Break Traditional PAL Rules with a Natural Accommodation Dream Lens

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Course description

There is a revolutionary new multifocal lens. It's a lens that requires a gentle raising or lowering of the chin to facilitate distance, intermediate, and near vision. But unlike progressive addition lenses (PAL), there are no narrow corridors to contend with, and no fitting height measurement is required. This new multifocal lens technology is the NAL® which stands for the Natural Accommodation Lens.

Objectives

Upon completion of this course, participants will be able to:

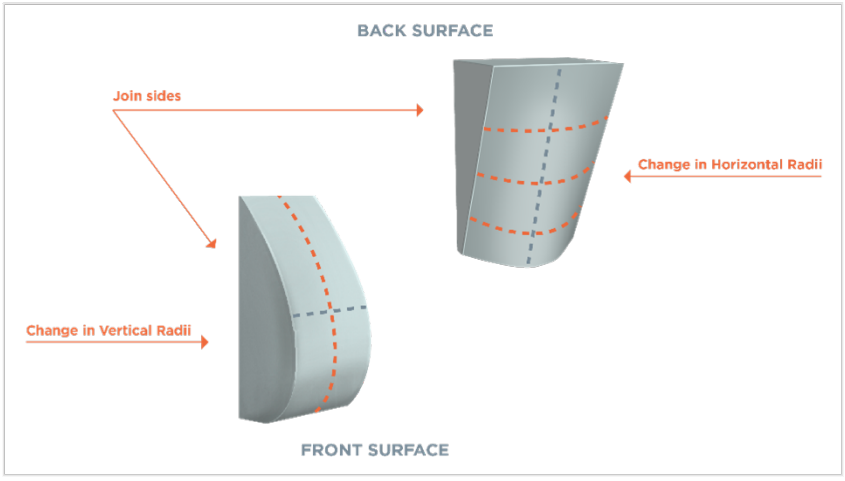
1. Explain the limitations of traditional progressive addition lenses
2. Describe the design of the Natural Accommodation Lens and its benefits
3. Describe fitting, edging, and dispensing the Natural Accommodation Lens

If you could describe a multifocal dream lens, what would it be like? Most likely it would be a lens that had no adaptation period or non-adapts due to feelings of swim or the learning process for navigating the lens, no costly redos due to inaccurate fitting height measurements, and in fact, didn't require fitting heights at all. Would we ever see a multifocal lens like that? Now there is such a lens.

But before we review the structure, features, and benefits of this breakthrough lens, and before we describe how this lens expands the opportunity for Brick-And-Mortar stores to capitalize on the trend of e-commerce, let's take a brief walk through the history of multifocal lenses.

History of Progressive Addition Lenses – PAL

The first patent for a progressive lens was British Patent 15,735, granted to Owen Aves with a 1907 priority date. Unlike modern progressive lenses, it consisted of a conical back surface and a cylindrical front with opposing axes to create a power progression. Owen Aves' design was never commercialized, however, but he can be considered the creator of the first progressive lens.



In 1948 Bernard Maitenaz followed in his father's and grandfather's footsteps and joined Société des Lunetiers as a research engineer. On March 2, 1951, more than 40 years after Aves' patent, Bernard Maitenaz deposited an envelope at the National Institute of Industrial Property in France, which included four drawings and mechanical data that would make it possible to manufacture the modern-day progressive lens. On November 25, 1953, Essel submitted the first patent for his invention.

The first commercially viable progressive lens in Europe, Essel's Varilux®, was introduced in 1959. In 1965 the Univis Omnifocal was introduced in the United States. The first progressive lenses were made of glass. In 1972 Essel changed its name to ESSILOR because of the fusion of two companies, Essel and Silor. In 1976 the first organic progressive lens, Essilor's version of Columbia Resin 39 (CR39) index 1.50, the Varilux® Orma, was released. A physicist Werner Koeppen and his team worked on the development of the Varilux® Comfort from 1960 into the 1990s, and Varilux® became the most successful PAL. Over half a century has passed since the introduction of the PAL, and the world has not been the same. Essilor has done an amazing job in the development, education, promotion, and marketing of progressive lenses and deserves the largest share of the credit.

