

The Impact of OZD on Visual Performance and Corneal Topography in Orthokeratology

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Introduction

Modern orthokeratology (OrthoK) lens construction has evolved in recent years to maximize the myopia controlling effect in children. The use of smaller back optical zone diameters (OZDs) has proven to further decrease axial growth in the young progressing myope.^{1,2} However, approximately 15% of OrthoK patients are adults.³ This study set out to better understand the visual response to a range of optical zones fit on adult eyes. The purpose of the following study was to evaluate 3 different back OZDs and how they impact central corneal topography and visual performance, specifically objective VA, subjective clarity, and subjective visual ghosting.

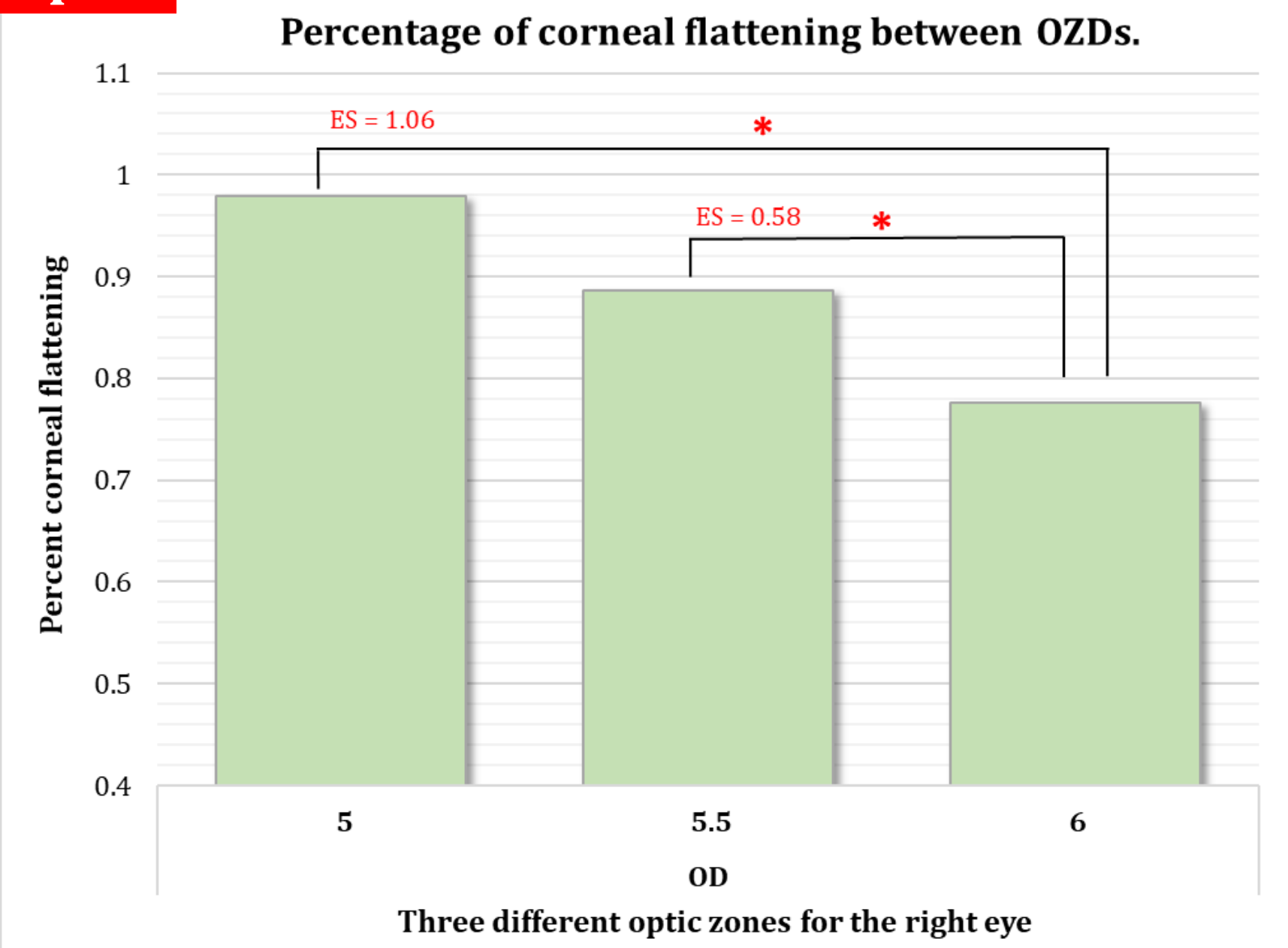
Methods

Twelve adult subjects with myopia -1.00 to -5.00 and less than -1.50 D of astigmatism were recruited from Pacific University College of Optometry. Subjects were fit with 3 different OrthoK lenses (Moonlens, Art Optical Grand Rapids, MI), each with a different back optic zone diameter (5.0mm, 5.5mm, and 6.0mm). Each lens diameter was worn for 2 weeks on both eyes. A 2-week washout period of no lens wear occurred between each optic zone. Corneal topography, Snellen VA, subjective visual clarity (via questionnaire), and subjective visual ghosting (via questionnaire) were measured. An effect size (ES) that was greater than or equal to 0.5 was considered clinically significant.

