Refract This!

Phernell Walker, MBA, ABOM, LDO, NCLEC
International Speaker & Author

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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 Education Planning Committee considers content and speakers for future meetings to provide you with the best education possible.

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Financial Disclosure

Phernell Walker, MBA, ABOM, LDO, NCLEC:

- VP of Optometric Relations, **Eyefinity**
- Chair-elect of the **American Board of Opticianry** (ABO-NCLE)
- Executive Board of Directors, **United Opticians Association** (UOA)
- Chair Education Advisory Board, **Vision Expo, Opticon** (VEE & VEW)

Mr. Walker has received honorarium from:

- Pure Optics LLC
- Pacific University College of Optometry
- Silmo (France)
- Silmo (Singapore)
- Mitsui Chemicals (Japan)
- 49 state opticianry and optometric associations (examples: Professional Opticians of Florida, Arkansas Optometric Association, Opticians Association of Kentucky, American Optometric Association, etc.…)
- Walman University
- Vision Expo

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- Principle | Pure Optics LLC
- Author | Pure Optics (text-book)
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- Pacific University College of Optometry, Former Adjunct Professor
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- American Board of Opticianry Certified
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vision expo

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Refraction - We Bend Light

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

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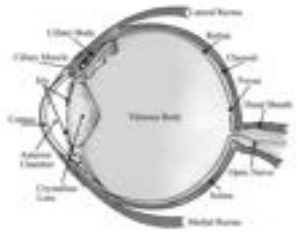
Human Eye



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Refractive State

No Refractive Error

- Emmetropia

Ametropia (Refractive Error)

- Myopia
- Hyperopia
- Astigmatism

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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

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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

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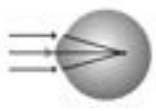
Myopia

- 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

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Hyperopia

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

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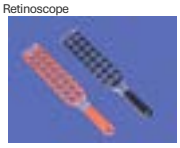
Objective Refraction

Determine the refractive state of the eye witho patient input

Examples

- Auto-Refractor
- Retinoscope



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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

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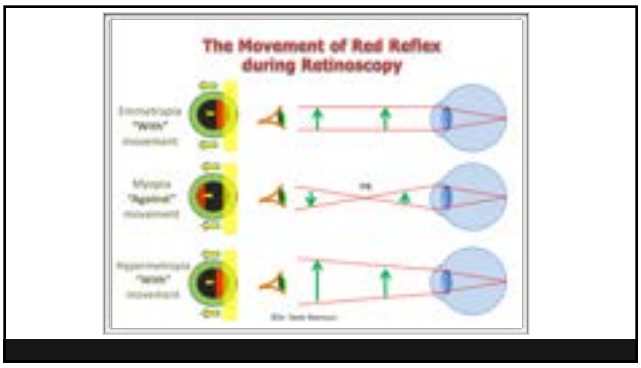

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Astigmatism

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

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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

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Jackson Cross Cylinder (JCC)

- Jackson Cross Cylinder - 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

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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

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Myopia & Near Point

- The eye has no need to accommodate, and does not converge…
- The myope tends to under accommodate and under converge.

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Uncorrected Myopia

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

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Uncorrected Hyperopic Children

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

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Uncorrected Hyperope

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

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Refraction Types

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

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Subjective Refraction

Subjective refraction is used after the initial objective refraction (used to determine a starting point or for non-communicative patients).

