Optometry Meets Neurology Linking Headaches, Dry Eye Sensation and Small Eye Misalignment

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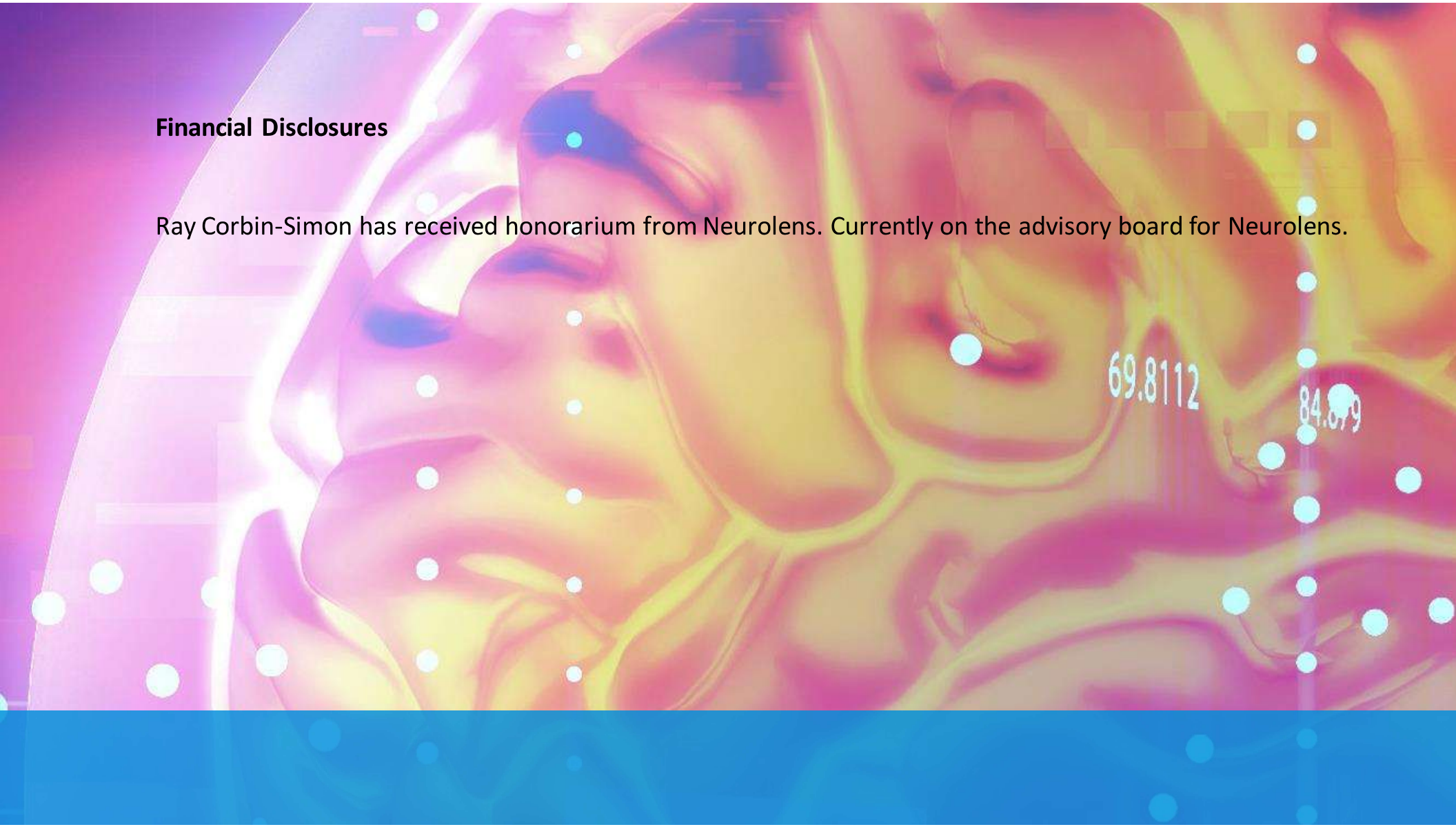
On behalf of Vision Expo, we sincerely thank you for being with us this year.

Vision Expo Has Gone Green!

We have eliminated all paper session evaluation forms. Please be sure to complete your electronic session evaluations online when you login to request your CE Letter for each course you attended! Your feedback is important to us as our Conference Advisory Board considers content and speakers for future meetings to provide you with the best education possible.

VISION EXPO



Financial Disclosures

Ray Corbin-Simon has received honorarium from Neurolens. Currently on the advisory board for Neurolens.

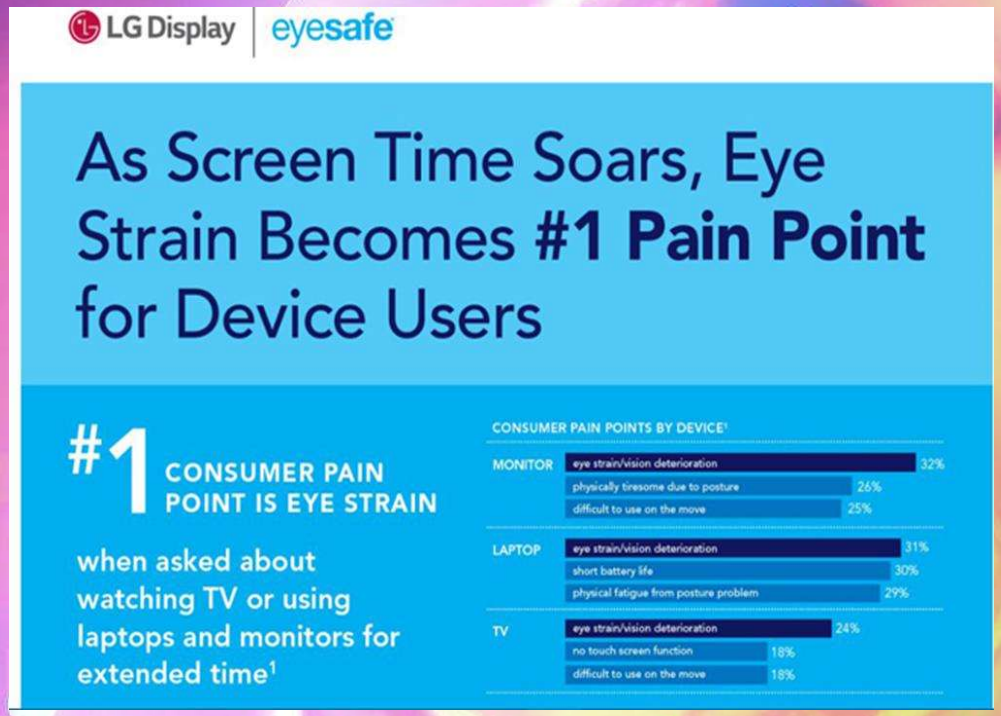
Our patients are suffering more than ever

Increasing stress and strain for adults and kids

Patients don't realize that their ECP can help

"People report more headaches and migraines during Covid-19."

-Forbes, March 2, 2021



People have been spending 13+ hours per day on screens since COVID-19 emerged (up 30% from last year).

Eye strain has become the #1 pain point for device users.

Eye strain and vision deterioration are the #1 complaint for device users.

2/3 of adults experience the symptoms of eye misalignment: headaches, dry eye sensation, and more.

1 out of 10

report their symptoms to their eyecare provider.

Population study, 2019-2020 (n=110,000)

Is there a link between Dry Eye Sensation and Headaches?

A big problem with many names

Documented in 1800s

Asthenopia

- Fatigue
- Eye Pain
- Blurred Vision
- Double Vision
- Headaches
- Burning
- Watery Eyes
- Dry Eyes
- Sore Neck
- Photophobia

Documented in 1855

Convergence Insufficiency

- Eyestrain
- Headaches
- Difficulty reading
- Double vision
- Difficulty concentrating
- Squinting or closing one eye

Documented in 1900

Fixation Disparity

- Eyestrain
- Headaches
- Difficulty reading
- Double vision
- Difficulty concentrating
- Squinting or closing one eye

Popularized in 2000s

Computer Vision Syndrome

- Eye Strain
- Headaches
- Blurred Vision
- Dry Eyes
- Neck and Shoulder pain

Popularized in 2010s

Digital Vision Syndrome

- Eye Strain
- Headaches
- Blurred Vision
- Dry Eyes
- Neck and Shoulder pain

Trigeminal Dysphoria

- Headaches
- Neck Pain/ Stiffness
- Tired Eyes
- Discomfort at Computer
- Dry Eyes
- Light Sensitivity

