

# Contrast sensitivity function differentiates between myopia control spectacle lens designs with glare and luminance manipulations

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## Abstract

**Purpose:** To assess the effect of glare and the luminance level of a contrast sensitivity function assessment test to differentiate between myopia control spectacle lens designs.

**Methods:** Twenty myopic (MSE -4.25D to -0.50D) adults (16F); aged 18-30 years, rendered functionally emmetropic with spherical soft contact lenses wore, sequentially, lenses with Diffusion Optics Technology (DOT), Defocus Incorporated Multiple Segments (DIMS), Highly Aspherical Lenslets (HAL) and standard single vision plano spectacle lenses in a prospective, single-visit, double-blind, four-way randomised crossover study. Contrast sensitivity function was assessed monocularly at 40cm with the tablet format Aston Contrast Sensitivity test in photopic condition, with strip lights attached either side of the tablet (115,000 cd/m<sup>2</sup> at an angle of  $\pm 12.3^\circ$ ) and under mesopic conditions, assessed viewing through the lens centre and/or periphery (lens decentred 10mm from the optical centre).

**Results:** The addition of a glare source ( $F=6.273$ ,  $p=0.022$ ), or decreasing the luminance from photopic to mesopic ( $F=103.264$ ,  $p<0.001$ ) reduced contrast sensitivity. Contrast sensitivity was lower when viewing through the peripheral treatment zone compared to the central clear zone ( $F=54.092$ ,  $p<0.001$ ), both with glare and a reduction to mesopic luminance (both  $p<0.001$ ) with all the lenses tested. There was no difference between the lenses worn with glare ( $F=3.088$ ,  $p=0.055$ ), but there was with a reduction to mesopic lighting levels ( $F=6.095$ ,  $p=0.005$ ); for the central clear zone, the standard single vision lens performed better than the three myopia control lens designs ( $p<0.001$ ), but for the peripheral treatment zone, the DOT lenses performed similarly to the standard single vision lenses ( $p=0.537$ ), and better compared to the HAL and DIMS lenses ( $p<0.01$ ).

**Conclusion:** The addition of glare and reducing the luminance to mesopic levels allowed the contrast sensitivity function to differentiate between single vision and within myopia control spectacle lenses.

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