SHORT-TERM EFFECTS OF MYOPIA CONTROL CONTACT LENSES ON BINOCULAR CONTRAST SENSITIVITY AND PUPILLARY RESPONSES

Merve Cetin [1] , MD, FEBO | Tuncay Kusbeci [1,2],MD, Prof. | Atılım Armagan Demirtas [1,2], MD, Assoc.Prof., FEBO | Mehmetcan Turgut [1] , MD
[1] Department of Ophthalmology ,Izmir City Hospital, İzmir, Türkiye
[2] Department of Ophthalmology, Izmir Faculty of Medicine University of Health Sciences Türkiye, Izmir, Türkiye

INTRODUCTION

Myopia-control soft contact lenses are effective in slowing myopia progression. However, their effects on functional visual performance remain less clear. Contrast sensitivity may provide more clinically relevant information than visual acuity alone.

PURPOSE

To compare the short-term effects of Acuvue Abiliti™ One Day and Acuvue Oasys 1-Day on binocular contrast sensitivity. To evaluate pupillary responses and their relationship with contrast sensitivity.

METHODS

In this prospective repeated-measures study, 20 myopic participants (40 eyes) underwent binocular static and dynamic contrast sensitivity testing under spectacle-corrected, Acuvue Oasys 1-Day, and Acuvue Abiliti™ One Day conditions, and pupillometry under habitual, Oasys 1-Day, and Abiliti conditions, using the Metrovision Vision Monitor platform.

RESULTS

Acuvue Abiliti™ One Day was associated with reduced binocular static contrast sensitivity, particularly at higher spatial frequencies, with significant differences at 3.6, 7.6, and 15.1 cpd; the greatest reduction was observed at 15.1 cpd (p = .004). A more pronounced effect was found for binocular dynamic contrast sensitivity, which was significantly lower with abiliti than with Oasys 1-Day at all spatial frequencies of 1.2 cpd and above. (Figure 1) Under photopic, mesopic and scotopic conditions, pupillometric diameter parameters were generally similar between lens conditions. No significant associations were found between contrast sensitivity and pupil diameter. However, dynamic contrast sensitivity showed significant positive correlations with pupillary response velocity. (Figure 2)

FIGURE 1 — COMPARISON OF BINOCULAR STATIC (TOP) AND DYNAMIC (BOTTOM) CONTRAST SENSITIVITY ACROSS LENS CONDITIONS. THE REDUCTION WITH ABILITI WAS MORE LIMITED IN STATIC TESTING BUT MORE PRONOUNCED IN DYNAMIC TESTING.

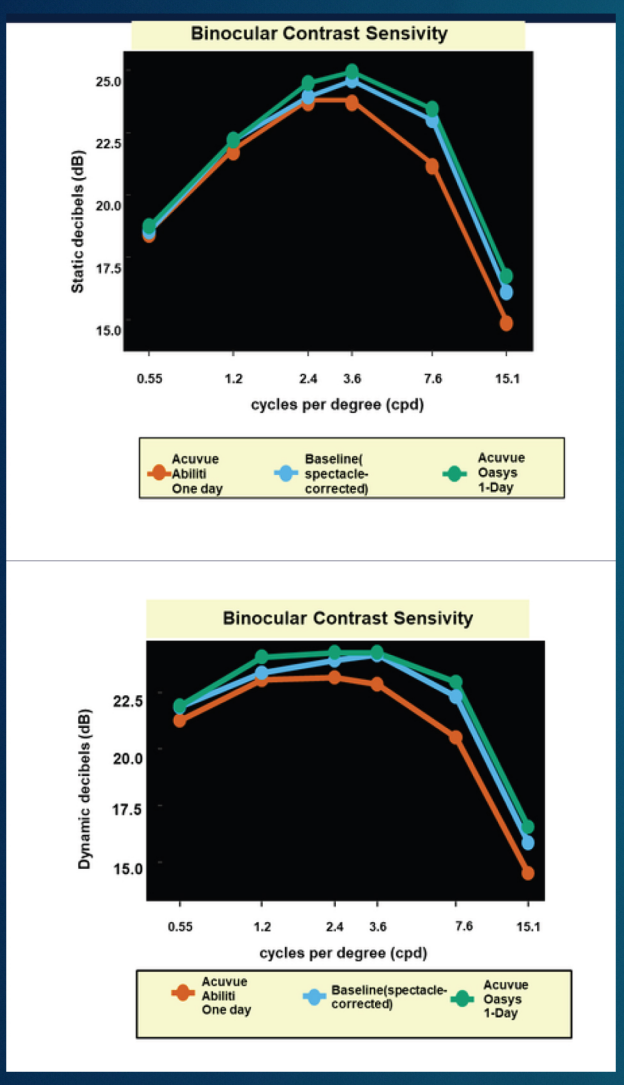

FIGURE 2 — KEY FINDINGS

Parameters	Results	Significance
Static Contrast Sensivity	Acuvue Abiliti™ One Day lower at 3.6, 7.6, 15.1 cpd	p = 0.001, <0.001, 0.004
Dynamic Contrast Sensivity	Acuvue Abiliti™ One Day lower at 1.2–15.1 cpd	all p ≤ 0.004
Pupil diameter	No significant relationship with contrast sensivity	all p > 0.05
Pupillary velocity	Positive relationship with dynamic contrast sensivity	p < 0.05

DISCUSSION

Acuvue Abiliti™ One Day was found to have a greater impact on dynamic contrast sensitivity than static contrast sensitivity. This suggests that dynamic testing may be more effective at identifying functional differences in visual performance between different lens designs. Previous ringfocus studies have emphasised the need to balance the efficacy of myopia control with visual performance. In our study, however, these changes were not explained by pupil size. Instead, significant associations were found between contrast sensitivity and pupillary response velocity.[1,2,3]

CONCLUSION

The Acuvue Abiliti™ One Day lens was found to reduce binocular dynamic contrast sensitivity and decrease high-frequency static contrast sensitivity. While myopia-control lenses are effective, the possibility of contrast sensitivity loss should also be considered.

REFERENCES

1) Cheng, X., Xu, J., & Brennan, N. A. (2022). Randomized Trial of Soft Contact Lenses with Novel Ring Focus for Controlling Myopia Progression. Ophthalmology science, 3(1), 100232.

2) Wu, J., Li, X., Huang, Y., Luo, Y., Zhang, S., Cui, Z., Hou, F., Bao, J., & Chen, H. (2024). Effect of myopia-control lenses on central and peripheral visual performance in myopic children. Ophthalmic & physiological optics : the journal of the British College of Ophthalmic Opticians (Optometrists), 44(2), 249–257.

3) Walline, J. J., Jones, L. A., Rah, M. J., Manny, R. E., Berntsen, D. A., Chitkara, M., Gaume, A., Kim, A., Quinn, N., & CLIP STUDY GROUP (2007). Contact Lenses in Pediatrics (CLIP) Study: chair time and ocular health. Optometry and vision science : official publication of the American Academy of Optometry, 84(9), 896–902.