The PAL Evolution and Its Current State

The advancements in equipment, technology, and software mathematical and development tools have opened the doors to amazing new conceptual and design possibilities − the *Freeform* Revolution! First, it was OptoTech's founder Roland Mandler, who, in 1985, adapted aerospace industry computer numerical control (CNC) technology in the production of ophthalmic lenses. Then, in 1986, Gunter Schneider of Schneider GmbH started using CNC technology in precision optics production, which later evolved into ophthalmic lens production. However, the biggest game-changer in PAL evolution came with the development of *PAL Freeform Lens Design Software*.

On October 11, 1977, Japanese scientists Hiroyuki Mukalyama and Kazutoshi Kato filed a patent application for a progressive multifocal lens and manufacturing method. After more than 20 years, the US 6,019,470 patent was granted on February 1, 2000, and was assigned to Seiko Epson Corporation. On July 18, 2000, the USPTO granted a patent for a spectacle lens with a spherical front side and multifocal back side and process for its production, US6089713A, to Albrecht Hof and Aldabert Hanssen. They then assigned it to Carl Zeiss Vision GmbH. Both patents followed the conventional PAL concept, but instead of utilizing a semifinished lens with the progressive design cast or molded on the front side of the lens, the multifocal surface was created on the back of a rotationally symmetrical front of a semifinished donor lens blank. In addition to the PAL design on the back side of the lens, the final lens back surface was further modified with Individual Optimization. Over the past twenty-plus years, that concept and production technology radically improved multifocal lenses' visual performance and acceptance/adaptability.

Today, apart from ZEISS and SEIKO, there are numerous freeform lens design companies like IOT, Crossbows, Shamir, Horizons, and HOYA, to name a few. All freeform lens designs companies are based on the conventional PAL utility, providing distance, intermediate, and near vision with about a ±8mm progressive corridor. Hundreds of PAL designs and individual optimization nuances offer "unique" or "proprietary" features. Although even the most astute ECPs aren't able to study and assess differences, most freeform lens manufacturers tend to offer three types of PAL designs: GOOD, BETTER, or BEST.

The consequence to this that comes as no surprise, is considerable disorientation among the global ECP community regarding the actual and objective visual performance of the abundance of PAL design offerings. Most commonly, it is GOOD, BETTER, or BEST PAL by major corporate brands and various private labels: the same PAL concept, different day.

Regardless of design, there are benefits and limitations to PALs. Yes, we are all well familiar with the wonderful features and benefits of PAL lenses like:

- No line
- No image jump
- Three focal distances - far, intermediate, near vision

We are all also well aware of some of the less desirable features of the PAL like:

- Cumbersome navigation through short and narrow intermediate vision corridors
- Taking accurate and time-consuming fitting height measurements and frequent fitting height redos
- Spatial disorientation, nausea, or dizziness due to peripheral waviness and distortions
- Adaptation period

The Dream Wish List

It is more than 60 years since the introduction of PAL. With new knowledge and technological evolution in computer technology and advancements in software development tools, we have reached the point that our dream wish list can be realized. First, we must drop our self-imposed limitations, get out of the box, and start our quest armed with new knowledge, unaffected insight, creativity, commitment, and courage. And the dream wish list? Actually, it is not that far-fetched or long, thanks to the numerous PAL advancements we can enjoy today:

• NO ADAPTATION PERIOD or NON−ADAPTS due to feelings of *swim or nausea*

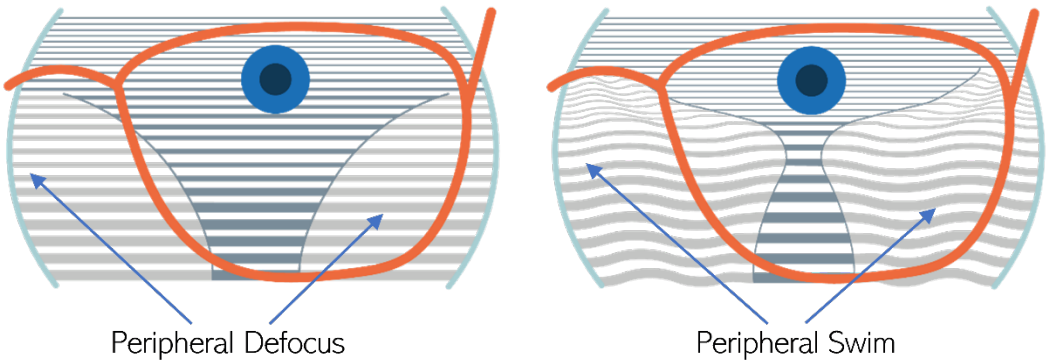
• NO ADAPTATION PERIOD or NON−ADAPTS due to *the learning process of navigation through a short and narrow intermediate vision corridor*

The Dream Lens Concept is Born: Natural Accommodation Lens (NAL®)

First came the development team, compiling relevant and timely data, and gaining the insight for the design. Upon extensive deliberations and complex considerations, a multifocal lens that would almost certainly meet the wish list criteria could be developed. After nearly 5 years of intense work and study, a functional, commercially viable, cloud-based freeform digital lens design platform was developed. That platform is ideally suited to meet specialty and vocational lenses, bifocal and multifocal lenses, and unconventional lens utility objectives. It can be integrated with any lab management system. To gain new, untainted optical insight, QLDS studied large numbers of fitting height statistical data based on frame measurements, frame shapes, and pantoscopic angles. They have created unconventional eye-lens ergonomic models, studied natural vision dynamics and natural vision habits, consulted with numerous ECPs, optical business experts and professionals, and the Natural Accommodation Lens concept was born.

Michael Walach, the inventor, is the President of Quest Vision Care Specialty Lab and the CEO of QLDS, both located in Largo, Florida. On September 21, 2021, the USPTO issued US Patent No. US 11,126,012 for Broadview Natural Addition Lens. On March 29, 2022, USPTO granted a second patent, US Patent No. US 11,287,673 B1. NAL® and OMNILUX® are USPTO registered trademarks. The registrant is Michael Walach.

The NAL® does not have the short, awkward to navigate intermediate vision corridor inherent in PALs. NAL® has a funnel-shaped visual field comprised of substantially aspheric, lateral power bands that are aligned along a vertical design backbone. (Think of a martini glass.) The design backbone has mathematically created curvature based on actual natural downward gaze focal length deceleration requirements derived from their unique eye/lens interaction ergonomic model, and extensive PAL fitting data. The focal length deceleration curve addresses natural accommodation requirements for focal lens reduction *from 6 meters (20') all the way to 35 cm (1' 4") along a continuous, smooth focal length deceleration ramp.*



No Adaptation Period or Non-adapts

The new NAL® eliminates the peripheral swim effect inherent in PAL due to peripheral defocus. They have been able to achieve that effect by:

- The application of substantially lateral aspheric broad power bands aligned vertically along the NAL® backbone and interpolated by various bi-quadratic, cubic, and quintic polynomials and splines (continuous curves constructed so as to pass through a given set of points) into one smooth continuous surface.
- Complex digital ironing out of peripheral areas.
- Significant reduction in focal length deceleration rate along the substantially vertical NAL® principal design axis due to a 2 to 4 times longer add power acceleration ramp radically reduces unwanted lateral astigmatism as per the Minkwitz Theorem.
- NO ADAPTATION PERIOD or NON−ADAPTS due to the learning process of navigation through a short and narrow intermediate vision corridor. Because the NAL® visual field is funnel-shaped, there is no short narrow progressive corridor for the wearer to learn to navigate. As a result, NAL® adaptation is virtually instant, and the navigation is intuitive and natural.

