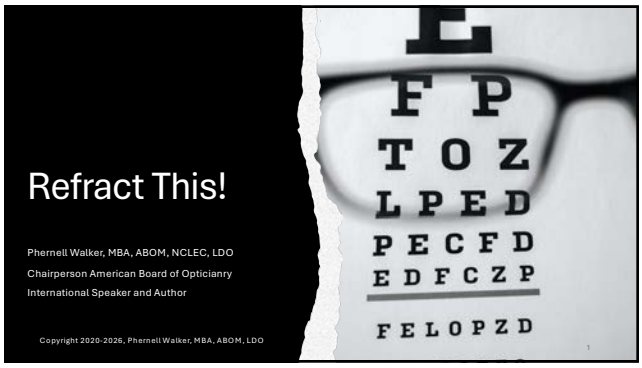
Refract This!
Phernell Walker, MBA, ABOM, NCLEC, LDO
Chairperson American Board of Opticianry
International Speaker and Author
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L
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T O Z
L P E D
P E C F D
E D F C Z P
F E L O P Z D
1

1


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vision expo
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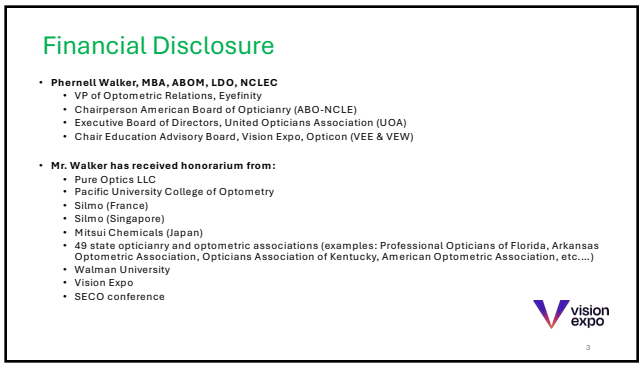
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3

Phernell Walker, MBA, ABOM, NCLEC, LDO

- Author | Pure Optics textbook
- Chairperson American Board of Opticianry
- Treasurer United Opticians Association
- Pacific University College of Optometry | Past Adjunct Professor
- Master in Business Administration (MBA)
- Master in Ophthalmic Optics (ABOM)
- Associates Science in Ophthalmic Optics (AS)
- Licensed Dispensing Optician (WA-LDO)
- National Contact Lens Examiners Certified (NCLEC)

4

SCAN ME

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Chairperson American Board of Opticianry
International Speaker and Author

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5

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Pacific North West (PNW)
Camas, WA

6

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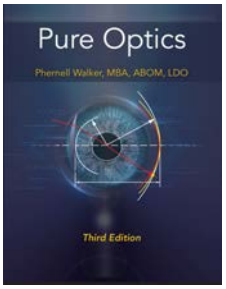
Reference Resource

Pure Optics Third Ed.

Phernell Walker, MBA, ABOM, NCLEC, LDO
Master Optician



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7

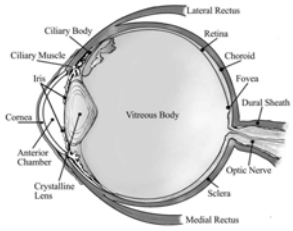
Refraction - We Bend Light

- Refraction the process of bending light.
- The process of measuring the refractive state of the eye.

