

The Near Triad

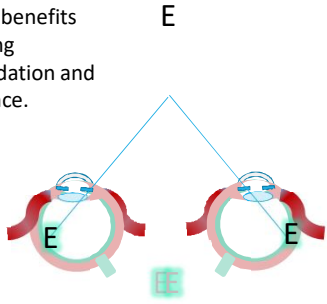
AC/A AND CA/C

JEN SIMONSON, OD, FCOVD

THE NEAR TRIAD 1

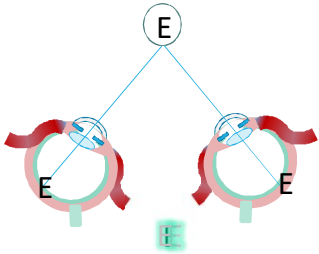
Normally when a target moves from far-to-near, our vision benefits from linking accommodation and convergence.

The AC/A



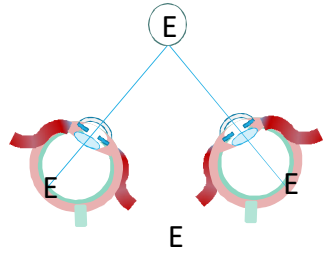
THE NEAR TRIAD 2

1. Our eyes accommodate to see clearly at near.
2. The accommodation also drives convergence to see single vision at near.



THE NEAR TRIAD 3

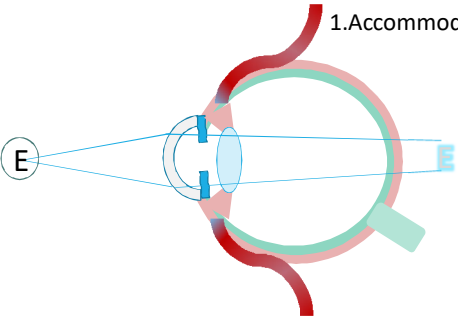
The amount of **accommodative convergence (AC)** driven by the amount of **accommodation (A)** is called the **AC/A** ratio.



