

## Aniseikonia Solved WITH OPHTHALMIC LENSES.





Shaw Lens Inc. 14 Leswyn Rd. Toronto, ON, Canada M6A 1K2 1-877-796-9944 Fax 416-981-3311

shawlens.com

Research and clinical trials indicate that spectacle-induced aniseikonia is a principal cause of patient discomfort with eyeglasses. There are no norms for tolerance to aniseikonia. This book contains real-life case summaries that demonstrate how solving aniseikonia can dramatically improve patients' experiences with glasses.



**Dr. Peter Shaw, designer of the Shaw Lens system.**Designed by an optometrist for optometrists, the SHAW™ lens is a comprehensive system that makes binocular lens design simple and foolproof. We can do better for our patients – and that's the driving force behind the SHAW lens.

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"Majority of patients have a wow experience and say it's the best lens they've ever worn."

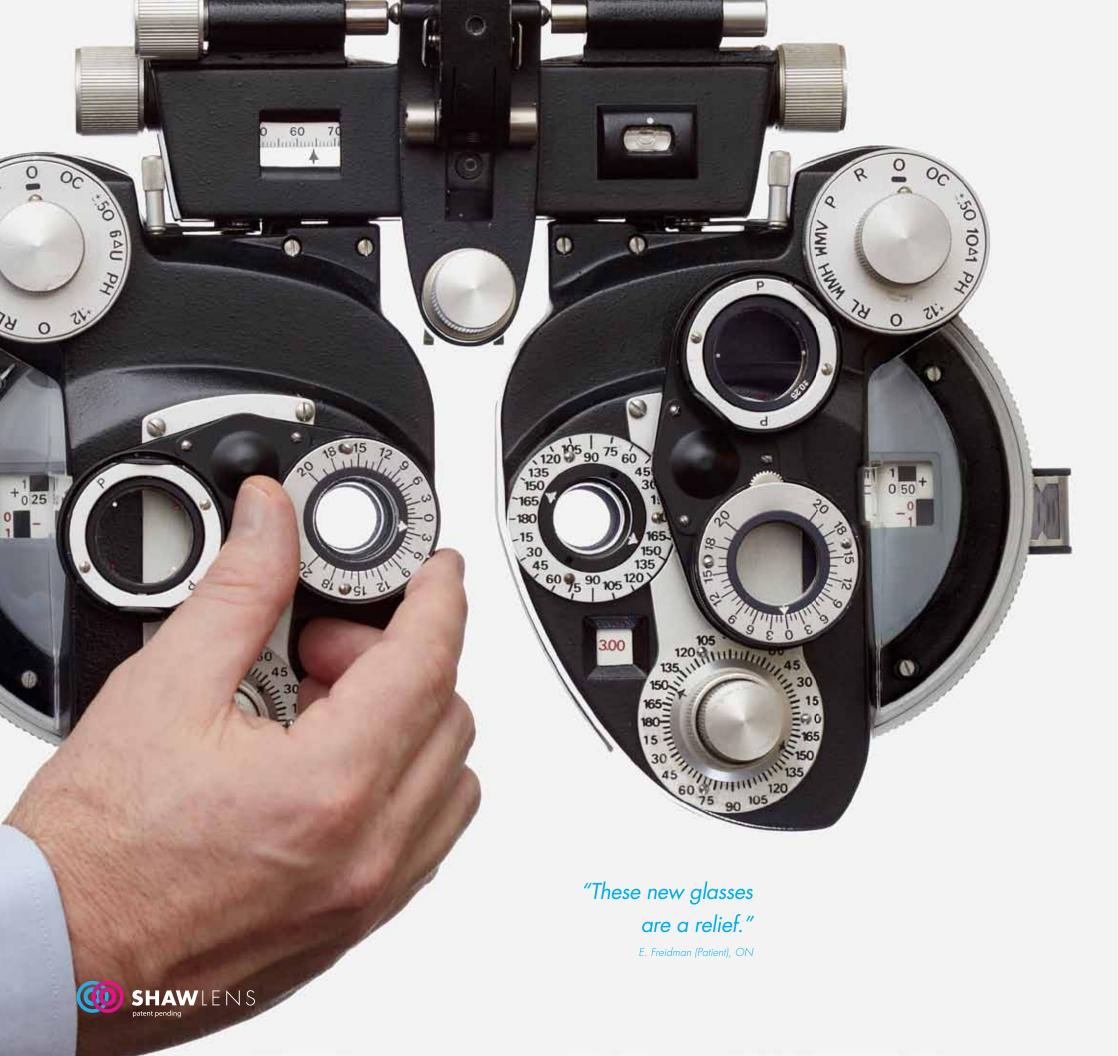
A. Shajani, OD, BC

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## Solving aniseikonia is the single most important factor in patient comfort.

