aura Natural Vision

aura·ai™

HORIZONS DESIGNED

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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 lens, presbyopes still often experience swim effects that compromise 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, as described in Minkwitz's 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 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 noticeable 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 lens generally have a high aberration gradient, causing a rapid increase in aberrations and constraining the wearer's area of comfortable lateral vision.

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

- **The swim effect**
- **Limitations in dynamic vision**
- **A perceived reduction in clear fields of view**

Visual perception

To design a lens with a more spacious and comfortable area of clear vision, 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 region that encircles the fovea.

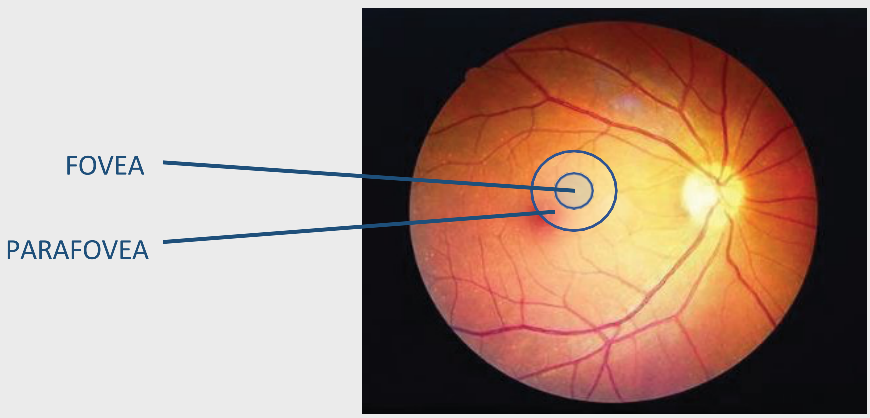


Figure 1 : *Fovea and Parafovea.*

When reading, up to 6º of visual angle is processed in parafoveal area and within 1º (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

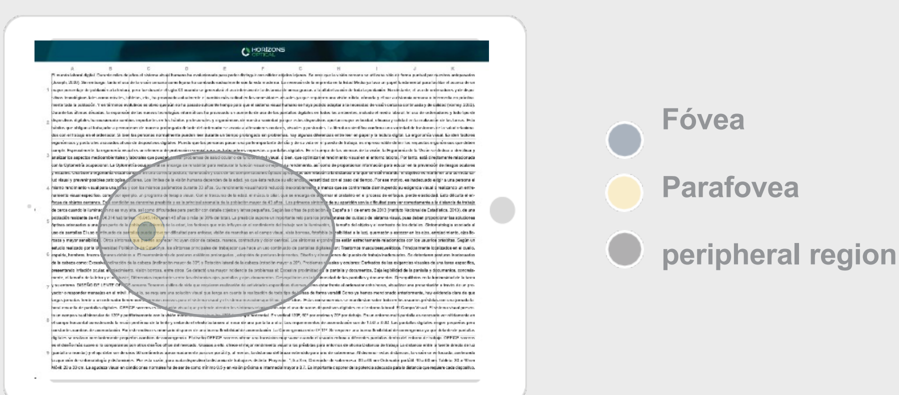


Figure 2: *Visual Processing in word recognition.*

In modern progressive lenses, images that fall within the foveal zone are perceived as sharp, while those that fall within the parafoveal area often have high aberrations.

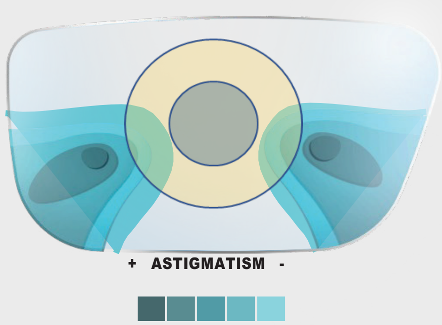


Figure 3: *Modern Progressive Addition Lens Representation.*

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

3. aura Natural Vision

In the **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 the **aura Natural Vision** lens provides a 35% wider intermediate and near field of vision compared to premium progressive lenses available on the market.

