

# aura Natural Vision

**aura·ai**<sup>TM</sup>

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## 1. Introduction

Since the introduction of the first progressive design in 1959, Progressive Lenses have undergone significant advancements. Market trends now show a growing preference for more extensive hard designs. Although modern Progressive Lenses are highly sophisticated, there is still room for improvement, particularly when it comes to reducing the "swim effect."

For the past 40 years, the development of progressive designs has been driven by two main goals:

- 1. Maximizing the visual fields of clear vision.**
- 2. Minimizing the maximum level of astigmatism.**

Despite all efforts to create the ideal Progressive Addition Lens, presbyopes still often experience the swim effect with modern progressives, which can compromise both visual quality and comfort.

This effect typically occurs when users shift their gaze between objects at different distances, moving from the central meridian to the periphery of the lens.

At Horizons Optical, significant progress has been made in eliminating the swim effect, with findings suggesting that reducing the gradient of astigmatism plays a key role in its minimization. But what exactly is the gradient of astigmatism?

## 2. Gradient of astigmatism

Although progressive lenses have evolved significantly over time, users may still encounter some limitations.

Every progressive design contains a particular level of astigmatism related to a given power (Minkwitz theorem). The astigmatism is distributed across the progressive surface based on a particular optimization.

The gradient of astigmatism refers to the change in astigmatism produced in a progressive design. In designs with a high gradient of astigmatism, there are many varying levels of aberrations within a short transition zone, which can make it difficult for users to adapt. On the other hand, a low gradient of astigmatism features fewer aberration levels with a smoother transition, resulting in no notiable changes for the wearer.

Additionally, when shifting focus from far to near, users may experience a visual "funnel" caused by aberrations within the corridor. Furthermore, lateral margins of a modern Progressive Addition Lens are occupied by high aberration gradient (sudden increase of aberrations), creating what can feel like a "visual prison" for the wearer.

**As a result, users often experience a sensation of visual barriers, including:**

- **The swim effect**
- **Limitations in dynamic vision**
- **A perceived loss of visual field**

## Visual perception

On the other hand, it is important to consider the physiology of the visual system, as physiological studies confirm the crucial role not only the fovea but also of the parafovea in vision.

The fovea is the central region in the retina responsible for high-definition vision, while the Parafovea is the surrounding region that encircles the fovea.

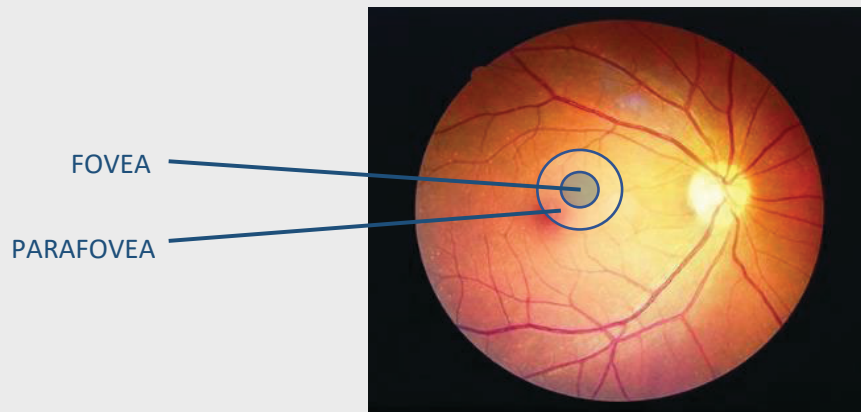


Figure 1 : Fovea and Parafovea.

When reading, up to 6° of visual angle is processed in parafoveal area and within 1° (approx. 6-8 characters) of the point of fixation, the information is processed in the foveal area.

People can perceive the difference in letters in fovea and near-parafovea, but not in the outer part of the parafovea. 1,2

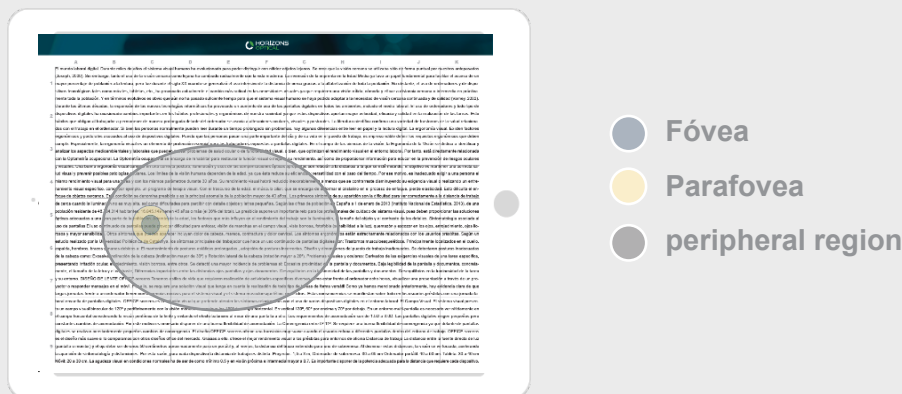
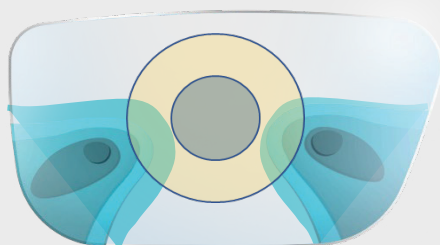


Figure 2: Visual Processing in word recognition.