Today, with the advent of digital manufacturing, all lenses perform pretty much the same. The differences between them are miniscule at best. And yet, they all do one thing wrong.

## They all treat binocular vision in a monocular manner.

The SHAW lens is different. The SHAW lens is a truly binocular vision system. It uses a patent-pending method that takes measured motor fusion limits (vergences), the prescription, and position-of-wear information all into account in the design of a pair of lenses. This provides unparalleled binocular vision. The resulting SHAW lenses are designed to maintain induced prismatic effect that falls within individual patients' limits. It solves aniseikonia.

# Why is dynamic aniseikonia so important?

Clinical trials indicate that solving dynamic issues is the single most important aspect of patient comfort with a pair of glasses. Conventional lenses induce aniseikonia by the very nature of their monocular design.

Simply, the images in each eye are different sizes. Both images are clear but the brain has trouble putting those different-sized images together, resulting in discomfort. And, when the eyes move around, the dynamic aniseikonia makes it even harder to fuse the images. Studies show it is dynamic aniseikonia causing many of the symptoms. Up to now, all an OD has been able to do is tell the patient, "You'll get used to it."

That's not good enough.

Tolerance of static and dynamic aniseikonia varies widely from patient to patient but fortunately it can be predicted through vergence testing. Our recommended method is to use Risley prisms to determine the motor fusion limits. (Base down to break OD, base up to break OD, base in to break OU, base out to blur/break OU.) This establishes the vergence (motor fusion) facility in both lateral and vertical meridians in primary gaze at distance.

With the SHAW lens design tool, the optometrist can then predict patients' motor fusion facility and design lenses that fall within those values. Solving aniseikonia makes a noticeable difference for a surprising number of patients.

"Up to 56% of those 18 to 38 have symptoms related to a binocular vision problem."

Dr. Dominick Maino, Professor, Illinois College of Optometry, Illinois Eye Institute

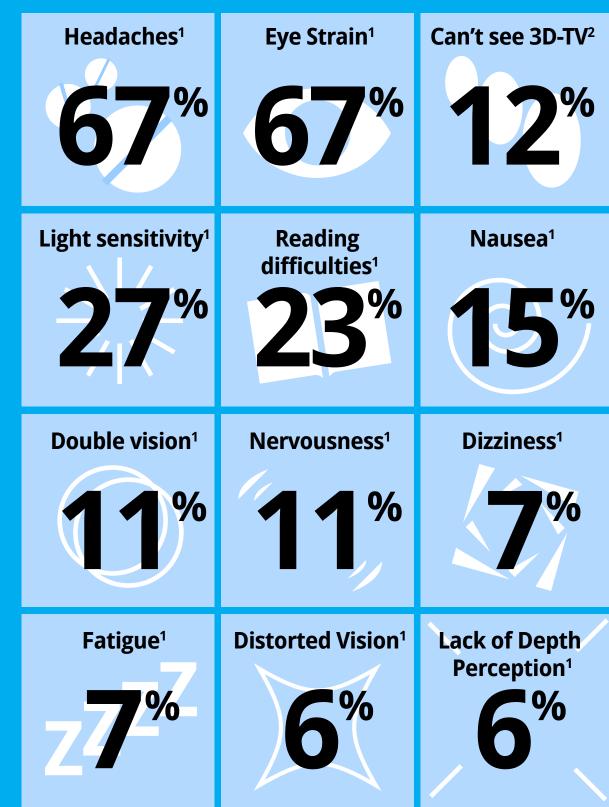
## What is dynamic aniseikonia?

Dynamic aniseikonia (anisophoria) is the difference in both eyes' abilities to make compensated eye movements to achieve foveal fixation of a peripheral target object.

This is generally the result of the spectacle correction of anisometropia, meridional aniseikonia due to asymmetrical astigmatism, curvature at the spectacle plane due to the frame's face form angle and/or prescribed prism.

Other causes include extraocular muscle paresis and oculomotor anomalies.

## Symptoms of Aniseikonia



B. E. Bannon, W. Triller, Aniseikonia - a clinical report covering a ten year period. Am. J. of Optometry, 1944. 171.
 3D Vision Council. Vision Institute, 2011



## Binocular Lens Design

"This is hard-core optometry."

-A. Glazier, OD, MD

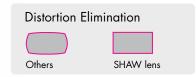
At the heart of what makes the SHAW lens different is our sophisticated lens design tool. Our lens design tool uses a patient's prescription, motor fusion limits and position-of-wear information to design a lens that falls within his or her binocular vision limits.

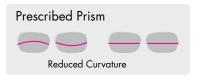
The Shaw Lens patient-centred methodology combines the physics of refractive optics with the physiology of an individual's binocular vision system, creating a bridge between science and patient comfort.

