

**Myopia:**  
Beyond the Eyeball, Within the Person

By: Amrit Bilkhu, OD, FAAO, FOVDR, FCCSO

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**Hello!** 🖐️


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**2019** - Doctor of Optometry, Illinois College of Optometry  
**2020** - Vision Therapy & Rehabilitation Residency, Berkeley Herbert Wertheim School of Optometry  
**2021** - Fellow, American Academy of Optometry  
**2024** - Fellow, Optometrists in Vision Development & Rehabilitation

**Practice:** Northern Sight Optometry, Vaughan, Ontario

**Where You'll Find Me:**

- Four Eyes Optometry Podcast
- NextGen OD Future Focus Podcast
- Pediatric Eye Care Masterclass Course



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**Learning Objectives**

- Understand myopia as an adaptation to stress
- Discussing physiological and psychological contributors to myopia onset
- Identifying binocular vision dysfunction in myopia progression



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## Thought-Provoking Questions

Why is near work commonly linked to myopia?

Why do people feel they need stronger lenses each year?

Why do some individuals progress faster?

How can we predict who will progress faster?

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## Nearpoint Stress Model

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## Dr. A. M. Skeffington

*"Near-work demands imposed by our culture are incompatible with our physiology and provoke a stress response characterized by a drive for convergence to localize closer than accommodation. The resulting mismatch between vergence and accommodation interferes with visual efficiency and information-processing, and may lead to adaptive changes within the visual system."*



Disorders by Martin Blinbaun

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### Extended nearpoint tasks are biologically unacceptable

- Requires sustained immobilization
- Imposes unique intense cognitive demands
- Tasks are in an artificial 2-D setting

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### Natural Buffers

Protects accommodative-convergence mechanism to maintain clear, single vision during sustained near tasks

1. Low Hyperopia (between +0.50 D to +0.75 D)
2. Low Exophoria (between 4<sup>Δ</sup> to 6<sup>Δ</sup>)



Large refractive errors and misalignments are adaptations to nearpoint stress when buffers break down!

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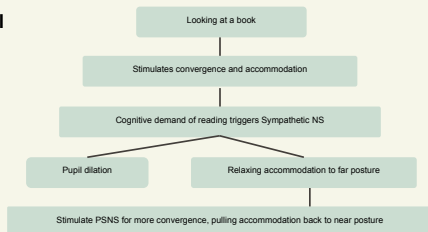
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### Nearpoint Stress Model



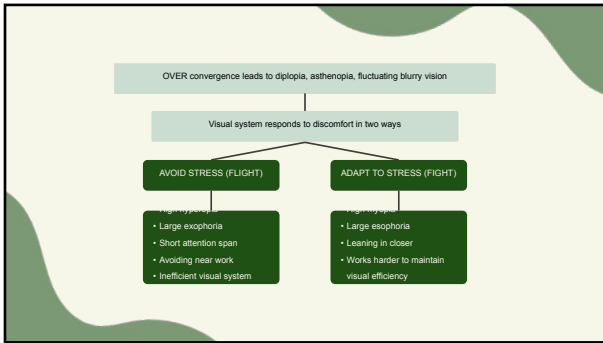
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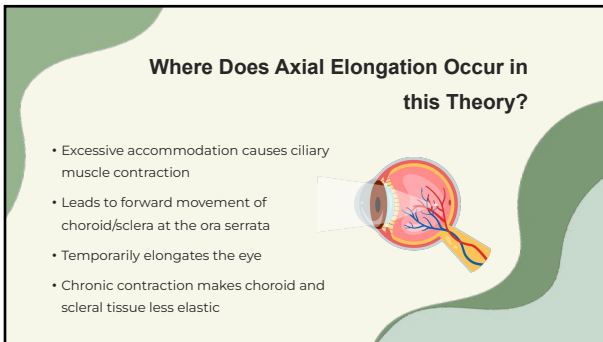
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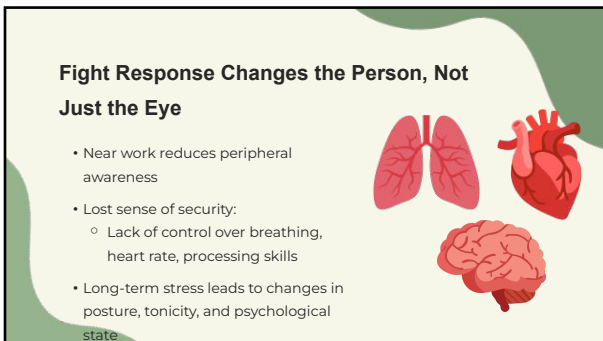
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# Psychological Influences on Myopia