In modern Progressive Addition Lenses available on the market, images fall within the foveal zone are perceived as sharp, while those that fall within the parafoveal area often has high aberrations.

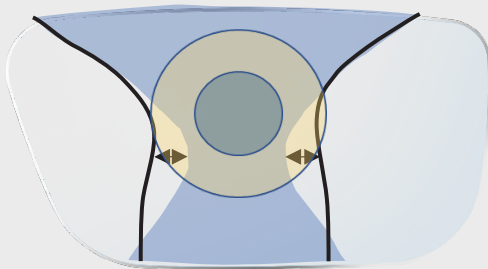


**Figure 3:** Modern Progressive Addition Lens Representation.

Based on this, Horizons Optical has developed a unique design that takes human physiology into account.

### 3. aura Natural Vision

With **aura Natural Vision** design, all images focused on the fovea and parafovea are optimized to produce aberrations below the level of perception. An internal study conducted at Horizons Optical shows that **aura Natural Vision** lens provides a 35% wider intermediate and near field of vision compared to premium Progressive Addition Lenses available on the market.



*Figure 4: aura Natural Vision Progressive Addition Lens Representation.*

**Aura Natural Vision** not only takes into account the movement of astigmatism from its beginning, which is understood as the SPEED, but also considers the change in astigmatism until it reaches its maximum, known as ACCELERATION.

**Aura Natural Vision** is the first progressive design that considers the gradient of astigmatism, enhancing visual perception and providing maximum comfort to the user.

In the optical industry, there are different design philosophies, such as Hard Progressive Addition Lenses and Soft Progressive Addition Lenses. But what makes the **aura Natural Vision** Progressive Addition Lens different?

- **In Hard Progressive Addition Lens, the gradient of astigmatism changes rapidly along its path.**
- **In a Soft Progressive Addition Lens, the gradient of astigmatism changes more gradually than in a Hard design.**
- **With aura Natural Vision, the gradient of astigmatism remains constant along its path, delivering the best possible visual perception in a Progressive Addition Lens.**

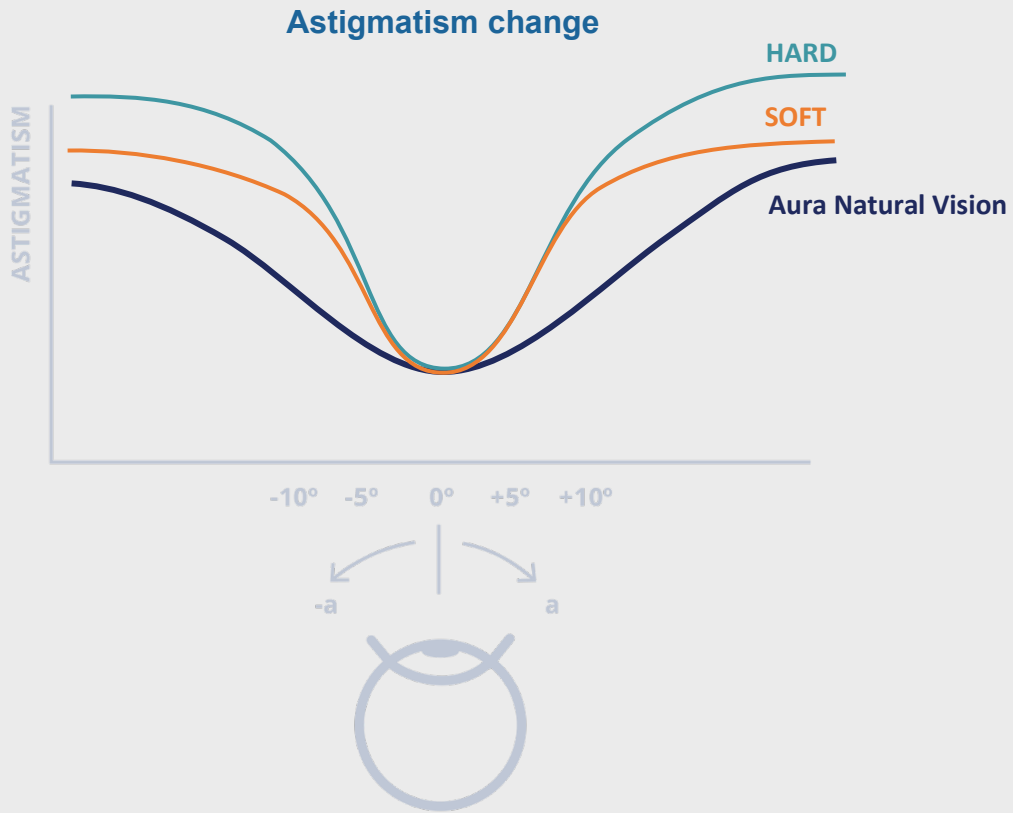


Figure 5: Astigmatism change – Slope comparison.