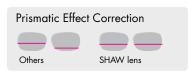
Rather than relying on the patient adapting to an arbitrary "normal" value, the SHAW lens design software performs the complex math and automatically determines the appropriate index, corridor length, base curve and centre thickness to solve aniseikonia to prescribed limits and give the best binocular vision results.

## Automated Corridor Length Adjusted for Position of Wear









## And it works

This technology was awarded a prestigious grant from the American Optometric Foundation. Its inventor, Dr. Peter Shaw, was made Adjunct Associate Professor at the University of Waterloo School of Optometry and Vision Science.

## Quality manufacturing

SHAW lenses are manufactured and delivered in partnership with an international lens manufacturer offering the wide range of base curves necessary for optimal application of the SHAW Lens design.

**International Patent Pending** PCT/CA2012/000743

## **Available Lenses:**

## **Progressive Addition and Digital Single Vision**

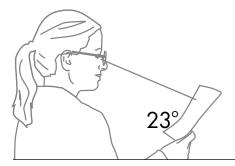
Index	Clear	Transitions <sup>TM</sup>	Polarized	Drivewear™	Cylinder	Prism	Add
1.50	-9.00 to +8.00	-9.00 to +6.50	-9.00 to +6.50	-9.00 to +6.50	-5.00	5	0.50 to 4.00D
1.59	-9.00 to + 8.00	-9.00 to + 6.50	-9.00 to +6.50		-6.00	5	0.50 to 4.00D
1.60	-14.00 to +9.50	-14.00 to +9.50	-14.00 to +8.00		-6.00	5	0.50 to 4.00D
1.67	-16.00 to +12.50	-16.00 to +9.50	-15.00 to +9.50		-6.00	5	0.50 to 4.00D
1.74	-18.00 to +11.50	-18.00 to +11.50			-6.00	5	0.50 to 4.00D

## FT28 Bifocal

Index	Clear	Transitions™	Polarized	Drivewear <sup>TM</sup>	Cylinder	Prism	Add
1.50	-9.00 to +8.00	-9.00 to +6.50			-5.00	5	1.00 to 3.50D
1.59	-9.00 to + 8.00				-6.00	5	1.00 to 3.50D

## Optimized corridor length

Corridor length is automatically specified based on frame dimensions and position-of-wear measurements to determine a patient's optimal reading zone.



Corridor length optimized for a comfortable 23° of downward gaze for reading.

## Coatings

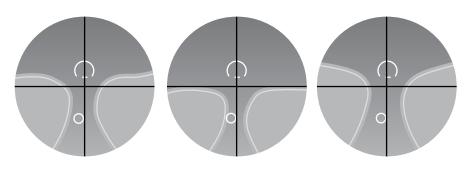
• All Shaw lenses are supplied with Super-anti-reflective, anti-scratch, hydrophobic and oleophobic coatings

## Tints

- Transitions Polarized
- Custom



## SHAW lens progressives are available in three distinct geometries.



## **Balanced** multi-purpose PAL for everyday

Active for sports (ideal for sunglasses)

**Boardroom** for enhanced reading

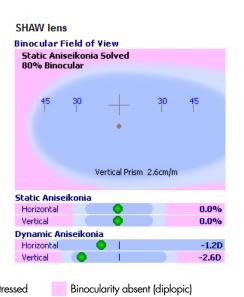


## Differentiate your practice

Show your patients the difference you and the SHAW lens can make to their vision – before they buy!

Eyeglasses are becoming commoditized. With online optical the message is that eyeglasses are simple devices. We know that is far from the truth. Using the SHAW lens app, you can demonstrate the improvement that you and the SHAW lens can make to your patients vision. It's a great tool that helps you demonstrate the improvement you bring to the quality of your patients vision. Plus, because of our passion for optometry, the SHAW lens is only available from authorized independent optometry practices.





The final design screen presents all the information optometrists need to make informed decisions about lens design. Included is a direct comparison of the binocular field of vision of the SHAW lens and a conventional lens (dark blue = adapt, pink = never adapt), and a comparison of static and dynamic aniseikonia (blue bar indicates measured patient limits, dot indicates lens performance within those limits, green = good, yellow = OK, red = bad)