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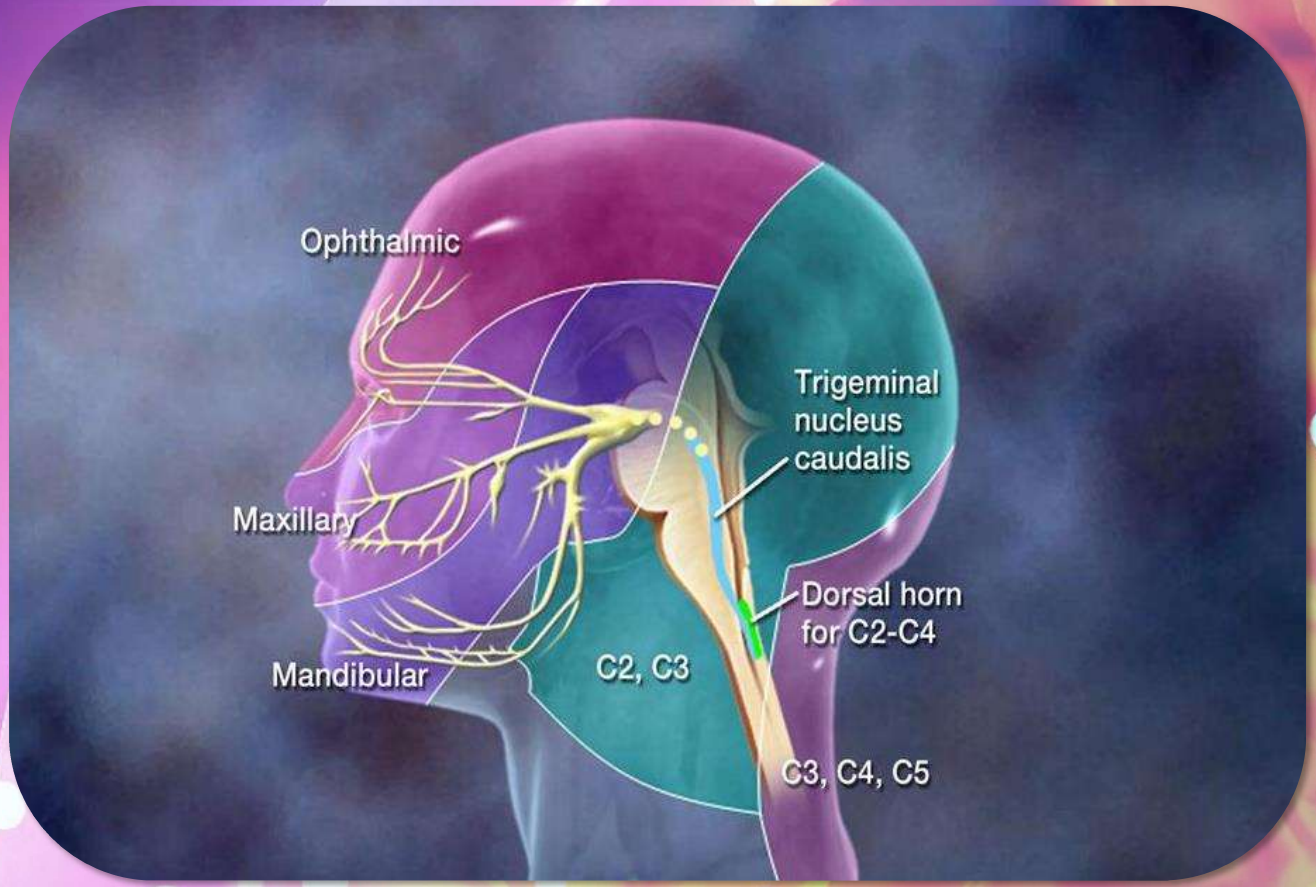
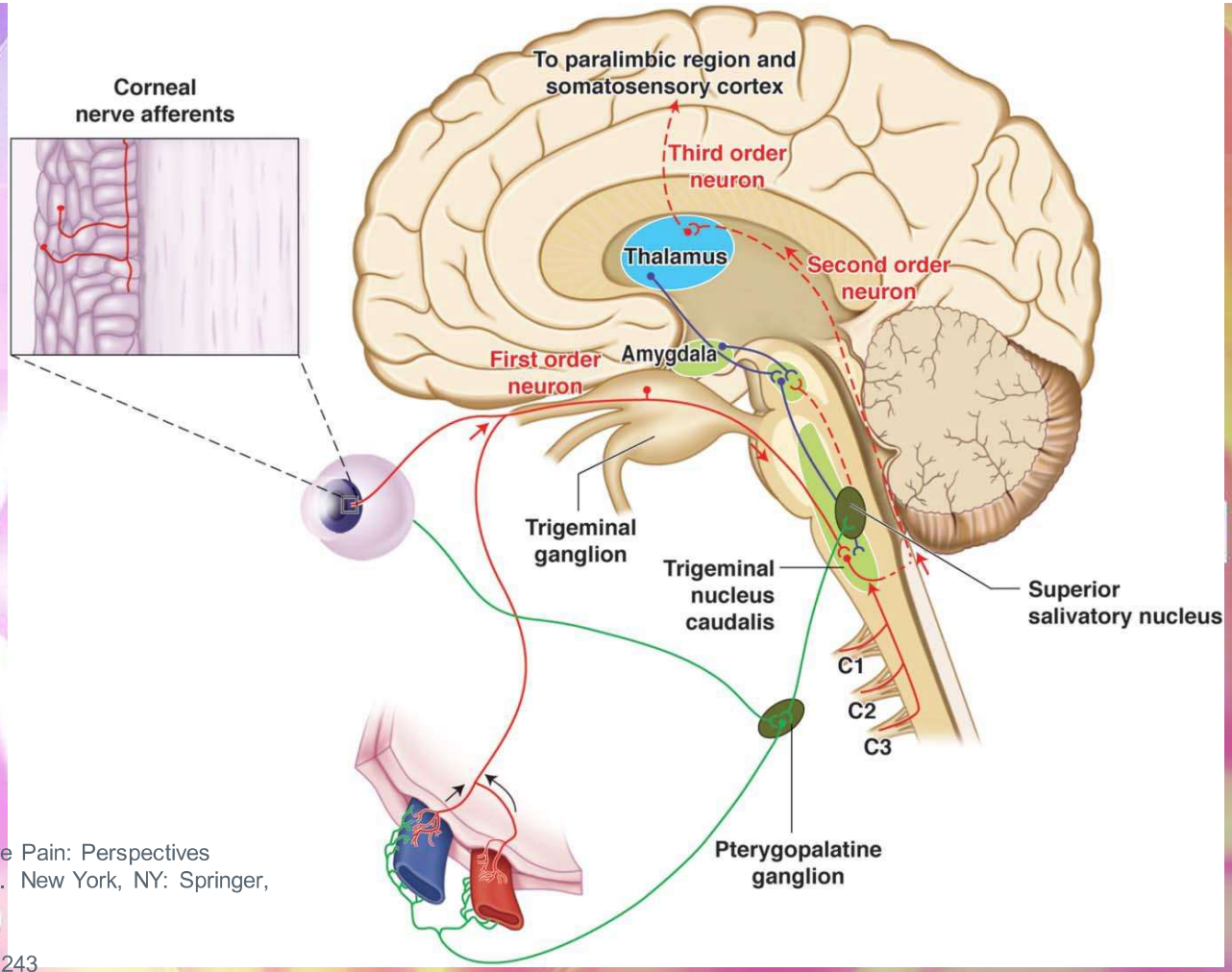
Neurological Mechanism of Trigeminal Nerve Pain



Trigeminal Neuralgia

vs.

Trigeminal Dysphoria



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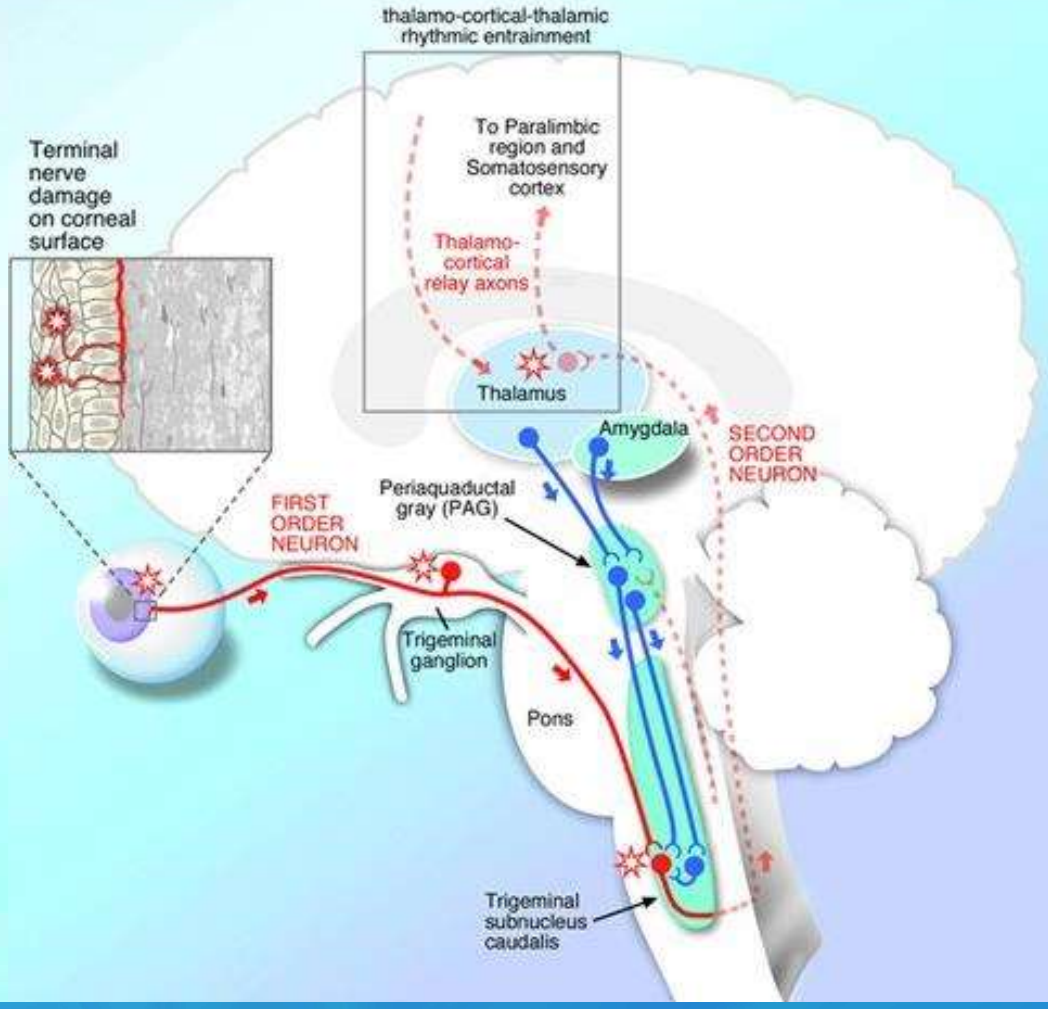
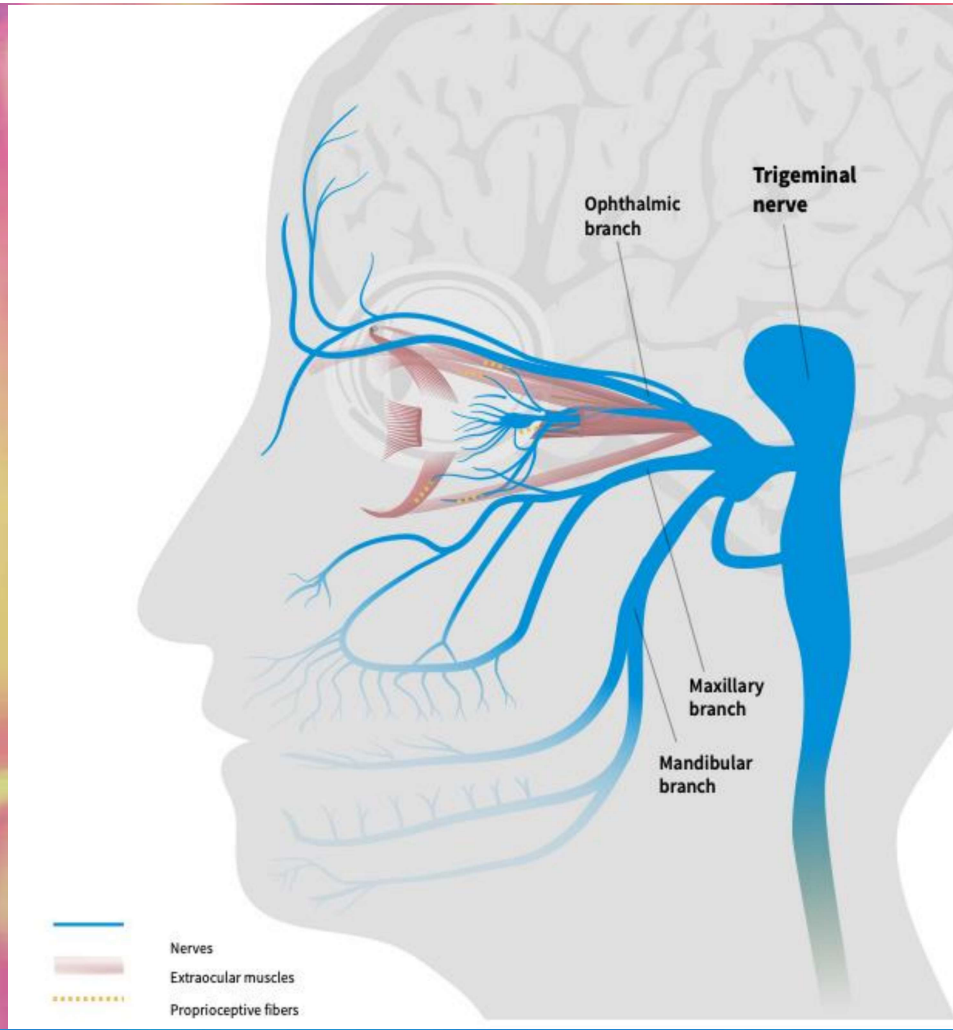
J Neuro-Ophthalmol 2018; 38: 237-243



