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

1

Disclaimers

Paige Shoven has received honorarium from EssilorLuxiottica and neurolens.

All relevant relationships have been mitigated.

I work for EssilorLuxiottica

I previously worked for Neurolens

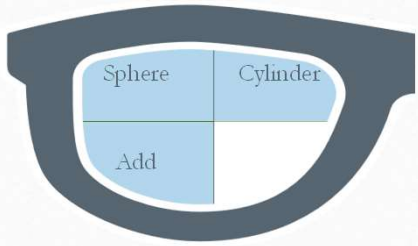
2

The Effect of Small Prism on the Visual System

Paige Shoven, M.Ed, ABOC

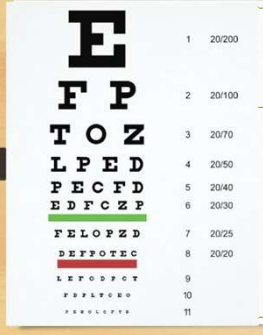
3

The Components of a Prescription Lens



4

Sphere/ Cylinder/ ADD



Use Magnification to correct Two-Dimensional Vision

All RXs with Sphere and Cylinder or ADD

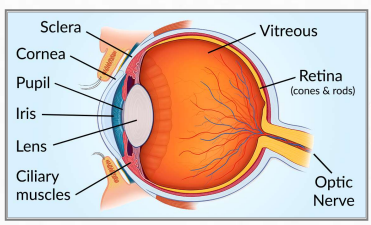
Are written with a Plus or Minus sign

Main symptom is blurry vision or patient reporting "I can't see"

Success is a patient seeing 20/20

5

These values are determined by how the parts of the eye work



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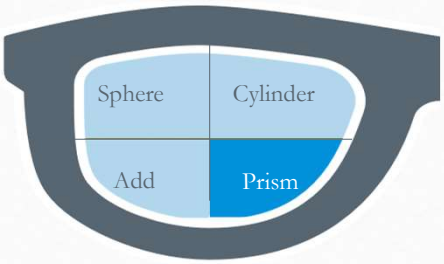
The Components of a Prescription Lens



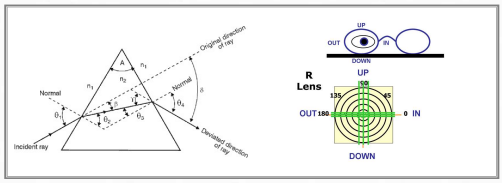
7

How often are you seeing RXs with Prism in them?

- NEVER
- Twice a Year
- Once a Month
- Once a Week
- Every Day

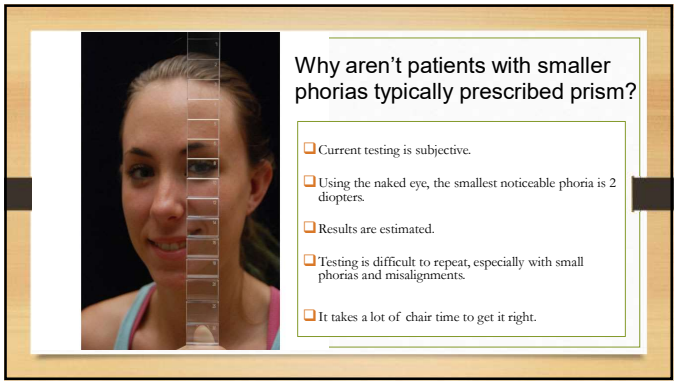
On average doctors prescribe prism to 3% of their patients

8

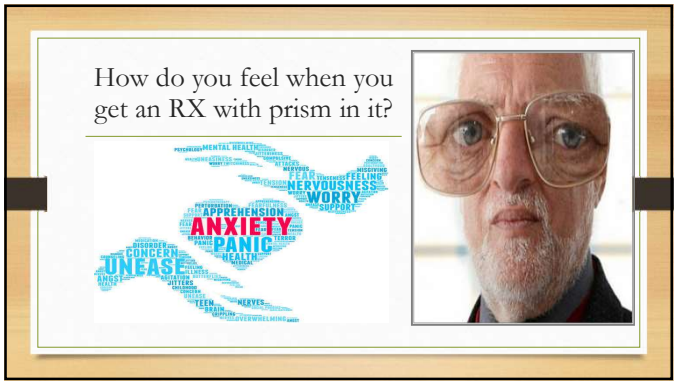


Why so much hesitation around prism?