The gradient of astigmatism directly impacts the visual acuity perceived by the user.

In Progressive Addition Lenses, as the user moves horizontally, they experience significant changes in astigmatism, which negatively affect their visual perception. However, with **aura Natural Vision**, users do not perceive changes, or they are minimal, so their visual acuity becomes more satisfactory.

The swim effect occurs in areas with a high gradient of astigmatism, causing image distortion and a reduction in the user’s visual acuity.

In modern Progressive Addition Lens designs, a strong change in astigmatism is typically found near the corridor. In contrast, **aura Natural Vision** features a very gradual change in astigmatism in this area, making it nearly imperceptible. As a result, **aura Natural Vision** ensures excellent dynamic vision.

Additionally, in Modern Progressive Addition Lenses, a significant change in astigmatism is typically found near the corridor. However, in **aura Natural Vision**, the near area is smaller, but the user’s perception of it is larger due to the smoother gradient of astigmatism.

While the design foundation is essential to adding value to Progressive Addition Lens designs, it is equally important to incorporate advanced design technologies to achieve optimal performance.

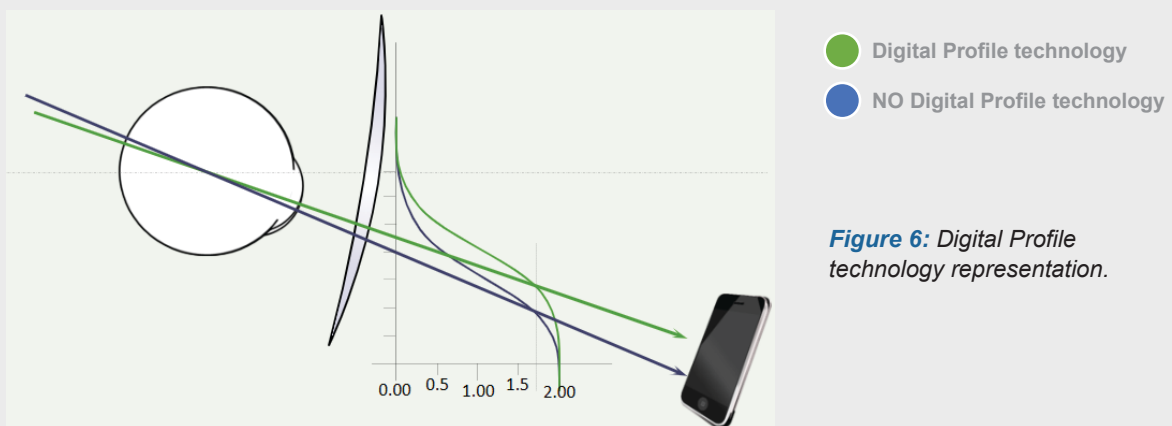
**Aura Natural Vision** focuses on innovation, and the significant advancements in lens design technologies are the result of extensive work by the R&D lens department.

### Lens design technologies

#### 1. DIGITAL PROFILE: Adapting aura Natural Vision to the digital world.

The use of handheld devices has become pervasive in society today. Thus, **aura Natural Vision** applies **Digital Profile technology** which optimizes the lens progression profile to offer comfort and sharp vision when using digital devices.

**Digital Profile technology** avoids awkward movements and ensures a comfortable posture for near vision. Based on the consideration of today’s visual needs and on the users ergonomics, **Digital Profile technology** achieves Greater vertical area with hundred per cent addition:



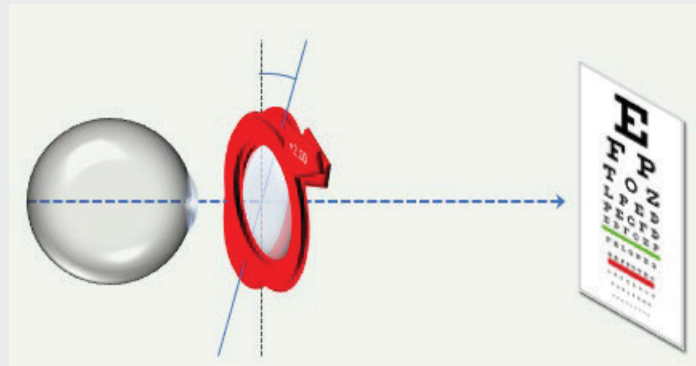
**Figure 6:** Digital Profile technology representation.

### Digital Profile technology benefits:

- Greater vertical area with 100% of the addition
- Easy transition between near and far vision
- Comfortable vision when reading
- Ergonomic design that eliminates uncomfortable postures
- Improved adaptation

## 2. OPTIMESH: Precise optics in all directions of gaze.

When using test lenses to get the user's prescription or when measuring the power of a lens in a lensmeter, the light goes perpendicular to the surface of the lens. But if the lens is tilted, the vision becomes blurry. This angle induces a difference between the power of the lens and the power perceived by the wearer.