8

8

Human Eye



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9

Refractive State

No Refractive Error

- Emmetropia

Ametropia (Refractive Error)

- Myopia
- Hyperopia
- Astigmatism

10

10

Gullstrand's Model Eye

- Allvar Gullstrand (Sweden)
- 1862 - 1930
- Cornea: +43.00 D (ct = .5 mm)
- Crystalline Lens = +19.00 D
- Index of Refraction:
  - Cornea: 1.376n
  - Crystalline lens: 1.416n
  - Aqueous/ Vitreous: 1.336n
  - Abbe Value: 45
- Axial length: 24 mm

11

11

Emmetropia

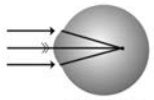
- No refractive error present
- Cornea and lens shaped correctly
- Distance between fovea and lens is correct
- Axial Length
- Light from 20ft. Is focused on the retina
- The eye can accommodate for near objects
- Emmetropia eye needs no corrective lenses

12

12

Myopia

- Nearsighted
- Eyeball is too long
- Distance between lens and fovea is too great
- Light comes to a focus in the vitreous humor
- Crystalline lens doesn't need to accommodate for near vision
- Requires Minus (diverging) lenses



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Myopic VA Approximation

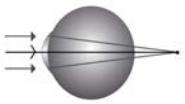
Myopia	Distance VA
-1.00 D	20/80
-2.00 D	20/200
-3.00 D	20/400
-4.00 D	Less than 20/400

14

14

Hyperopia

- Farsightedness
- Eyeball's axial length is too short
- Light from distance does not focus on the retina
- Light's focus is behind the retina
- Requires a plus (converging) lens



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Objective Refraction

Measure the refractive state of the eye without patient input

Examples

- Auto-Refractor
- Retinoscope

16

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Retinoscopy

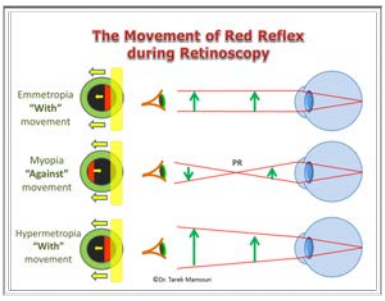
Process of shining a light into the patient's eye and observing the **"fundus reflex"**.

Look for the Motion of the Reflex:

- With Motion
- Against Motion

17

17



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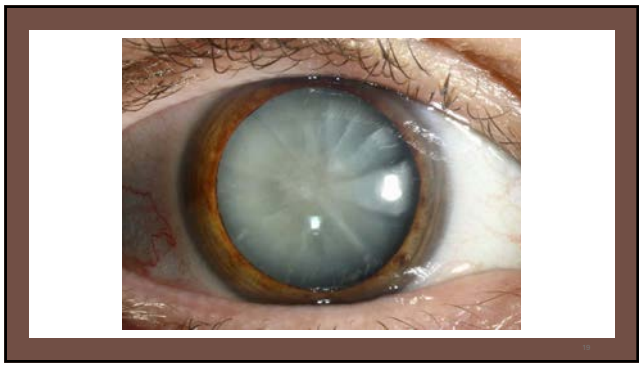

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Astigmatism

- Refractive condition
- Light does not focus on the retina
- Two-line foci 090 degrees apart

20

Clock Dial Method

1. Fog Patient (Plus Power) to ~ 20/40
2. Which lines are clearest?
3. Equally in Focus = 0 Astigmatism
4. Not equally in focus = Astigmatism
5. Axis - Multiply the lower number x 30

Example:

If 3 & 9 are clear: 3 x 30 = 090

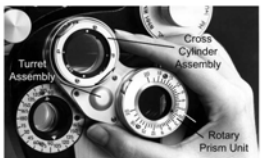
Answer:

Axis = 090

21

Jackson Cross Cylinder (JCC)

- Jackson Cross Cylinder is a combination of two cylinders (minus & plus power) 090 degrees apart
- JCC Power = +/- 0.25 or -/+0.50
- Red Dots = Minus Power
- White Dots = Plus Power



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Presbyopia

- This is a condition, not a refractive error
- Crystalline lens loses natural ability to focus
- Ciliary loses its elasticity, ability to accommodate
- Accommodation lessens with age
- Multifocal such as Bifocals, trifocals, progressive, SV near are used to correct

23

23

Astigmatism

- Most common refractive error
- Cornea - aspherical in the in the central zone
- Light has different focal points in different meridians creating a line focus
- Meridians are usually 90 degrees apart
- Almost 2/3 of the population has astigmatism
- Spherocylindrical lenses are used correct

24

24

Uncorrected Myopia

- Force eyes to converge at near
- Alternate vision
- Eyes turn outward
- Don't use one eyes
- Myopes typically have exophoria

25

25

Hyperopic Children

- Young hyperopes over accommodate
- Over converge
- Typically have esophoria.
- High risk of becoming amblyopic if not corrected by age 6 or 7.

