Abstract

The speed of prism movement in standard optometric testing has not been well documented nor standardized. 15 experts in the field who routinely perform base in and base out ductions as part of their visual analysis had their testing sequences recorded with a live patient. The average rate of speed of movement of the prisms was 2.98 prism dipters total or 1.49 prism dipters per eye per second.

Methods

Clinicians were recruited from the Conference on Clinical Vision Care and asked to participate in the study. Subjects were blinded to the purpose of the study so that they would not alter either their standard routine or the speed they moved the prisms during testing. The subjects were asked to start their analytical testing from having completed their subjective. They were asked to conduct their testing routine including all tests or probes that they normally would do. The first author sat as the subject for all of the testing and responded naturally as he would as an actual patient. A video recorder was set up to give a clear view of the dials on the phoropter to allow for analysis later of the speed of movement of the prisms during standardized testing. There was no time limit on how long they could take or how many tests they could perform.

Video Validation

Prior to testing with live subjects we needed to validate the video recording process as keeping accurate time. We recorded the iPhone stopwatch screen for three full minutes. The video was then transferred into the Corel Pinacle Studio 16 video editing software and the timeline was compared to the time shown on the iPhone screen face. This showed that during the transfer into the video editing suite that no alterations in timing were made.

Changes in frame rates can cause a video sample to have a different time basis. The sample rates were found to be correct. The average rate of speed of movement of the prisms was 2.98 prism dipters total or 1.49 prism dipters per eye per second.

The video segments when each subject used prisms to perform vergence testing were analyzed. The rate of prism addition was calculated using the total amount of prism and the time to move that far. One subject (Doctor 9) included only one vergence test in their routine. Most performed a minimum of a base out and base in vergence to break and recovery at distance and near. One subject (Doctor 12) did repeated testing in some areas including as many as 11 individual binocular prism probes during their analytical sequence. The average rate of movement of the prisms was 1.47 prism dipters (PD) per second per eye or 2.96 PD per second binocularly with a standard deviation of 0.84 PD. The range was from 0.83 PD per second per eye to 2.24 PD per second per eye or 1.66 PD total per second to 4.48 PD total per second.

Discussion/Conclusion

The testing guide for participants in the Convergence Insufficiency Treatment Trials (CITT) recommends changing base in and base out demands when testing both positive and negative relative vergence at two prism dipters per second. They used prism bars rather than Risley prisms. This study showed that expert optometrists who perform smooth prism vergences regularly move the prisms at a pace 50% faster than this. The results from the study will be helpful to faculty teaching the mechanics of testing to new students. Moving too fast or too slow has its consequences and this should help give faculty and students alike an evidence-based recommendation. Subsequently a number of tests will be conducting collecting eye movement data during duction and phoria testing and these results will be used to program the prism moving device to mimic the testing done by experts in the field.

References

1. CITT Chapter 4 Assessment of Study Measures page 4-5 http://optometry.osu.edu/research/citt/epi/1004_CITT_Chapter4.pdf