

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

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Background/Purpose

Defocus Incorporated Multiple Segments (DIMS) spectacle lenses have been proven effective in slowing myopia progression, with no significant impact on visual functions.¹⁻³ To further enhance myopia control efficacy, we have modified the DIMS spectacle lens, resulting in two new designs: the D1 and D2 spectacle lenses. Before evaluating their effectiveness in controlling myopia, we first assessed their impact on visual performance.

This study evaluates the visual performance of two spectacle lenses, D1 and D2, which feature different central optical zones, increased defocus power, and an expanded myopic defocus zone, based on the DIMS spectacle lens design.

Methods

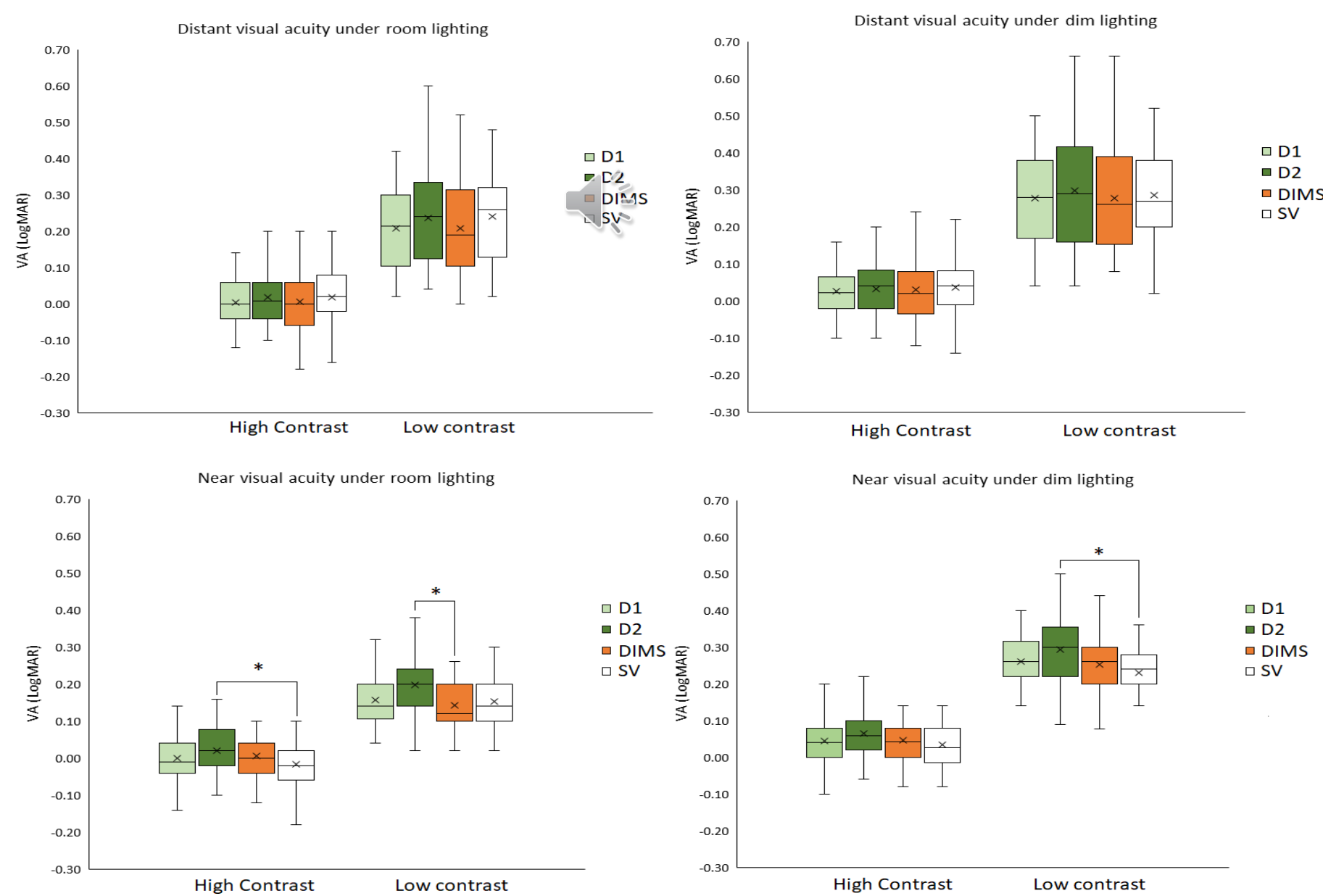
- 38 myopic schoolchildren (18 males and 20 females 10.5 ± 1.8 years of age; SER -2.63 ± 1.09 D) were enrolled.
- Participants wore four spectacle lens designs—DIMS, D1, D2, and single vision (SV)—for one week each in a randomized order. The spectacles were prescribed based on cycloplegic subjective refraction.
- Visual acuity was assessed under high- and low-contrast conditions with varying luminance levels, along with heterophoria, stereopsis, and accommodation function.
- At the end of each one-week trial, participants completed a questionnaire evaluating symptom frequency and intensity for each lens design. Frequency was rated on a scale from 0 (Never) to 4 (Always), while intensity was scored from 0 (Not at all) to 4 (Very Severe).