26

26

Uncorrected Hyperope

- Ignore one image, develop lazy eye
- Diplopia
- Asthenopia
- Alternate vision
- Eyes can become crossed-eyed
- Typically have esophoria

27

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Refraction Methods

- Habitual Rx (WRx)
- Auto-Refractor (AR)
- Manifest Rx (MRx)
- Cycloplegic (CRx) (aka Wet)
- Final Rx (Rx)

28

28

Subjective Refraction

Starting Point

1. Find Spherical Power
2. Determine Cylinder Axis & Power
3. Refine the Sphere
4. Binocular Balancing (Dissociated Prism or Duochrome)

29

29

Lighting Conditions

- Use indirect light
- Avoid total darkness or bright light
- Use a dimmer switch

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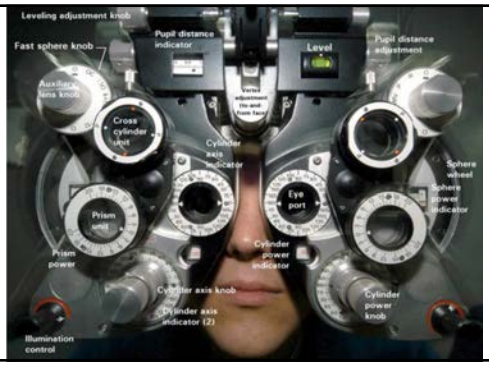
Phoropter

- Diagnostic Instrument - determines the eyes refractive state
- Measures deviation using prisms
- Contains plus, minus, cylindrical and prism lenses secured in a "lens bank"

31



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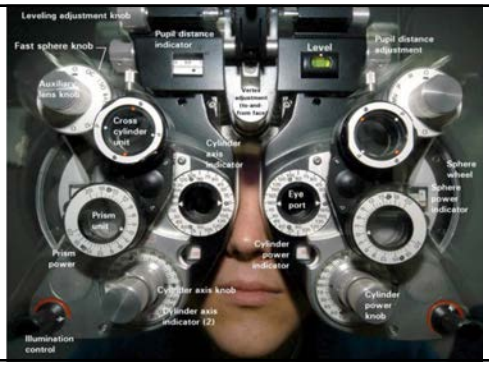

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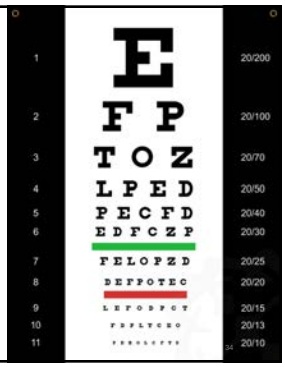
Snellen Chart



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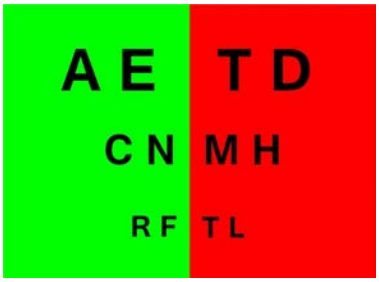
Refractive Sequence