*Figure 7: As worn position*

The same happens when the user wears a pair of glasses. When the eye looks through the lens, the light does not go perpendicular to the surface. Therefore, it is necessary to compensate that difference in the orientation of the lens to maintain the best acuity of vision.

**Aura Naural Vision** solves this issue thanks to **Optimesh technology**, which compensates optical aberrations and corrects the difference in power between theoretical and resulting prescriptions, taking into account the lens in as-worn position.

For the compensation, the following parameters should be considered:

- **Naso-pupillary distance:** distance between the center of the bridge and the pupil's center.
- **Wrap angle:** frame curvature. Default value: 5°.
- **Back vertex distance:** distance from the cornea to the back side of the lens. Default value: 12mm.
- **Pantoscopic angle:** vertical tilt of the frame once it is placed in the user's face. Default value: 10°.
- **Near Working distance:** measurement of the distance at which the user normally reads. Default value: 40cm.

These parameters have an important effect on the width of visual fields because they provide the location/orientation of the lens in front of the eye.

**Optimesh technology benefits:**

- **Natural vision with the highest visual acuity**
- **Optimized vision for each position of wear**
- **Comfort when reading**
- **Personalized Progressive Addition Lens**

### **3. BINOCULAR BALANCE:** aura Natural Vision achieves the perfect stability.

A Progressive Addition Lens is a complex lens with a distribution of power different in each part of its surface. The progressive change of power in the intermediate zone generates the lateral astigmatism in both sides of the umbilical line. **3**

When we look at a distance object, our eyes keep the visual axis parallel between them to obtain a binocular vision of the object. However, when looking at a near object the eyes converge, they rotate towards the nasal area, to bring the image on corresponding points of the retina and that fuse it in the brain.

To follow the eye movement during convergence, the near vision area of a Progressive Lens is designed with a lateral displacement towards the nasal zone.

This lateral displacement causes the lens to lose symmetry and causes the astigmatism to be concentrated more in the nasal zone than in the temporal zone generating and aberrant power imbalance.

When we look at an object placed in a lateral position, each eye sees through different areas of the lens so the blurring they perceive is different. The brain can not easily fuse both images.

**Binocular Balance technology** balances the amount of bluriness at both sides of the corridor. In this way the user get both eyes perceive the same amount of fuzziness when looking at an object through the lateral area.

This unique mathematical algorithm addresses the inherent imbalance of astigmatism between nasal and temporal area of Progressive Lenses. As a result, lenses provide similar amounts of unwanted astigmatism on both sides of the corridor, improving visual perception when looking toward the periphery.

**Binocular Balance technology benefits:**

- **Optimum binocular vision**
- **Better fusion of lateral images**
- **Sharper peripheral vision**
- **Visual comfort at all distances**
- **Enhanced vision at computer distance and at reading distances**

**4. CLEARVIEW: Breaking the limits of Progressive Addition Lens.**

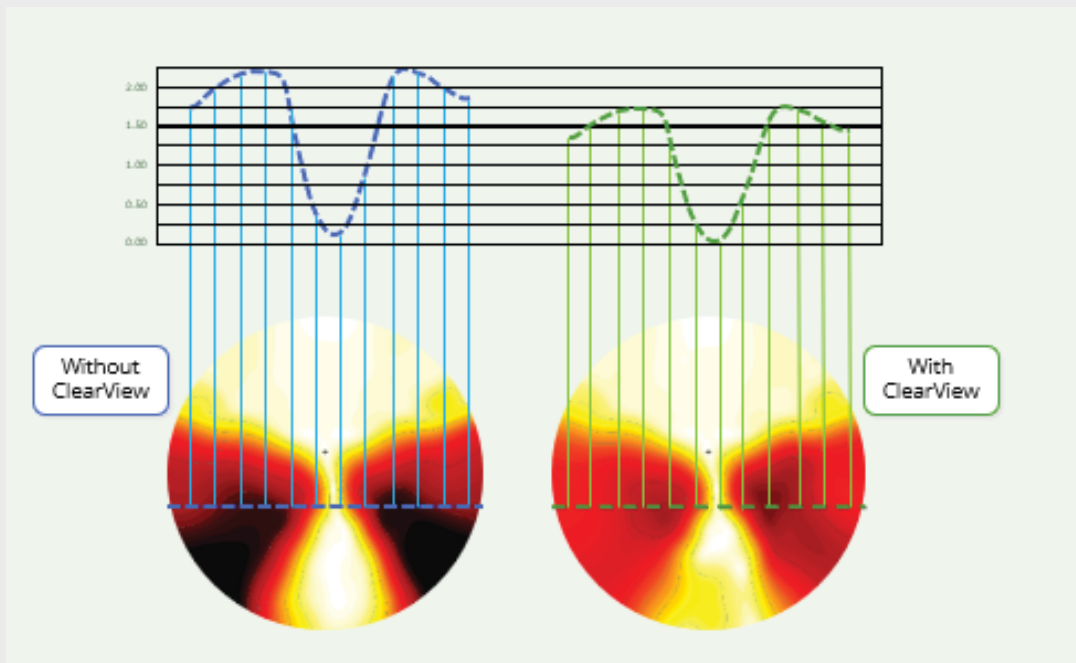
Aberrations are intrinsic features in a progressive surface; a dioptric power always has a certain amount of aberrations. They are perceived as blurriness by the user, producing discomfort and sometimes dizziness.