No Costly Redos Due to Inaccurate Fitting Height Measurements

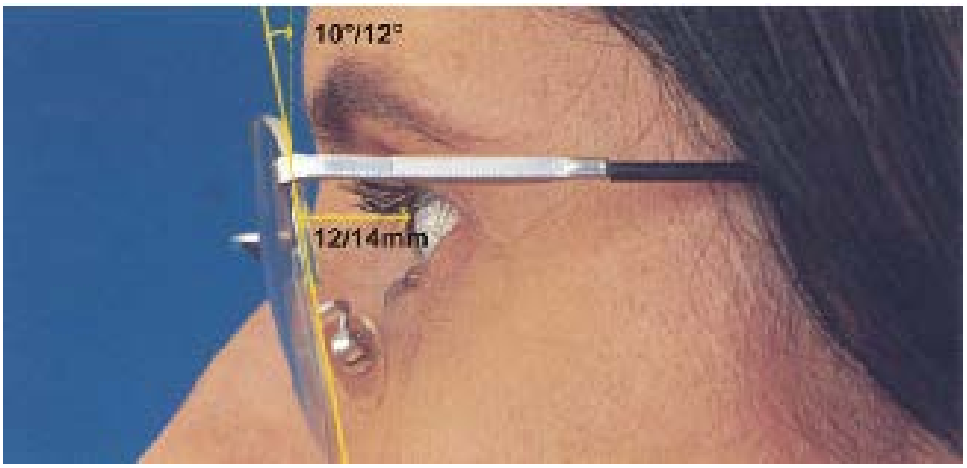
The NAL® visual field is shaped like a funnel or martini glass. Therefore, it does not have a short, narrow intermediate vision corridor like a PAL. The NAL® has no progressive corridor. Consequently, NO time-consuming FITTING HEIGHT measurement is required, which means that NO issues arise from incorrect FITTING HEIGHT. And there are NO irritating redos typically caused by PALs ordered with an incorrect fitting height. To change the focal distance in NAL®, the patient gently lowers or raises their chin to fix their gaze on the object viewed and perfectly focus on the distance needed.

The objective of the NAL® concept is to provide a youthful, natural single vision viewing experience for active and professional presbyopes. Numerous wearer studies proved that the actual viewing experience with the NAL® is more natural and closer to the visual experience afforded single vision lens wearers. Remember youthful vision? Remember how natural the transition was from the office, golf, bike, tennis, or viewing the computer screen? This is the visual experience that patients desire in their multifocal eyewear.

Fitting, Edging, and Dispensing

To fit the NAL®, start with the frame:

- Select a frame with a minimum "B" measurement of 34
- Adjust the frame on the patient for maximum comfort and accuracy before taking any measurements
- Set the vertex distance between 12 and 14mm



- Set the pantoscopic tilt between 10° and 12°
- Frame should have positive facial wrap

There is no need to measure a fitting height. NAL® lenses do not require a fitting height. Always take a monocular PD to ensure exact decentration of the eye behind the lens.

For lab ordering of uncut lenses, the ''B'' measurement of the frame is required, and a trace or accurate drawing should be supplied. For edging, use only the horizontal decentration for the PD, just like single vision lenses. And for inspection, the laser Engraving Marks are 34mm apart and are **always** located at the vertical center of the frame. The Engraving Reference Point (ERP) is centered between the Engraving Marks. The Prism Reference Point (PRP), Power Verification Point (PVP), and Layout Reference Point (LRP) all coincide at the ERP for single point inspection. Dot the lens directly in the middle of the engraving marks and measure the PD to verify it is correct. Confirm the prescription with the lensometer using the verification prescription provided by your Laboratory Management System.

Upon dispensing:

- Place the frame on the patient. Adjust "as worn" pantoscopic tilt at 10° to 12° for optimum visual performance as recommended on most advanced freeform multifocal lenses.
- With the Distance PD marked verify that the PD is in the center of the patient's iris.