THE NEAR TRIAD 4

The Near Triad

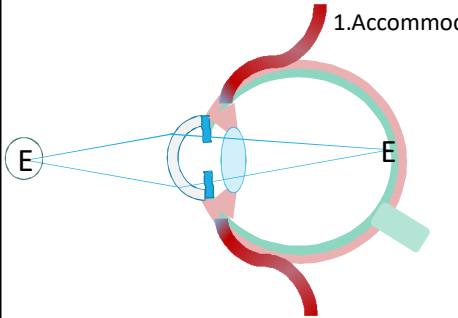
1. Accommodation



THE NEAR TRIAD 5

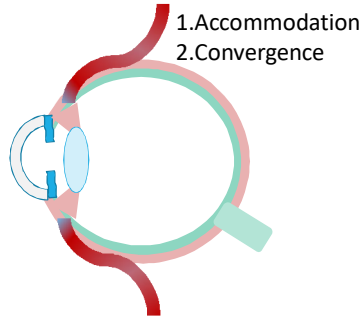
The Near Triad

1. Accommodation



THE NEAR TRIAD 6

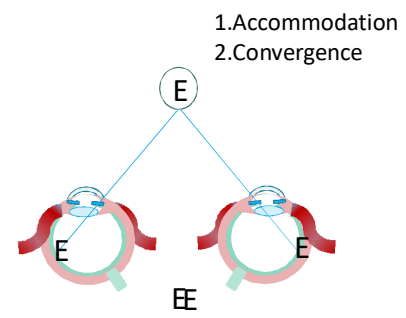
The Near Triad



THE NEAR TRIAD

7

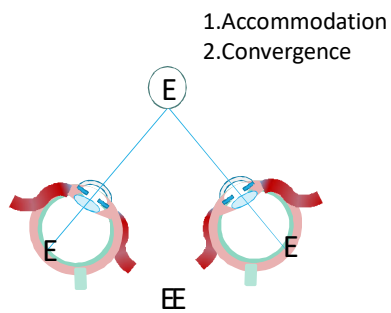
The Near Triad



THE NEAR TRIAD

8

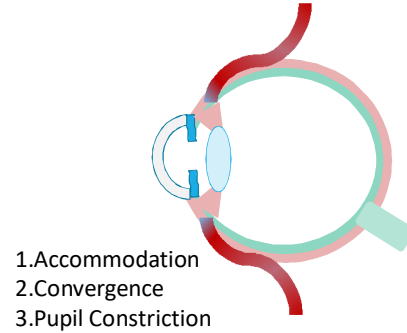
The Near Triad



THE NEAR TRIAD

9

The Near Triad

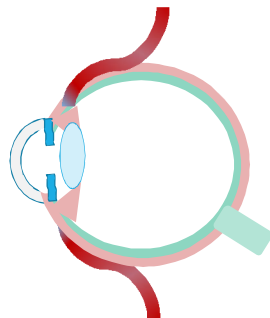


THE NEAR TRIAD

10

The Near Triad

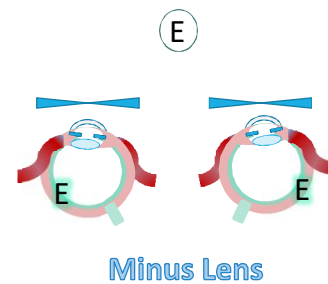
All three neuro-muscular responses occur with a stimulus moving from far to near.



THE NEAR TRIAD

11

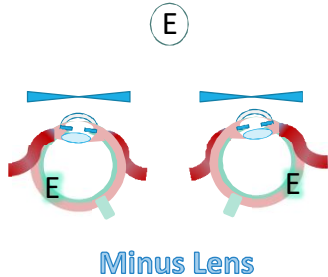
How does the visual system respond to a minus lens?



THE NEAR TRIAD

12

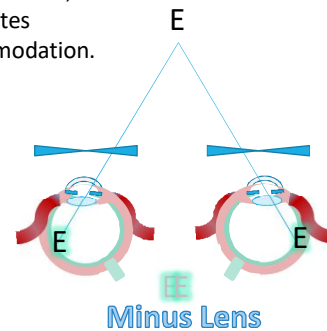
Minus lenses stimulate accommodation. Through the AC/A, the eyes reflexively converge. This creates the situation where our eyes must adjust by diverging to keep the image clear and single.



THE NEAR TRIAD

13

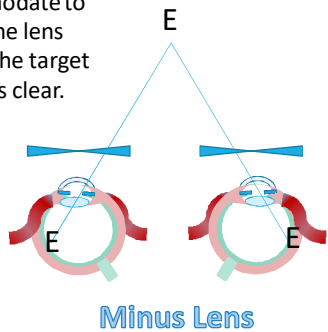
Step 1: Minus lenses cause defocus, which stimulates accommodation.



THE NEAR TRIAD

14

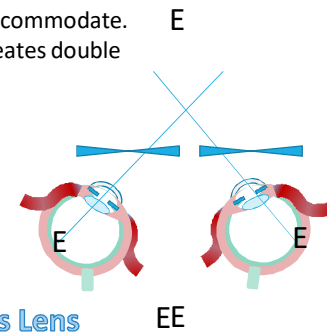
When the eyes accommodate to match the lens power, the target becomes clear.



THE NEAR TRIAD

15

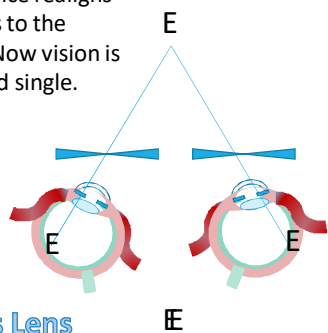
Step 2: Convergence is stimulated when the eyes accommodate. This creates double vision.