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# Psychological Traits and Myopia

Studies suggest certain personality traits accompany myopia...

- Internalizing stress
- Resisting life
- Feeling vulnerable
- Self-doubt
- Low self-esteem
- Blaming oneself for mishaps
- Introvert / shyness
- Passively enduring anxiety
- Need for achievement

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# Childhood Stress and Myopia

One study (Katz, 2014) found potential correlation between myopia and certain childhood stress in university students

- 457 students (myopes and emmetropes)
- Surveyed anonymously regarding childhood experiences
- Questions organized into 6 categories

- Stress-Fear-Abuse**
- Praise-Support**
- Social Contact**
- Fresh-Organic Food**
- Realistic Understanding as Child**
- Criticism as Child**

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## Childhood Stress and Myopia

Myopic students scored higher on:

Stress-Fear-Abuse

- Lower self-esteem
- More lonely
- Criticism about physical appearance
- Higher weight
- Experienced more fear over stressful

Myopic students are more likely to have perceptual problems related to recognition and interpretation of stressful situations.

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## Optometry's Role in Myopia Perception

# 20/20



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## Optometry's Role in Myopia Perception

The 20/20 standard has led to societal pressure to have "perfect" vision

- Patients feel inadequate if not achieved
- Leads to hyperfixating on clarity of vision
  - Increases stress and reduces peripheral awareness
- Asking just noticeable differences triggers stress response
- Believing in one final exact prescription for most precise vision
  - Anything else prescribed is subpar



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# Physiological Adaptations to Near Stress

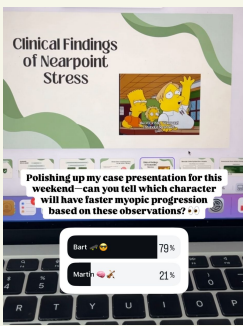
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# Physiological Adaptations to Near Stress

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## Binocular Vision Dysfunction & Myopia

Clinical findings of over-convergence:

Orthophoria / EP @ near

Poor BO vergence ranges @ near

Low PRA or Low BAF on (-) lens

FCC / MEM Lead of accommodation

Receded NPC without large XP

High lag of accommodation w/ ATR

Emmetropic or Myopic refractive error

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## Behavioural Observations During Exam

### Adaptations

- Holding objects closer
- Leaning body closer to object
- Tense shoulders
- Tight jaw / neck muscles
- Holding breath
- Lack of blinking
- Widening eyes

### Anxiety / Fear

- Pressure to complete task
- Looking at parents for reassurance
- Asking to repeat tests to try again
- Taking long to answer
- Afraid to make an error
- Removes occluder immediately after reading VA line to check answers

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## Management Recommendations

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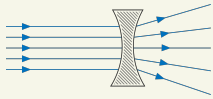
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### Address Near BV Challenges



- Conventional myopia treatment involves prescribing concave lenses for full-time wear at all distances
- **Concave lenses:**
  - Increase muscle tonicity
  - Stimulate accommodation
  - Shorten breathing
  - Promote central awareness

**These are ALL factors involved in the fight response due to nearpoint stress!**

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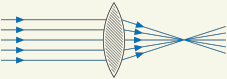
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### Address Near BV Challenges



