

# Comparison of QuickSee to other autorefractor and photorefraction devices



*QuickSee: the world's most accurate handheld autorefractor*

## Takeaways in Focus

**Key features of QuickSee not found in other handheld autorefractors:**

- **Binocular, open view design for comfort, ease, and improved accuracy**
- **Wavefront aberrometry for enhanced information about refraction correction needed**
- **Dynamic measurements for highly reliable measurement results**

The QuickSee (QS) is the first commercial handheld autorefractor designed to be open view, binocular, while utilizing wavefront aberrometry and dynamic measurements. The device marries an ergonomic design that is robust, calibration-free, and is equipped to be used in any illumination, indoors and outdoors. It is a useful device for screenings, clinical practice and evaluation of refraction in a wide variety of settings<sup>1</sup>.

In a recent peer-reviewed meta-analysis of clinical articles comparing handheld autorefractors against subjective refraction, clinical studies involving QuickSee were determined to be the most rigorous and QuickSee was found to be the most accurate handheld autorefractor<sup>2</sup>.

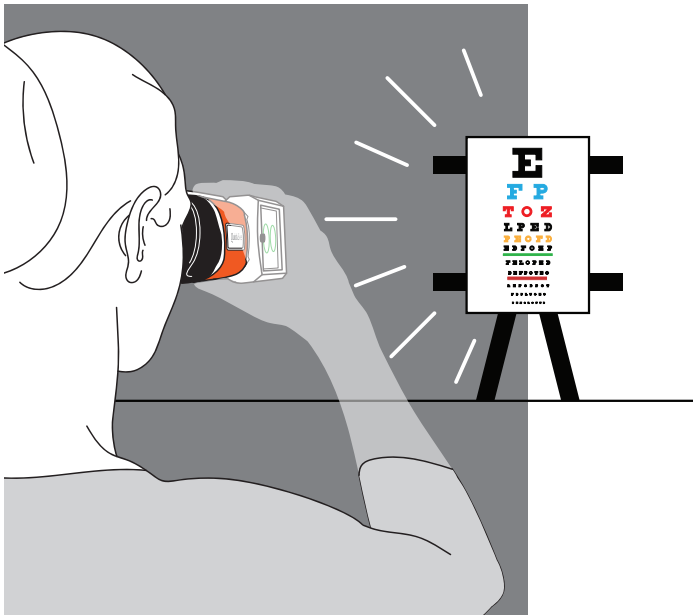
## Features distinguishing QuickSee from autorefractors and photorefraction vision screeners

### **Binocular, open-view**

QuickSee has an open view design factor. This means it offers a natural viewing experience while the patient looks through it at a distant target. The binocular open-view design has three significant advantages:

- A more pleasant and natural viewing experience for the patient.
- A verified reduction of the accommodation effect. This is particularly important when measuring children and youth – populations with high accommodative power.
- Reduction in anisometric effects that may occur when performing monocular measurements.

**Photorefraction devices** are typically held 3 feet away from the subject and draw the attention of the subject. At this distance, it is likely that the subject (especially children), will accommodate during the measurement, thereby reducing measurement accuracy.



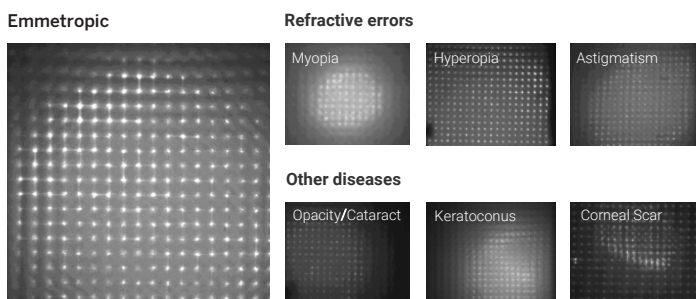
QuickSee is open view and not sensitive to ambient light.

**Desktop and handheld autorefractors** (including Retinomax and almost all desktop autorefractors) have internal fixation targets. Handheld autorefractors are typically held in front of the subject, and desktop autorefractors wherein the subject looks into, each display a virtual image inside the device for the subject to focus on. Although the virtual image simulates an object at a distance, it still causes instrument myopia and does not relax the subject's accommodation<sup>3</sup>.