THE NEAR TRIAD

16

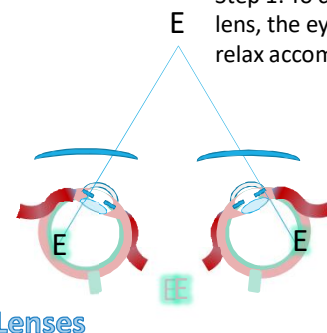
Step 3: Fusional Divergence realigns the eyes to the image. Now vision is clear and single.



THE NEAR TRIAD

17

Step 1: To clear a plus lens, the eyes must relax accommodation.



THE NEAR TRIAD

18

When the eyes adjust to match the lens power, the target becomes clear.

Plus Lenses

THE NEAR TRIAD 19

Step 2: This relaxation of focus also causes a relaxation of vergence – the eyes diverge.

Plus Lenses \overline{E}

THE NEAR TRIAD 20

Step 3: We must use fusional convergence to create single vision.

Plus Lenses \overline{E}

THE NEAR TRIAD 21

The Near Triad

1. Accommodation
2. Convergence
3. Pupil Constriction

THE NEAR TRIAD 22

The work of Linda Sanet, COVT:

PLUS LENSES

- 1) Accommodation and convergence at plane of regard.
- 2) Plus lens introduced: accommodation is relaxed, vergence is reflexly relaxed (divergence) behind plane of regard.
- 3) Convergence movement must occur or diplopia will result.

MINUS LENSES

- 1) Accommodation and convergence at plane of regard.
- 2) Minus lens introduced: accommodation is stimulated, vergence reflexly stimulated (convergence) in front of plane of regard.
- 3) Divergence movement must occur or diplopia will result.

THE NEAR TRIAD 23

The work of Linda Sanet, COVT:

BASE-OUT PRISM

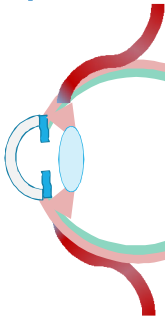
- 1) Accommodation and convergence at plane of regard.
- 2) Base-out prism introduced: convergence takes place and acc. is reflexly stimulated in front of plane of regard.
- 3) Accommodation must relax or object will be blurred.

BASE-IN PRISM

- 1) Accommodation and convergence at plane of regard.
- 2) Base-in prism introduced: divergence takes place, acc. is reflexly relaxed behind plane of regard.
- 3) Accommodation must be stimulated or object will be blurred.

THE NEAR TRIAD 24

The AC/A



Stimulating Accommodation also stimulates Convergence.

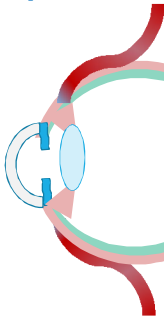
This is called the "AC/A"

The AC/A is the amount of Accommodative Convergence per unit of Accommodation.

E

THE NEAR TRIAD 25

The AC/A

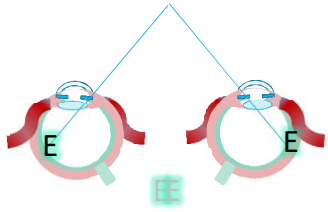


Stimulating Accommodation **more** makes the eyes converge **more**. This is because when an object moves closer, the eye has to both focus more and turn in more.

E

THE NEAR TRIAD 26

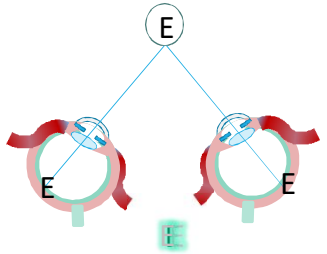
The AC/A



E

THE NEAR TRIAD 27

The AC/A

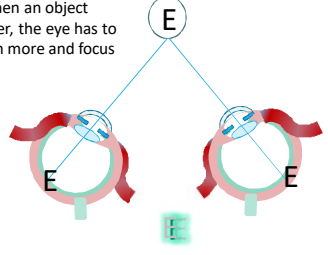


E

THE NEAR TRIAD 28

The CA/C

Stimulating Convergence **more** makes the eyes accommodate **more**. This is because when an object moves closer, the eye has to both turn in more and focus more.