Ascending corneal nociceptive projections

- Ipsilateral
- Contralateral
- Descending pain modulation

- Proprioceptive fibers innervating the extraocular muscles provide afferent feedback to the brain about the location of each eye.
- This feedback is required to avoid binocular misalignments.
- These proprioceptive signals are transmitted through the ophthalmic branch of the trigeminal nerve, which is responsible for detecting sensation and reporting pain.
- It appears that these signals play a large role in the stimulation of the trigeminal nerve, resulting in symptoms associated with **Trigeminal Dysphoria**.



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The Vision Council. Digital Eye Strain. Accessed April 2018.

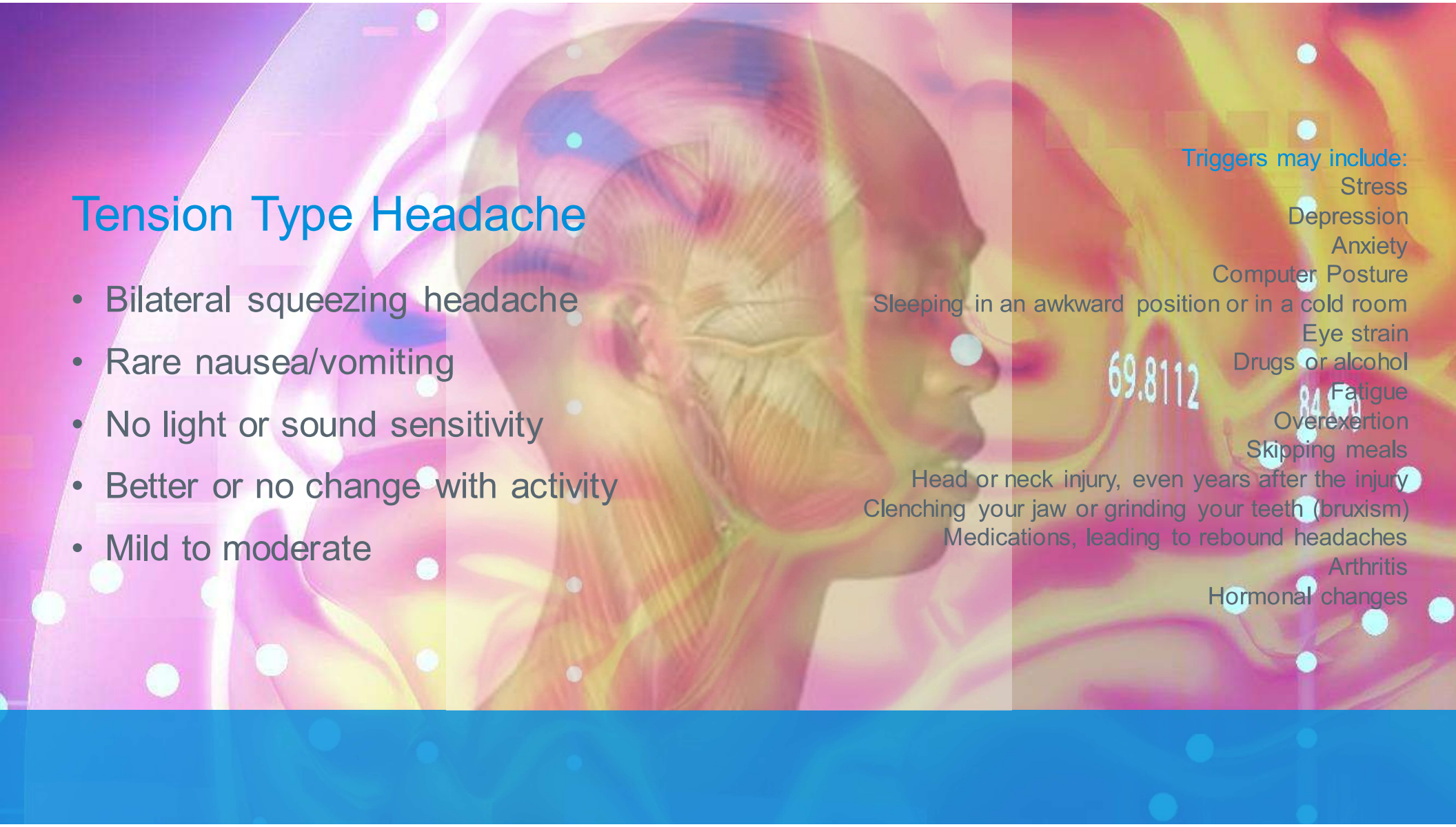
J Neuro-Ophthalmol 2018; 38: 237-243

Trigeminal Dysphoria

- Bilateral occipital and neck pain that radiates to the retro-orbital regions
- Constant pressure or ache
- Dry eye sensation
- Fatigue
- Light sensitive
- Worse with reading and working on the computer

Tension Type Headache

- Bilateral squeezing headache
- Rare nausea/vomiting
- No light or sound sensitivity
- Better or no change with activity
- Mild to moderate



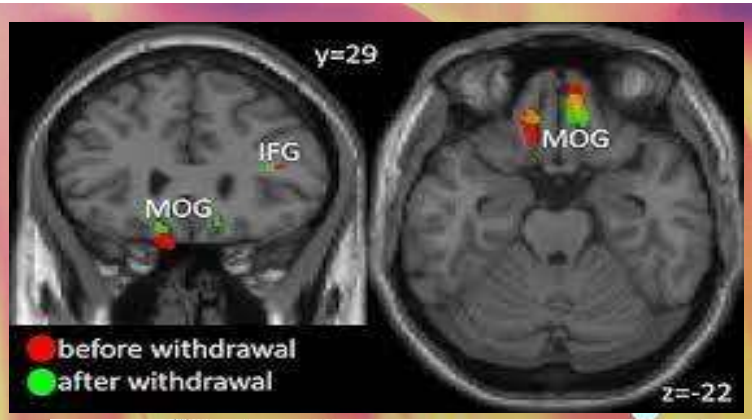
Triggers may include:

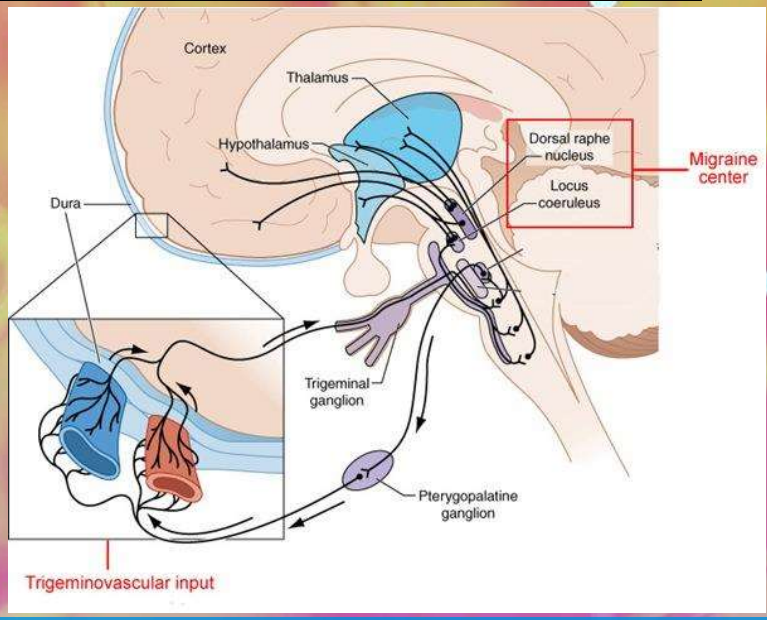
Stress
Depression
Anxiety
Computer Posture
Sleeping in an awkward position or in a cold room
Eye strain
Drugs or alcohol
Fatigue
Overexertion
Skipping meals
Head or neck injury, even years after the injury
Clenching your jaw or grinding your teeth (bruxism)
Medications, leading to rebound headaches
Arthritis
Hormonal changes