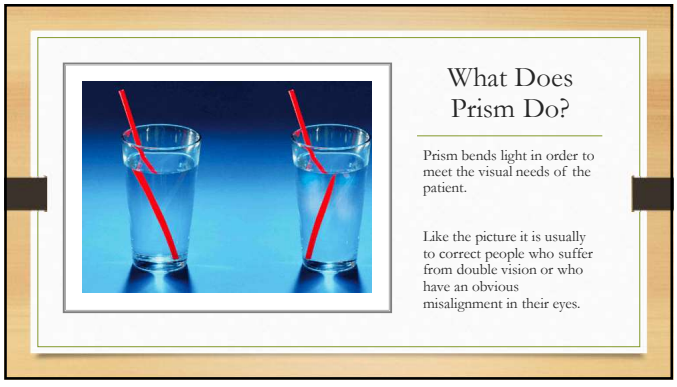
9


Why aren't patients with smaller phorias typically prescribed prism?
Current testing is subjective.
Using the naked eye, the smallest noticeable phoria is 2 diopters.
Results are estimated.
Testing is difficult to repeat, especially with small phorias and misalignments.
It takes a lot of chair time to get it right.

10


How do you feel when you get an RX with prism in it?
ANXIETY
PANIC
UNEASE
NERVOUSNESS
WORRY
APPREHENSION

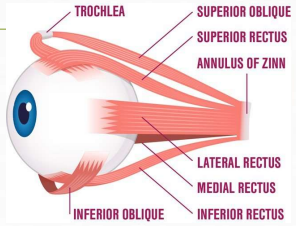
11


What Does Prism Do?
Prism bends light in order to meet the visual needs of the patient.
Like the picture it is usually to correct people who suffer from double vision or who have an obvious misalignment in their eyes.

12

Prism as written on a prescription is a Value based on the misalignment of the extraocular muscles

Extraocular Muscles



13

Vertical Movements

- Medial Rectus (MR)
  - Moves the eye inwards towards the nose
- Lateral Rectus (LR)
  - Moves the eye outwards towards the ear

14

Superior Rectus (SR)

Moves the eye Upwards
Rotates the eye towards the nose
Moves the eye inward

Inferior Oblique (IO)

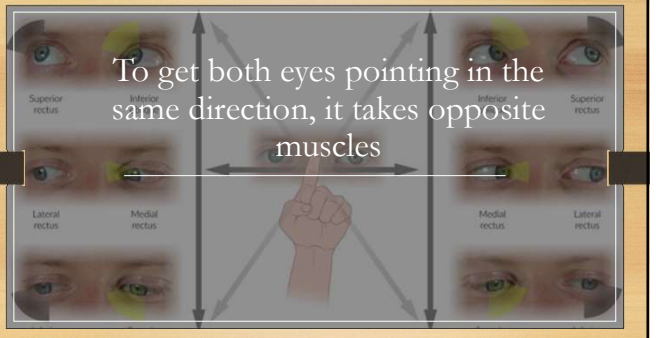
Rotates the eye towards the ear
Moves the eye Upwards
Moves the eye Outward

15

- Inferior Rectus (IR)
  - Moves the eye Downwards
  - Rotates the eye towards the ear
  - Moves the eye inward
- Superior Oblique (SO)
  - Rotates the eye towards the nose
  - Move the eye downward
  - Moves the eye outward

16

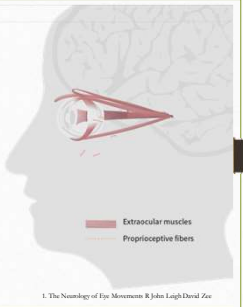
To get both eyes pointing in the same direction, it takes opposite muscles



17

The eye **(extraocular)** muscles are unlike other muscles in the body.
In addition to movement, they are filled with nerves/fibers called **proprioceptive and sensory fibers.**

These fibers provide information to the brain about where each eye is in relation to the other and assist in delivering 3D vision (**stereoscopic sight**) or a sense of where we are in relation to the rest of the world (**Proprioception**).