1. Occlude OS (while OD is open)
2. Check for patient's ability to read 20/30 or more (use starting point: AR, HBx, or Ret)
3. Once 20/30 visual acuity is achieved, show only ½ the 20/30 line
4. Add plus power (blur patient) to relax accommodation, until they tell you to stop
5. Dial 3 clicks or +0.75 D (4 clicks if using 20/40 line)
6. Refine the sphere power (which is better 1 or 2)
7. Check for cylinder in the 0, 045, 90, 135 and 180th meridian
8. Example: Which is better #1 Plano or #2 which is -0.50 D
9. If cylinder exist, place JCC in front of the eye using -0.50 D
10. Refine the axis of the cylinder (follow the red dots) minus power
11. Remove JCC, then Duochrome (red green) at 20/30 line
12. Occlude OD, open OS show other ½ of 20/30 line
13. Repeat the (1-12) sequence for OS eye
14. Fog patient (dial down 4 clicks +0.75 D), then open the OD
15. Binocular balance (vertical prism: Better top or bottom?) or Duochrome
16. Remove fog (dial up 4 clicks -0.75 D), then remove the prism
17. Duochrome test OU (R.A.M. or G.A.P.)
18. Red Add Minus or Green Add Plus until equally clear

35

35

Duochrome Balance



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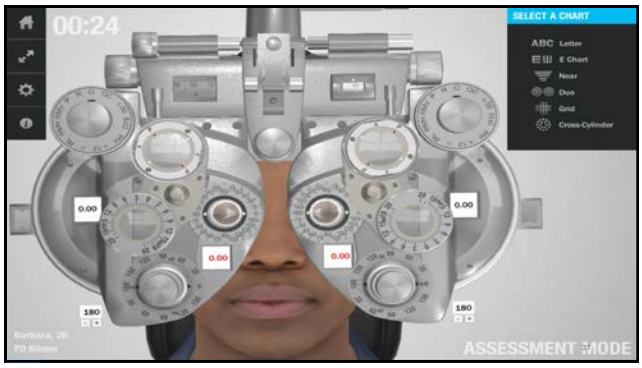
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E Chart
Near
Duo
Grid
Cross-Cylinder
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0.00
0.00
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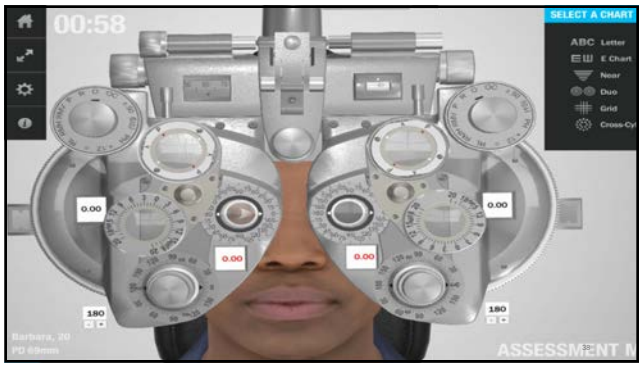
180
180
ASSESSMENT MODE

37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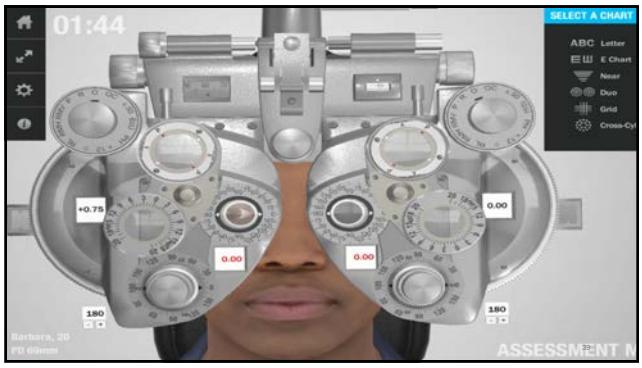
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0.00
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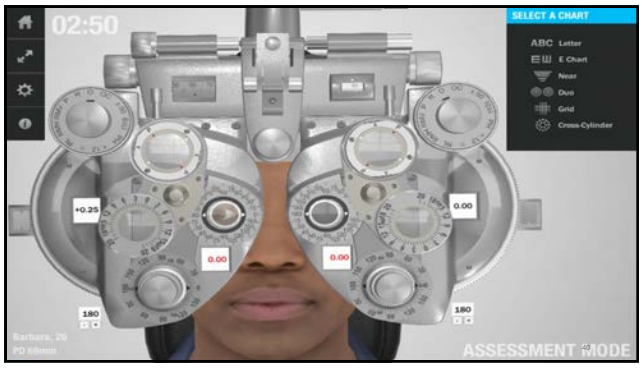
180
180