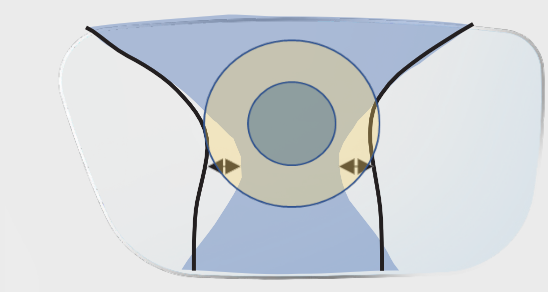


Figure 4: *aura Natural Vision progressive addition lens representation.*

The **Aura Natural Vision** not only accounts for the progression of astigmatism from its beginning, which is understood as the SPEED, but also the increase 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" and "soft" designs. But what makes the **aura Natural Vision** progressive lens different?

- **"Hard" designs provide wider areas of perfectly clear vision, but astigmatism increases rapidly in the periphery.**
- **In "soft" designs, the areas of perfectly clear vision are smaller, and the gradient of astigmatism changes more gradually.**
- **With aura Natural Vision, the gradient of astigmatism remains constant along its path, delivering the best possible visual perception.**

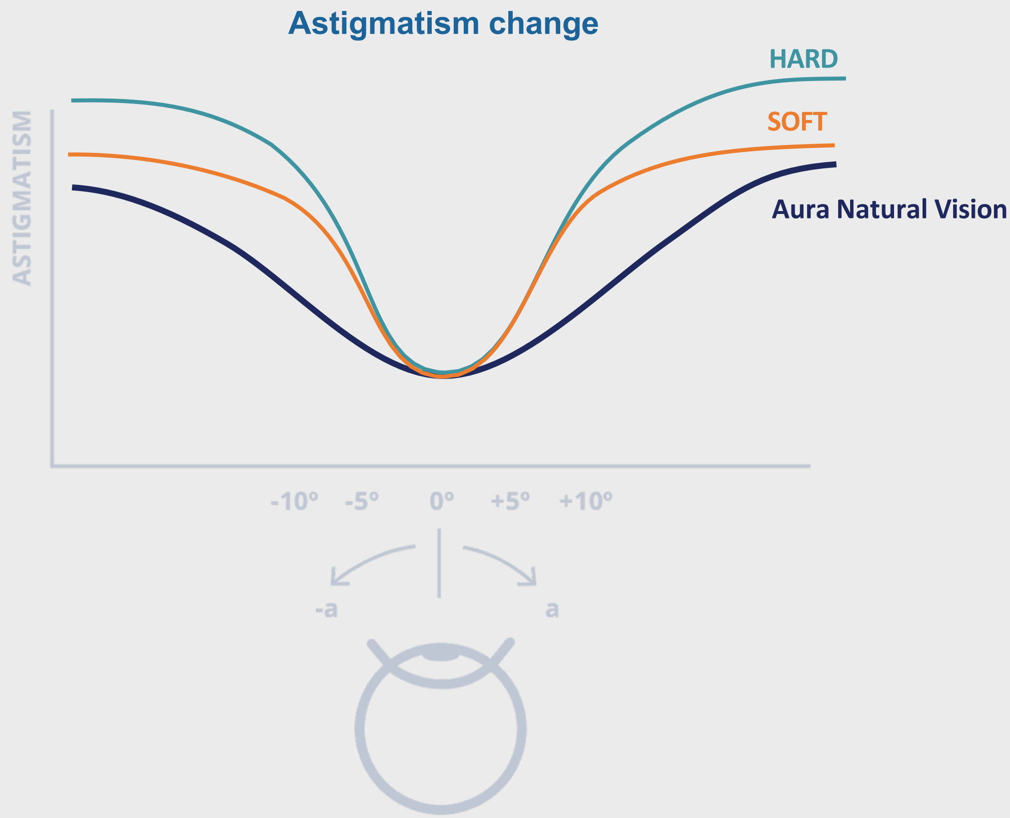


Figure 5: *Astigmatism change – slope comparison.*

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

In progressive lenses, as the wearer's eyes move horizontally, they experience significant increases in astigmatism, which negatively affect their visual perception. However, with **aura Natural Vision,** users do not perceive these increases, or they are minimal, resulting in improved visual acuity.