1. The Neurology of Eye Movements R John Leigh David Zee

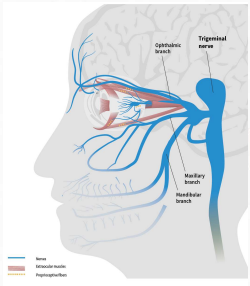
18

The proprioceptive and sensory fibers inside the extraocular (eye) muscles then flow into the Trigeminal Nerve.

The Trigeminal nerve receives "messages" from 3 areas:

- Ophthalmic nerve (eyes)
- Maxillary nerve (ears)
- Mandibular nerve (jaw)

It is the most complex nerve system in the cranium.

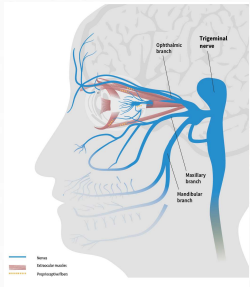


19

When the Trigeminal Nerve is over-stimulated, pain appears anywhere along the nerve system:

The results can be:

- Neck, Shoulder, Back Pain
- Eye Strain
- Headache
- Blurred Vision
- Dry Eyes



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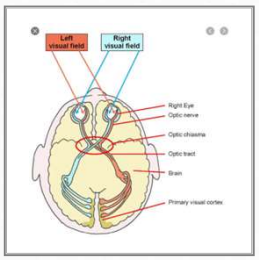
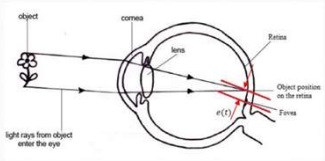


Two Eyes...ONE Brain

- **Binocularity or Stereopsis**- Two eyes working together with your brain to make one image
  - It is the ability to use two eyes together to focus on the same object, which is perceived as a single image when the images from each eye meet in the visual cortex of the brain. When the images are fused into one, it is perceived as a three-dimensional object, maintaining its solidarity and position in space.
  - Issues relating to binocularity include **fixation, fusion, convergence and divergence, phorias, and tropias**.

21

Fixation: the act of positioning an image on the **fovea**, a small depression in the retina where vision is the best.



The brain uses **Saccades**, tiny fast movements of the extraocular muscles, to position an object it is looking at onto the fovea

Pursuits are smaller eye movements that act as a locking mechanism to keep the slow-moving object images on the fovea.

22

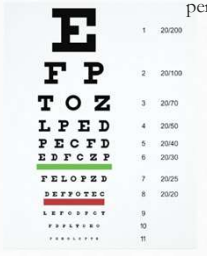
Fusion: the blending of two images—one from each eye—and perceiving them as one image.

First grade of fusion is the ability to superimpose two different images and perceive them as one composite image.

For example: One fovea sees a picture of a lion while the other fovea sees a picture of a cage; the brain, however, perceives the image of a lion **in** the cage.

23

Fusion: the blending of two images—one from each eye—and perceiving them as one image.



Second grade of fusion is the ability to maintain the blending of two similar images from the two foveae into a single perception as the images move off the foveae.

This form of fusion is two-dimensional vision (2D).

24

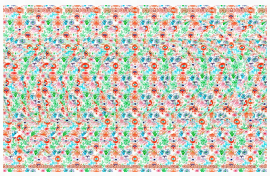
Fusion: the blending of two images, one from each eye, and perceiving them as one image.

Third grade of fusion is **stereopsis** . When the fovea of each eye is looking at the same object, each eye will see a slightly different image since the foveae are about three inches apart.

Stereopsis is achieved when the brain fuses these two images into one and the object is perceived in depth. This form of vision is three-dimensional vision (3D)

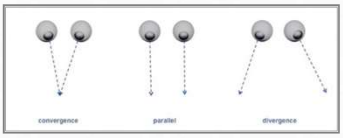
25

Stereopsis Test



26

Vergence: is the action of both foveae, one from each eye, tracking an object as it moves closer (convergence) an d further way (divergence).



Normal retinal correspondence occurs when the fovea of each eye is receiving the image at the same time.

27

Diplopia or double vision occurs when an image falls off one or both fovea.

Therefore, when the brain detects diplopia, it triggers for a vergence movement to achieve binocular fixation.