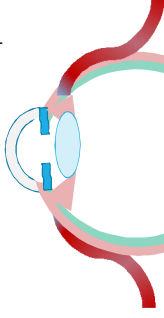


E

THE NEAR TRIAD 29

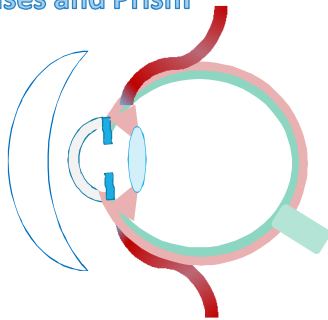
The Near Triad

When an object moves from near to far, the response is relaxed accommodation, divergence and pupil dilation.



THE NEAR TRIAD 30

Lenses and Prism

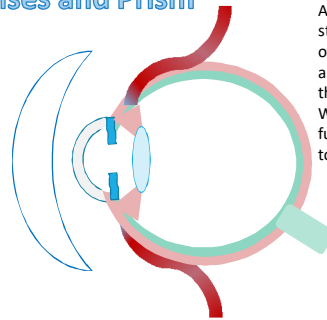


When we add a lens or prism in front of the eye, we still respond as if the target moved closer or further away. We must then make an adjustment to see clear and single vision.

THE NEAR TRIAD

31

Lenses and Prism

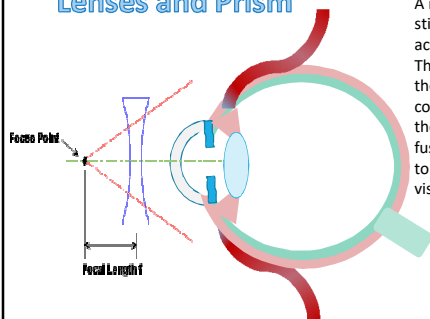


A plus lens will stimulate relaxation of accommodation and divergence through the AC/A. We must then use fusional convergence to see single vision.

THE NEAR TRIAD

32

Lenses and Prism

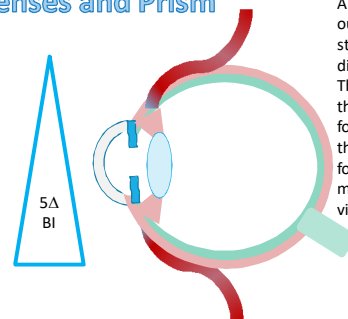


A minus lens stimulates accommodation. Through the AC/A, the eye also converges. We must then adjust by fusional divergence to maintain single vision.

THE NEAR TRIAD

33

Lenses and Prism

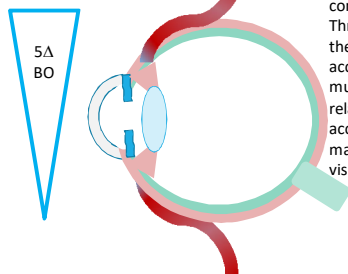


A base-in (apex-out) prism stimulates divergence. Through the CA/C, the eye also relaxes focus. We must then adjust by focusing to maintain clear vision.

THE NEAR TRIAD

34

Lenses and Prism



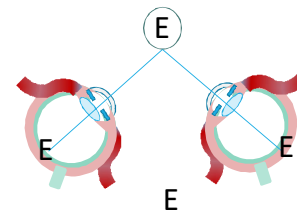
A base-out (apex-in) prism stimulates convergence. Through the CA/C, the eye also accommodates. We must then adjust by relaxing accommodation to maintain clear vision.