- Validate the patient's distance, arm's length (typically a computer monitor) and near vision with the reading card.
- Consider Martin's Formula - every 2° increase of pantoscopic tilt raises the optical center/NAL® vertical design position by 1mm.
- Correct adjustment of pantoscopic tilt has a positive effect on the clarity.
- If there is an issue with comfortable natural vision at any gaze, ask the patient to move the eyewear up and down, in and out, and with more or less tilt while their gaze is locked on an object to establish the best vision position, then adjust the glasses exactly as the patient had them positioned.

Troubleshooting:

VISION ISSUE	RESOLUTION
Patient has narrow reading area:	• Verify PD Measurements • Verify Add Power • Add pantoscopic tilt and decrease vertex Distance
Peripheral vision blurs and moves:	• Adjust frame to decrease vertex distance and to increase facial wrap • Increase pantoscopic tilt to 10-12° • Spread nose pads or lower the frame
Patient lifts head or glasses to read:	Lenses are too low: • Adjust frame to sit higher on patient's face Adjust nose pads closer together • Increase pantoscopic tilt to 10-12° and have patient confirm the change corrected the issue
Patient lowers head or glasses to read at a distance:	Lenses are too high: • Adjust frame to sit lower on the patient's face • Lower frame by widening nose pads • Increase pantoscopic tilt and have patient confirm the change corrected the issue

Patient moves reading material off to side for better focus:	• PD is off or lenses are mounted incorrectly • Verify monocular PD measurement • Mark the distance PD measurements in the frame • Mark the PD on the frame (midway between the engraving marks) and verify the PD is in front of the patient's iris • Have lenses remade with correct PD measurements
Distance vision is slightly blurry:	• Increase pantoscopic tilt • Verify lens power • New RX/old RX comparison

NAL® and its Impact on the Industry and the Patient

Despite the enduring efforts of lens designers worldwide, the bell curve of new PAL concept design innovations is significantly leveling off. There have been over 60 years of PAL design improvements and design modifications. Since SEIKO, ZEISS and RODENSTOCK pioneered the backside lens surface individual optimization concept over 20 years ago, more than 200 "proprietary" or patented designs have been introduced since the freeform digital revolution. New PAL innovation at this time appears to be trying to squeeze water from the stone.

It is also important to realize that the prescription eyewear e-commerce business is growing about ten times faster than brick-and-mortar. It seems reasonable to assume that the trend is going to continue. The ECP brick-and-mortar community should seriously consider this and expand its marketing outreach to include an e-commerce presence. At this moment, multifocal PAL internet sales are falling far behind brick-and-mortar PAL sales. Still, the NAL® with no fitting height requirement creates an opportunity for retailers to expand e-commerce. The NAL® has the potential to shift the numbers in favor of e-commerce significantly.

NAL® is available as OMNILUX® for all daily youthful vision needs and OMNILUX® OFFICE for extensive computer work. NAL® is available in all lens materials and treatments. The Rx power range is +8.00 D to -12.00 D SPH, -6.00 D CYL, and PRISM up to 6.0 D. The ranges can vary, broader or narrower, depending on the type of freeform production line, lens material, and lens design systems (LDS) provider.

Summary

NAL® OMNILUX® is a truly new concept in multifocal lenses. The NAL® does not have the short, awkward- to-navigate intermediate vision corridor inherent on PALs. NAL® has a funnel shaped visual field comprised of substantially aspheric, lateral power bands that are vertically aligned along a substantially vertical design backbone. The design backbone is mathematically created curvature based on actual natural downward gaze focal length deceleration requirements, on their unique eye/lens interaction ergonomic model, and extensive PAL fitting data. The visual fields are smoothly connected,

providing natural vision from distance to near. The wide intermediate visual field provides effortless mid-range navigation, and near reading vision is comfortable.