Horizons Optical has developed a unique technology which reduces the unwanted astigmatism to the lowest possible. This disruptive technology represents the best and authentic method to optimize lens properties to the real frame shape by pushing an important amount of blurriness out of the useful area.

By knowing the shape of the frame and the position of the pupil, it can be determined the exact location of the progressive surface in relation to the eye and the edge of the frame.

With this information, the **ClearView technology** is able to modify the distribution of aberrations and to reduce them greatly within the useful area of the final lens.

Below comparing the progression of the aberrations in a concrete dimension:



*Figure 8: Aberrations comparison between Progressive Addition Lens without and with ClearView technology.*

**ClearView technology benefits:**

- **Up to 20% reduction in aberrations**
- **Minimization of the swim effect**
- **Allows a more comfortable and ergonomic position**
- **Maximum visual acuity and comfort**
- **Optimized to every specific frame**

**5. ERGOPATH: Takes aura Natural Vision to a next level of personalization.**

To focus objects placed at different distances with sharpness, the convergence is required. Very often presbyopes experience issues with visual ergonomics and adaptation because they struggle to focus correctly on objects. These problems are often caused by an improper application of the corridor and sometimes an inset.

The corridor is not an OMA standard label, there is not a unique and specific description for it; each provider has its own version. This leads to errors and mistakes when selecting the appropriate corridor.

If the selected corridor is too short or too long, it can cause visual discomfort.

Additionally, convergence problems can arise when choosing a non-optimal inset.\*

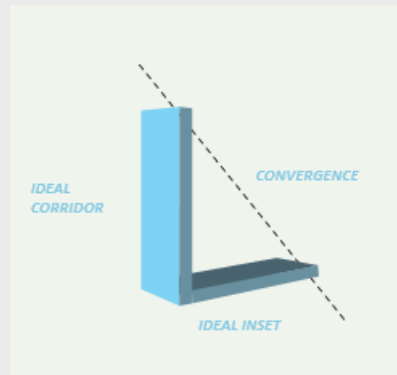
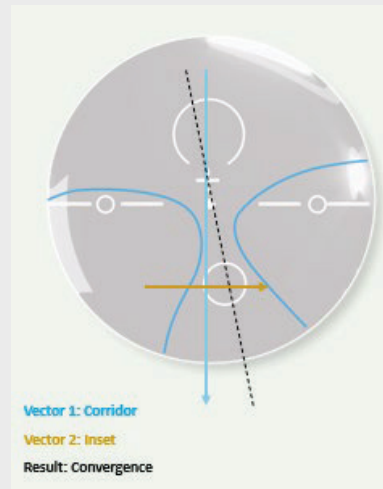
It is common in the industry to apply a default value which is 2.5mm. However, several factors in patients need to be considered:

- **Physiognomy**
- **Ergonomics**
- **Position of wear**
- **Prescription**

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\* Horizontal off-centring that appears in near zone of progressive addition Lenses caused by the convergence of the eyes when looking at near objects.

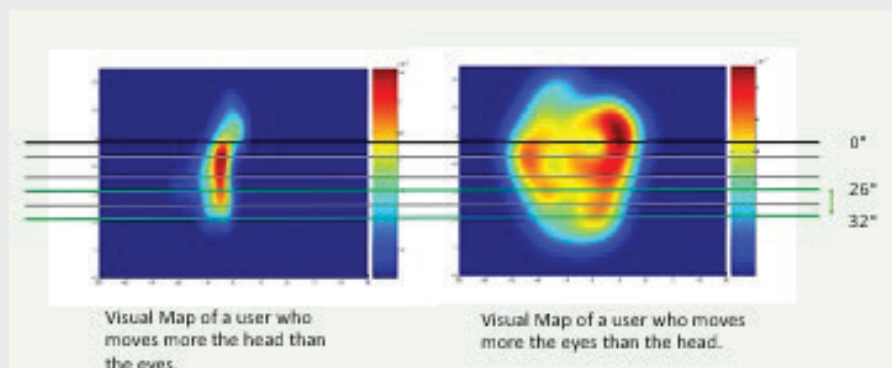
**ErgoPath technology** solves the problems of convergence and assures a good ergonomics to the user through the calculation of the optimum corridor and inset. To achieve this, Ergo Path technology takes into account **Prescription, Position of wear** and the **Vertical Rotation Angle**.