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 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.

Lens design technologies

While the design foundation is essential to adding value to progressive 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 research and development.

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.

Based on an understanding of today's visual needs and user ergonomics, **Digital Profile Technology** positions the area of 100% addition to begin higher up in the lens, avoiding awkward head positions and ensuring comfortable posture for viewing both digital devices and printed matter.

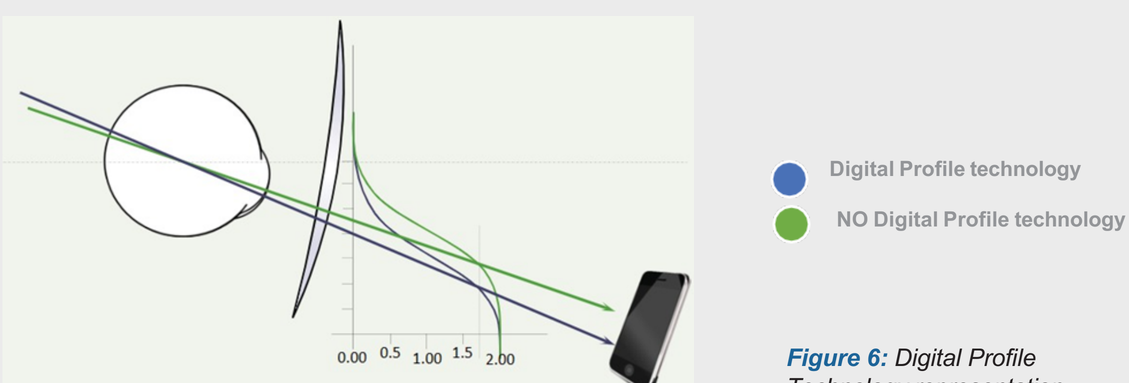


Figure 6: *Digital Profile Technology representation.*

Digital Profile technology benefits:

- **Greater vertical area with 100% 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 lensometer, 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.

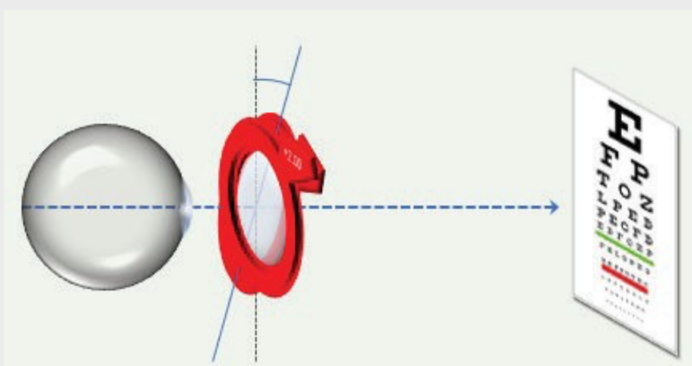


Figure 7: *As-worn position*

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

Aura Natural Vision addresses this issue with **Optimesh Technology**, which accounts for the as-worn position of the lens, correcting the difference in power between the theoretical prescription value and the real-world experience of the wearer.

For the power compensation, the following parameters are considered:

- **Pupillary distance: distance between the center of the bridge and the pupil's center.**
- **Wrap angle: frame curvature. Default value: 5º.**
- **Back vertex distance: distance from the cornea to the back side of the lens. Default value: 12mm.**
- **Pantoscopic angle: the vertical tilt of the frame once it is placed in the user's face. Default value: 10º.**
- **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 allow the lens to be compensated for the location/orientation of the lens in front of the eye.

