Subjective and Objective Performance of Antireflective Lenses During Daily Activities

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Introduction

Antireflective (AR) lenses are designed to reduce reflections and secondary images produced by the spectacle surface. As described by Fresnel’s formula (FP[λ][hv]) approximately 60% of incident light is transmitted to the observer, whereas the remaining 40% of the incident light is reflected back from the lens surface. Light reflection is greater for polycarbonate (p=0.85) at approximately 10.2% then polycarbonate with the reflection of faint images called ghost images and AR glue. AR coatings applied to transparent surfaces are able to reduce the surface reflections to less than 1% of the incident light. Ideal images are reduced; glass is reduced, and objects appear to be more brightly lit thru AR coated lenses.

Two participants used their glasses primarily for intermediate and near activities and were tested for acuity. The majority of enrolled subjects used their glasses on a full time basis and were tested for acuity and contrast sensitivity alone using the Freiburg Visual Acuity & Contrast Test.

Results:

When comparing comfort and clarity under different conditions (daytime work and driving, night driving, low light driving, and when using a desktop computer or a handheld device), the subjects rated the AR lenses as being very good to excellent, while the non-AR lenses were rated good to very good (p<0.01).

Upon completion, the subjects were more likely to recommend or repeat the AR coated lenses, while 78% of the subjects chose to keep the AR lenses as their preferred pair.

Following consent, each subject was examined and fit for spectacles of the same type habitually worn (i.e. single vision, bifocal, progressive lenses). Two nearly identical pairs of glasses were made for each subject. One pair had polycarbonate lenses with scratch coating (non-AR), the other pair contained polycarbonate lenses with scratch coating and a premium AR coating (AR). Each pair of glasses was dispensed with identical cleaning instructions and supplies.

The glasses were dispersed for normal use for two weeks, using a randomized, crossover, double-masked design.

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Conclusion

The majority of subjects displayed a clear preference for AR lenses over non-AR lenses. Subjectivity the AR lenses provided better clarity and comfort when performing normal daily activities and tasks including driving, working at a computer and using a handheld device.

Objective glare was reduced thru the AR lenses when compared to non-AR lenses, but contrast sensitivity was not significantly improved. Recommending AR lenses may benefit the wearer by reducing glare, as well as enhancing comfort and acuity.

Future Directions

Our study had no disposition toward glare difficulty (no presence of cataract etc) yet still performed better using AR-coated lenses. A study incorporating subjects known to have increased glare difficulty would provide more information on benefits in other groups.

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References


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