## 1 SHAW lens design app



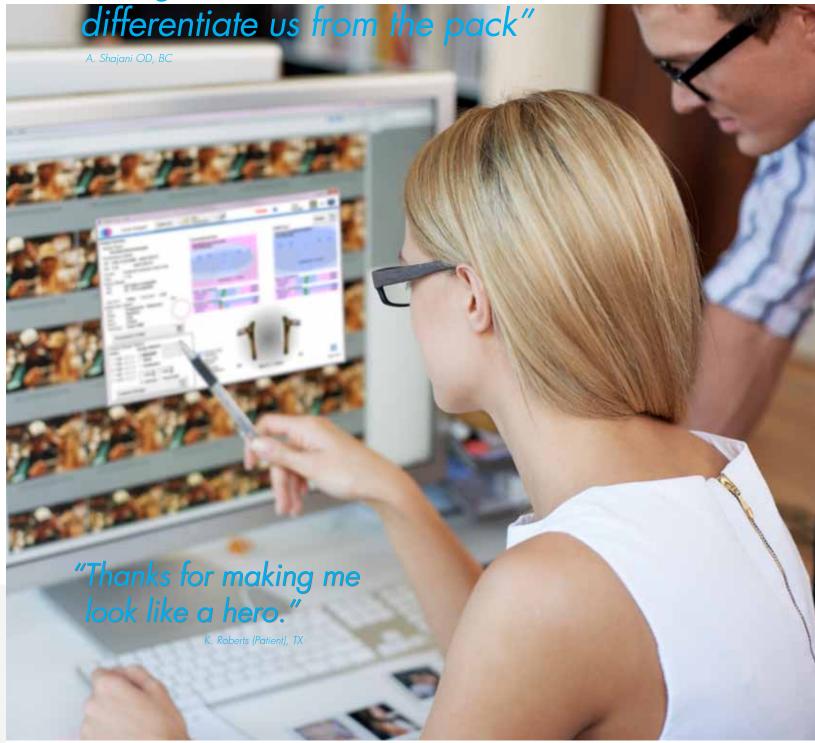


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## "I think this lens will be a game changer for us and further



"Patients report it's the best progressive (lens) by far, with the least distortion they have ever experienced."

A. Glazier, OD, MD



The Love at First Sight Guarantee. Our promise to your patient: If you don't think your SHAW lenses are the best you've worn from the minute you put them on — then we'll make it right or give you a full refund. It's that simple.



## When to use the SHAW lens

All glasses create aniseikonia to one degree or another. Some patient's adapt easily, while others do not. It's hard to test for, and you can't predict its impact simply by looking at a prescription. With the SHAW lens method you don't have to guess.

Using motor fusion limits with our lens design tool you can predict patients' binocular vision problems and solutions. Use it for every patient and know for sure when to recommend a SHAW lens. In fact, the University of Waterloo and the University of Auckland both use the SHAW lens algorithm as a best practice for every patient.

These case studies give a good understanding of where the SHAW lens technology has already had a big impact on patient comfort. You can see more at shawlens.com.

- Amblyopia
- Anisometropia
- Antemetropia
- Astigmatism

- Contact lens Wearers
- Prismatic correction
- Refractive surgery
- Presbyopes (new to glasses)

Patient symptoms can indicate negative effect of their current glasses.

- Headaches
- Eve strain
- Distortions in peripheral gaze
- Trouble reading
- Double vision
- Inability to see the 3D in 3DTV

Why guess? Perform the SHAW lens method for all patients and know for sure. You can see when a SHAW lens will make a difference for a patient, and when it won't. After all, less aniseikonia is always better.



# Amblyopia

## SHAW lens NO PATCH Amblyopia Treatment Program

- The optometrist refracts the patient as per usual and takes the frame and position-ofwear measurements.
- 2. The OD can either send this information to Shaw Lens or can input the information in the SHAW lens design tool. (In the SHAW lens tool, choose the Amblyopic design method. This will design a SHAW lens to a target value of 0% difference in the horizontal meridian.)
- 3. Complete order using the SHAW lens design tool.
- 4. Assess after 12 weeks of full-time wear.

For additional reading, please see "A considerations of binocular parameters in the spectacle correction of anisometropic amblyopia: A Case Report" by William Bobier OD, PhD, FAAO, MBCO (School of Optometry, University of Waterloo) and Peter Shaw OD, Optometry and Vision Development Volume 43, Number 2, 2012.

This patient's parents ordered an additional pair of spectacles from an online optical supplier. The young patient put them on and then just took them off, saying, "I can't wear those." The refractive prescription was correct and the PD was supplied as requested. However, these traditional lenses failed to correct the static and dynamic components of the anisometropia, making the glasses unwearable.



Straight-eye amblyopia with monocular hyperopia. Age 4.

 Refractive Error

 Sphere
 Cylinder
 Axis
 Add
 PD

 OD
 +3.50
 26

 OS
 Plano
 26

Motor Fusion Limits @ 6m
BU BD BI BO

Motor Fusion Limits not applicable for amblyopia

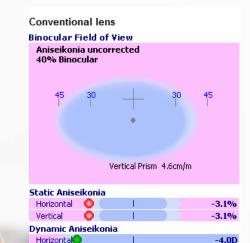
 Frame Data

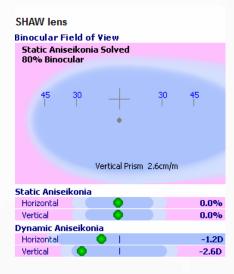
 Eye
 DBL
 Wrap
 Vertex
 Height

 45
 18
 8
 10
 14

This four-year-old presented without previous spectacle correction and had complaints of blurred vision in the right eye. At the time of the initial examination, acuities with correction were OD 20/100, OS 20/20, stereo acuity distance 360". There was no evidence of strabismus. Because of the age of the child, and the condition itself, it was difficult to get accurate motor fusion limits. An iseikonic correction of 0% was prescribed using the SHAW lens software. The patient was instructed to wear the SHAW lenses full-time and patching was not employed. At the one-month follow-up visit, the acuity was OD 20/32, OS 20/20, stereo acuity 80". At the six-month follow-up, visual acuity was OD 20/20, OS 20/20, stereo acuity 40".