Optimesh technology benefits:

- **Natural vision with the highest visual acuity**
- **Optimized vision for the individual's position of wear**
- **Comfort when reading**
- **A personalized visual experience**

3. BINOCULAR BALANCE: aura Natural Vision achieves perfect stability.

A progressive lens is a complex design with a distribution of power that is different on 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 view of the object. However, when looking at a near object the eyes converge towards the nasal area, to bring the image onto corresponding points of the retina.

To follow the movement of the eyes 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 concentrates astigmatism more in the nasal zone than in the temporal zone, generating an 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 mount of blur they perceive is different. The brain cannot easily fuse both images.

Binocular Balance Technology balances the amount of blur on both sides of the corridor. As a result, both eyes perceive the same amount of blur when looking at an object through the lateral area.

This unique mathematical algorithm addresses the inherent imbalance of astigmatism between nasal and temporal area in 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 and reading distances**

4. CLEARVIEW: Breaking through the limits of progressive addition lenses.

Aberrations are intrinsic features in to a progressive surface. They are perceived as blur by the user, producing discomfort and sometimes dizziness.

Horizons Optical has developed a unique technology which reduces unwanted astigmatism to the lowest possible level. This disruptive technology represents the best method to optimize lens properties for the individual frame shape by pushing a significant amount of blurriness out of the useful areas of the lens.

By knowing the shape of the frame and the position of the pupil, the exact location of the progressive surface in relation to the eye and the edge of the frame can be determined. With this information, **ClearView Technology** is able to modify the distribution of aberrations and greatly reduce them within the useful area areas of the lens.

Below is a comparison of the progression of aberrations in a concrete dimension with and without **ClearView Technology**.:

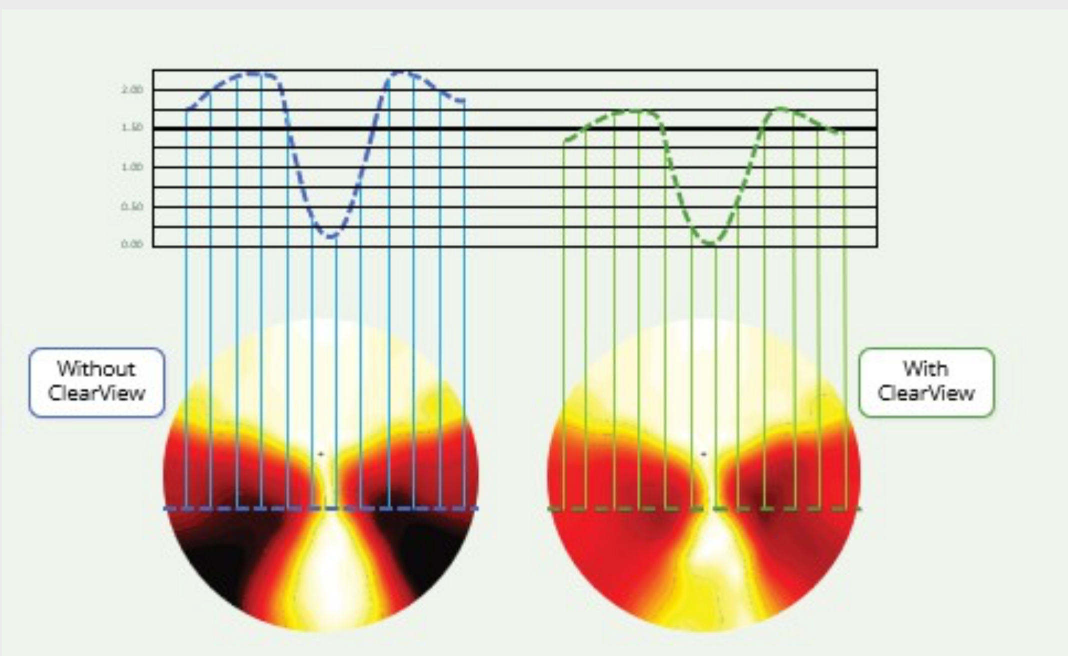


Figure 8: *Aberrations comparison between Progressive Addition Lens without and with ClearView Technology.*