Summary Order:

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

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Lighting Conditions

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

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Phoropter

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Snellen Chart

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Step	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
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 OU (RAM or GAP)
18	Red Add Minus or Green Add Plus until equally clear

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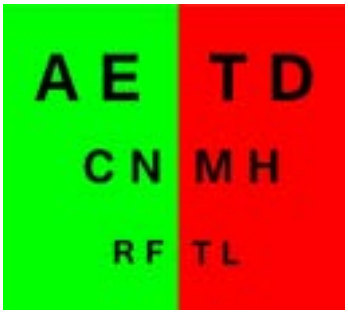
Duochrome Balance



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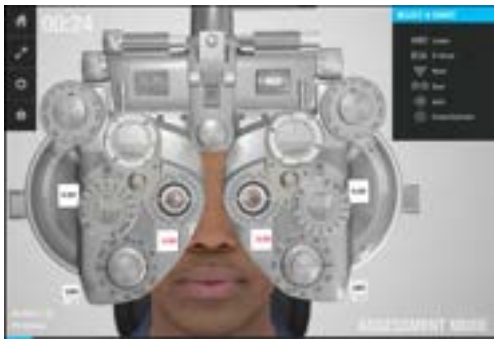

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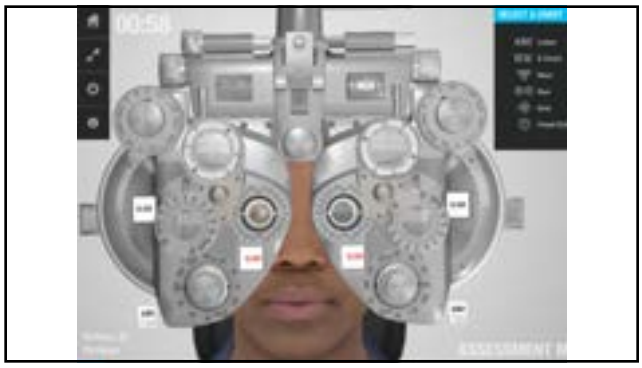

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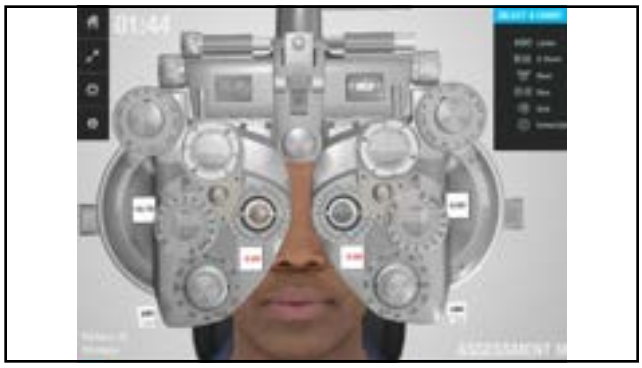

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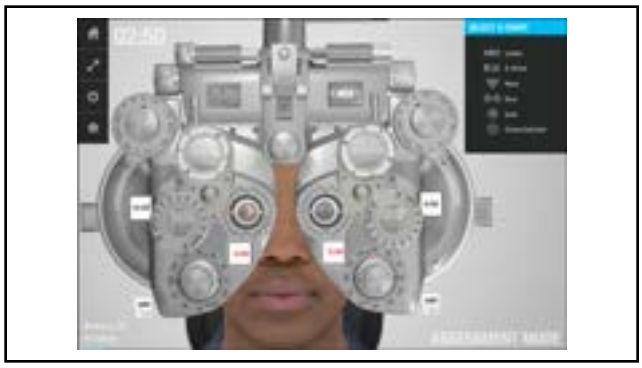

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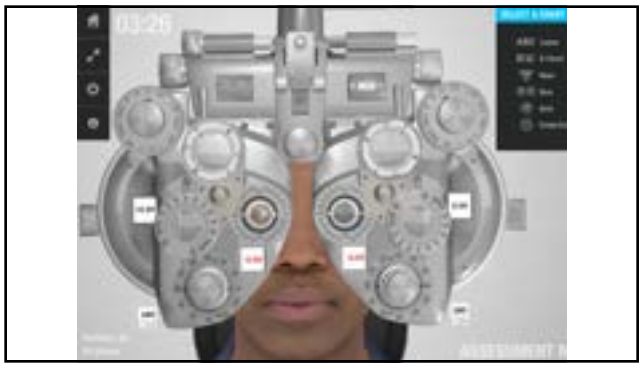