Medication Overuse Headache

- Diffuse dull ache, pressure or discomfort
- Non throbbing
- No nausea/vomiting
- No light or sound sensitivity
- No change with activity
- Mild

Epidemiological data suggest that up to 4% of the population overuse analgesics and other drugs for the treatment of pain conditions such as migraine

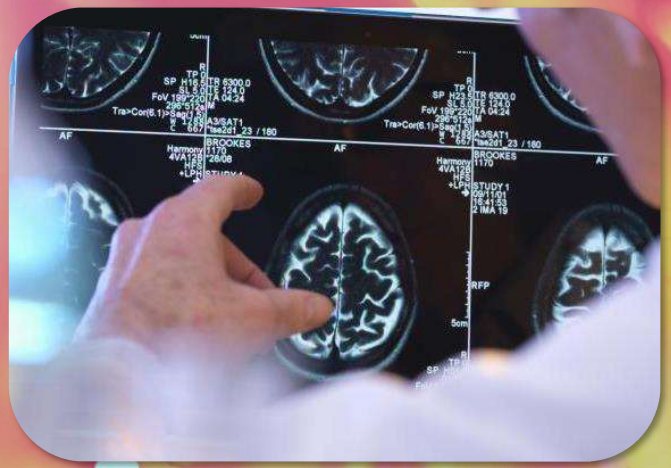


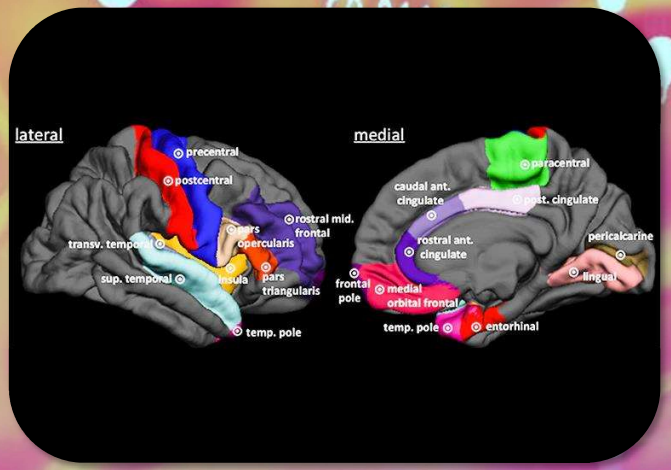


Migraine Without Aura

- Unilateral
- Throbbing
- Nausea/vomiting
- Light and sound sensitive
- Worse with activity
- Severe
- Last 6-8 hours untreated

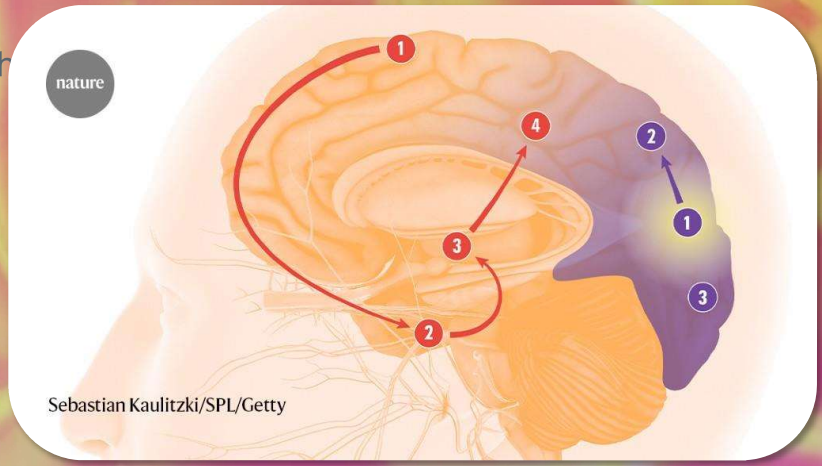
The idea that dilation of cerebral vessels is a primary cause of migraine pain has been challenged by a variety of evidence. However, the "trigeminovascular system" continues to be widely accepted as an important component of the headache.





Migraine With Aura

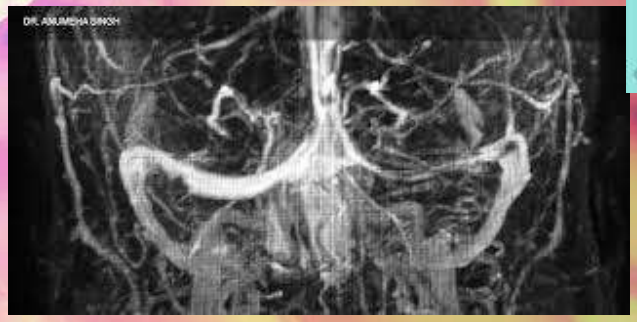
- Reversible neurologic symptoms that are fully reversible
- Usually last 20-30 minutes
- Can be visual, unilateral numbness, unilateral weakness or dysphasia
- Migraine with aura (also called classic migraine) is a recurring headach that strikes after or at the same time as sensory disturbances called aura. These disturbances can include flashes of light, blind spots and other vision changes or tingling in your hand or face.
- Blind spots (scotomas), which are sometimes outlined by simple geometric designs
- Zigzag lines that gradually float across your field of vision
- Shimmering spots or stars
- Changes in vision or vision loss
- Flashes of light
- Differential diagnosis: stroke or retinal tear

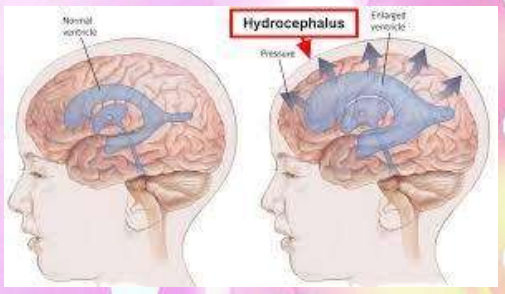


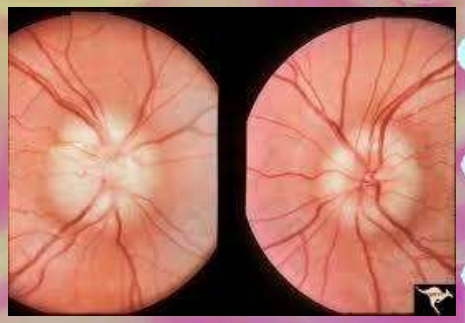
Ominous Headaches

Headache pain as a symptom of emergent etiology that needs neurology or ED referral: Examples:

- Tumor
- Venous sinus thrombosis
- Pseudotumor cerebri
- Hydrocephalus
- Thunderclap headache







THUNDERCLAP HEADACHE"

- may be defined as an abrupt onset, often a "worst ever" headache that is maximal in seconds but may develop in minutes.

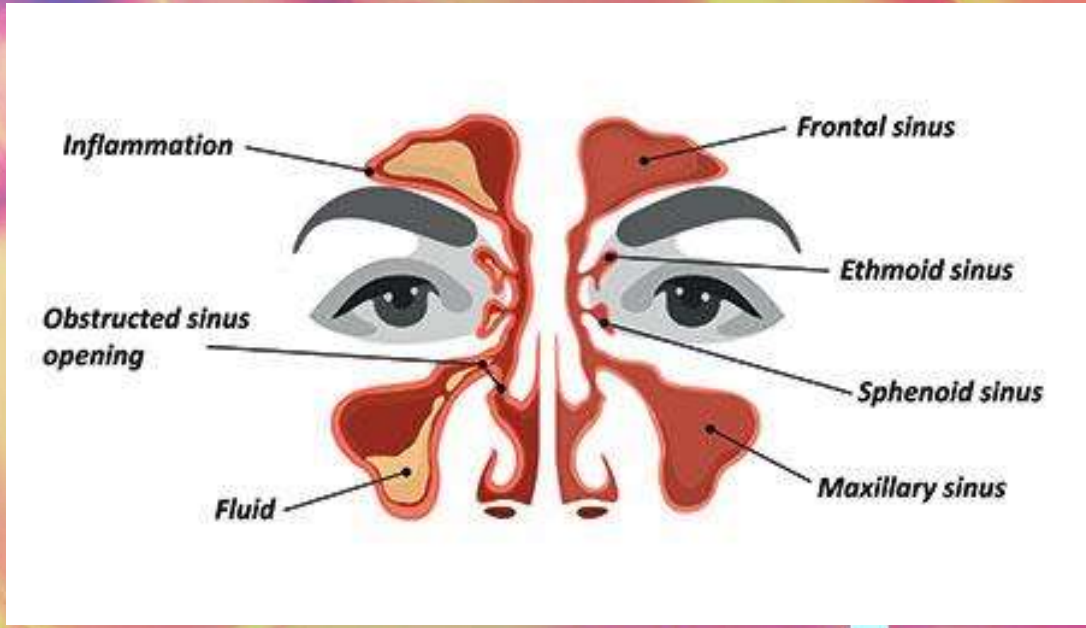
Vascular causes
- SAH
- Carotid and vertebral artery dissection
- Cerebral venous thrombosis
- Arterial hypertension
- Temporal arteritis