28

Tropias vs Phorias

Tropias: is a misalignment of the eyes that is always present. Even when the eyes are both open and trying to work together, large angle misalignments are apparent. A **tropia** is the resting position that your eyes go to when covered or when fusion is broken by repetitively alternately covering each eye.

Phorias: is a misalignment of the eyes that only appears when binocular viewing is broken, and the two eyes are no longer looking at the same object. The misalignment of the eyes starts to appear when a person is tired, therefore it is not present all the time.

An occluder is used to test for tropias and phorias at the optometrist office

29

Strabismus- An Extreme misalignment of the eyes

Esotropia (ESO)- an inward misalignment of the eyes

(Cross Eyes)

Exotropia (EXO)- an outward misalignment of the eyes

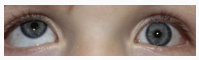
When speaking with an OD, exotropia and esotropia may be referred to as "tropes"

These are 'point at stuff' disorders

30

Strabismus- An Extreme misalignment of the eyes

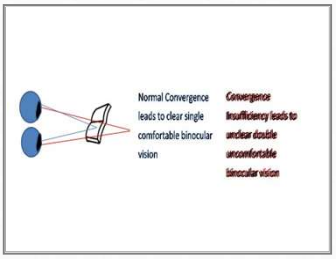
Hypertropia: An ocular misalignment that occurs when one eye looks like it is higher than the other or looking above the other.



Hypotropia: An ocular misalignment that occurs when one eye looks like it is lower than the other or looking below the other.

These are 'point at stuff' disorders

31



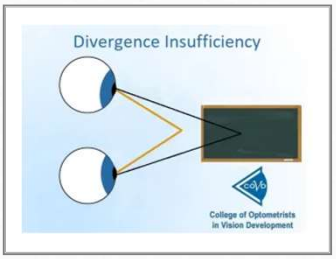
Convergence Insufficiency (Exotropia)

Defined as Exotropia (the eye turns out)

Is a sensory and neuromuscular anomaly of the binocular vision system, characterized by a reduced ability of the eyes to turn towards each other or sustain convergence.

Point and Focus Disorder

32



Divergence Insufficiency (Esotropia)

Is defined as esotropia (the eye turns in) at distance with much less esophoria or normal fixation at near

33

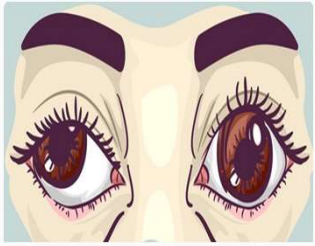
Asthenopia

- Tired eyes due to excessive strain
- This eye strain can cause headaches, fatigue, difficulty concentrating, and dizziness.

34

Amblyopia

- Also called lazy eye, is a disorder of sight in which the brain fails to process inputs from one eye and over time favors the other eye.
- It results in decreased vision in an eye that otherwise typically appears normal.
  - A patient's visual acuity can be worse in one eye.
- In extreme cases, the brain will **suppress**, or turn off, the vision of the amblyopic eye.



35

The Horizontal Nystagmus Test (HGN) is a standardized field sobriety test (FST) that police often administer in order to gauge whether a DUI suspect is under the influence of alcohol.

Nystagmus

- Vision condition in which the eyes make repetitive, uncontrolled movements.
- These movements often result in reduced vision and depth perception and can affect balance and coordination.
- These involuntary eye movements can occur from side to side, up and down, or in a circular pattern

36

Symptoms of Tropias and Phorias

- Double Vision
- Headaches
- Neck Strain
- Eye Fatigue
- Dizziness
- Dry Eye

1500 general population consumers surveyed
65% Report experiencing eye discomfort daily

Latest News

National Survey from VSP Vision Care Finds Our Eyes Are in Overdrive

37

A big problem with many names

Documented in 1800s	Documented in 1855	Documented in 1900	Popularized in 2000s	Popularized in 2010s	
Asthenopia	Convergence Insufficiency	Fixation Disparity	Computer Vision Syndrome	Digital Vision Syndrome	Trigeminal Dysphoria
Fatigue	Eyestrain	Eyestrain	Eye Strain	Eye Strain	Headaches
Eye Pain	Headaches	Headaches	Headaches	Headaches	Neck Pain/ Stiffness
Blurred Vision	Difficulty reading	Difficulty reading	Blurred Vision	Blurred Vision	Tired Eyes
Double Vision	Double vision	Double vision	Dry Eyes	Dry Eyes	Discomfort at Computer
Headaches	Difficulty concentrating	Difficulty concentrating	Neck and Shoulder pain	Neck and Shoulder pain	Dry Eyes
Burning	Squinting or closing one eye	Squinting or closing one eye			Light Sensitivity
Watery Eyes					
Dry Eyes					
Sore Neck					
Photophobia					

