Functional Prescribing for

Refractive Amblyopia

in Primary Care

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No financial disclosures

Learning Objectives

- Understand amblyopia is a binocular dysfunction
- Learn a functional prescribing approach for refractive amblyopia
- Review case examples

Traditional Definition of Amblyopia

Poor visual acuity of the affected eye due to abnormal visual development without any structural ocular abnormality

Key Insight
Places emphasis on the eye with the problem

Traditional Treatment Methods for Refractive Amblyopia

Optimal lens prescription
- Max Rx that provides BCVA for FT wear

Patch fixing eye (based on PEDIG recommendations)
- 2hr/day for moderate cases (20/40-20/80)
- 6hr/day for severe cases (20/100+)

Atropine 1%
- One drop in fixing eye every weekend

Bangerter Filter
- Certain filter density over fixing eye

Challenges of Traditional Treatment Methods

- Max optical Rx induces aniseikonia
  - Locks visual system into artificially distorted environment
- Recurrence of amblyopia with discontinued or tapered patching
  - Risk of occlusion amblyopia
- Atropine medication side effects
  - Also negatively impacts accommodative system
- Negative psychological impacts from patching or cosmetic appearance of lenses

ALL these treatments place emphasis on MONOCULAR function of the amblyopic eye!

Accumulating evidence placing an emphasis on how binocular rivalry and suppression are key players in the etiology of amblyopia

Huang, Zhou, Liu et al, 2011	• Imbalance of monocular excitatory and inhibitory connections to visual cortex influencing ocular dominance. • Demonstrates attenuated signal in amblyopic eye, as well as strong direct and indirect inhibitory signals in the fixing eye.
Lunghi, Morrone, Secci et al, 2016	• Demonstrates binocular rivalry between fixing and amblyopic eye with traditional patching therapy over 5 months. • Even with VA improvements in amblyopic eye, fixing eye demonstrates stronger ocular dominance post-patching therapy.

Li, Thompson, Lam et. al, 2011	• Degree of suppression measured significantly correlated with degree of amblyopia and poor stereopsis quality. • Greater suppression lead to greater level of amblyopia.
Hess and Thompson, 2015	• Review of research shows positive correlation between suppression and depth of amblyopia, indicating binocular dysfunction as primary issue. • Traditional amblyopia treatment endpoints focus on VA, but endpoint should focus on stereoacuity.

Redefining Amblyopia

A binocular dysfunction creating a monocular symptom of reduced visual acuity.

Key Insight
Severity depends on depth of suppression

Shift Focus
Treat suppression and enhance binocularity, do not treat symptoms.

Why Functional Prescribing?

Traditional approach: Treat symptoms --> Recurrence likely

Functional approach: Treat underlying issue --> Stable results

Goal of Functional Prescribing:

- Improve stereopsis
- Reduce anisometropia and asymmetry in VAs
- Avoid patching or monocular treatments

Step 1 - Baseline Information

Tests to Perform:

- ☑ Unaided monocular VAs
- ☑ Dry retinoscopy with monocular VAs
- ☑ Unaided global and local stereopsis
- ☑ Unaided MEM retinoscopy

No cycloplegia. Focus on real-life accommodative state.

Step 2 - Dry Refraction

Correct amblyopic eye:

- Slowly increase lens power until VA improvement plateaus

Slightly fog non-amblyopic eye:

- Aim to reduce the asymmetry in VA by 1-2 lines

Ignore most of the astigmatism:

- Attempt to Rx less than half of cyl measured

Step 3 - Trial Frame

Repeat Testing:

- [x] Aided binocular VA
- [x] Aided global and local stereopsis

Key Expectations:

- VA should match or exceed baseline data
- Local stereopsis should improve

Step 4 - Use MEM for Near Rx

Assess Accommodative Status with Trial Frame:

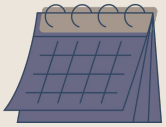
- Aim for trial frame Rx to provide normal MEM results
  - Also aim for more symmetrical, bright reflexes
- Address high lag with bifocal Rx
  - Monocular bifocal is acceptable if amblyopic eye has much higher lag compared to non-amblyopic eye

Rx Protocol

- Full-time wear
- Trivex material
- Preferred bifocal designs:
  - **1-6 y/o:** Flat top 28 or 35, seg height at mid-pupil
  - **7-9 y/o:** Flat top or round, seg height at lower pupil
  - **10+ y/o:** Round bifocal or Anti-fatigue lens, seg height at lower pupil

Follow-Up Protocol

- Follow-up every 6-8 weeks
  - Reassess VAs, stereopsis, and MEM
- Determine if updated Rx is necessary
  - Strongly consider if improvements plateau
  - Be aware of lens Rx warranty
- Refer for vision therapy if no improvements with updated Rx
  - Or if compliance is very low



CASE EXAMPLES

Case #1 - 4y/o Female

Notes:
- In senior kindergarten, loves to play
- Can't sit for long to read

MEM was not part of my routine at this time

Final SRx:
OD: +1.50-1.25x090
OS: +0.75

	OD	OS
VA	20/40-2	20/25+1
CT @ near	6^XP	
NPC	TTN	
Stereo	250" Global, Unable to measure Local (poor attention)	
Acc. Amps	10 D	13 D
Dry Ret	+2.25-1.75x090	+0.50-0.25x090
Sub Ref	+1.50-1.25x090 (20/30-2)	+0.75 (20/30)

2m Follow-up Appointment

	OD	OS
VA (sc)	20/30+1	20/25+1
VA (cc)	20/25-2	20/20-2
Stereo (cc)	20" Local	

1 Year Later

	OD	OS
VA (cc)	20/20-2	20/25+1
Stereo (cc)	250" Global 20" Local	
Dry Ret	+2.25-1.75x090	+0.75-0.25x090