- **Convex lenses:**
  - Decrease muscle tonicity
  - Relax accommodation
  - Slows breathing
  - Promote peripheral awareness

**These are ALL factors involved in the rest and digest response.**

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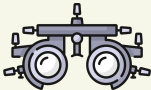
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- Trial frame final SRx and repeat near BV tests
  - If BVD still present, **CUT BACK MINUS**
- Offer **ALTERNATE** near SRx that improves BV functions and reduces physiological adaptations:
  - a. Bifocal or anti-fatigue lens for full-time wear
  - b. Centre-near MF SCLs
  - c. Myopia control lens package deals for multiple pairs
    - i. Describe situations for when to wear each lens




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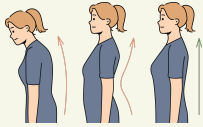
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## 2

### Visual Hygiene and Posture



- Demonstrate proper posture when sitting at a desk or on couch
  - Avoid lying down
  - Place objects higher to eye level
- Shoulders relaxed, chest open
  - Slow, deep breathing
- Recommend co-management with chiropractor

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## 2

### Visual Hygiene and Posture

- Enlarge font size on printed material or digital devices
  - Reduces risk of leaning in closer
- Work in larger rooms with windows and less clutter
- Reduce time spent on near tasks by:
  - Prioritize spending time outdoors on daily basis all year round to enhance peripheral awareness
  - Schedule time to socialize with family and peers
  - Teach concepts on easel boards, by painting, or using sensory bins in replacement of pencil and paper

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## 3

### Parent Counseling & Emotional Support

- **AVOID NEGATIVE TALK REGARDING EYES**
  - Shift mindset on addressing findings
  - Discuss concerns without child present
- Recommend activities to reduce stress response
  - Breathing exercises, stretching,
- Co-management with psychotherapist
  - Use effective strategies to reduce anxiety and fear

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# 4

## Vision Therapy



- Continue myopia control treatment options but co-manage with VT program at same time
- Educate parents on benefit of combination therapy for kids with fast myopia progression
- VT will enhance BV skills and peripheral awareness

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### Case #1 - 11 y/o male

#### July 2024

- No concerns
- Wears DV SRx occasionally
- All BV testing done unaided
- MHx unremarkable

#### Plan

- Continue hab DV SRx

	OD	OS
Dist VA (sc)	20/20	20/50
Near VA (sc)	20/20	
Hab SRx	+0.00 (20/20)	-0.75 (20/25-2)
CT	Dist: Ortho, Near: 4+XP	
NPC	TTN	
Stereo	250° Global	25° Local
Amps	13 D	14 D
MEM	+0.50 D	+0.50 D
Dry Ret	+0.00 (20/20)	-1.25 (20/20-1)

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#### Jan 2025

- Blurry distance vision
- Noticed when OD eye looked through OS lens

#### Plan

- Update SRx to anti-fatigue lens for FT wear:

**OD: -0.75 / +0.50 ADD**

**OS: -1.25 / +0.50 ADD**

- F/U in 2 months

	OD	OS
Dist VA (sc)	20/40	20/80
Near VA (sc)	20/40	
Hab SRx	+0.00	-0.75
Dist VA (cc)	20/30+2	
CT	Dist: ortho Near: Ortho	
MEM	-0.25 D	-1.00 D
Dry Ret	-1.00	-2.00
Sub Ref	-1.00 (20/20)	-1.75 (20/20-1)
FCC	-0.50	
Binoc Ref	-0.75 (20/20-2)	-1.25 (20/30+1)
Dist VA (TF)	20/20-1	

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## Mar 2025

Hi Dr. Blikhu,

Can you send me the details of [redacted] prescription and what type of glasses her has at present?

I.e. Myopia? The company that did the lens etc? What has been added to his lens?

[redacted] has been squinting a fair bit so we were in Brampton over March break so I got his eyes rechecked. His Prescription has changed and I'm a worried things are getting worse very quickly.