38

A big problem with many names

Documented in 1800s	Documented in 1855	Documented in 1900	Popularized in 2000s	Popularized in 2010s	
Asthenopia	Convergence Insufficiency	Fixation Disparity	Computer Vision Syndrome	Digital Vision Syndrome	Trigeminal Dysphoria
Fatigue	Eyestrain	Eyestrain	Eye Strain	Eye Strain	Headaches
Eye Pain	Headaches	Headaches	Headaches	Headaches	Neck Pain/ Stiffness
Blurred Vision	Difficulty reading	Difficulty reading	Blurred Vision	Blurred Vision	Tired Eyes
Double Vision	Double vision	Double vision	Dry Eyes	Dry Eyes	Discomfort at Computer
Headaches	Difficulty concentrating	Difficulty concentrating	Neck and Shoulder pain	Neck and Shoulder pain	Dry Eyes
Burning	Squinting or closing one eye	Squinting or closing one eye			Light Sensitivity
Watery Eyes					
Dry Eyes					
Sore Neck					
Photophobia					

39

What are Current Treatments for Digital Vision Syndrome -DVS?

Ocular (Inside the Eyeball)

- Need for a new or updated RX
  - New glasses or contacts
- Dry Eyes
  - Drops/ Scrubs
  - Therapies
- More Blue Light Exposure
  - Blue Light Filters

Extraocular (Outside the Eyeball)

- Bad posture
  - Ergonomic support
  - Occupational Therapy
- Binocular Vision Disorders-BVD
  - Standard Prism
  - Vision Therapy

40

Vision Therapy Can Help

- **Goal:**
  - To treat extreme phorias with non-surgical techniques. It is like physical therapy for the visual system
- **Techniques:**
  - Lenses, prism, video games, balance boards, metronome, pencil push-ups
- **Average Cost:**
  - $900 for initial consult, $200 per appointment
  - Appointments are weekly, biweekly or monthly
- **Average treatment time:**
  - Varies between patients
  - Average is 6-18 months
  - Requires home exercises

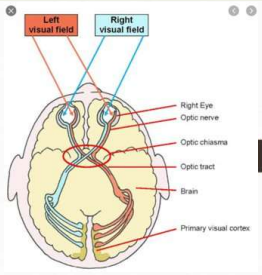
41

BUT What if,

Digital Visual Syndrome is caused is by the entire visual system?

OR

How do the eyes work together with the brain?



42

But 90% of patients have different phoria measurements at distance and near

- Convergence Excess
- Convergence Insufficiency
- Divergent Excess
- Divergent Insufficiency

- Traditionally, patient needed Vision Therapy and/or 2 pairs of glasses.

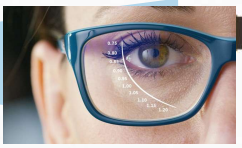
43

The Evolution of Prism

Standard Prism

Slab-off Prism

Contoured Prism



44

Standard prism

- Usually prescribed when a patient complains of diplopia (double vision)
- Uses the same value throughout the entirety of the lens
- Can be ordered Base In/Base Out or Base Up/Base Down
- Corrects Vertical and Horizontal misalignments
- Can be in one lens or divided between both lenses
- Discovered by Sir Isaac Newton in the 1660's
- Added into the glasses RX in the 1930's

45

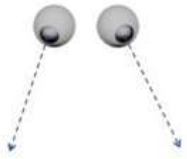
The Basics: Standard Prism helps these patients
If eyes have the same amount of phoria or misalignment at all distances