*Figure 9: Convergence, a triangular solution.*

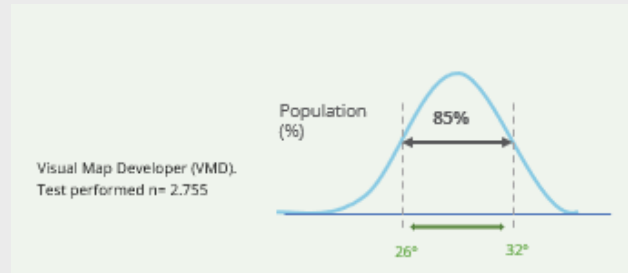
The ideal corridor is the corridor that offers the optimum ergonomic position for each user. To obtain the optimum corridor, **Vertical Rotation Angle** of the Eye is key.

**Visual Map** this is the result of a visual test performed to users. This test registers the natural way a user moves head and eyes when he/she is performing a specific task.



*Figure 10: Results of a Visual Map test.*

Through the visual map performed to almost 3.000 presbyope users, it is possible to obtain the range of optimum **Vertical Rotation Angle** for a specific population.



**Figure 11:** Vertical Rotation Angle for a specific population.

The study concluded that between 26° and 32° is the ergonomic range for the Vertical Rotation Angle.

A **Vertical Rotation Angle** greater than 32° will cause ocular stress, while one less than 26° will result in blurred vision. These parameters are used to determine the optimal and ergonomic corridor length. Once the first vector of convergence is known, the second one -the inset value- can be obtained.

The ideal inset is calculated based on the corridor length, near Nasopupillary distance, and the working distance of each user. Thanks to the personalized corridor and inset adjustments, ErgoPath technology ensures optimal convergence.

#### **ErgoPath technology benefits:**

- **Next level of personalization**
- **Progression profile tailored for each patient**
- **Ergonomic design**
- **Elimination of ocular stress**
- **Guaranteed adaptation with a higher rate of satisfied patients**
- **Automatic personalization, eliminating human errors**
- **Minimization of returns**
- **Differentiated technology**

## 4. User test

We know that user satisfaction with progressive lenses is subjective, i.e., it depends on each person's perception. This means that, between two progressive lenses in the same category (e.g., Premium), two users may prefer solutions from different manufacturers.

Currently, the progressive lens market offers limited options, meaning users often face a restricted selection of designs, which is sometimes influenced by the established business relationships between optical shops and their suppliers.

However, based on the clinical trials we have conducted over the past few years, we have identified optical features that show varying levels of perception and acceptance among different users.

### Study design

The study design performed was a double-blind, randomized test involving N users, comparing a premium design, referred to as Design A, with **aura Natural Vision. 4**

Both are premium designs, fully personalized based on the position of wear and frame shape. Each design has different gradient of astigmatism.

The clinical trial procedure was as follow: Each lens was tested for two weeks, with each user completing a personal survey regarding their comfort of use.

### Study population

The age range was from 44 years old to 73 years old.

The prescription range was:

- **Sphere: from +8D to -6.75D**
- **Cylinder: from 0D to -5D**
- **Addition: from +0.75D to +2.75D**

### Study results

Regarding **aura Natural Vision** lens performance, results revealed that the first impression immediately after the lenses delivery was Very Satisfactory in 92% of the subjects, reaching 100% when Satisfactory grading users were added.

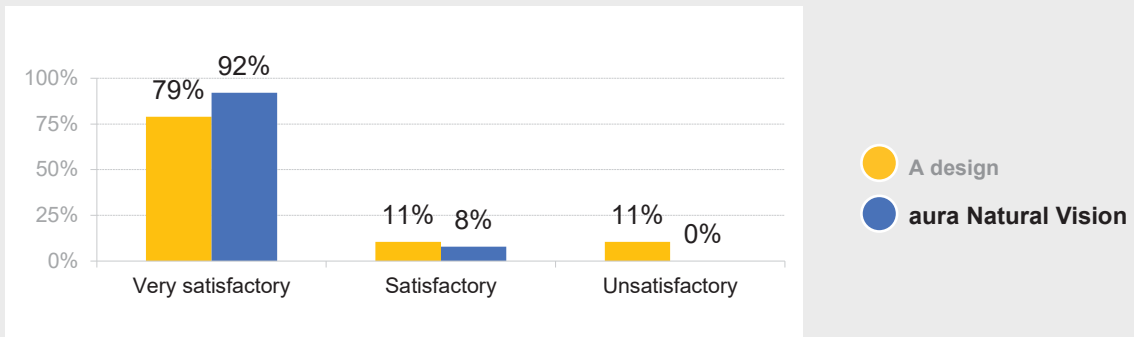


Figure 12: A design vs aura Natural Vision - First impresion.

One of the parameters that emerges as food indicator of success in subject preferences is the adaptation time. The graph below shows the adaptation times obtained, which were immediate in 89% of subjects and only in 3% of the participants took more than 3 days.