OMNILUX® is a premium product that can be offered at a premium price. Because no fitting height is needed, it eliminates costly redos and non-adapt issues due to fitting height errors and reduces valuable dispensing time. Power verification and PRP are at one point only - at the ERP, which simplifies the finishing layout. The lenses are edged like single vision. There's an opportunity for increased multifocal sales because OMNILUX ®is available in all materials and treatments. Just when you thought there couldn't be anything new in lens design, NAL® OMNILUX® presents a new multifocal concept for greater patient acceptance that gives your business a competitive advantage – what lens dreams are made of.

Test questions

1. The first patent for a progressive lens was issued in 1907 to
    a. Bernard Maitenaz
    b. Owen Aves***
    c. Essel
    d. Werner Koeppen
2. The first commercially viable progressive lens was
    a. Univis Omnifocal
    b. Varilux Orma
    c. Lunetiers
    d. Essel's Varilux***
3. The biggest game-changer in PAL evolution was
    a. PAL Freeform Lens Design Software***
    b. Availability in new materials
    c. Front side curves
    d. Monocular PDs
4. Conventional PAL designs have an intermediate corridor of
    a. + or - 15 mm
    b. + or - 20 mm
    c. + or – 8 mm***
    d. + or – 10 mm
5. Which is NOT a benefit of PALs?
    a. No line
    b. No image jump
    c. Short intermediate corridor***
    d. Three focal distances – far, intermediate, and near
6. A reason for PAL non-adapt is
    a. Feeling of swim or nausea***
    b. Monocular PDs
    c. Accurate height
    d. Lens material
7. The NAL® development team took this long to develop their lens design platform
    a. Nearly 10 years

b. Nearly 2 years
c. Nearly 8 years
d. Nearly 5 years***

8. NAL® stands for
    a. New Accurate Lens
    b. Natural Accommodation Lens***
    c. Naturally Accurate Lens
    d. Next Accommodation Lens
9. The inventor of the NAL® is
    a. Owen Aves
    b. Michael Walach***
    c. Bernard Maitenaz
    d. Werner Koeppen
10. The NAL ® visual field is shaped like
    a. A vase
    b. A semicircle
    c. A concentric ring
    d. A martini glass***
11. NAL® complex digital ironing out across visual field peripheral areas eliminates
    a. Peripheral swim effect***
    b. Chromatic aberration
    c. Problems with near vision
    d. Problems with intermediate corridor navigation
12. NAL® requires
    a. Precise fitting heights
    b. No PDs
    c. No fitting heights***
    d. A large frame
13. To change the focal distance in NAL®
    a. The patient raises or lowers their seat
    b. The patient adjusts the vertex distance
    c. The patient gently raises or lowers their chin***
    d. The prescription must be changed
14. To fit the NAL®, select a frame with a minimum B measurement of
    a. 34 mm***
    b. 40 mm
    c. 28 mm
    d. 42 mm
15. NAL® vertex distance is set
    a. Between 10 and 12 mm
    b. Between 9 and 11 mm
    c. Between 8 and 10 mm
    d. Between 12 and 14 mm***
16. NAL® pantoscopic tilt is set

a. Between 12 and 14 degrees
b. Between 10 and 12 degrees***
c. Between 8 and 10 degrees
d. Between 9 and 11 degrees

17. NAL® laser engraving marks are always located
    a. At the horizontal center of the lens
    b. At the vertical center of the frame***
    c. 20 mm from the lowest point on the lens
    d. 15 mm from the top of the lens
18. Every 2 degrees of pantoscopic tilt raises the optical center by 1 mm is
    a. Minkwitz Theorem
    b. Prentice's Rule
    c. Optical Theorem
    d. Martin's Formula***
19. Prescription eyewear e-commerce business is growing
    a. 10 times faster than brick-and-mortar***
    b. More slowly than brick-and-mortar
    c. 5 times faster than brick-and-mortar
    d. At half the rate of brick-and-mortar
20. Omnilux® and Omnilux® Office are
    a. Only available outside the US
    b. Only available in CR39
    c. Two NAL® designs***
    d. Two types of lens design software