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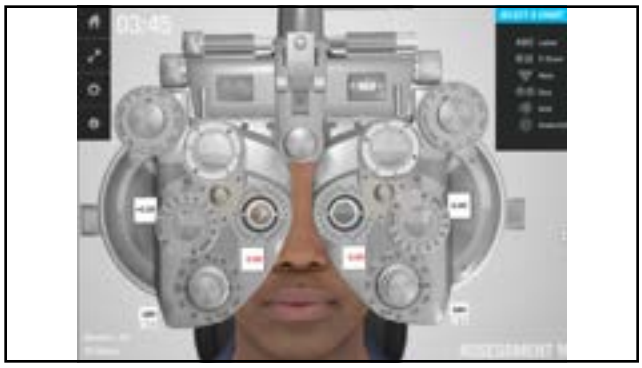

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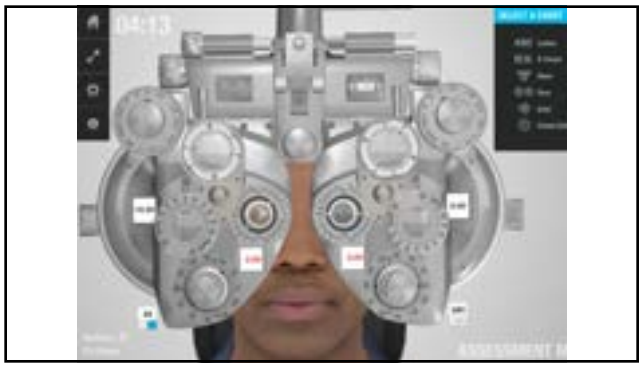

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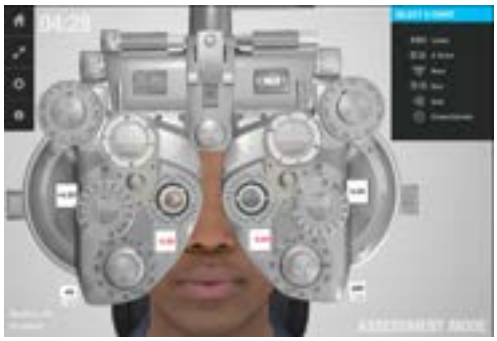

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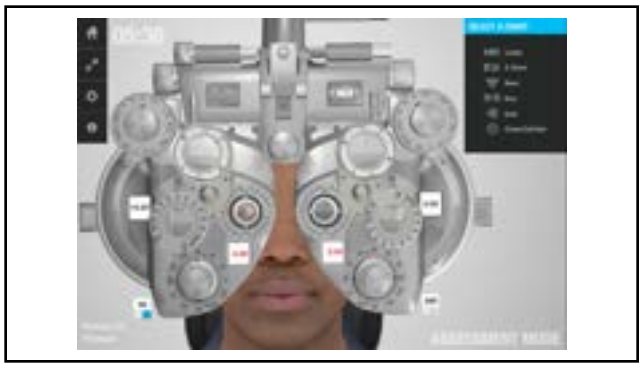

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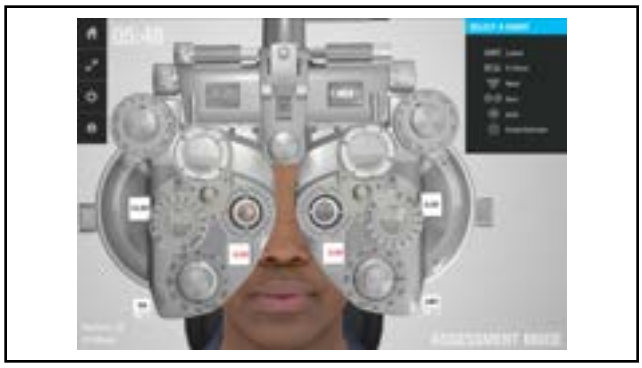

