A Comparative Analysis of Online Progressive Addition Lenses

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Introduction

Online purchasing of eyewear has gained a reputation of offering quick delivery and low prices. This investigation evaluates the most difficult lenses to fit, progressive addition lenses (PALs). Even brick and mortar eye care providers are challenged to precisely fit this category of lens with the patient sitting in front of them at a practice. The extreme sophistication of this lens type requires critical measurements that are spot on.

The driving force behind this research is to determine the quality of the finished eyewear and how might a traditional brick and mortar eye care provider compete with this new avenue to purchase spectacles for advanced presbyopia.

Methods

- 35 pairs of PAL eyewear were ordered from 11 randomly selected online providers.

OD: -1.25 -1.50 x095
OS: -1.00 -3.25 x095
Add: +2.25

- Ordered eyewear as identical as possible
- Three main areas evaluated: ease of order, cost and quality.
- Each set of eyewear was assessed in an identical fashion with all criterion having a point value recorded in a Microsoft Excel program for analysis.
- To analyze the fitting cross location, a ratio of each lens was calculated. The ratio was calculated using the formula listed below:

$$\text{Ratio} = \frac{\text{(Datum line in mm + Distance of fitting cross above datum line in mm)}}{\text{Frame B Measurement}}$$

- Ratio's for each pair of lenses is displayed in Figure 2. A simple linear regression of the data results in $R^2 = 0.1054$ while the 95% confidence interval is 0.0146. The ratio of all pair of lenses was then averaged for an average ratio of 0.610. Using this information, one can predict the ocular center height on any PAL with fair certainty using the following formula:
  Vertical Pupil Position (mm) = B measurement x 0.61

Results

Ease of Ordering:
- Overall smooth but no segment height asked.

Assessment of Cost:
- Average actual cost was greater than the advertised cost.

Analysis of Spectacle Data:
- 54% rejection rate
- The most common overall missed standard was the pupillary distance (PD).

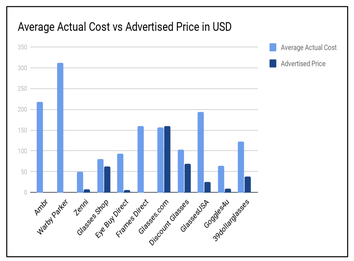

Figure 1. Average actual cost vs. advertised price in USD

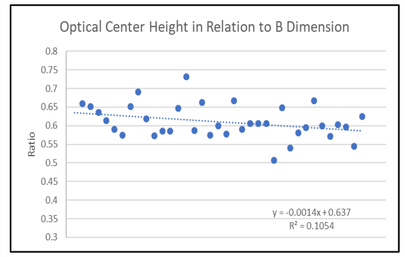

Figure 2. Optical center height in relation to B Dimension

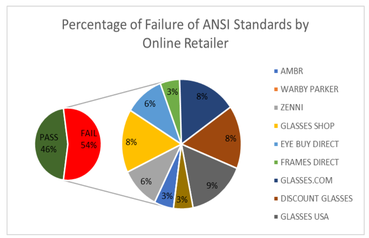

Figure 3. Percentage of failure of ANSI standards by online retailer

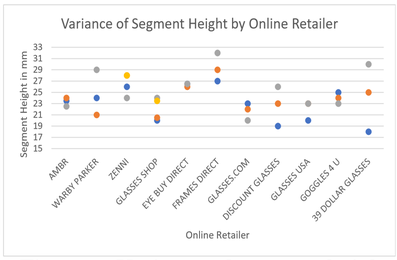

Figure 4. Variance of segment height by online retailer

Conclusions

Patients ordering PALs online should be getting the same quality and accuracy as when ordering from a brick and mortar store. 54% of the glasses the patient receives will have been made incorrectly.

For eye care providers, the accuracy of the prescriptions is of the utmost concern, but it is also important to understand the ease of ordering online and cost to the patient.

It is also worth noting that many of the online retailers offered anti-reflective coatings free with all their lenses—typically a premium add-on in brick and mortar locations. This popular coating provides an improved patient experience at a price much less than can be acquired by the eye care provider themselves. This fact raises concerns about how traditional eye care providers can compete with online retailers in pricing and add-ons.

The fitting cross location has upmost significance. In brick and mortar locations, patient's will often bring in online purchased eyewear to be adjusted. Without knowing the location of the fitting cross, a brick and mortar eye care provider cannot properly adjust or evaluate the PAL. An electronic system which contains this data is available free online from the Vision Council of America. This system, the Electronic Progressive Identifier Catalog (EPIC), uses the engraved markings on a lens to identify the lens and its predetermined parameters. However, upon further analysis, not one lens that was delivered through this study had lens markings that were identifiable through the EPIC system. Therefore, before the calculated formula was determined through this analysis, it was nearly impossible to know where the fitting cross is located. This omittance by the online retailers is a disservice to the patients, as they will likely never be able to obtain a proper adjustment. Brick and mortar eye care providers may now use the data from this qualitative analysis to better adjust and evaluate their patient's online-ordered PAL lenses.

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