### Wavefront aberrometry

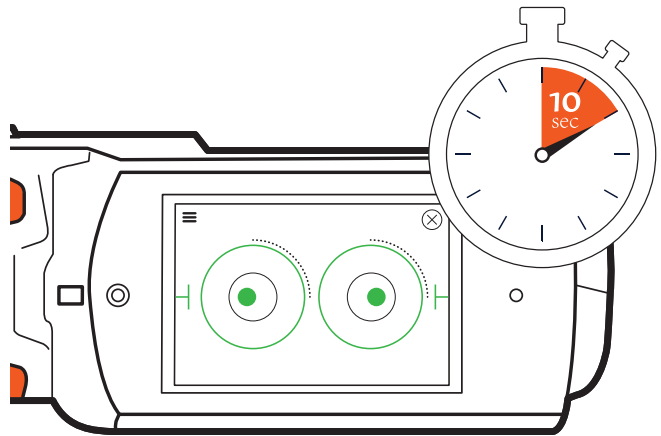
QuickSee is a wavefront aberrometer. Wavefront aberrometry provides refractive measurements by assessing both lower- and higher-order aberrations. It captures additional refractive information that is unavailable to traditional autorefractors and photorefractive screeners. This additional information provides an enhanced view of what refractive correction is needed, thereby providing a more accurate starting point for subjective refraction.

**Photorefraction and autorefractors** do not utilize wavefront aberrometry, and instead use older optical techniques which are not as comprehensive as wavefront aberrometry.



### Dynamic measurements

QuickSee takes 10 second measurements which provides significant advantages compared to existing instruments. During the 10 second QuickSee measurement, the patient is encouraged to blink, thereby allowing them to relax and refresh their tear film, which are strong contributors to the refractive power of the eye. Also, the longer measurement means more data is collected, so if the patient blinks or shifts their gaze or focus (e.g., as may be the case with a highly active child), the accuracy of the measurement is not affected.



**Photorefraction and autorefractors**, in contrast, take a single or few measurements which are highly affected by blinking or eye movement. For adults, the QuickSee will give more accurate measurements; however, in the case of very small children (6 months to about 4 years), the QuickSee is not recommended so photoscreener devices would be recommended.

### QuickSee's accuracy under cycloplegic and non-cycloplegic conditions in children

The sensitivity (90%) and specificity (98%) of QuickSee under noncycloplegic conditions compares favorably with other pediatric portable photoscreeners on the market. Importantly, under non-cycloplegic conditions, QuickSee's open-view system enabled it to be more accurate than clinical gold standard desktop autorefractors. QuickSee, the instrument should be considered a viable tool for pediatric vision screening<sup>13,14</sup>.

## Other refraction technologies

### Retinomax and handheld autorefractors

Retinomax is the oldest and mostly widely used handheld autorefractor. Despite this, in side-by-side clinical studies, Retinomax has been demonstrated to be less accurate than QuickSee<sup>4</sup>. This is due to it being a close-view system, not employing wavefront aberrometry, and its less accurate algorithms. Retinomax's strengths of ease-of-alignment comes at the expense of its bulky form-factor.

### Photorefractors and eccentric refraction devices

SPOT, PlusOptix, and 2win instruments are photorefractor based vision screeners, primarily used on young children<sup>5-11</sup>. Photorefractor is highly dependent on distance from the patient and ambient lighting conditions, so it tends to suffer from inaccuracy and irreproducibility. However, it is the easiest technique for vision screening because it only takes a few seconds and is essentially "point and shoot". It is mainly used for vision screening and does not provide as an accurate starting point for subjective refraction<sup>12</sup>. Eccentric refraction, the most common type of photorefractor, is typically not as accurate as wavefront aberrometry for cylinder and axis, which are the components of refraction that take the longest to manually measure. Typically affected by blinking and patient moving their eye because only a few measurements are taken.

## QuickSee comparison to desktop autorefractors and to subjective refraction



QuickSee provides the same accuracy as a high-end clinical desktop autorefractor<sup>13, 15-17</sup>. Desktop autorefractors measurement range is -25 to +25 diopters; the QuickSee device covers -10 to +10 diopters, which addresses the needs of over 95% of adult population. QuickSee is within < 0.25 D (excellent agreement) and < 0.5 D (good agreement) of subjective refraction for 65-75% and 85-90% of adult patients, respectively, whereas desktop autorefractors are usually within < 0.25 D and < 0.5 D of subjective for 50-60% and 80-90% of these patients, respectively.

Clinical studies on over 1,000 patients have demonstrated that QuickSee, remarkably, had an equal patient acceptance rate for eyeglasses prescribed by it as compared to eyeglasses prescribed by subjective refraction<sup>15, 16, 18</sup>.



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