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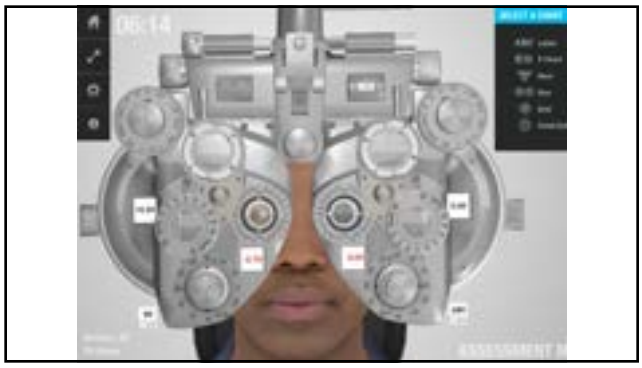

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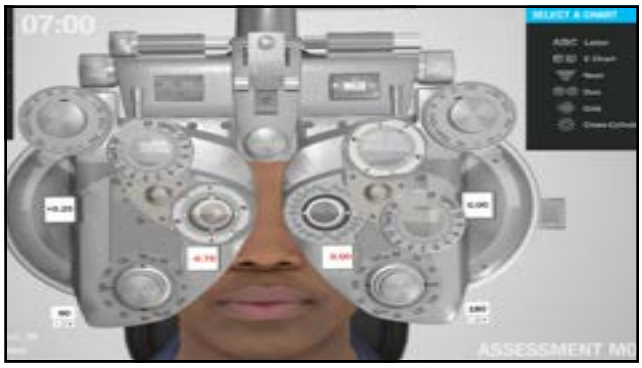
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SELECT A CHART
ASSESSMENT MO

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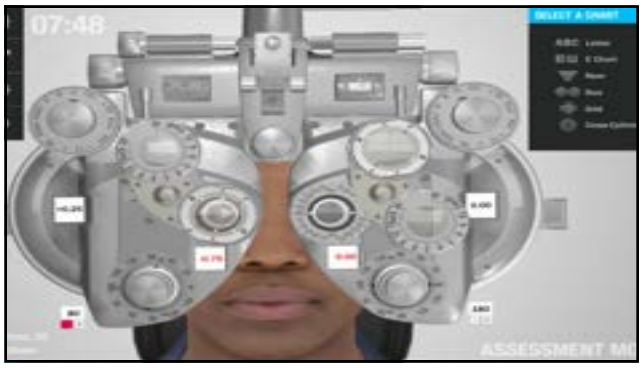
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SELECT A CHART
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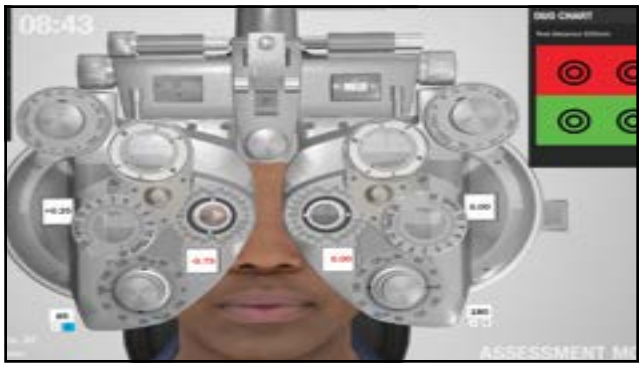
08:43
DUO CHART
ASSESSMENT MO

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Beware of Pseudomyopia

Condition of on-going spasm of accommodation.

Hyperope or emmetrope can become falsely myopic.

Treatment

- 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

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Refraction Goal

Provide the patient with the clearest perceived vision as possible.

Prescribe the **most plus power** possible for hyperopes and the **least minus** power to myopes.

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Questions

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