39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Duo
Grid
Cross-Cylinder
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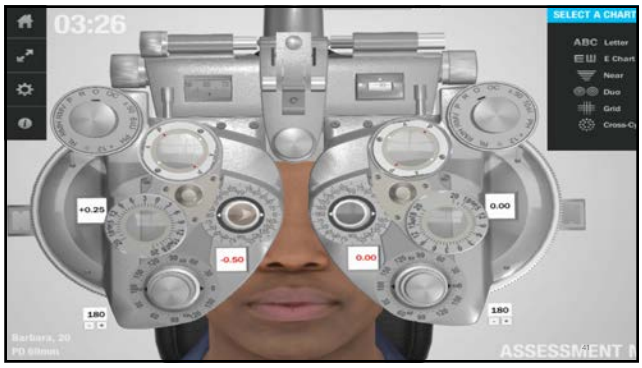
0.00
0.00
180
180
ASSESSMENT MODE

40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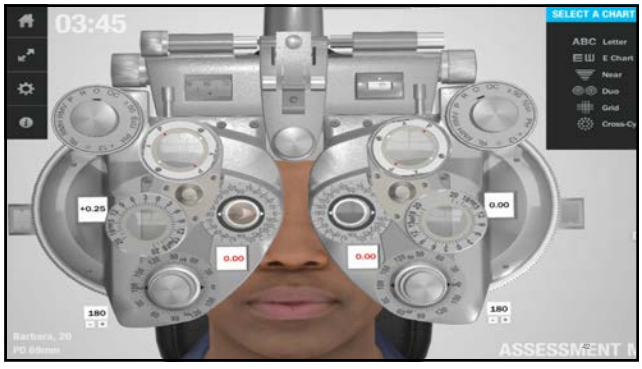
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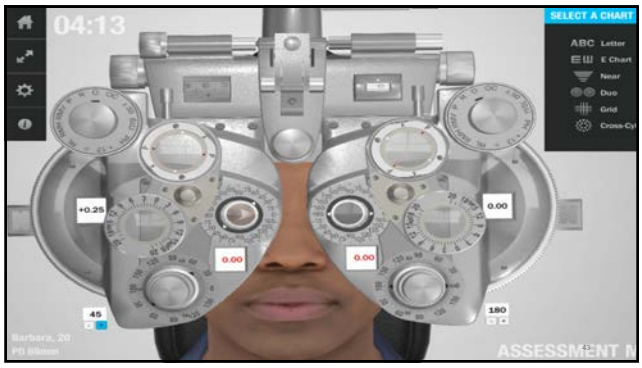
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45
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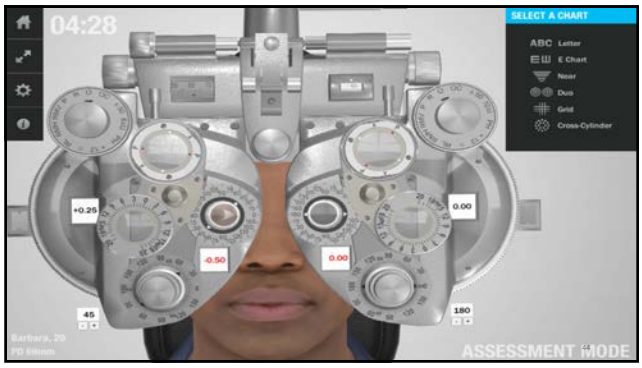
ASSESSMENT