Convergence
ESOPHORIC (ESO)
Eyes naturally turn in,
Use BASE OUT to correct

11% of Patients are Esophoric

Parallel
ORTHOPHORIC (ORTHO)
Eyes naturally align where they should

2% of Patients or Orthophoric

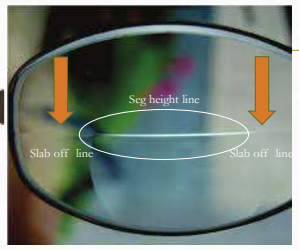


Divergence
EXOPHORIC (EXO)
Eyes naturally turn out,
Use BASE IN to correct

87% of Patients are Exophoric

46

Slab Off Prism (Ben Franklin invented bifocals in the 1770's)



- A technique used to neutralize unwanted prism effect when looking down the bifocal.
- Used when lens powers between each eye is greater than 3 diopters
- Allows the near image not to appear to jump
- Can be added to a FT lens or a PAL (in some instances, ask your lab)
- Applied to the most minus or least plus
- Corrects vertical prism only

47

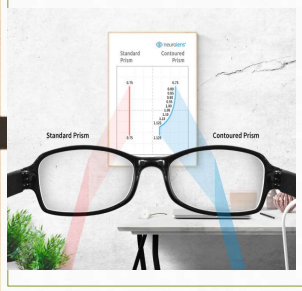
Fresnel Prism

- Fresnel prism is usually used for temporary usage (recovering TBIs)
- Usually applied to only one lens
- Attaches like a sticker using water to activate the adhesive
- Needs to be traced and applied at either 0°or 180° line
- Discovered by Augustin Jean Fresnel in 1822

Hillary Clinton following her TBI in 2012

48

Contoured Prism



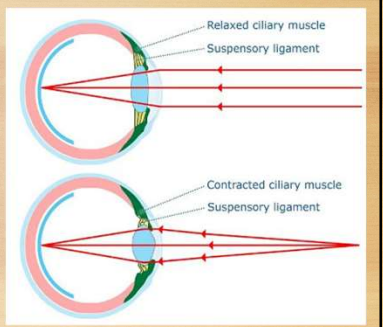
- 90% of patients have a greater misalignment at near than they do at distance
- Allows for more base in prism at near than at distance to correct for more EXO or less ESO needs
- Think a progressive lens design that uses prism instead of power as the user looks down the lens
- Only available from neurolens, using the neurolens measurement device
- 82% of patients report a decrease in painful symptoms
- 54% say they are significantly reduced or completely gone!
- First patent in 2006 by Dr. Jeff Krall

49

Some patients require
Less EXO or
More ESO at near
compared to distance

Think ADD power for these patients

Increase the add power in presbyopes
Use an EyeZen for single vision patients



50

There is no one answer that is right for every patient, BUT if you listen closely, they will tell you what they need!

Cues to listen for

Headaches
Car Sickness
Dyslexia
Concussions
ADHD
Clumsiness
Ringing in the ears
Clenching or grinding your teeth
Neck or Shoulder pain

51

Questions?

Thank You for Coming

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214.673.6842

52

References

- Rosenfield, Mark. "Computer vision syndrome (aka digital eye strain)." Optometry 17.1 (2016): 1-10.
- Scheiman, Mitchell, and Bruce Wick. Clinical management of binocular vision: heterophoric, accommodative, and eye movement disorders. Lippincott Williams & Wilkins, 2008.
- Heynchak, P. K., Herriot, C, & Irving, E. L. (2010). Comparison of alternate cover test reliability at near in non-strabismus between experienced and novice examiners. Ophthalmic and Physiological Optics, 30(3), 304-309.
- Fogt, N., Baughman, B. J., & Good, G. (2000). The effect of experience on the detection of small eye movements. Optometry and vision science, 77(12), 670-674.
- Bade, Annette, et al. "Relationship between clinical signs and symptoms of convergence insufficiency." Optometry and vision science: official publication of the American Academy of Optometry 90.9 (2013): 988.
- Goss, D. A., Reynolds, J. L., & Todd, R. E. (2010). Comparison of four dissociated phoria tests: reliability and correlation with symptom survey scores. J Behav Optom, 21(4), 99-104
- Lahhishetty, Vivek, (2021) Can small prism corrections improve visual comfort? Yes and here is why.
- https://my.clevelandclinic.org/health/body/21581-trigeminal-nerve#:~:text=The%20trigeminal%20nerve%20is%20the,help%20you%20chew%20and%20swallow.

53