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- All authors declare no commercial relationship except Lam CSY and To CH are inventors of the DIMS spectacle lens and received royalties from HOYA, Qi H, Hasegawa K and Matsuoka S are HOYA employees.

Results

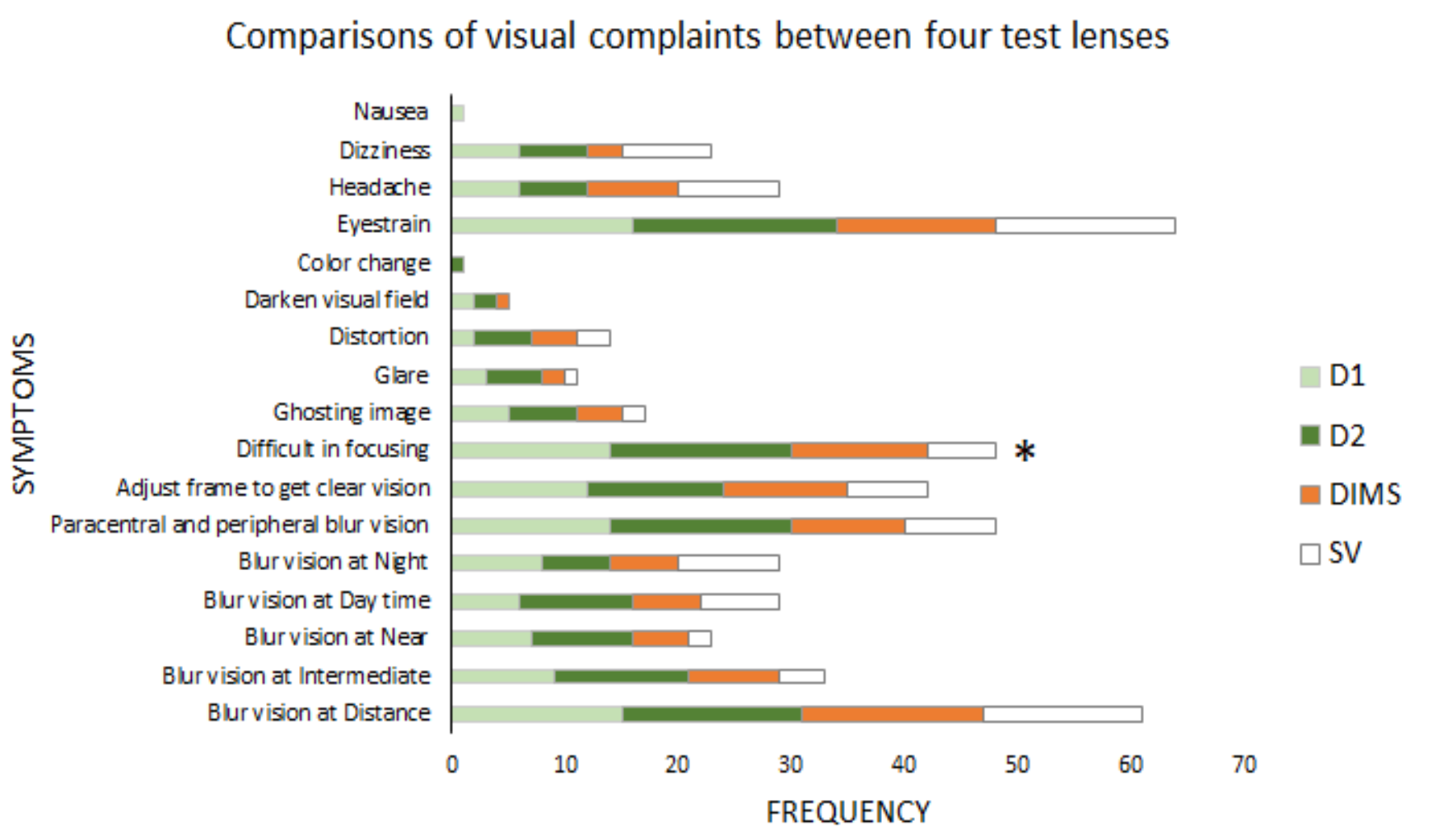
No significant differences in distance visual acuity (VA) were observed among the spectacle lens designs. However, the D2 spectacle lens, which features a smaller central optical zone, showed a slight reduction in near VA. Specifically, it exhibited a 0.04 logMAR decrease under high contrast (room lighting, post-hoc pairwise test, $p < 0.05$) and a 0.06 logMAR decrease under low contrast (dim lighting, post-hoc pairwise test, $p < 0.01$) compared to the single-vision (SV) spectacle lens.



Discussions & Conclusions

Increasing myopic defocus power and the defocus zone ratio maintained visual performance comparable to DIMS and SV spectacle lenses across most visual functions. However, the D2 lens design exhibited a slight reduction in near VA. These findings highlight the potential for tailored lens designs to optimize myopia control.

Most visual functions showed no significant differences ($p > 0.05$). Still, symptoms such as difficulty focusing were reported more frequently with DIMS, D1, and D2 spectacle lenses compared to SV ($p < 0.01$). Despite this, the overall frequency of symptoms remained similar across all lens designs.



References

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