43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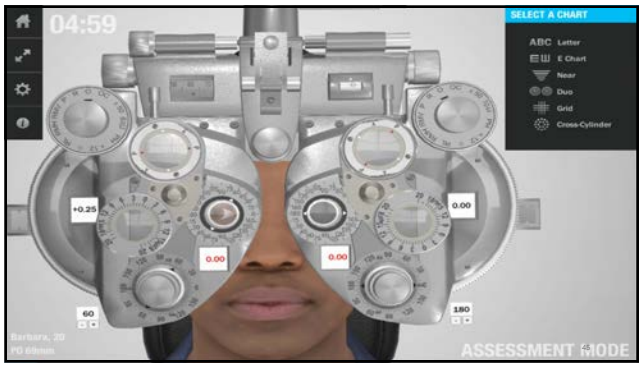
45
180
ASSESSMENT MODE

44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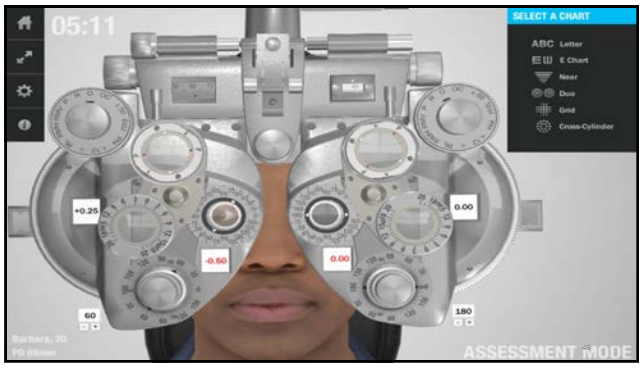
ASSESSMENT MODE

45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180
ASSESSMENT MODE

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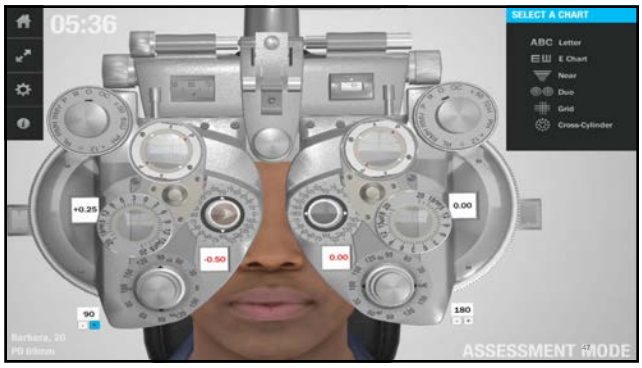
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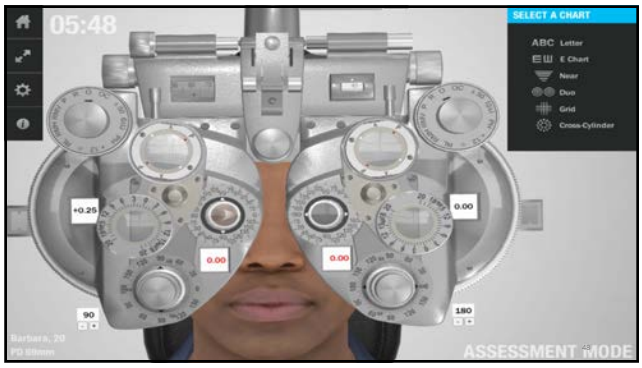
90
180
ASSESSMENT MODE

47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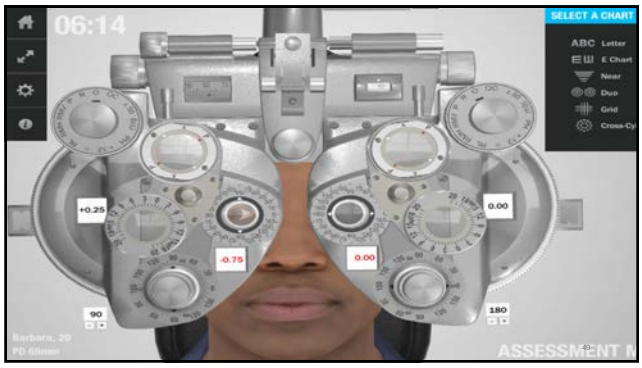
90
180
ASSESSMENT MODE

