VISIONIX

# BETTER DATA, IMPROVED EFFICIENCY

## A dynamic binocular wavefront refraction system provides precise refraction in less time

The most commonly performed test in ophthalmology practices is the measurement of refractive error type and degree.[1-2] Automated refraction is often performed first, with results being refined and verified with manual refraction.[1-2] Many of the tools currently used for assessing refractive error are technologically outdated, impractical, and associated with inconsistent measurements.[3] For example, some commonly used conventional refractors provide more negative values of mean spherical equivalent when compared with subjective refraction, often because of stimulation during measurement.[2] The best refractive systems should combine state-of-the-art objective technology with classical subjective refraction methods.[1] Eye Refract offers a rapid, dynamic binocular measurement of refraction using wavefront technology to deliver efficient, consistent, and precise results.

Many automated refraction instruments used in everyday practice work in a monocular, closed-view environment, which can result in instrument myopia;[4] but, binocular, open-view, automated refraction instruments resolve over-accommodation.[1] The Eye Refract system uses revolutionary refraction technology to combine a binocular wavefront aberrometer with a phoropter to perform dynamic refraction.[2] Because the objective refraction is obtained binocularly through a phoropter, a more precise measurement is provided compared with standard monocular autorefractor use by combining an objective refraction measurement with a simultaneous subjective lens adjustment.[2]

The Eye Refract System from Visionix

### SUBJECTIVE VERSUS OBJECTIVE REFRACTION

Subjective refraction is the gold standard for refractive error assessment.[1-2] Various commercially available autorefractors are used in ophthalmology to provide an objective refraction of reference prior to performing the subjective refraction, such as conventional, open-field, or wavefront-based refractors.[2] Numerous studies have compared the efficacy of various autorefractors to that of subjective refraction, with most demonstrating significant differences in spherical equivalent and cylinder component between subjective refraction and autorefraction and varying widely in specificity.[2,5-6] A vision score should be consistent and reproducible; unfortunately, with subjective refraction, the same patient could have varying results in different sittings on the same day.[3] Therefore, variability in subjective refraction may be another likely source of disagreement between objective and subjective refractions.[4]

### WAVEFRONT TECHNOLOGY

Taking this type of variability into consideration, the Eye Refract system was designed to include an open-field, wavefront-based refractor that demonstrated similar efficacy to subjective refraction in all refractive parameters.[2] Visual perception depends on optical and neural factors, with ocular wavefront aberrations affecting the optical quality of the eye.[2,7] The Eye Refract system is based on patented wavefront technology that uses two Shack-Hartmann sensors running simultaneously to provide binocular refraction, allowing for determination of wavefront variations induced by the ocular refractive surfaces.[8] These sensors, combined with a phoropter head, allow The Eye Refract system to automatically correct visual defects by measuring the wavefront under physiologic pupil conditions and re-calculating aberrations for 3 mm.[2] This innovative wavefront technology offers measurement of the low- and high-order aberrations to measure the value of spherical and cylindrical components of the eye at thousands of points in comparison to traditional technologies that measure a single or a few points.[9]

### UNIQUE ALGORITHM

The binocular wavefront aberrometry metric used for objective refraction is based on the principle of equivalent quadratic, which uses the method of paraxial curvature matching.[10] The Eye Refract system algorithm couples automatic refraction measurement and a simultaneous iterative lens adjustment. This unique algorithm method performed by the Eye Refract system takes into account high-order aberration analysis up to the fourth order.[2,10] This innovative system performs an objective and subjective refraction, allowing the operator to adjust the initial objective refraction obtained by the Hartmann-Shack sensors from an algorithm of subjective questions related to visual quality during the refraction process, with the final refraction obtained from an automatic algorithm based on the subjective answers of each patient and manually modified in the device according to operator criteria.[2] The intuitive algorithm of the Eye Refract system provides similar results to conventional subjective refraction, but saves time comparing the subjective refraction to the patient's current prescription and binocular wavefront autorefraction.[2]

## INCREASED EFFICIENCY FOR FASTER RESULTS

Refraction is the most frequently performed step in an ophthalmology practice, so reducing the time ophthalmic professionals spend completing refractions improves overall clinical efficacy.[2] The Eye Refract system can obtain precise refraction measurements in less time than conventional subjective refraction, which has been shown to take approximately 5 minutes when conducted by experienced clinicians.[2] Indeed, using the Eye Refract system, trained operators have been shown to achieve binocular refraction in approximately 3 minutes.[2] The saved refraction time allows for more time for patient interaction and examination. What's more, the increased efficiency offered by the Eye Refract system technology can also lead to a reduction in patient wait times and increased patient satisfaction.[2]

> REFRACTION IS THE MOST FREQUENTLY PERFORMED STEP IN AN OPHTHALMOLOGY PRACTICE, SO REDUCING THE TIME OPHTHALMIC PROFESSIONALS SPEND COMPLETING REFRACTIONS IMPROVES OVERALL CLINICAL EFFICACY.[2]

## STUDY DEMONSTRATES PRECISE MEASUREMENTS AND EFFICIENCY

A recent experimental, prospective, cross-sectional, randomized, and evaluator-masked study was conducted to evaluate the efficacy of the Eye Refract system that compared refractive parameters, visual acuity, visual satisfaction, and spent time with conventional subjective refraction.[2] Three refractions were performed with the Eye Refract system and three subjective refractions were performed for 99 participants between the ages of 7 and 99.[2] For comparison with the Eye Refract system results, the mean of each subjective refraction parameter was determined for each subject.[2] Visual satisfaction was reported by participants with the visual analogue scale.[11] Time spent in the refractions was measured with a timer.[2]

The study demonstrated a positive and statistically significant correlation between the Eye Refract system and subjective refraction for the mean spherical equivalent and vertical and oblique cylindrical components for the total group.[2] In addition, there were no statistically significant differences seen for binocular best-corrected visual acuity.[2] Visual satisfaction, as measured by visual analogue scale, was similar between the Eye Refract system and subjective refraction, with just a two-point difference reported.[2] Time spent performing the refraction was statistically lower with the Eye Refract system compared with conventional subjective refraction.[2]

## CONCLUSIONS

Although previous studies comparing the efficacy of various autorefractors with subjective refraction demonstrated significant differences between the two, a recent clinical study assessing the Eye Refract system showed similar results to subjective refraction in terms of spherical and cylindrical components, visual acuity, and visual satisfaction. Equally important, this study proved that total refraction time is lower with Eye Refract as compared with conventional refraction methods. Therefore, the novel Eye Refract system has been proven to be an effective and precise device for evaluating refraction in all age groups. Use of the Eye Refract system reduces refraction time, which allows doctors to spend more quality time with patients, allows eye care practices to operator more efficiently, see more patients, and enhances the patient experience. This new, innovative refraction system provides ophthalmologists with the ability to optimize time spent with patients, to provide a highly customized experience, and with the technology to deliver an exceptionally precise prescription. ■

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