THE NEAR TRIAD

35

The AC/A and the CA/C

The more you accommodate (focus), the more the eyes converge. The more you converge, the more your eyes focus.

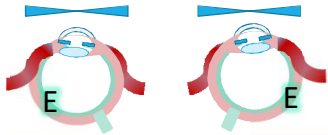


THE NEAR TRIAD

36

How lenses and prisms affect eye alignment and focus:

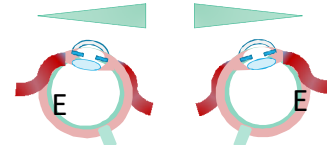
Plus and Minus lenses cause defocus – the first eye response will be to clear the image. The second response is reflexive, the vergence will change. Lastly the eyes will have to realign.



THE NEAR TRIAD

37

How lenses and prisms affect eye alignment and focus:

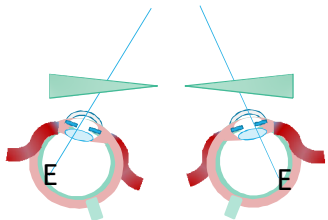


Base-in and Base-out prisms cause disparity – the first eye response will be to fuse the image. The second response is reflexive, the focus will change. Lastly the eyes will have to refocus.

THE NEAR TRIAD

38

How does the visual system respond to a Base-out Prism?

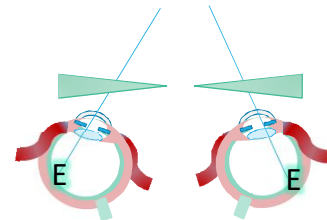


Base-Out Prism E

THE NEAR TRIAD

39

Option #1 – it does NOT respond. The image is blurry and double.

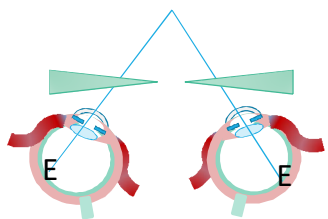


Base-Out Prism E

THE NEAR TRIAD

40

Base-Out Prism stimulate convergence. Through the CA/C, the eyes reflexively accommodate. This creates the situation where our eyes must adjust by relaxing focus to keep the image clear and single.

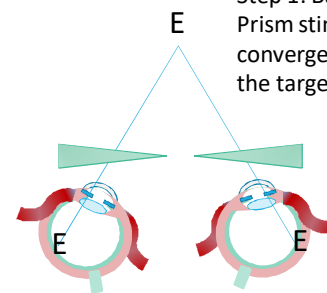


Base-Out Prism E

THE NEAR TRIAD

41

Step 1: Base-out Prism stimulates convergence to keep the target single.

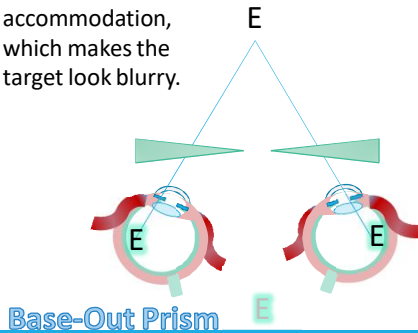


Base-Out Prism E

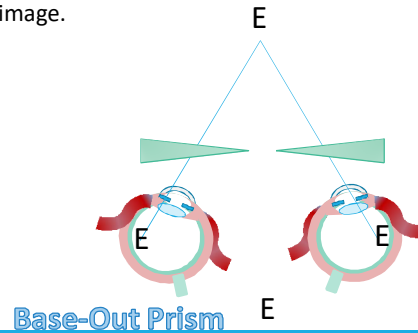
THE NEAR TRIAD

42

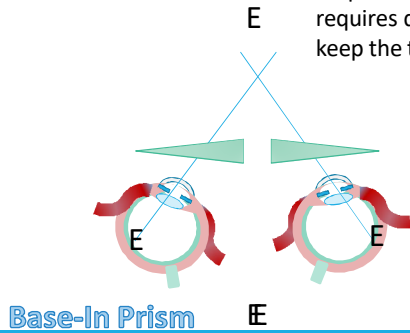
Step 2: Convergence stimulates accommodation, which makes the target look blurry.



