

Evaluation of the Visual Performance of Two Modified Defocus Incorporated Multiple Segments (DIMS) Spectacle Lens Designs

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Purpose

This study evaluates the visual performance of two spectacle lenses (D1 and D2) with, different central optical zones, increased defocus power and increased area of myopic defocus zone, based on the DIMS spectacle lens design.

Methods

In a prospective crossover study, participants wore four spectacle lens designs (DIMS, D1, D2 single vision (SV)) for one week each in random order. Spectacles were ordered according to the cycloplegic subjective refraction. The subjects were assessed for visual acuity in high and low contrast with different luminance levels, heterophoria, stereopsis and accommodation function. The methods of measurement followed the previous DIMS RCT and visual performance measurement procedures. A questionnaire was used to evaluate symptoms in terms of frequency and intensity for each spectacle lens design at the end of one-week wear. Subjects needed to score the frequency (0 = Never; 1 = Seldom; 2 = Sometimes; 3 = Often; 4 = Always) and the intensity (0 = Not at all; 1 = Mild; 2 = Moderate; 3 = Severe; 4 = Very Severe) of the listed symptoms if any. Apart from heterophoria and stereopsis, data from the right eye were analysed using paired t-tests and repeated measures ANOVAs, with post-hoc tests as needed.

Results

Thirty-eight subjects completed the study. No significant differences in distant VA were observed between the spectacle lens designs. However, D2 spectacle lens design, with a smaller central optical zone, showed slightly reduced near VA (0.04 logMar) under high contrast (room lighting, post-hoc pairwise test, $p < 0.05$) and low contrast (dim lighting, post-hoc pairwise test, $p < 0.01$) when compared to SV spectacle lens. Most visual functions showed no significant differences ($p > 0.05$). Symptoms like difficulty focusing were reported more frequently with DIMS, D1, and D2 spectacle lenses than SV ($p < 0.01$), though overall symptoms frequency was similar.

Conclusions

Increase myopic defocus power and defocus zone ratio maintained comparable visual performance to DIMS and SV spectacle lenses for most visual functions but slightly reduced near VA was found in the D2 lens design. These findings suggest potential for tailored lens designs to optimize myopia control.