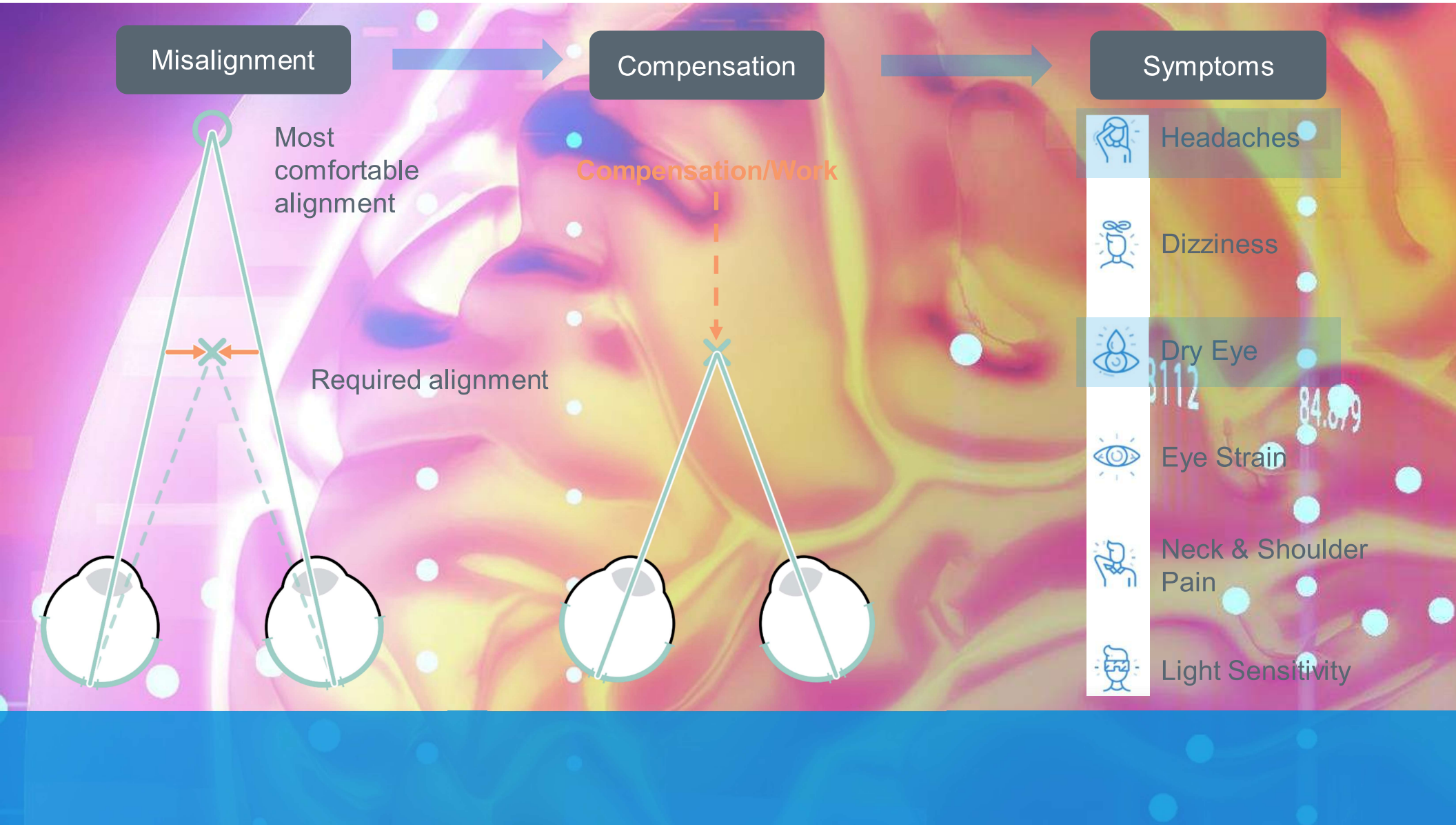
Nonvascular causes
- Meningoencephalitis
- Intermittent hydrocephalus (colloid cyst of the 3rd ventricle)
- Spontaneous intracranial hypotension

only one person in eight who has such a 'thunderclap' headache will have had a subarachnoid hemorrhage = other symptoms including vomiting and neck stiffness

Sinus Headache

- Pain, pressure and fullness in your cheeks, brow or forehead
- Worsening pain if you bend forward or lie down, worsens with activity
- Stuffy nose
- Fatigue
- Achy feeling in your upper teeth
- Sinusitis, however, usually isn't associated with nausea or vomiting or aggravated by noise or bright light — all common features of migraines.




Misalignment
Compensation
Symptoms
Most comfortable alignment
Required alignment
Compensation/Work
Headaches
Dizziness
Dry Eye
Eye Strain
Neck & Shoulder Pain
Light Sensitivity

What is this?

What is this?

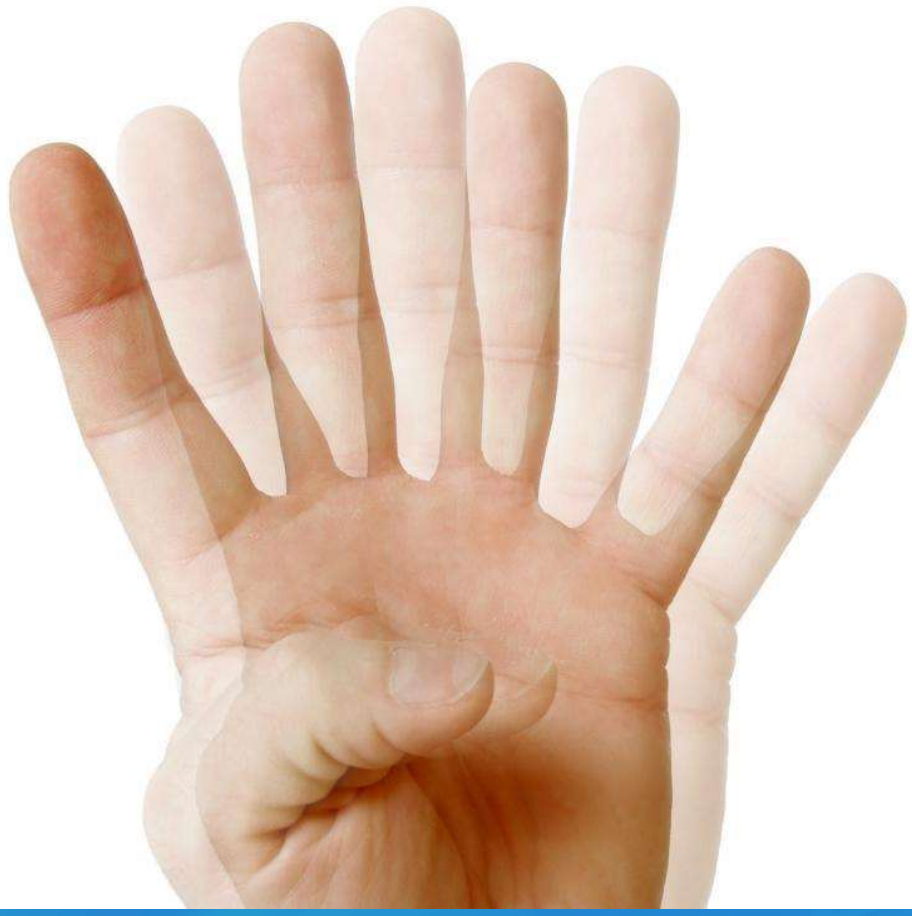
Ghost imaging

Diplopia

Focusing issue

Eye misalignment issue

Neural confusion/congestion in the Trigeminal area



Clinical Data Linking Dry Eye Sensation & Headaches

Results from 1,056 patient lifestyle surveys

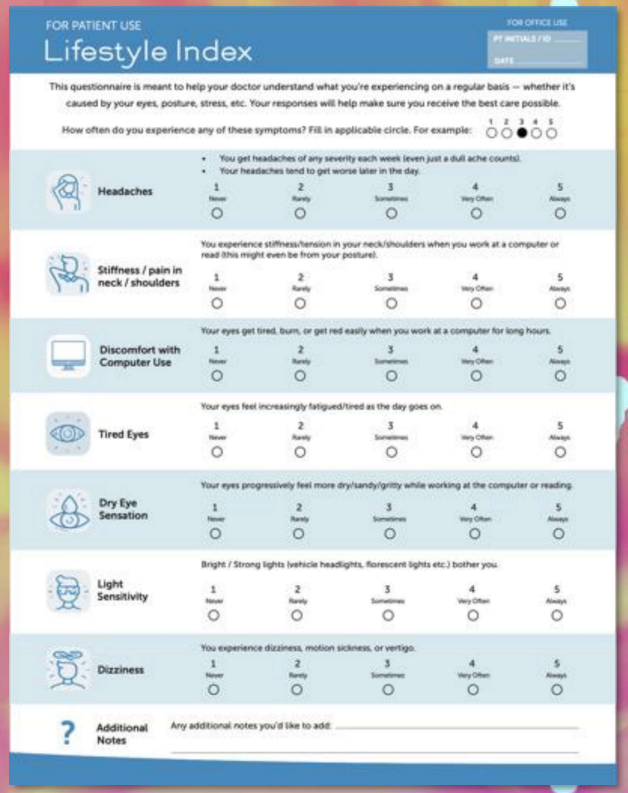
1= Never, 2= Rarely, 3= Sometimes, 4= Very Often, 5= Always

50% of respondents indicated both 3+ Dry Eye Sensation and 3+ Headaches

- **77%** Headaches 3+, Dry Eye Sensation <3
- **60%** Dry Eye Sensation 3+, Headaches <3

18% of respondents indicated both 4+ Dry Eyes and 4+ Headaches

- **48%** Headaches 4+, Dry Eye Sensation <4
- **32%** Dry Eye Sensation 4+, Headaches <4



FOR PATIENT USE

Lifestyle Index

FOR OFFICE USE

PT INITIALS / ID

DATE

This questionnaire is meant to help your doctor understand what you're experiencing on a regular basis — whether it's caused by your eyes, posture, stress, etc. Your responses will help make sure you receive the best care possible.

How often do you experience any of these symptoms? Fill in applicable circle. For example: 1 2 3 4 5

Headaches

- You get headaches of any severity each week (even just a dull ache counts).
- Your headaches tend to get worse later in the day.

1 Never 2 Rarely 3 Sometimes 4 Very Often 5 Always

Stiffness / pain in neck / shoulders

You experience stiffness/tension in your neck/shoulders when you work at a computer or read (this might even be from your posture).

1 Never 2 Rarely 3 Sometimes 4 Very Often 5 Always

Discomfort with Computer Use

Your eyes get tired, burn, or get red easily when you work at a computer for long hours.

1 Never 2 Rarely 3 Sometimes 4 Very Often 5 Always

Tired Eyes

Your eyes feel increasingly fatigued/tired as the day goes on.