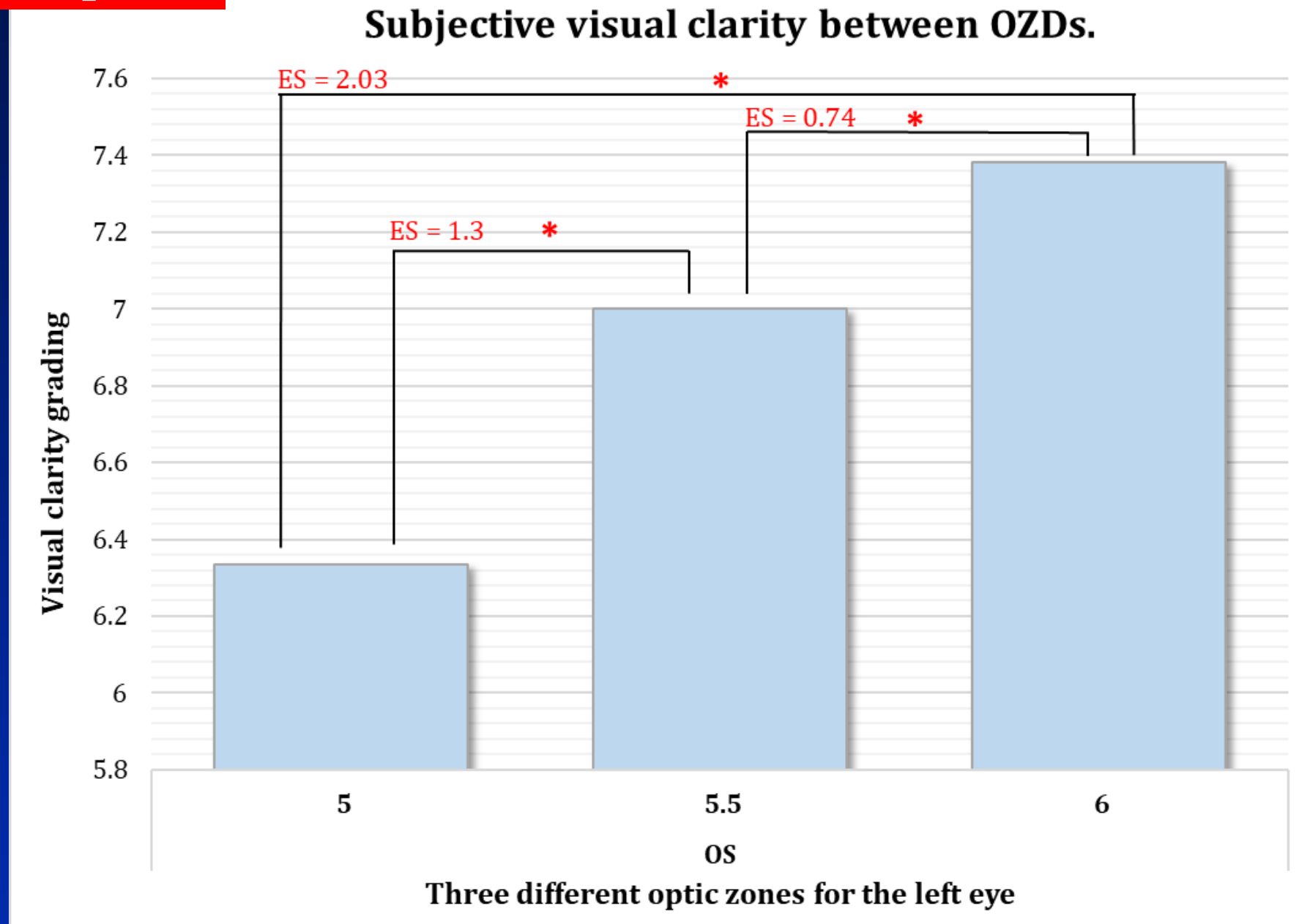
Results

The main results can be seen in Graphs 1-3. **Graph 1** shows that the smaller 5.0 mm OZD flattened the central cornea more than the larger 6.0 mm OZD ($ES = 0.58$, 1.06). **Graph 2** demonstrates the smaller OZDs had worse visual clarity as experienced by the subject than the larger OZDs ($ES = 1.3$, 0.7 , 2.03). The smaller OZDs produced more visual ghosting for the subjects as seen in **Graph 3** ($ES = 1.2$, 1.4 , 1.1 , 1.7 , 2.8). All 3 OZDs reached a Snellen VA between 20/20 and 20/25 at the end of the 2 weeks.