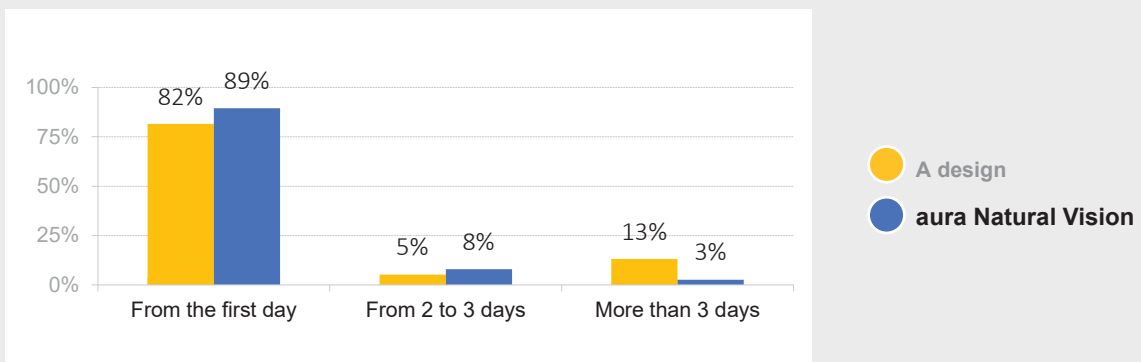


Figure 13: A design vs aura Natural Vision - Adaptation period.

Since the gradient of astigmatism directly affects visual performance at near and intermediate distances, these two factors will be crucial for validating the lens's overall performance.

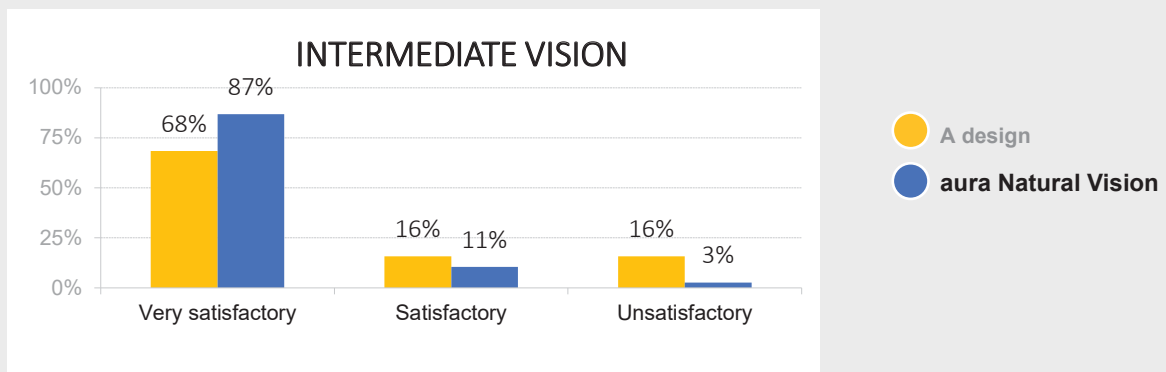


Figure 14: A design vs aura Natural Vision - Intermediate vision performance.

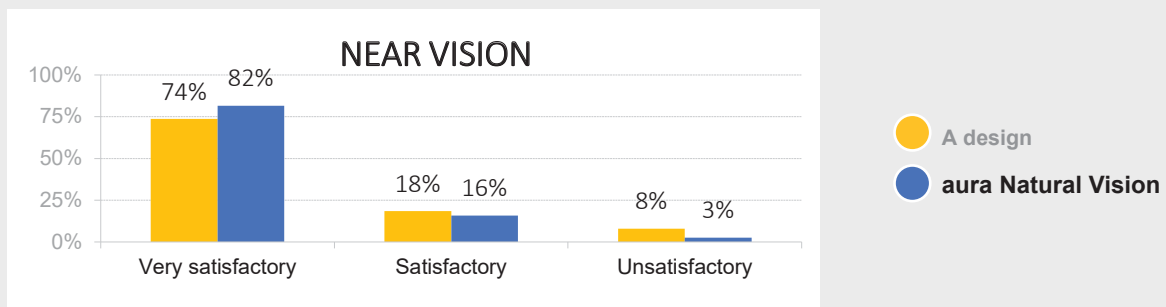
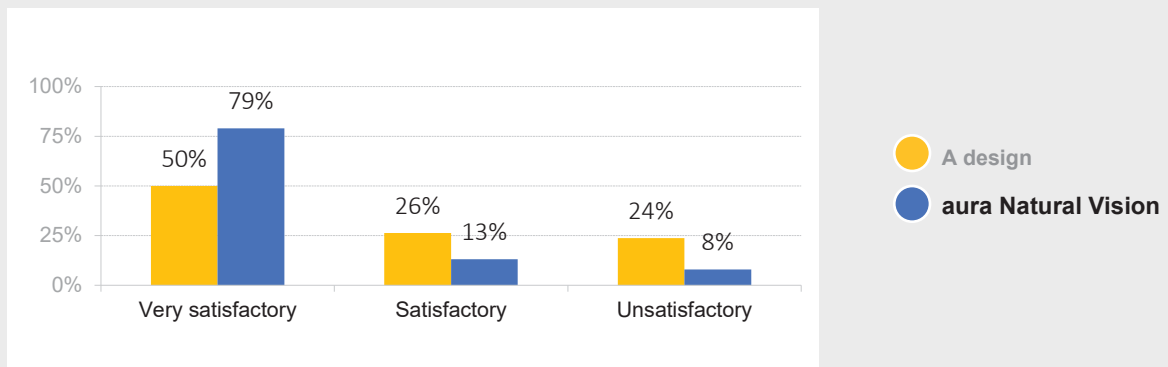


Figure 15: A design vs aura Natural Vision – Near vision performance.