ClearView technology benefits:

- **Up to 20% reduction in aberrations**
- **Minimization of the swim effect**
- **A more comfortable and ergonomic viewing position**
- **Maximum visual acuity and comfort**
- **Optimization for every specific frame**

5. ERGOPATH: Taking aura Natural Vision to a new level of personalization.

To focus objects placed at different distances with sharpness, 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 improper positioning of the corridor and sometimes an the inset*.

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

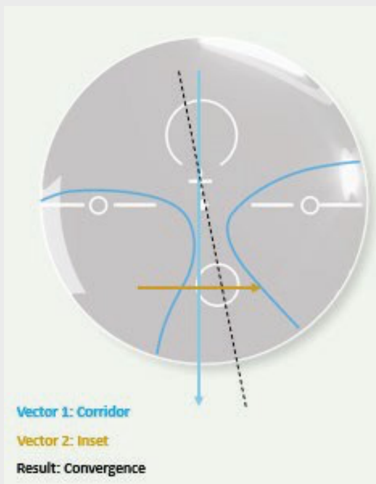
If the selected corridor is too short or too long, it can cause visual discomfort. Additionally, convergence problems can arise when choosing a non-optimal inset.*

It is common in the industry to apply a default inset value of 2.5mm. However, several individual patient factors need to be considered:

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

* Horizontal off- centering 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 ensures good user ergonomics through the calculation of the optimum corridor and inset. To achieve this, Ergo Path technology takes into account the **Prescription, Position of wear** and **Vertical Rotation Angle**.



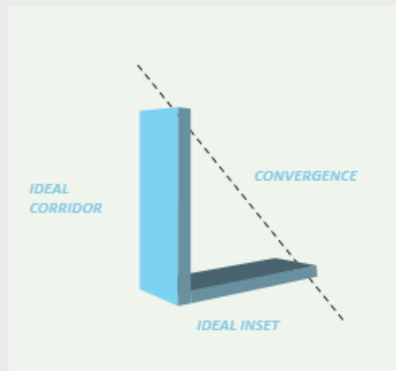


Figure 9: *Convergence, a triangular solution.*

The ideal corridor offers the optimum ergonomic position for each user. To obtain the optimum corridor, understanding the vertical rotation angle of the eye is key.

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

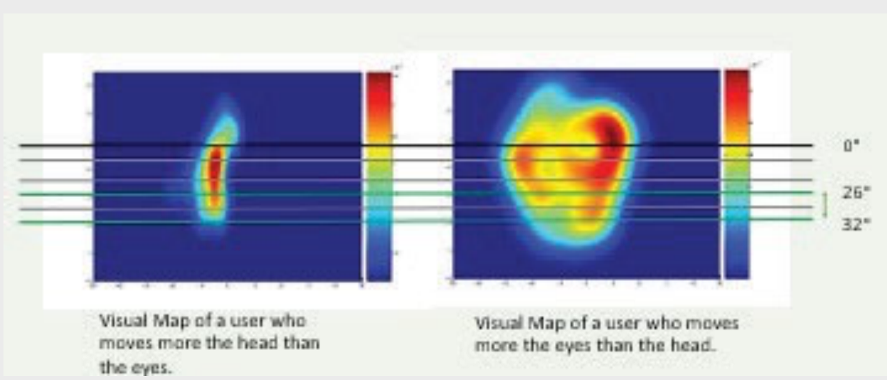


Figure 10: *Results of a Visual Map test.*

Through visual mapping of almost 3.000 presbyopes, it is possible to obtain the range of optimum vertical rotation angles for a specific population.