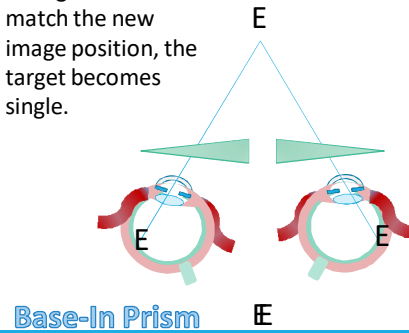
Step 3: The eyes must relax focus to clear the image.



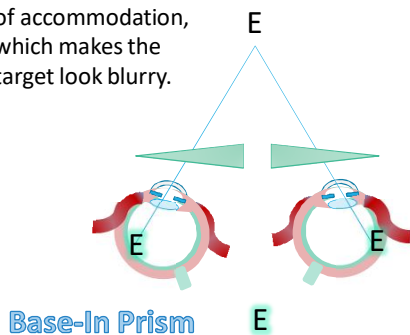
Step 1: Base-in Prism requires divergence to keep the target single.



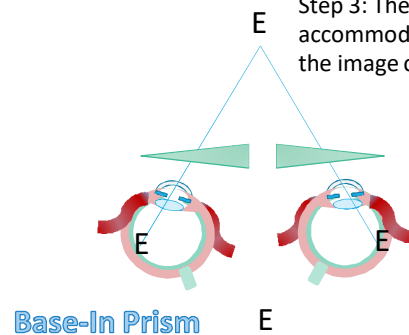
When the eyes diverge to match the new image position, the target becomes single.



Step 2: Divergence creates a relaxation of accommodation, which makes the target look blurry.

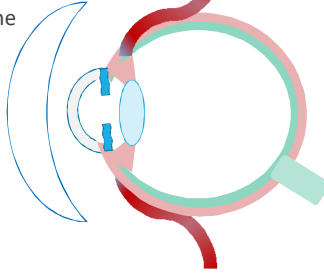


Step 3: The eyes accommodate to make the image clear.



Plus Lenses

1. Relax focus to clear the image.
2. Eyes reflexively diverge.
3. Converge eyes to regain single vision.

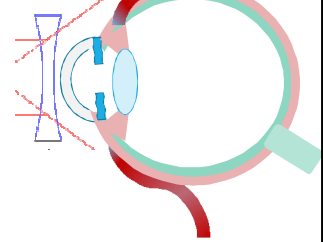


THE NEAR TRIAD

49

Minus Lenses

1. Increase focus to clear the image.
2. Eyes reflexively converge.
3. Diverge eyes to regain single vision.

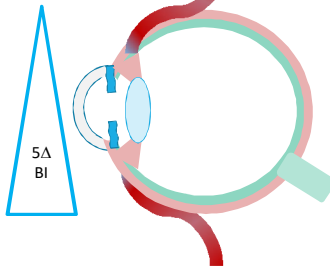


THE NEAR TRIAD

50

BI Prism

1. Diverge to fuse the image.
2. Eyes reflexively relax focus.
3. Accommodate to regain clear vision.

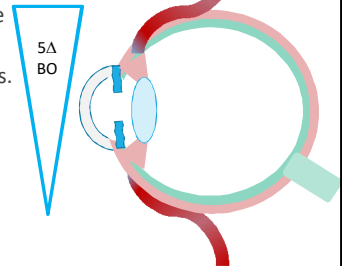


THE NEAR TRIAD

51

BO Prism

1. Converge to fuse the image.
2. Eyes reflexively focus.
3. Relax accommodation to regain clear vision.



THE NEAR TRIAD

52