48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90
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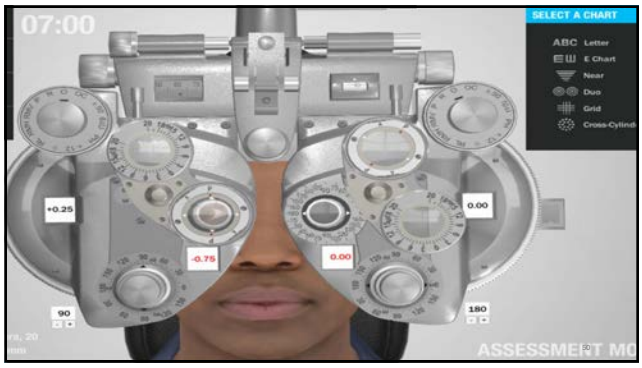
49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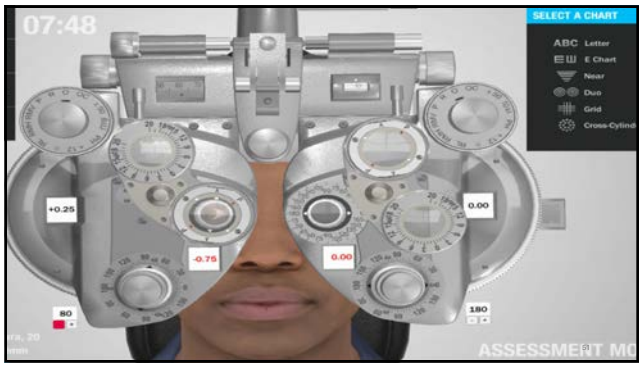
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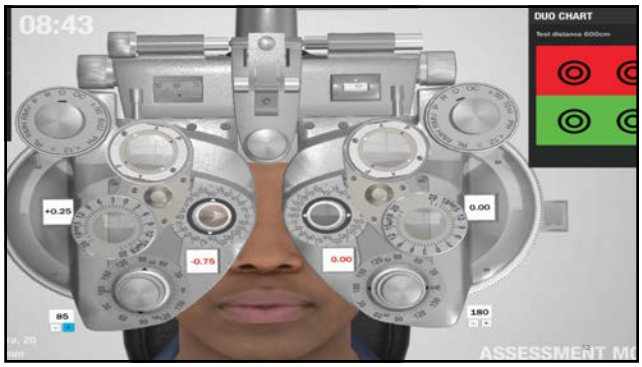

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Beware of Pseudomyopia

Condition of on-going spasm of accommodation.

Hyperope or emmetrope can become falsely myopic.

Correction
- Requires plus lenses
- Prism Base In – to relieve convergence from the work of overcoming excessive exophoria & relieve acc/ conv. Function
- Visual Training

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Add Power

- Additional plus (Add) power typically prescribed for presbyopes.
- Measured with a reading rod or estimated by age.

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Average Add Power

Age	Myopia	Emmetropia	Hyperopia	Low to High Add
34 - 38	X	X	X	+0.75
39 - 40	X	+1.00	+0.75	+1.25
44 - 48	+1.00	+1.25	+1.25	+1.75
49 - 55	+1.50	+1.75	+1.75	+2.25
56 - 62	+1.75	+2.00	+2.25	+2.50
63	+2.25	+2.50	+2.50	+2.50

55

55

Refraction Goal

- Provide the patient with the clearest perceived vision as possible.
- Prescribe the **most plus power** possible for hyperopes.
- Prescribe the **least minus power** to myopes.

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Questions and Answers

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