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### Mar 2025

- Significant squinting frequently every day
- No headaches / brow aches
- Another OD urged parents to get MiyoSmart

#### Behaviours Noted:

- Hiding face in jacket
- Looking away, avoiding eye contact
- Widening eyes

#### Plan:

- ~~No change to glasses~~
- Thoroughly educated on visual hygiene and mental health / emotional support

	OD	OS
Dist VA (cc)	20/20-1	20/25
Near VA (cc)	20/20	
CT	Dist: ortho Near: 4+XP	
NPC	TTN	
MEM	+0.25 D	+0.25 D
Amps	14 D	14 D
Sub Ref	-1.00 (20/20)	-1.75 (20/20-1)

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- Reassurance that there is absolutely nothing wrong with the health or vision status of the eyes. It is perfectly normal to need glasses to see better, and if there is ever an increase in his prescription, it will be because we want him to see "comfortably" throughout the day, not because his eyes are getting "worse".
- Reassurance that wrong answers and less than optimal performance on a task is part of our learning experience, so it is ok to make mistakes.
- Eliminate all screens at least one hour before bedtime. Use this hour to take a warm bath, listen to music, or unwind on the sofa together as a family and talk about your day (highs, lows, gratitude, what to look forward to tomorrow).
- Use the syntonics phototherapy glasses about half an hour before bed time.
- Give him a massage to relieve muscle tension before bed.
- Practice a 5-10 min breathing, meditation, or stretching routine on a daily basis before starting the day.
- [redacted] tends to widen his eyes and stare when focusing on something which leads to air exposure and dry eyes. Hydrate his eyes with preservative-free artificial tears or a hot towel/eye mask gently placed on the eyes for a few minutes at a time, at various times throughout the day.

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**Apr 2025**

- Squinting much less
- Purposely lowering his eyebrows and slowly blinking now
- No headaches **anymore**
- Used syntonics 4-5 days only
- Reports vision is clear and comfortable
- Sleeping better

	OD	OS
Dist VA (cc)	20/20	20/25+2
Near VA (cc)	20/20	
CT	Dist: ortho Near: 4*XP	
NPC	TTN	
MEM	+0.50 D	+0.25 D
Amps	14 D	14 D

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**Case #3 - 14y/o male**

**Chief Complaint & History:**

- Gradual onset blurry vision OU at far distances
- Eye strain, headaches from squinting often
- Leaning closer to computer screen
- MHx and DHx unremarkable
- POHx:
  - Low hyperopia OU
- LEE: 5 yrs ago

	OD	OS
Dist VA (sc)	20/150	20/100
Near VA (sc)	20/25	
CT	Dist: Ortho, Near: 6*XP	
NPC	TTN	
Dry Ret	-1.50 DS	-1.25 DS
Sub Ref	-1.50 DS (20/20)	-1.25 DS (20/20)
FCC	+0.25 D	
NRA/PRA	+2.50 / -1.25	

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**Diagnoses:**

- Simply myopia, both eyes
- Exophoria at near
- Accommodative excess

**Rate of Myopic Progression:**

- Previous dry retinoscopy 5 years ago was:
  - OD: +0.25 DS
  - OS: +0.50 DS
- Rate of progression = **-0.35D/yr**

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**Distance Rx Rationale:**

- Full myopic correction not necessary
- Goal is to prescribe lenses for functional vision in classroom setting which may not be 20/20 VA

**Near Rx Rationale:**

- Signs of nearpoint stress with subjective refraction
- Prescribe less minus at near
- At plano, BV was within normal limits

Final SRx for FT wear:  
OD: -0.75 DS / +0.75 ADD  
OS: -0.75 DS / +0.75 ADD

**Educate on Visual Hygiene:**

- Frequent visual breaks from near tasks
- Extended working distance, upright posture
- Larger print and electronic devices
- Spend time outdoors, work by window

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3 months after initial visit

	OD	OS
Dist VA (cc)	20/20-1	20/20-1
Near VA (cc)	20/20	
CT @ near (cc)	4°XP	
NPC (cc)	TTN	