This case illustrates how the wearing of spectacle correction in anisometropic amblyopia provides amelioration of refractive amblyopia without the need for patching. Further, as amblyopia decreased, the quality of binocular vision improved. Classic clinical thinking would suggest that spectacles have improved the quality of the image in the right eye, leading to the amelioration of the amblyopia. However, recent evidence points to a path where it is the restoration of the binocular vision that actually improves the amblyopia.





Note the improvement in the zone of binocular vision comfort in addition to the elimination of static aniseikonia and the dramatic reduction of dynamic aniseikonia. Keep in mind that children are even less willing to try to "get used to it" than adults are.



Vertical()

# Amblyopia

Adult refractive amblyopia with unequal hyperopia. Age at first treatment: 44.

Refractive Error

	Sphere	Cylinder	Axis	Add	PD
OD	+5.00	-0.50	180	1 <i>.75</i>	32
OS	+2.00	-0.50	180	1.75	32

Motor F	usion Limits @	6m		
BU	BD	BI	ВО	
Motor F	usion Limits not	applicable f	or amblyopia	

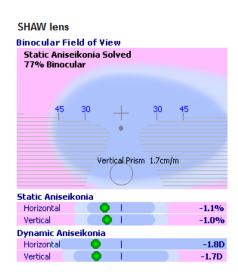
Frame	Data
-------	------

Eye	DBL	Wrap	Vertex	Height	
50	18	5	12	20	

This patient initially presented at age 44 with +1.25 OU with a 2.00 add. Her best corrected visual acuities were OD 20/200, OS 20/20. An iseikonic (0%) design was prescribed to treat the amblyopia. The patient wore these glasses full-time without patching, and within one month her acuity with full line presentation had improved to OD 20/50, OS 20/20; after 6 months, OD 20/32, OS 20/20; and at 5 years, it is OD 20/25, OS 20/20.

This case clearly demonstrates that there is no cut-off age for treating binocular and sensory dysfunction. The patient was amazed at the rapidity of the improvement. Needless to say, she is a big fan of the SHAW lens after having been told for 40 years that there was no cure for her "lazy eye."

## 



Not only is the static aniseikonia corrected, but the prismatic effect is reduced in the progressive reading zone.

# Aniseikonia

"They are amazing.
I've never had vision
as good as I have with
my new glasses."

J. Robertson, (Patient), ON

Axial length changes from retinal detachment surgery. Age 52.

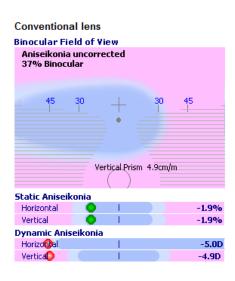
Re	frac	tive	En	or

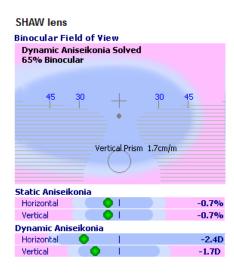
	Sphere	Cylinder	Axis	Add	PD
OD	-1.50	· -	-	2.00	32
OS	-4.00	-	-	2.00	32

Motor F	usion Limits @	6m	
BU	BD	BI	ВО
2.5	2.5	4	12

Frame Data							
Eye	DBL	Wrap	Vertex	Height			
<u> </u>	1.4		10	22			

This patient had a sudden refractive error change subsequent to retinal detachment surgery with a scleral buckle. It is common for axial length changes due to the procedure to create myopic anisometropia. The optometrist was assisted by the SHAW lens design tool, which enabled the clinician to easily specify the iseikonic correction. This method optimizes the design to accommodate the unique motor fusion physiology of each patient without resorting to bicentric manufacturing.





The -3% the doctor specifies for static magnification is achieved without a detrimental effect on dynamic aniseikonia. Note how the area of single vision compares to a conventional design while sensory fusion is maintained. This is accomplished by base curve optimization with minimal thickness penalty (max ET 4.2 mm). Vertex changes with base curvature and the non-linearity of base effects contribute to a design that is not predictable using paraxial methods.



Sudden onset due to monocular cataract surgery. Age 74.