1 Never 2 Rarely 3 Sometimes 4 Very Often 5 Always

Dry Eye Sensation

Your eyes progressively feel more dry/sandy/gritty while working at the computer or reading.

1 Never 2 Rarely 3 Sometimes 4 Very Often 5 Always

Light Sensitivity

Bright / Strong lights (vehicle headlights, florescent lights etc.) bother you.

1 Never 2 Rarely 3 Sometimes 4 Very Often 5 Always

Dizziness

You experience dizziness, motion sickness, or vertigo.

1 Never 2 Rarely 3 Sometimes 4 Very Often 5 Always

Additional Notes

Any additional notes you'd like to add: _____

ORIGINAL ARTICLE

Peer Reviewed Linkage

Can Binocular Vision Disorders Contribute to Contact Lens Discomfort?

Erin M. Rueff*, P. Ewen King-Smith†, and Melissa D. Bailey‡

ABSTRACT

Purpose. To determine the relationship between binocular vision (BV) disorder and dry eye symptoms and the frequency of BV disorders in subjects with contact lens–induced dry eye symptoms.

Methods. Subjects recruited for a larger dry eye study (n = 104) completed the Ocular Surface Disease Index (OSDI) and Convergence Insufficiency Symptom Survey (CISS) to determine if symptoms assessed on these two surveys were related. Also, myopic soft contact lens wearers (n = 29) with self-reported dry eye symptoms were recruited. Subjects completed the OSDI and CISS to assess severity of dry eye and BV disorder symptoms. Basic BV and dry eye testing was performed on each subject.

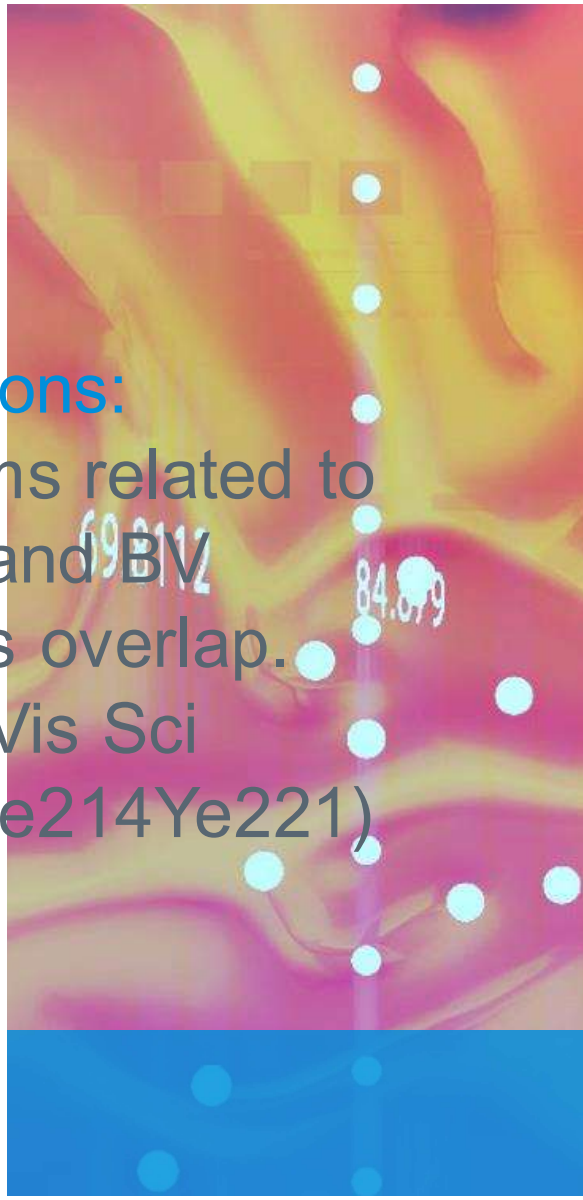
Results. Severity of symptoms assessed on the OSDI and CISS was found to be significantly correlated in the larger subject group ($\rho = 0.68$, $p = 0.0001$). This significant correlation warranted further investigation of both symptoms and clinical signs. In the group of myopic soft contact lens wearers, 48.3% had a BV disorder. This proportion appeared to be higher than previously reported prevalence estimates of BV disorders. Accommodative lag greater than or equal to 1.00 diopter was the most common BV disorder sign encountered (48.3%), and pseudo-convergence insufficiency was the most common BV disorder (31.0%).

Conclusions. Symptoms related to dry eye and BV disorders overlap. Subjects with symptoms of discomfort while wearing soft contact lenses may be experiencing a concurrent or stand-alone BV disorder. Accommodative insufficiency and pseudo-convergence insufficiency were common in the sample of myopic soft contact lens wearers. Clinicians should screen symptomatic contact lens–induced dry eye patients for BV disorders. Dry eye studies should assess basic BV function. (Optom Vis Sci 2015;92:e214–e221)

Key Words: dry eye, binocular vision disorders, contact lens, Ocular Surface Disease Index, Convergence Insufficiency

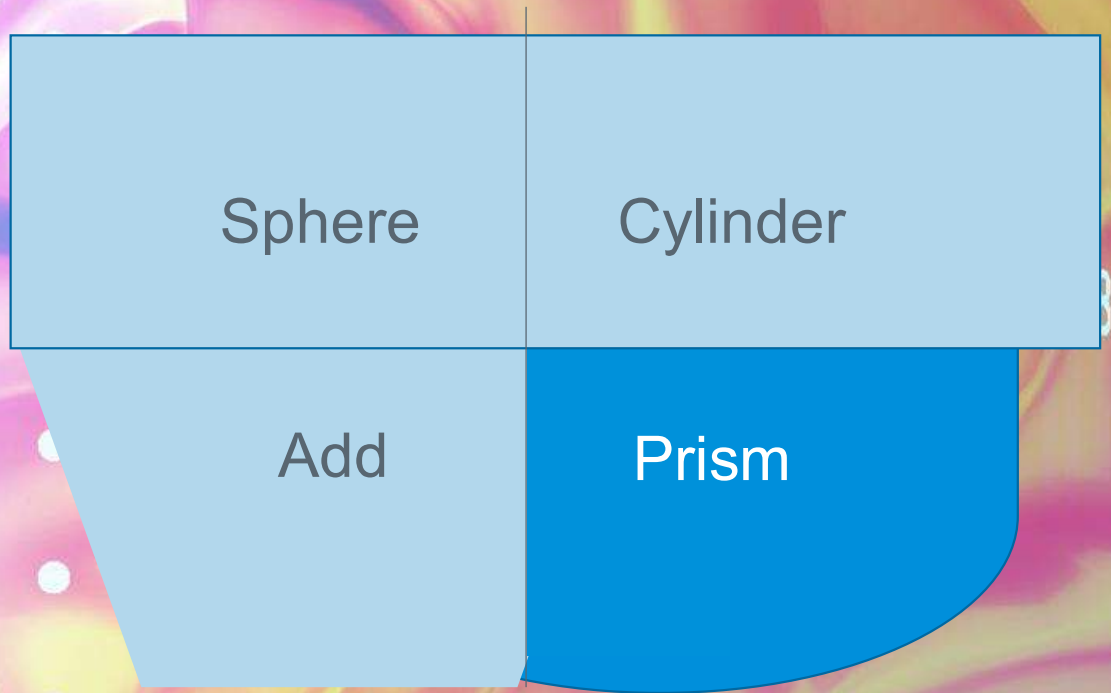
Conclusions:

Symptoms related to dry eye and BV disorders overlap. (Optom Vis Sci 2015;92:e214Ye221)



Clinically Addressing Binocular Vision Disorders

The Components of a Prescription Lens



What influences you make the decision to prescribe prism?

neurolens®
Relief is in Sight

Based on your last 100 patients, What percentage included Prism?

a) 1%
b) 3%
c) 5%
d) 7%
e) 10%

	SPH	CYL	AX	PRISM	ADD
O.D.	+0.75	-1.00	120	1.0 BO	
O.S.	PL	-0.50	110	2.0 BU	
			PD 63 /		

Based on 6 months data ending March 1, 2020 from 15,024 Independent ECPs, the national average for prescriptions that contain prism correction is…?

a) 1%
b) 3%
c) 5%
d) 7%
e) 10%

	SPH	CYL	AX	PRISM	ADD
O.D.	+0.75	-1.00	120	1.0 BO	
O.S.	PL	-0.50	110	2.0 BU	
			PD 63 /		

Even Small Prism Correction Can Have Big Impact

Can small prism corrections improve visual comfort? Yes! Here is why.

Vivek Labhishetty BSc Optometry, MSc, PhD

Background

DVS is an emerging public health concern where individuals experience a wide range of symptoms including headaches, eye strain, dry eye sensation and neck pain while navigating through their digital lives. Predictably, a growing trend in digital usage in the modern age has led to a steep acceleration of associated DVS symptomology (Rosenfield, 2016); therefore, it is critical to understand, measure and treat this problem appropriately. DVS could be caused by both ocular and extraocular anomalies. While ocular anomalies include uncorrected refractive errors, eye misalignments or dry eyes, extraocular anomalies include muscle strains due to compensating postural changes. Uncorrected refractive errors are typically corrected using prescription lenses, dry eyes are treated with therapeutics, and compensating postural habits are corrected by employing occupational therapy or better ergonomic habits.

An often-overlooked cause of DVS related symptomology is binocular vision disorders (BVD); for example, convergence insufficiency, where the patient typically presents with an eye misalignment (large exophoria at near compared to distance) coupled with other clinical signs such as reduction in near point of convergence (NPC). Typical treatment options for BVD involve prescription lenses, prisms or vision therapy (Scheiman et al., 2008). Lenses—especially plus lenses—are not commonly employed and are reserved for patients with heterophoria associated with a high AC/A. Prescription prism glasses, with horizontal and vertical relieving prisms, are offered to either patients with large phoria or in conjunction with vision therapy. The prism value prescribed is often based on fixation disparity analysis, Sheard's criterion or Percival's criterion. These glasses provide a constant prism correction to patients at all distances even though patients often present with varying amounts of misalignment at different distances.

