

The short-term effects of spectacle-based myopia management interventions on dynamic vision

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Purpose: To explore anecdotal reports of difficulties with dynamic vision whilst wearing defocus-based myopia management spectacle lenses by determining the short-term effect of myopia management spectacle lenses on measures of dynamic vision in adults.

Methods: Twenty myopic (MSE -4.25D to -0.50D) adults (16F); aged 18 to 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 single vision (SV) plano spectacle lenses in a prospective, single-visit, double-blind, four-way randomised crossover study. To ascertain differential effects of eye gaze, measures of dynamic vision were taken through the lens centre and periphery (decentred 10 mm from the optical centre). Viewed monocularly, participants completed three tasks: 1) Hart Chart dynamic vision test; 2) Circles Search test, and 3) MNRead.

Results: Using the Hart Chart test, all four lenses were comparable in terms of error score ($p=0.53$), whilst pairwise comparisons of distance-near cycles per minute were invariant after Bonferroni correction (all $p>0.008$). Similarly, for task duration, all lenses performed equally well with the Circles Search test through the lens centre ($p=0.68$) and the lens periphery ($p=0.35$). Peripheral near acuity threshold (NAT), maximum reading speed (MRS) and critical print size (CPS) were all similar between the SV, DOT and HAL lenses (all $p>0.05$), with the DIMS lens demonstrating a significantly higher (i.e., worse) NAT (by 0.11 ± 0.02 logMAR compared to SV, $p<0.001$) and a larger (i.e., worse) CPS than SV ($p<0.001$), DOT ($p<0.01$) and HAL ($p<0.001$) lenses.

Conclusion: Generally, the dynamic vision through all three myopia management lenses performed well compared to the SV control for both the lens centre and periphery. Despite anecdotal reports, the selected tests have not been able to quantify differences in dynamic vision. Clinicians should, however, be cognisant of differences in reading performance between lenses, typically through the lens periphery, and should consider visual requirements when discussing treatment options with parents and children. Further research is required to determine the long-term impact of myopia management interventions on dynamic visual function in children.

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