Refracti	ve Error				
	Sphere	Cylinder	Axis	Add	PD
OD	+3.00	-1.00	090	2.50	32
OS	Plano	-	-	2.50	32
Motor F	usion Limits @	9 6m			
BU	BD	BI	ВО		
3	3	4.0	8		
Frame [	Data				
Eye	DBL	Wrap	Vertex	Height	
<u> </u>	1 5		10	1.0	

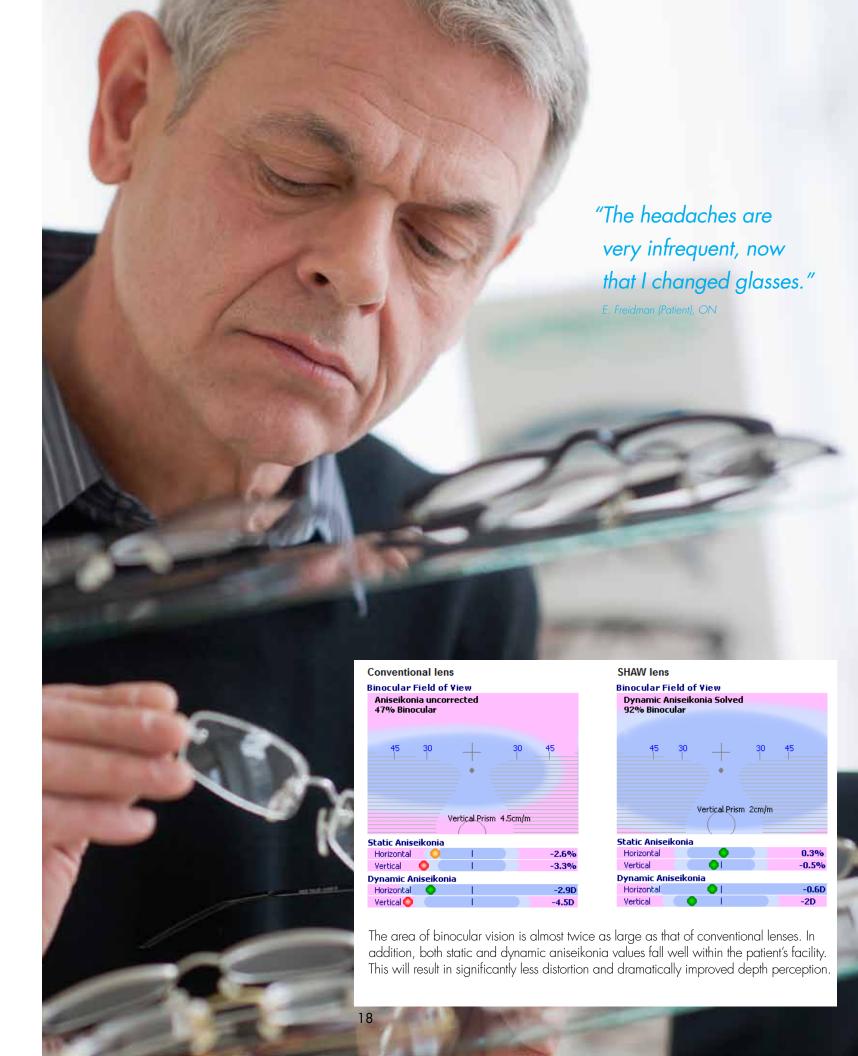
## Anisometropia

Patients who experience spatial distortion and impaired depth perception as a result of the effects of dynamic aniseikonia due to sudden monocular prescription changes (caused, for example, by cataract surgery) can be prone to falls and injury. This is especially problematic for the elderly. Management of the dynamic components of aniseikonia is critical for these patients. Optometrists can provide expert management using the SHAW lens system.

This patient had cataract surgery performed on the left eye only. The cataract in the right eye was still marginal, and it was decided not to perform surgery until it became problematic. The patient wanted to retain the full-time use of progressive lenses. To maintain fusion in all positions of gaze and particularly in the progressive reading zone, the default dynamic design of the SHAW lens algorithm was selected. The patient picked up and wore the glasses without any problems. Binocular vision was maintained in distance and in near gazes. The SHAW lens design ensured that motor fusion limits were respected in all positions of gaze.

In order for rapid adaptation to occur following dramatic refractive error changes, both motor and sensory fusion stimuli need to be respected.





New progressive lens wearer. Age 44.