6 months after initial visit

	OD	OS
Dist VA (cc)	20/25	20/25
Near VA (cc)	20/20	
CT @ near (cc)	2°XP	
NPC	TTN	
FCC	-0.50	
NRA/PRA	+2.25 / -2.00	

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1 year after initial visit

	OD	OS
Dist VA (cc)	20/25-2	20/25-2
Near VA (cc)	20/20	
CT @ near (cc)	4°XP	
FCC	-0.25	
NRA/PRA	+2.25 / -2.25	
Dry Ret / Ref	-1.00 DS (20/20)	-1.00 DS (20/20)

**Rate of Myopic Progression:**

- Previous dry retinoscopy 6 years ago was:
  - OD: +0.25 DS
  - OS: +0.50 DS
- Rate of progression = **-0.20D/yr**

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### In hindsight...

- Stress point retinoscopy or MEM retinoscopy could have provided better guidance in determining appropriate ADD power
- Access to axial length device would provide more detail into true progression rate of myopic growth and risk of myopic-related ocular diseases

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### Case #4 - 9y/o female

#### Chief Complaint & History:

- Writing far away seems too small
- Currently enrolled in online learning full-time
- MHx and DHx unremarkable
- POHx:
  - Functional emmetrope OU
- LEE: 2 yrs ago

	OD	OS
Dist VA (sc)	20/70	20/100
Near VA (sc)	20/20	
CT	Dist: Ortho, Near: Ortho	
NPC	15 cm break, closes eyes	
Stress Ret	-0.25 D	
Dry Ret	-1.50 DS	-1.50 DS
Sub Ref	-1.00 DS (20/30)	-1.00 DS (20/30)
FCC	+0.50 D	
NRA/PRA	+1.75 / -0.75	

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#### Diagnoses:

- Simple myopia, both eyes
- Convergence insufficiency

#### Rate of Myopic Progression:

- Previous dry retinoscopy 2 years ago was:
  - OD: +0.00 DS
  - OS: +0.50 DS
- Rate of progression
  - OD: **-0.75D/yr**
  - OS: **-1.00D/yr**

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**Rx Rationale:**

- Least amount of minus that provides good quality VAs within visual demand
- Add power will improve NPC and relieve small ortho posture

Final SRx for FT wear:  
OD: -1.00 DS / +1.50 ADD  
OS: -1.00 DS / +1.50 ADD

**Educate on Visual Hygiene:**

- Frequent visual breaks from near tasks
- Extended working distance, upright posture
- Larger print and electronic devices
- Spend time outdoors, work by window

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1.5 years after initial visit

	OD	OS
Dist VA (cc)	20/25	20/25
CT @ near	Ortho	
NPC	5/8 cm	
Amps	12 D	12 D
Dry Ret	-1.25	-1.25
Sub Ref	-1.25 (20/20)	-1.25 (20/20)
FCC	+0.25	
NRA/PRA	+2.25 / -2.00	

3 years after initial visit

	OD	OS
Dist VA (cc)	20/30	20/30
CT @ near	4*XP	
NPC	TTN	
Amps	13 D	13 D
Dry Ret	-1.25	-1.25
Sub Ref	-1.25 (20/20)	-1.25 (20/20)
MEM	+0.50	
Final SRx	OD: -1.25 / +1.50 ADD OS: -1.25 / +1.50 ADD	

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**Rate of Myopic Progression:**

- Previous dry retinoscopy 5 years ago was:
  - OD: +0.00 DS
  - OS: +0.50 DS
- Rate of myopic progression **OD: -0.25D/yr** and **OS: -0.35D/yr**

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## Thought-Provoking Questions

Why is near work commonly linked to myopia?

Why do people feel they need stronger lenses each year?

Why do some individuals progress faster?

How can we predict who will progress faster?

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## Summary

"Myopia" does not only impact the eyeball.

Myopia is an adaptation to near demands and psychological influences.

Holistic management improves long-term outcomes.

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# Q+A

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