Additionally, it is crucial to understand how peripheral vision can be enhanced by minimizing the gradient of astigmatism, thereby reducing the swim effect.

The swim effect is related not just with amount of astigmatism but also with its gradient. **Aura Natural Vision** is the first progressive lens designed to minimize both of these negative effects, improving comfort and clarity while eliminating the swim effect. It also offers the widest intermediate visual field, combined with natural vision for both distance and near.

The graph below demonstrates the improvement in peripheral vision provided by **Aura Natural Vision** compared to Design A:

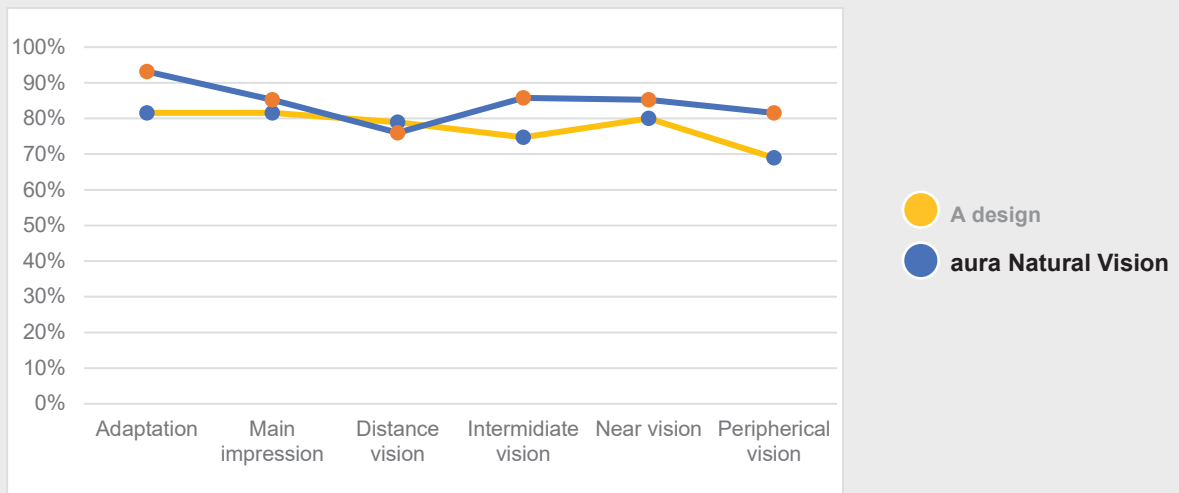


**Figure 16:** A design vs aura Natural Vision – Peripheral Vision performance.

**Study conclusion**

The **aura Natural Vision** outperforms Design A at all distances, particularly in intermediate and periheral vision. Both designs have a very similar far and near vision zone, but Intermediate and peripheral vision are rated higher in the **aura Natural Vision** design.

**Aura Natural Vision** is often perceived as a **single vision lens**, offering enhanced clarity and comfort.



*Figure 17: A design vs aura Natural Vision – Global Results.*

## 5. Benefits

**PERCEPTION OF NO LIMITS:** Distance, intermediate and near vision feels wider and smoother.

**ACCELERATED ADAPTATION:** The easiest progressive lens to wear.

**EXCELLENCE IN VISUAL COMFORT:** Comfortable transition when moving between areas all over the lens surface, no swim effect.

**PROVEN; TESTED AND ACCELERATED ADAPTATION:** The easiest progressive lens to wear.

**BALANCED LENS:** Balanced and minimized amount of blurriness at both sides of the corridor thanks to Binocular Balance technology.

**SHARP VISION AT ALL DISTANCES:** Up to 20% unwanted astigmatism refraction thanks to ClearView patented technology.

**PERSONALIZED LENSES:** Superb sharpness and precision in all gaze directions thanks to Optimesh.

**ADAPTED TO THE DIGITAL WORLD:** Comfortable position when using handheld devices thanks to Digital Profile technology.

**ERGONOMIC DESIGN:** Ensures a comfortable position of the near zone, allowing for natural reading, thanks to ErgoPath.

## 6. Target

1. Addressed to those consumers who value confidence and comfort.
2. Ideal for those who require smooth transitions and ergonomic areas for an active lifestyle.
3. Perfect for users sensitive to swim effect and demanders of optimum dynamic vision.
4. For individuals looking for versatile Progressive Addition Lens that offers maximum comfort, easy-to-use and confidence with top-tier performance.

## 7. References

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