Recent data shows that Varilux Physio Enhanced™ provides improved vision, particularly in low light.

Progressive addition lens wearers face a common problem: decreased acuity in dim lighting conditions. While everyone’s vision is diminished in dark, low-contrast situations, progressive lens wearers have a unique predicament: As the pupil expands in dark settings, a larger beam of light enters the eye. This wider beam utilizes a larger area of the spectacle lens, and as more of the spectacle lens is utilized, more of the aberrations inherent in the lens cause wavefront distortions in the beam. This can result in reduced contrast sensitivity and diminished quality of vision.

Varilux Physio Enhanced™: A New Benchmark in Progressive Lens Design

At the annual meeting of the American Academy of Ophthalmology in October 2010, I presented a poster on Varilux Physio Enhanced™, a new wavefront-corrected progressive lens design that incorporates pupil size modeling data for improved low-light vision. The full poster, “Factoring Pupil Size Changes into a Wavefront-Optimized Progressive Lens Design Improves Vision in Low Light Conditions,” is included on the following pages.

Varilux Physio Enhanced™ uses W.A.V.E. Technology 2™ to identify and manage distortions. Built on earlier W.A.V.E. Technology™: Wavefront Advanced Vision Enhancement, which minimizes the amount of distortion caused by light passing through the lens, W.A.V.E. Technology 2™ incorporates pupil size modeling. This complex model allows designers to fine tune the design to provide the sharpest possible vision for all patients in all lighting conditions.

Cumulative results from a double-masked wearer study and optical bench testing suggest that, compared with progressive lens designs that do not incorporate pupil size modeling, the Varilux Physio Enhanced™ lens provides superior vision, with the greatest benefit seen in low-lighting conditions.

The Importance of Contrast Sensitivity

These findings have important implications, as contrast sensitivity is a vital component of visual quality. Numerous everyday activities require the ability to discern objects, depth, and dimensions under low-contrast conditions. When driving in the rain, fog, or in the evening, for example, we rely on contrast sensitivity to distinguish forms that may blend in with the background, including pedestrians.

The ability to carry out more mundane tasks, such as reading a menu or dialing a phone in a dimly lit restaurant, also contribute to quality of life. Although some patients are more sensitive to changes in contrast sensitivity than others, the fact that we are now able to provide this added benefit marks a new achievement in progressive lens design.

Clearer, Crisper Vision, One Innovation at a Time

Progressive addition lenses have come a long way, with each incremental advance providing better vision for our patients. In addition to the breakthrough in pupil size modeling, Varilux Physio Enhanced™ lenses achieve higher levels of sharpness by customizing the design to patient prescription and viewing distance. This level of sophistication means that our patients can enjoy safer night driving and less strain during daily activities such as reading, television watching, and computer use. The design and quality of vision cues adaptation and helps ensure the one thing we all want: happier patients.

Marguerite B. McDonald, MD, FACS, is a cornea/refractive/anterior segment specialist with Ophthalmic Consultants of Long Island, Lynbrook, NY, and a pioneer in wavefront-based refractive correction. Dr. McDonald, who performed the world’s first excimer laser vision correction procedure, also conducted the first wavefront-based laser surgeries in the USA.

For more information:
▶ Contact your Varilux Sales Consultant
▶ Please visit www.variluxusa.com

VARILUX PHYSIO ENHANCED™ WITH NEW W.A.V.E. TECHNOLOGY 2™

● Superior aberration control
● Customized for optimal performance
● DualOptix™ digitally surfaced lenses

Learn more at www.variluxusa.com

Wavefront-Optimized Progressive Lens Design with Pupil Size Modeling Enhances Low-Light Vision for Presbyopes

— Marguerite B. McDonald, MD, FACS

For more information:
▶ Contact your Varilux Sales Consultant
▶ Please visit www.variluxusa.com

VARILUX Physio Enhanced™ Lenses — for the sharpest vision in any light, even at night.
**Purpose**

*Vertebral PhysioEnhance*™, Enid is a new wavefront-corrected progressive lens that incorporates pupil size modeling into its design. The study evaluated whether this lens provides better vision, especially in low light conditions, than other progressive lens designs.

**Effects of Pupil Size on Progressive Lens Performance**

A healthy pupil dilates and contracts in response to light levels and distance. Further, pupil size affects image quality. Smaller pupils can improve lens performance. When pupils are small, or in low light conditions, the wavefront exit pupil is also smaller. This has been previously shown to result in a smaller magnification of the retinal image. This can be improved by decreasing pupil size for improved performance.

*TABLE 2*

<table>
<thead>
<tr>
<th>Test-item</th>
<th>Wavefront</th>
<th>Undetectable</th>
<th>Undetectable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age: 72.5 years</td>
<td>6.4% ± 1.4%</td>
<td>25% ± 1.4%</td>
<td>1.4% ± 1.4%</td>
</tr>
<tr>
<td>Cylinder: up to 1.46°</td>
<td>4 subjects</td>
<td>80%</td>
<td>12 subjects</td>
</tr>
<tr>
<td>Axial: 8% ± 1.25°</td>
<td>26.5° ± 1.25°</td>
<td>12.5° ± 1.25°</td>
<td>1.25° ± 1.25°</td>
</tr>
</tbody>
</table>

**METHODS**

A phosphor-stimulated, non-deviating test was compared to the standard Vertebral PhysioEnhance lenses to determine their performance.

**RESULTS AND DISCUSSION**

Statistically Significant Preference for PAL that Uses Pupil Size Data to Optimize Wavefront

Test Protocol

Subjects received two pairs of identical eyewear, one with Vertebral PhysioEnhance and one with Vertebral PhysioEnhance Enhanced. After testing, the first lens was implanted, followed by a second test of the second lens.

**Wearer Studies Confirm Optical Bench Test Findings**

Three new wearers completed 10-second optical bench test results that showed the Vertebral PhysioEnhance Enhanced lenses exhibited reduced wavefront aberration levels (Figure 4) and improved contrast function (Figure 5) compared to the original lens.

**CONCLUSIONS**

The Vertebral PhysioEnhance Enhanced design, which accounts for pupil size and darkness, provides improved vision, particularly in low light.

The study confirmed that the new lens design improves vision in low light conditions, with statistically significant improvements compared to the original design. This is important for individuals who use progressive lenses in low light conditions, as it can improve their vision and reduce strain on the eyes.

*References*


