

No More Patching

Alternative Treatments
for Amblyopia and
Strabismus

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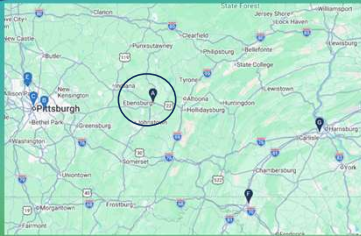


Disclosures

I do not have any financial disclosures.

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Dr. Robert Sanet
Dr. Pilar Vergara



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Amblyopia

- Amblyopia comes from the Greek word meaning *dull sight* or *blunt sight*
- Amblyopia—also known as lazy eye—is the loss or lack of development of clear vision in one or both eyes.
- AOA Website
- A **"lazy eye" is not lazy at all**. Recent research has shown that amblyopia is a disorder of the brain's ability to use both eyes together as a team.^[2] Amblyopia is an active process due to *suppression*, or the brain actively ignoring the information coming from one eye.
- OVDRA Website

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Amblyopia

- Amblyopia is defined as the reduction of best-corrected visual acuity of one or both eyes that cannot be attributed exclusively to a structural abnormality of the eye. Amblyopia develops during childhood and results in the interruption of normal cortical visual pathway development. It is clinically defined as a difference in best-corrected visual acuity of 2 or more lines of acuity between the eyes
- American Academy of Ophthalmology
- "Amblyopia is the medical term for an eye that is not able to see 20/20 even with glasses"
- Nora Conway, OD

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Periods of Development

- **Newborn to 1 Month (Reflexes & Contrast):** Infants blink at bright lights, can only distinguish light and dark, and focus on objects 8 to 10 inches away.
- **1 to 3 Months (Coordination):** Tracking improves, and they begin to notice high-contrast colors like black, white, and red. The accommodation reflex (focusing) begins.
- **3 to 6 Months (Binocular Vision):** Focusing improves, depth perception develops, and full color vision is achieved.
- **6 to 12 Months (Precision):** Distance judgment and eye-hand coordination advance, allowing the baby to grasp objects and crawl.
- **Age 3 to 9 (Critical Period):** Visual acuity develops to near 20/20. Because the brain's neural connections are highly dependent on sensory experience, untreated vision problems during this time can cause permanent deficits.

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Amblyogenic Factors

TABLE 1. AMBLYOGENIC FACTORS²⁻⁴

Refractive		
Anisometropic		Isoametropic
+1.00D	Hyperopia	+3.00D to +5.00D
-2.00D to -3.00D	Myopia	-6.00D to -8.00D
-1.50D	Astigmatism (WTR)	-2.50D

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Patching History

- Documented practices dating back to around 900 A.D.
- In 1743, George Comte de Buffon, a French physician, described that the weak eye regains all its strength by occluding the good eye, which is why he is considered as a beginner of the occlusion therapy in amblyopia.
- For a long time, patching was prescribed all day on the stronger eye.
- Late 1800s, Vision Therapy was pioneered by a French ophthalmologist, Dr. Javal. Originally the field was called "Orthoptics", meaning "the straightening of eyes".
- 1928 the field really started to grow due to American Optometrist, Dr. A.M. Skeffington.

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Patching History

- In 1963, Torsten Wiesel and David Hubel published landmark papers on the development of the visual pathway in kittens.
 - CONCLUSION:
 - They proved that visual experience physically shapes the brain.
 - Without early visual stimulation, the brain's neural connections degenerate
 - Established a critical period of neuroplasticity
 - Patching is needed to give stimulation to the weaker eye
- In the 1990s, many researchers switched to studying mice, where they could more easily study how specific genes and molecules influence plasticity.
 - CONCLUSION:
 - Suppressing GABA production in the visual cortex deprived of visual stimulation protected them from blindness.
 - Manipulating GABA, scientists can delay the onset of the critical period for vision.
 - Patching still the standard for treatment

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Patching History

- 2005 Pediatric Eye Disease Investigator Group (PEDIG) — "Randomized Trial of Treatment of Amblyopia in Children Aged 7 to 17 Years"
 - CONCLUSION
 - patching still improved VA at 13–17 if amblyopia hadn't been treated before, but showed little added benefit if it had already been treated and failed
- 2014 Schepens Eye Research Institute/Massachusetts Eye and Ear, Harvard Medical School and MIT.
 - CONCLUSION
 - Their results show that the human visual system can retain plasticity beyond critical periods, even after early and extended blindness.
 - "Our results show remarkable plasticity, and vision continues to improve in many children long after the surgery."