Vision therapy is another commonly employed option for treating eye misalignment. The time course of the therapy and the treatment modality are decided based on the clinical (optometric) findings. The therapy, however, does not provide instant relief and is heavily reliant on the compliance of the patient over an extensive time course. Clinicians typically prescribe these treatment options only to symptomatic patients with large phoria. Clinicians tend to overlook patients with a smaller phoria and instead look for other causes for DVS.

There are several reasons why symptomatic patients with smaller phoria are not prescribed prisms or other corrective modalities to treat eye misalignments. One of the primary reasons is the inability to accurately measure smaller eye misalignments. As a result, only patients with a larger phoric posture are diagnosed and treated while individuals who could benefit from small prismatic corrections (less than 2PD) are overlooked. Clinicians have been testing phorias and fixation disparity subjectively for almost a century now, but it has been virtually impossible to accurately test prism in small increments of 0.10 PD for patients until the advent of the neurolens Measurement Device (nMD) in 2018. There is a need to recognize the functionality and application of small prism correction. This paper will demonstrate how prescribing small amounts of horizontal prism (less than 2PD) can relieve symptoms commonly related to DVS. So, what do we know about the relationship between small eye misalignments and DVS symptoms?

Eye Misalignment and the Severity of Symptomology

One of the common misconceptions with binocular vision disorders is that symptomatic patients tend to exhibit large phoria or fixation disparity coupled with other clinical signs. The assumption is that these large eye misalignments reflect a breakdown of the binocular vision system, especially the accommodation (focusing) and vergence (aligning) mechanisms. However, several studies have consistently reported evidence contrary to this belief.

1

No correlation between amount of misalignment and severity of symptoms.

A patient with 1PD exophoria and a patient with 10PD exophoria could experience same severity.

Small horizontal prism corrections (< 1PD) can provide significant relief in symptomatic patients.

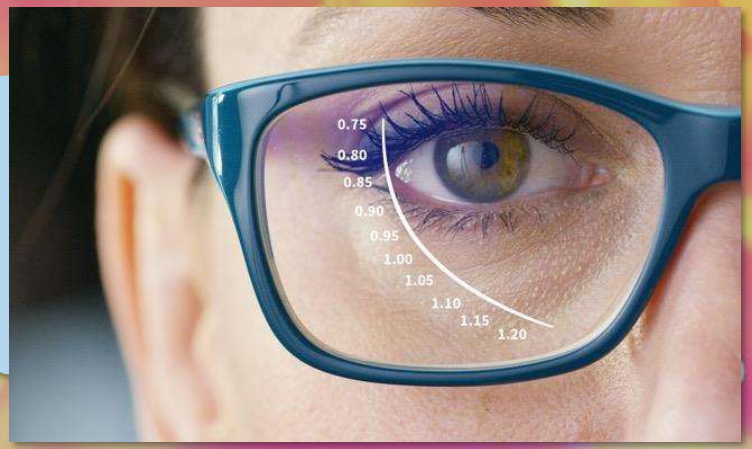
Subjective clinical diagnostic tools limit our ability to accurately detect small eye misalignments.

Evolution of Prism

Standard Prism

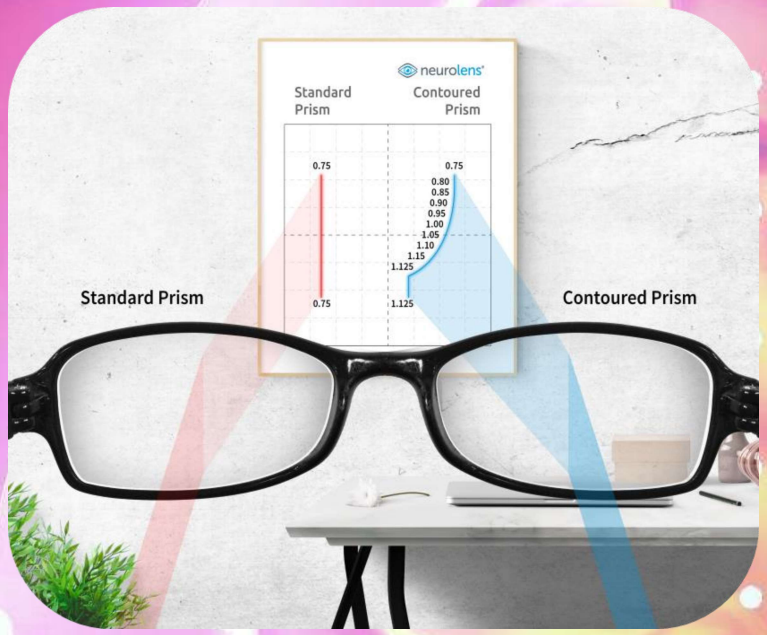
Slab-off Prism

Contoured Prism



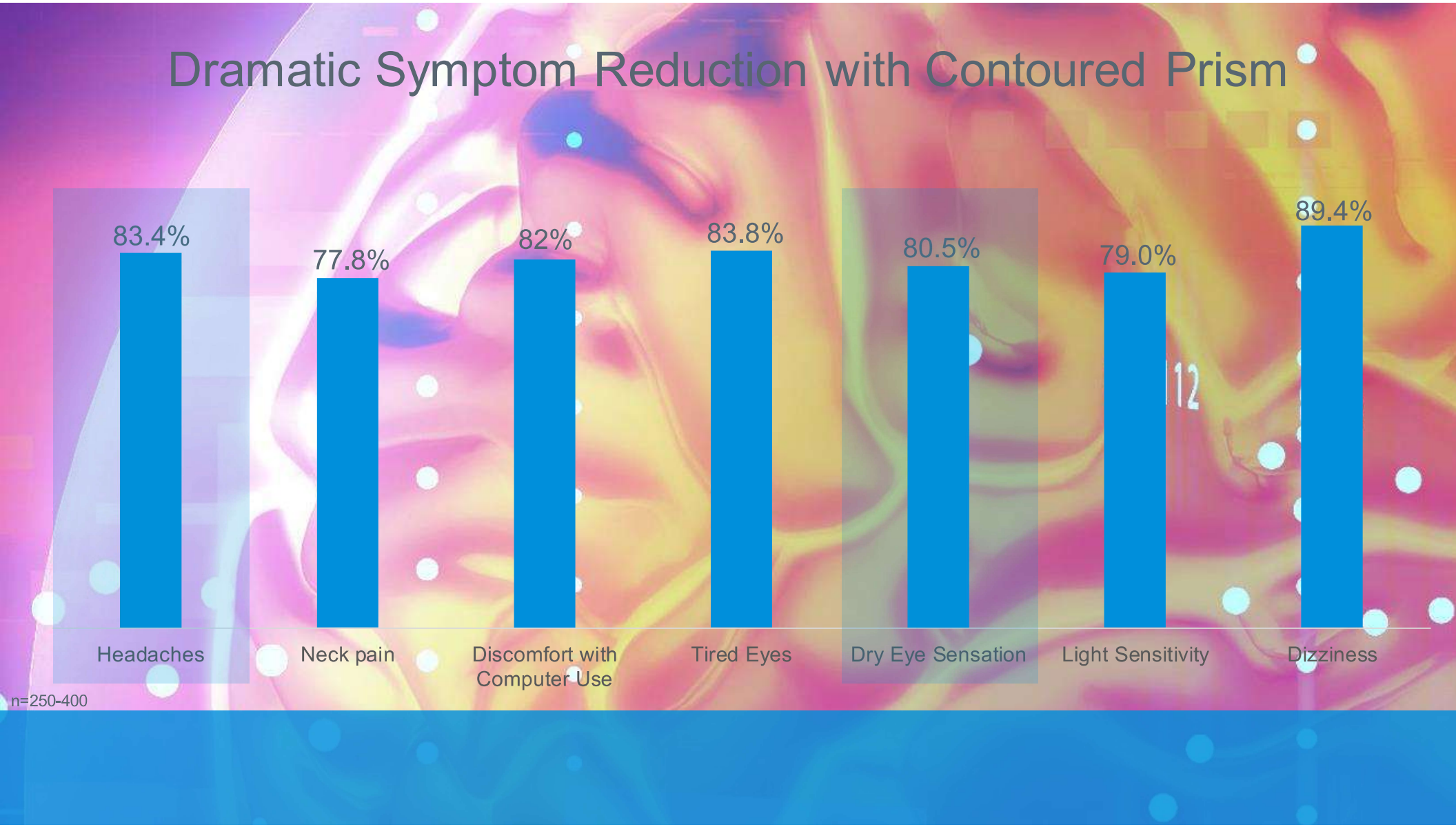
90% of people have a larger misalignment at near, so linear prism simply doesn't make sense for today's wearer.

Advantage of Contoured Prism



- ***Research indicates that over 90% of patients experience a larger misalignment when fusing at near than at distance.***
- ***Contoured prism increases in BI prism .375 PD as you progress down the lens***
- ***Small prism prescriptions can have profound results***

Dramatic Symptom Reduction with Contoured Prism



Chronic Headache Study, MD Neurology HA Clinic (n=179)