Graph 1

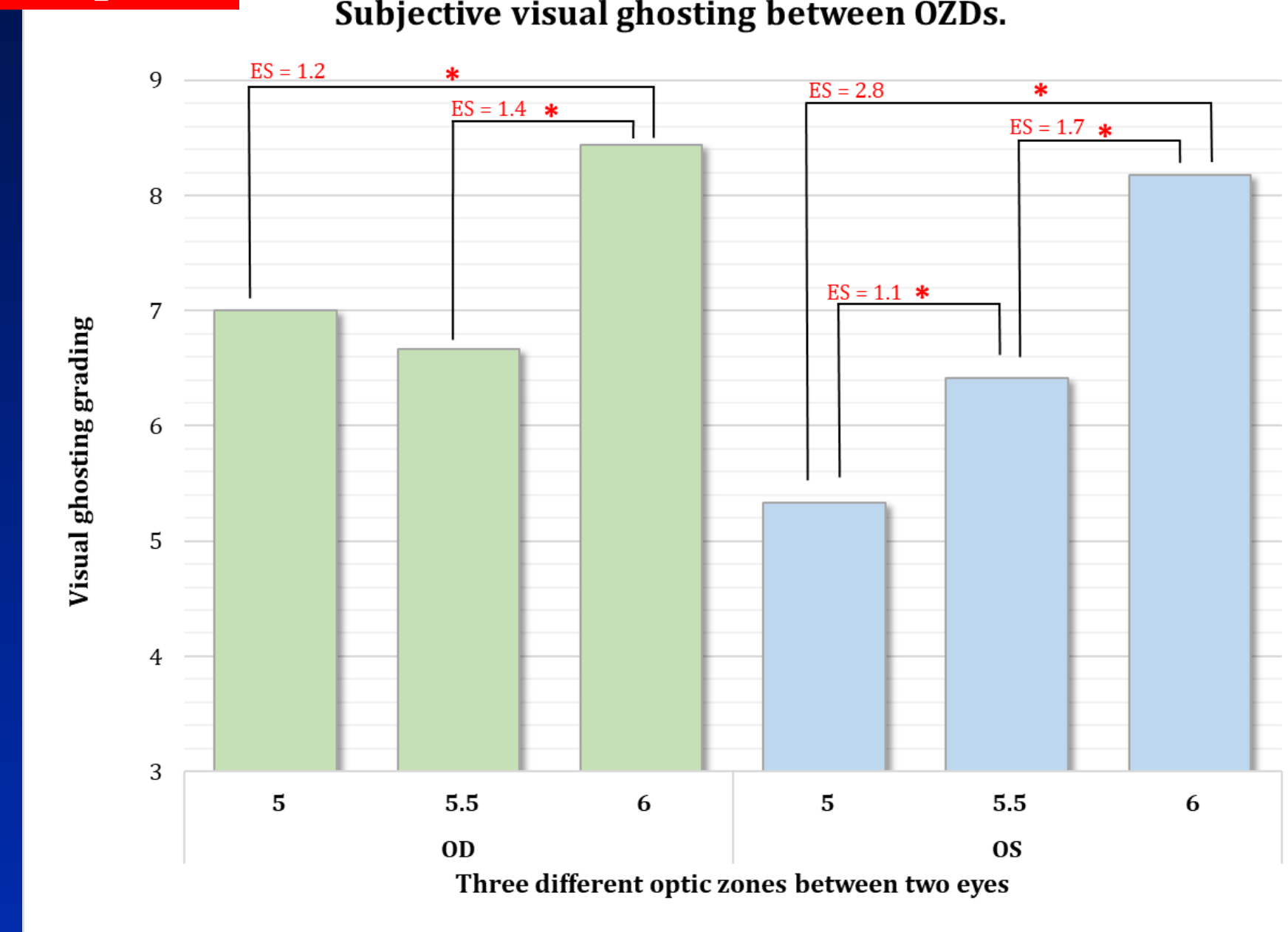


Graph 2



1 = Blurriest; 10 = Clearest

Graph 3



1 = Most Ghosting; 10 = No Ghosting

Discussion

The results partially supported the hypothesis that a smaller OZD would produce more corneal flattening, but more visual disturbances via clarity and ghosting. More central corneal flattening is inversely correlated with the mid-peripheral corneal steepening.⁴ While this mid-peripheral steepening is beneficial in the myopia control discussion, it also can affect the visual performance of the OrthoK lens wearer. This is one of the first studies to directly measure subjective visual performance with different back OZDs. There were variable results of significance between the two eyes measured. Future similar studies should consider a larger sample size for a more robust and significant effect.

Conclusion

When fitting OrthoK lenses, this study suggests an adult patient's visual quality would be improved with a larger diameter back optic zone. Patients experience subjectively clearer vision and less ghosting the larger the back optic zone diameter of an orthokeratology lens.

References

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2. Pauné, J., Font, S., Rodríguez, L., & Queirós, A. (2021). The Role of Back Optic Zone Diameter in Myopia Control with Orthokeratology Lenses. *Journal of Clinical Medicine*, 10(2), 336.
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