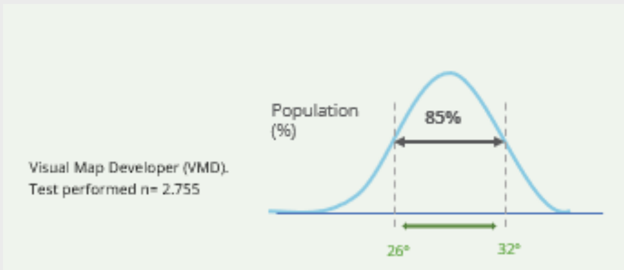


Figure 11: *Vertical Rotation Angle for a specific population.*

The study concluded that between 26º and 32º is the ergonomic range for the vertical rotation angle. A vertical rotation angle greater than 32º will cause ocular stress, while one less than 26º will result in blurred vision. These parameters are used to determine the most 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 pupillary 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

Study design

The study was a double-blind, randomized test involving N users, comparing a premium design, referred to as Design **A**, to **aura Natural Vision**. **4.** Both are premium designs, fully personalized based on the position of wear and frame shape. Each design had a different gradient of astigmatism. Each lens was tested for two weeks, with each user completing a personal survey regarding their comfort when using the lens.

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

The test revealed that the first impression of **aura Natural Vision 4** immediately after the lenses delivery was Very Satisfactory for 92% of the subjects, with 100% of wearers rating the lens rating the lens Satisfactory or Very Satisfactory.