Notes:

- Mom says reading skills skyrocketed once she wore glasses
- Handwriting is slowly improving, less messy
- Now in grade 1 with no academic concerns

Case #2 - 5y/o Male

Notes:

- In junior kindergarten, short attention and can't sit still
- Gets frustrated quickly

MEM was not part of my routine at this time

Final SRx:
OD: +0.50
OS: +1.50-1.25x180

	OD	OS
VA	20/30	20/80
CT @ near	4^XP	
NPC	TTN	
Stereo	250" Global, Unable to measure Local (poor attention)	
Dry Ret	+0.50-0.50x180	+2.00-2.25x180
Sub Ref	+0.50 (20/30+1)	+1.50-1.25x180 (20/40-1)

3m Follow-up Appointment

	OD	OS
VA (cc)	UTA (fidgeting)	20/40+1
Stereo (cc)	70" Local	

3m Follow-up Appointment

	OD	OS
VA (cc)	20/25+2	20/30+2
Stereo (cc)	30" Local	

Notes:

- Mom says handwriting is much better
- Still struggling with paying attention, sitting still, and interrupting teacher when talking

F/U Plan:

- Continue with SRx for FT wear
- Enroll in VT program to address oculomotor and visual-motor challenges.

Case #3 - 4y/o Male

Notes:
- Referred for 2nd opinion
- In preschool
- Very shy/ quiet but friendly

	OD	OS
VA (sc)	20/40-1	20/100
CT	4^EP @ far, 10^EP @ near	
NPC	TTN	
Amps	13 D	11 D
Stereo	500" Global @ 10cm from face, 200" Local	
Dry Ret	+1.00-1.00x160	+2.50-2.00x020
Sub Ref	+1.00 (20/50+1)	+0.50-1.00x020 (20/70)
MEM (over TF)	+1.50 D	+1.75 D

Final SRx:
OD: +1.00 / +1.00
OS: +0.50-1.00x020 / +1.00

3m Follow-up Appointment

	OD / OS / OU
VA (cc)	OU: 20/30 @ far, 20/20 @ near
Stereo (cc)	500" Global @ 20 cm, 100" Local
CT (cc)	ortho @ far, 2^EP @ near
Amps (cc)	15 D OD & OS
MEM (cc)	OD: +0.00 D, OS: +0.75 D

4m Follow-up Appointment

	OD	OS
VA (cc)	20/25-2	20/50
Stereo (cc)	250" Global @ 20 cm	
CT (cc)	ortho @ far & near	
Amps (cc)	14 D	14 D
MEM (cc)	+0.25 D	+0.75 D
Dry Ret	+1.00-0.50x160	+1.50-1.00x020
Sub Ref	+0.75-0.25x160 (20/25-2)	+1.25-0.50x020 (20/30)

Final SRx:
OD: +0.75-0.25x160 / +0.75
OS: +1.25-0.50x020 / +0.75

2m Follow-up Appointment w/ new SRx

	OD	OS
VA (cc)	20/25+1	20/30-2
Stereo (cc)	250" Global @ Harmon's distance, 100" Local	
CT (cc)	ortho @ far, 2^XP @ near	
Amps (cc)	14 D	14 D
MEM (cc)	+0.25 D	+0.75 D

Notes:
- Parents say child is doing very well in junior kindergarten
- Teachers have no concerns
- Loves to play with legos or small toys, enjoys drawing

F/U Plan:
- Continue with SRx for FT wear
- Monitor every 3-4 months
- No VT recommended

Case #4 - 8y/o Female

Notes:

- Mom says she holds iPad too close to face
- In grade 2, writing is messy and reading skills declined this year (excellent previously in grade 1)

MEM was not part of my routine at this time

Final SRx:
OD: +0.75
OS: +1.75

	OD	OS
VA	20/20-1	20/50+1
CT	10^XP @ far, 20^XP @ near	
NPC	3 cm break, closes eyes before recovery	
Amps	13 D	12 D
Stereo	250" Global @ 10cm from face, 200" Local	
Dry Ret	+0.75-0.25x090	+2.75-0.25x090
Sub Ref	+0.75 (20/25-2)	+1.75 (20/30+1)

No follow-up... wah waah

Case #5 - 6y/o Male

Notes:

- Second opinion eye exam
- First exam was 1 day ago
- In grade 1, doing very well
- Competitive soccer year round, swimming, tennis
- daily journal writing

Final SRx:
OD: +0.00 / +0.75
OS: -1.00-0.75x180 / +0.75

	OD	OS
VA	20/25+1	20/80-2
CT	Ortho @ far, 2^EP @ near	
NPC	TTN	
Amps	13 D	13 D
Stereo	250" Global, 30" Local (with effort)	
MEM	+0.25	-0.50
Dry Ret	-0.50	-2.00-1.50x180
Sub Ref	-0.25 (20/20-2)	-2.00-0.75x180 (20/30+2)

Case #6 - 14y/o Female

Notes:

- First eye exam
- No concerns
- In grade 9, doing very well in school overall

Final SRx: NOTHING!

	OD	OS
VA	20/25+1	20/50-1
CT	Ortho @ far, 6^XP @ near	
NPC	TTN x3	
Amps	12 D	11 D
Stereo	250" Global, 40" Local	
Dry Ret	+0.00-0.50x180	+1.50-2.00x180
Sub Ref	+0.25 (20/25)	+0.75-0.75x180 (20/30+2)

Summary

Treat amblyopia as a binocular dysfunction.

Less is more; Prescribe what enhances function, not max correction.

Feel empowered to use lens therapy before vision therapy!

Resources

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