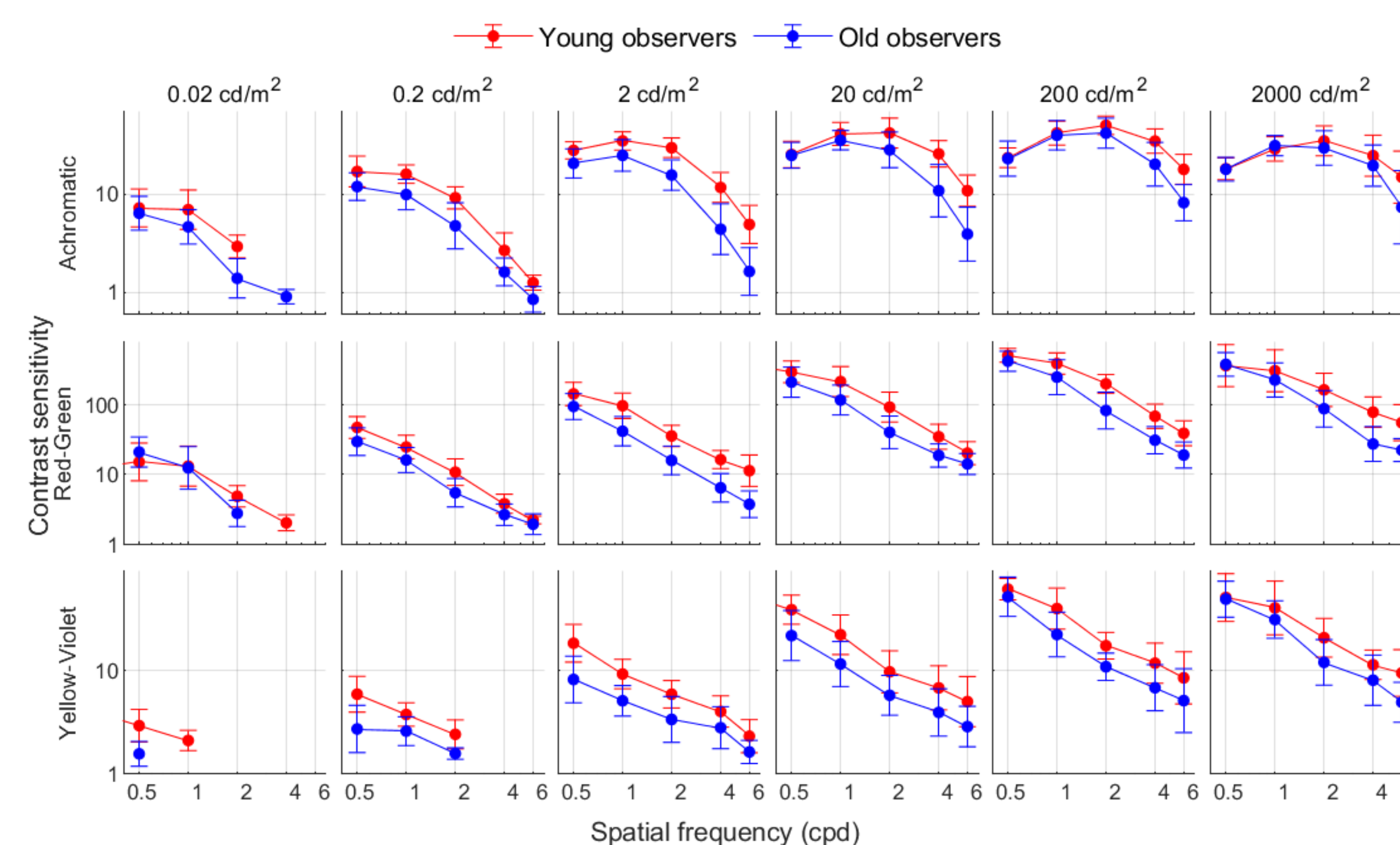
Fixed-cycle Gabor patches, spatial frequencies: 0.5, 1, 2, 4, and 6 cpd modulated along (1) Black-white; (2) Red-green; (3) Lime-Violet directions at 0.02, 0.2, 2, 20, 200, 2000, and 7000 cd/m²



FINDINGS

- Age-dependent decline in achromatic contrast sensitivity (Fig. 1, row 1) becomes larger with increasing spatial frequency.

- Chromatic contrast sensitivity declines with age for luminance levels up to 20 cd/m² for all spatial frequencies (Fig. 1, rows 2, 3).
- Measurement variations (error bars in Fig. 1) are higher for older age group as individual variability becomes more pronounced with advancing age.
- Highest differences between achromatic sensitivities of the two age groups is recorded in mesopic range.



Contrast Matching (Suprathreshold vision)

Observers

- Color normal observers
- 27 younger participants; mean age: 28 years
- 20 older participants; mean age: 65 years

Psychophysical Task

- Test stimuli displayed on an HDR screen at multiple luminance levels; reference stimuli displayed on a SDR screen at a fixed luminance level
- Observers adjust the contrast of test stimuli haplo-scopically such that the two contrasts appear similar

Stimuli

- Reference stimuli: 200 cd/m² (older group), 200 & 20 cd/m² (younger group), 0.5, 2, and 4 cpd, in 3 color directions
- Test stimuli: Each reference stimulus matched with equivalent HDR test stimuli at 0.02, 0.2, 2, 20, 200, and 2000 cd/m²



FINDINGS

- Test contrasts at different luminance levels matched with the same reference stimulus are plotted as a contour of matching contrasts (Fig. 2).
- Despite physiological changes with age in human visual system, contrast matching curves from older and younger observers show little differences.
- Human visual system compensates for age-related changes with changes in neural mechanisms at suprathreshold levels.

Ageing affects threshold vision at low luminances and high spatial frequencies.

Ageing has little impact on supra-threshold photopic contrast vision.