Refractive Error

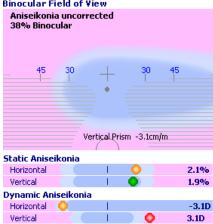
	Sphere	Cylinder	Axis	Add	PD
OD	-0.75	-0.25	090	1.50	31
OS	+1.00	-	-	1.50	32

Motor Fu	Motor Fusion Limits @ 6m						
BU	BD	BI	ВО				
1.5	1.5	2.5	10				

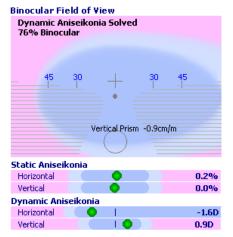
Frame Data								
Eye	DBL	Wrap	Vertex	Height				
54	16	3	11	20				

This patient had never worn glasses before. Her primary complaint was blurred vision in distance and near gazes. She didn't want two pairs of glasses so opted for progressive lenses. This type of patient typically has issues adapting to progressive lenses due to the dynamic aniseikonia. Her fusional tolerance indicates potential for non-adaptation to glasses. With the SHAW lens modelling software, the optometrist was able to determine the optimal solution. In addition, the SHAW lens design tool customizes corridor length to a preferred end point calculated with the exact position of wear and magnification effects of the spectacles. In this case, after instruction on how to use progressive lenses, the patient was happy with her new glasses and had no adaptation issues.

## Conventional lens Binocular Field of View



## SHAW lens



Of particular interest in this case is the improvement of both lateral and vertical components of the induced dynamic aniseikonia. Also note how induced prism in the reading zone is dramatically less than what the patient would experience with all other designs.

"It is absolutely natural. Feels like I don't have glasses at all."

E. Freidman (Patient), ON

Low myopia with low motor fusion limits. Age 57.

## Refractive Error

	Sphere	Cylinder	Axis	Add	PD
OD	-1.00	-0.25	090	2.00	32
OS	-1 <i>.7</i> 5	-	-	2.00	32

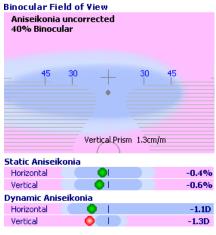
## Motor Fusion Limits @ 6m BU BD BI BO 0.5 0.5 2.5 12

## Frame Data

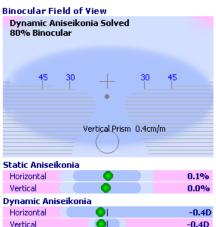
Traine E	Julu				
Eye	DBL	Wrap	Vertex	Height	
50	18	5	10	20	

Optometrists know that some patients adapt well to eyeglasses and others don't. Motor fusion facility often holds the key to predicting how patients may fail to adapt. This patient presented with discomfort from her habitual spectacles, stating that she only felt comfortable while looking through the centers of her lenses. Of clinical relevance here are the low motor fusion limits. This case clearly demonstrates that even a mild degree of anisometropia can be problematic. This is easily and accurately predicted through standard motor fusion testing by the optometrist, assisted by the SHAW lens design software. The resultant SHAW lens satisfies the motor fusion requirements.

## Conventional lens



## SHAW lens



Note how the patient's limited motor facility has severely restricted the binocular field. The SHAW lens significantly improves comfort by ensuring all values fall well within the patient's tolerance.



# Astigmatism

Meridional anisometropia. Age 45.

<u>Retracti</u>	ve Error				
	Sphere	Cylinder	Axis	Add	PD
OD	+0.25	-0.25	010	1.50	30
$\bigcirc$ S	±0.25	3 25	012	1.50	3.1

Motor F	Motor Fusion Limits @ 6m						
BU	BD	BI	ВО				
2	2	4	10				

Frame Data							
Eye	DBL	Wrap	Vertex	Height			
52	17	6	12	21			

At first glance, this Rx would not attract the attention of the attending OD as both sphere values are equal. Of clinical interest in this case of anisometropia due to monocular astigmatism is the dynamic aniseikonia created in the vertical meridian. The SHAW method optimizes the design to reduce the prismatic effect induced vertically by the eyeglasses. It does this through a combination of corridor length and base curve optimization.



Dynamic aniseikonia is a major contributor to headaches and vision fatigue. Even though this patient had minimal aniseikonia laterally, there was substantial improvement with vertical dynamic and static aniseikonia with the SHAW lens.

Myopia

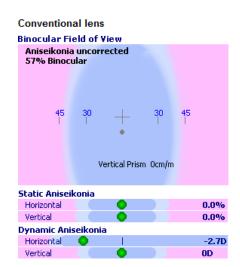
Moderate myopia contact lens wearer with trouble adapting to glasses. Age 25.

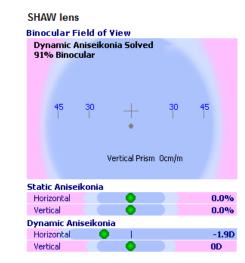
Refractive Error							
	Sphere	Cylinder	Axis	Add	PD		
OD	-5.00	-	-	-	32		
OS	-5.00	-	-	-	32		

Motor I	Motor Fusion Limits @ 6m						
BU	BD	BI	ВО				
2	2	4	12				

Frame Data							
Eye	DBL	Wrap	Vertex	Height			
54	16	7	12	18			

Minus-power glasses lenses force the eyes to diverge in lateral gaze. This compounds the demand on base in prism. With her prescription, this patient always had trouble diverging her eyes in lateral gaze and so her binocular field of vision was restricted by the lens design. Dynamic aniseikonia is induced due to the prismatic effect of a lens rotation about a vertical axis. This case looks unremarkable, but the binocular field of view is limited even with this relatively low face form angle.