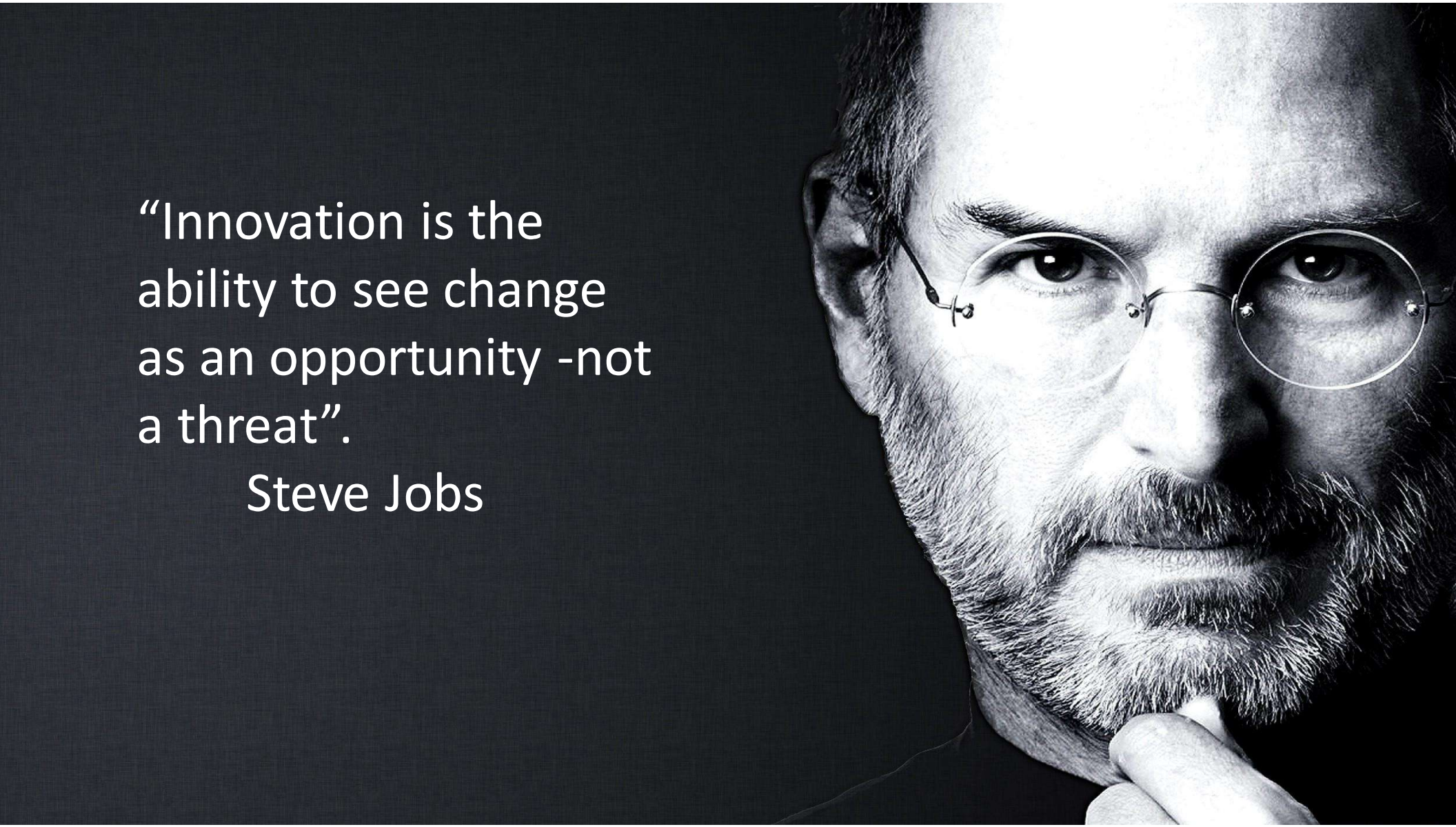
93%

of patients have had a **positive response** to wearing contoured prism

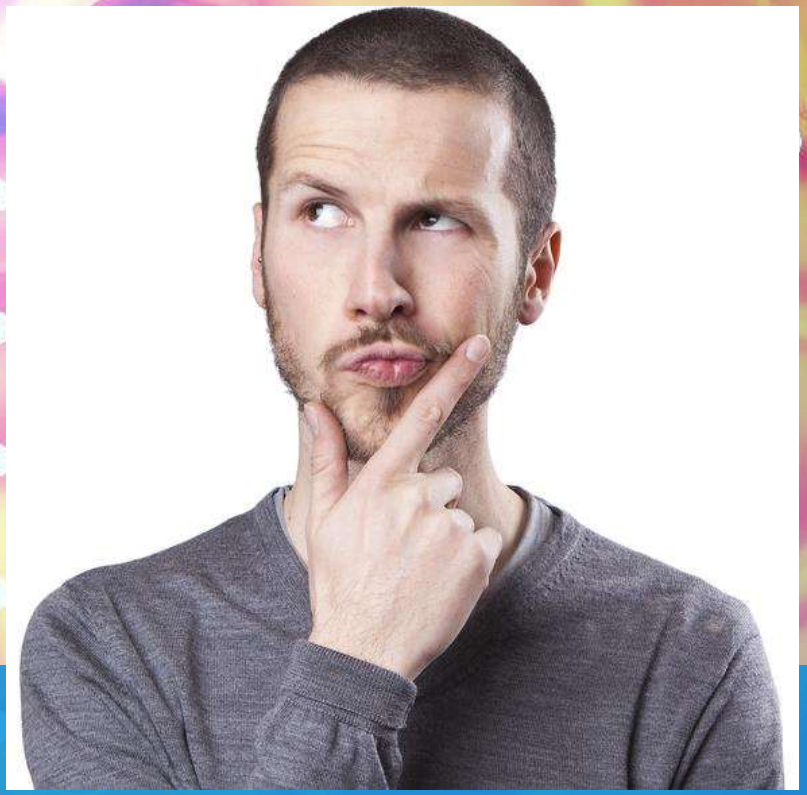
82%

of patients suffering from chronic daily headaches reported their symptoms were **substantially reduced** or **"basically gone"** after wearing contoured prism for 90 days.

Miles, C, Krall, J, Thompson, V, Colvard, M. A New Treatment for Refractory Chronic Daily Headache. The study included 179 patients who suffered from chronic daily headaches and was conducted from September 2012 to June 2013 by Neurology Associates, LLC, and the offices of Dr. Jeff Krall in Sioux Falls, South Dakota.


“Innovation is the ability to see change as an opportunity -not a threat”.
Steve Jobs

What tests do you routinely preform to determine if a patient may benefit from prism?



neurolens®
Relief is in Sight

Eye Misalignment as Taught in School

- Cover test
- Phorias
- Fixation Disparity
- Percival's Criteria
- Sheard's Criteria
- Maddox Rod

Now,
NOW!

Eye Misalignment as Taught in School

- Cover test
- Phorias
- Fixation Disparity
- Percival's Criteria
- Sheard's Criteria
- Maddox Rod

Subjective

Inconsistent

Poorly controlled standards

The Measurement Device

Real-life measurement of Binocular Vision, taking into account:

- Heterophoria
- Vergence conditioning
- Binocular peripheral fusion
- Fixation disparity
- Accommodative convergence response
- Alternating monocular central fixation

*Peripheral and central vision measure in **objective, repeatable, accurate** at both near (50 centimeters) and far (6 meters, simulating optical infinity).*

Case Studies

Patient Case Study #1

Synopsis: 15-year-old female. Complains of headaches, and dizziness. Convergence insufficient intermittent exotrope. Has worn glasses since age 11, which have helped, but still complains of headaches and dizziness.

Lifestyle Index:

Headaches	4
Neck Stiffness	3
Computer Discomfort	2
Tired Eyes	4
Dry Eye Sensation	3
Light Sensitivity	2
Dizziness	4

neurolens Measurement Device:
3.1 EXO Distance
10.2 EXO Near

Prescribed: neurolens SV
+0.50-1.00x096
+1.00-1.25x090
1.6 BI neurolens value

Result: Patient reports her glasses are MUCH clearer than before despite the exact same Rx. She is making fewer mistakes when taking tests using scantron forms. She can read longer. Headaches have lessened significantly, and she no longer experiences dizziness.

Case Study: Follow Up

"My vision just feels stable!" Patient says he has never had glasses that have made his vision feel so stable in his whole life. He is thrilled to see his computer work with ease, and in much greater detail throughout the day. He was so used to needing an afternoon break from the computer just to let his eyes rest prior to contoured prism, that he is able to put in more hours during the day to have more free time with his family at night.

Lifestyle Index	
Headache	3
Neck Stiffness	1
Computer Discomfort	4
Tired Eyes	3
Dry Eye	3
Light Sensitivity	2
Dizziness	1

Before vs After

Lifestyle Index	
Headache	1
Neck Stiffness	2
Computer Discomfort	1
Tired Eyes	2
Dry Eye	1
Light Sensitivity	1
Dizziness	1

Patient Case Study #2

Synopsis: 42-year-old female. Headaches, light sensitivity, tired eyes, eyes never quite feel right, and vision has always seemed off. Frustrated with her eyes with dry eye sensation. Been to several other doctors, tried various dry eye treatments with little or no improvement.

Add your own Case studies

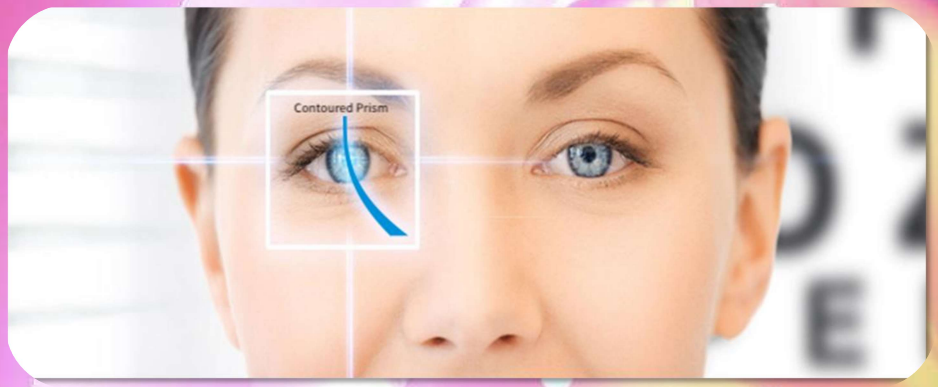
Lifestyle Index:

Headaches	4
Neck Stiffness	2
Computer Discomfort	3
Tired Eyes	4
Dry Eye Sensation	4
Light Sensitivity	4
Dizziness	1

neurolens Measurement Device:
3.4 EXO Distance
9.5 EXO Near

Prescribed: neurolens PAL
Plano with 1.50 Add OU
1.5 BI neurolens value

Result: Patient reported back, relieved and thrilled with new correction. Reported only one headache in 14 days (previously, almost daily). Vision seems “natural” and has more energy and concentration. Needs fewer breaks. Feels like a weight lifted off her shoulders. “Finally, someone that listened and understood my problems.”



"Only a **small amount** of **Base-In prism** will produce a **noticeable change** in the relation of fusional demand and reserve so that the average patient may require very limited amounts to restore comfort."

-Irving Borish

Q&A

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Thank You

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