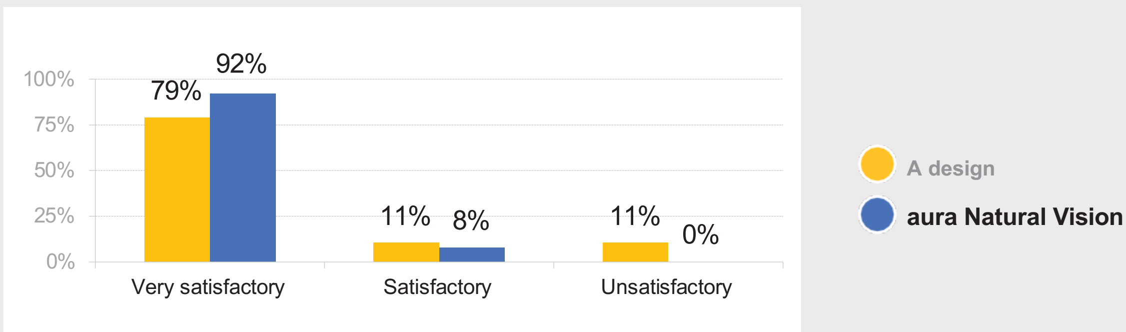


Figure 12: *Design A vs. aura Natural Vision - first impression.*

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

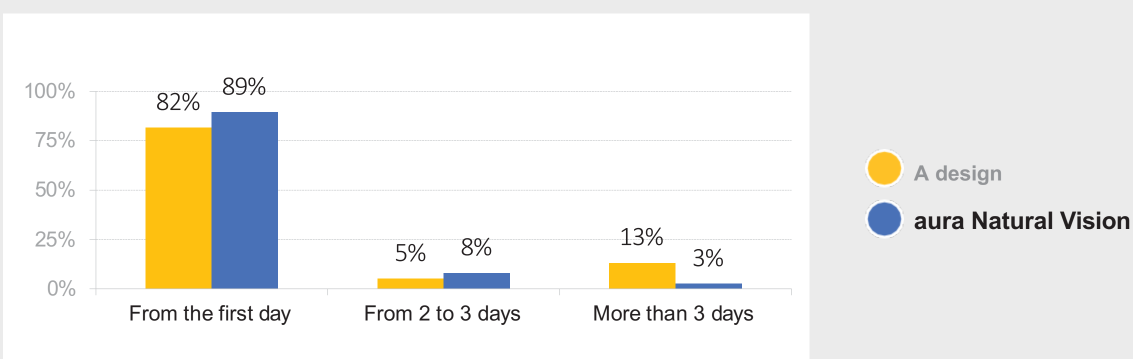


Figure 13: *Design A vs. aura Natural Vision - adaptation period.*

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

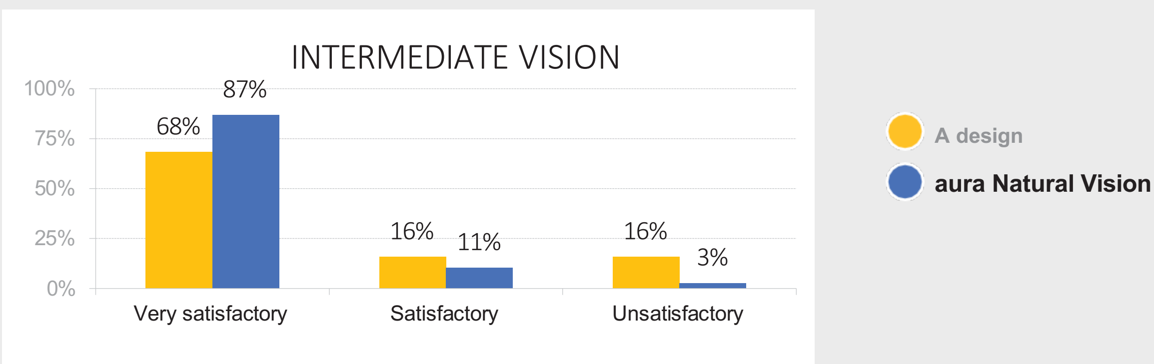


Figure 14: *Design A vs. aura Natural Vision - intermediate vision performance.*

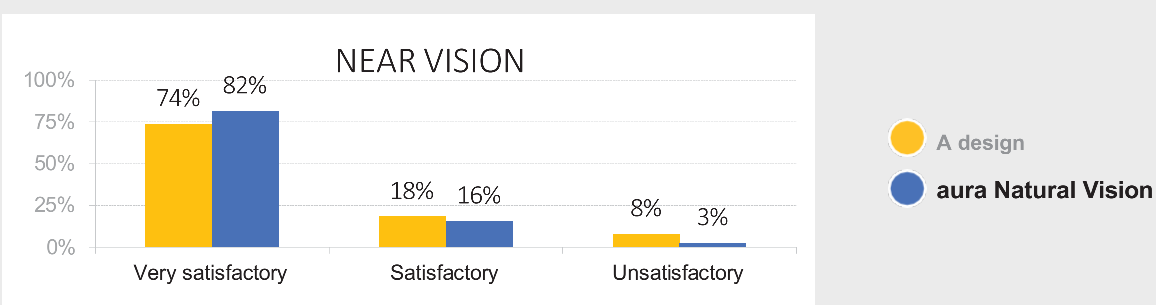


Figure 15: *Design A vs. aura Natural Vision – near vision performance.*

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 to the amount of astigmatism but also to its gradient. **Aura Natural Vision** is the first progressive lens designed to minimize both contributing factors, 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:

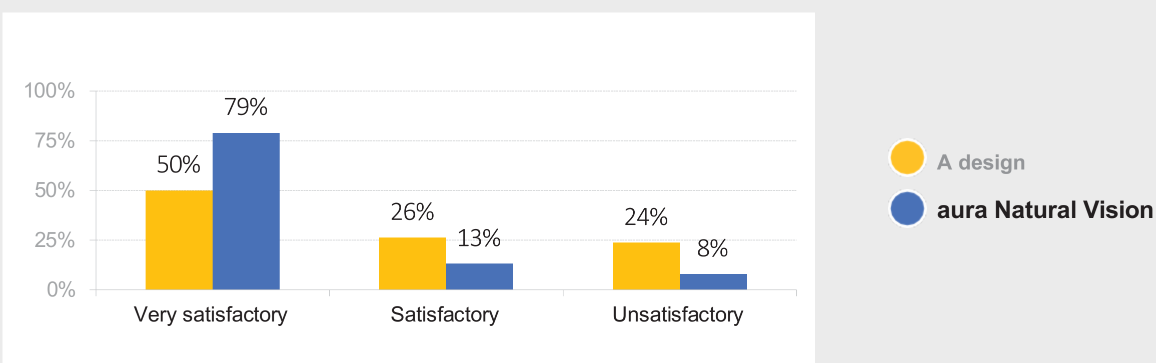


Figure 16: *A design vs aura Natural Vision – peripheral vision performance.*

Study conclusion

aura Natural Vision outperforms Design A at all distances, particularly in intermediate and peripheral 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.

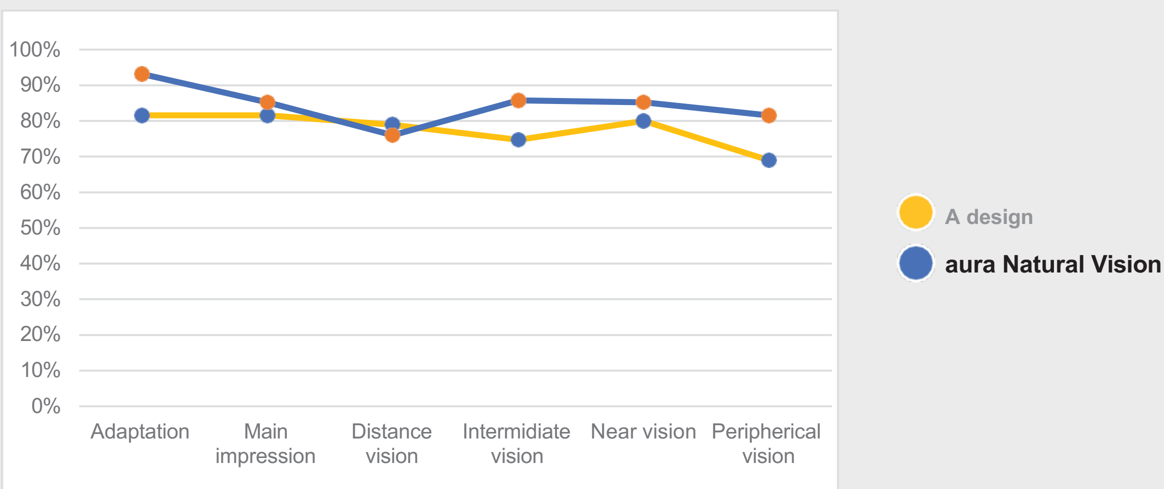


Figure 17: *A design vs aura Natural Vision – global results.*

5. Benefits

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

ACCELERATED ADAPTATION: The easiest progressive lens to wear.

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

BALANCED: Balanced and minimized blur on both sides of the corridor thanks to **Binocular Balance Technology**.

SHARP VISION AT ALL DISTANCES: Patented **ClearView Technology** reduces unwanted astigmatism up to 20%.

PERSONALIZED LENSES: Superb sharpness and precise clarity in all gaze directions thanks to **Optimesh Technology.**

DESIGNED FOR A DIGITAL WORLD: **Digital Profile Technolo**gy delivers a comfortable viewing position when using handheld devices.

ERGONOMIC DESIGN: **ErgoPath Technology** ensures a near zone position, allowing for natural reading posture.

6. Target

1. Addressed to those consumers who value clarity and comfort.

2. Ideal for those who require smooth transitions and ergonomic viewing zones for an active lifestyle.

3. Perfect for users sensitive to swim effect and those who demand optimum dynamic vision.

4. For individuals looking for a versatile progressive lens that offers maximum comfort, ease of use, and top-tier performance.

7. References

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3. Minkwitz G. Bemerkungen uber nabelpunktslinien auf flachen-stucken. Monatsberichte der deutschen Akademie der Wissenschaften 1965;7:608–10.

4. Horizons Optical: Internal studies.