Note how SHAW lens optimization increases the binocular field. This technology is highly effective with contact lens patients and helps them rapidly adapt to their eyeglasses and avoid the diplopia that commonly happens when they first put their glasses on.

difference. I spent the first three days walking around like a kid saying 'wow'."

"I couldn't believe the

J. Alexander (Patient), ON



Linear prism correction for esophoria. Age 62.

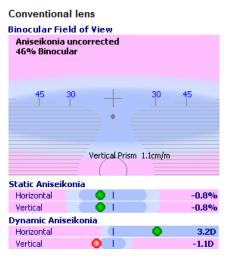
Retractive Error								
	Sphere	Cylinder	Axis	Add	PD	Prism	Prism	
OD	-1. <i>7</i> 5	-	-	2.50	28.5	4 out	0.5 up	
OS	-2.25	-	-	2.50	28.5	4 out	0.5 down	

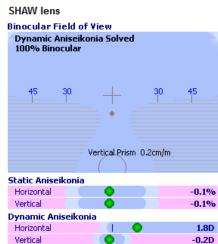
Motor	Fusion Limi	its @ 6m				
BU	BD	BI	ВО			
.5	.5	0	20			

Frame Data							
Eye	DBL	Wrap	Vertex	Height			
53	18	2	12	1 <i>7</i>			

This patient has a very fragile binocular system. Her high esophoria is present constantly and requires a substantial prismatic correction. The SHAW lens software optimizes base curvatures to reduce binocular distortions from the prism and remove the influence of a small degree of anisometropia. Fortunately, the lens thickness actually induces base out prism in lateral gaze, in this case a welcome distortion. The SHAW lens design system automatically selects a lens with a high Abbe value.

A very important benefit is the opportunity to give instructions to the edging lab as to how much to decentre the lenses in order to maintain alignment of the major reference point. In this case, the lenses must be decentred 27.2 mm and 27.3 mm from the PD of 28.5 in the eyes due to their rotation towards the prism apex.





Conventional lenses severely limit the binocular field due to the lack of attention to motor fusion facility. Only the SHAW lens considers these values in the design process.

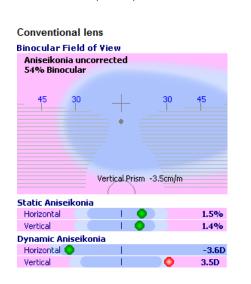
Post Lasik regression. Age 57.

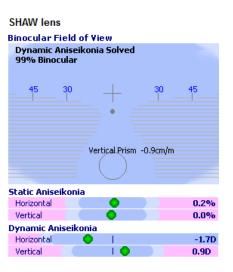
Refractive Error								
	Sphere	Cylinder	Axis	Add	PD			
OD	-2.50	25	090	2.00	30			
OS	-0.75	-	-	2.00	30			

Motor F	Motor Fusion Limits @ 6m					
BU	BD	BI	ВО			
2.5	2.5	4	12			

Frame Data							
Eye	DBL	Wrap	Vertex	Height			
50	18	7	12	1 <i>7</i>			

This patient had monovision PRK for high myopia. Over time there had been regression, and an enhancement procedure was not a treatment option. Because of her history of nearsightedness, she had reasonably good motor fusion facility. SHAW lens technology managed the resultant dynamic aniseikonia to maintain an aesthetically acceptable solution for her chosen rimless frame.





Binocularity is greatly enhanced with the SHAW design, without any increase in centre thickness. The reading area is well within the patient's range of motor fusion facility.

"I do not have the 'end-of-the-day' headache or tired eyes to which I have become so accustomed."

K. Roberts (Patient), TX



"I just used the SHAW lens on two difficult patients with amazing results!"

D. Lowy OD, ON

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Dr. Shaw has been a member of the College of Optometrists of Ontario since 1978. In addition to operating a thriving practice, Dr. Shaw is a former Chief of Low Vision, Vision Institute of Canada, has served on many Ministry of Health committees, co-founded the Scarborough Low Vision Centre at Scarborough General Hospital, and was made an Adjunct Associate Professor (Research) at the University of Waterloo in recognition of his work on aniseikonia.



During his 30 years in primary care and vision rehabilitation, Dr. Shaw has successfully researched and developed approaches to lens design that help his patients cope with vision-limiting impairments. The SHAW lens is a result of those years of experience.

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