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Exam elements

- History
 - Full-term at birth?
 - Any complications?
 - NICU? Oxygen?
 - Milestones on time?
 - Any Early Intervention?
 - How is school? Do you like to read?
 - Clumsy?
 - Head turning/tilting?
- Visual Acuity
 - Refraction
 - Auto
 - Retinoscopy
 - Subjective
 - Stereo
 - Worth 4 Dot

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To Patch or Not to Patch

1. CRITICAL PERIOD
2. What we were taught in school
3. Studies show improvement in vision

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To Patch or Not to Patch

- **Poor compliance**
 - Kids and parents hate patches
 - Uncomfortable
 - Forced to use the weaker eye
 - Poor understanding
 - Cosmetics
- **Regression**
 - Although patching does improve acuity, there is a higher rate of regression and needing to repeat patching
- **Penalization instead of coordination**

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To Patch or Not to Patch

- List out the benefits of no patching
- Better compliance
no critical period – even adults

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Monocular vs Binocular Treatment

- 2014 Xi J, Jia WL, Feng LX, Lu ZL, Huang CB. *Perceptual Learning Improves Stereoacuity in Amblyopia*.
- We later demonstrated that subject's disparity threshold can also be understood within the multipathway, contrast-gain control model framework, **indicating both signal attenuation and interocular inhibition contributed to stereo information computation**.
- Future stereo training studies should also consider the effects of suppression on stereo performance in amblyopia
- 2020 Webber, et al. *Suppression Rather Than Visual Acuity Loss Limits Stereoacuity in Amblyopia*.
- It has been believed for some time that amblyopia is the primary problem and loss of binocularity, the consequence. However, more recently it has been suggested that it is the other way around; loss of binocularity is the primary problem and amblyopia the consequence
- Novel treatments for amblyopia are aimed at reducing suppression of the amblyopic visual pathway to improve binocularity

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Monocular vs Binocular Treatment

- 2022 : Jia Y, Ye Q, Zhang S, Feng L, Liu J, et al. *Contrast Sensitivity and Stereoacuity in Successfully Treated Refractive Amblyopia*
- Full recovery of visual acuity following treatment for refractive amblyopia does not equalize interocular contrast sensitivity or restore normal stereopsis. Alternative therapeutic approaches that target contrast sensitivity and/or binocular vision are required
- 2025 Recommendations for use and coverage of digital, binocular treatments for amblyopia.
 - Amblyopia is the most common cause of vision impairment in children and presents as reduced visual acuity caused by suppression of neurologic signals from an eye. Traditional treatments include penalizing the better-seeing eye by occlusion. This **does not address the binocular vision deficits of amblyopia** and leaves most patients with unresolved disease and permanent vision loss

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Clinical Takeaway

- Refractive amblyopia has long been treated as an acuity problem solved by lenses and patching.
- The research makes a strong case that it is fundamentally a **binocular vision disorder** driven by interocular suppression.
- Acuity normalization is not the finish line: patients who achieve "successful"
- VA outcomes still frequently present with suppression, contrast sensitivity imbalances, and stereoacuity deficits requiring binocularly-targeted intervention.
- Vision therapy — which directly targets binocular integration and suppression reduction — addresses the deficit that monocular treatment leaves behind.

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Amblyopia and the binocular approach to its therapy

Robert F. Hess a, Benjamin Thompson b,c
Vision Research (2019)

- Dichoptic (using both eyes) therapy improves visual function in adults and children with amblyopia.
- Non-invasive brain stimulation improves contrast sensitivity in adults with amblyopia.
- Mechanisms may include reduced suppression, increased monocular sensitivity or metaplasticity.
- Patching therapy has been used to treat amblyopia for hundreds of years even though its shortcomings are many; compliance is poor (Searle et al., 2002) because of the social and psychological difficulty of forcing a child to wear a patch combined with the impaired vision experienced by the child when the patch is in place (Holmes et al., 2003; Webber et al., 2008).

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Amblyopia and the binocular approach to its therapy

Robert F. Hess a, Benjamin Thompson b,c
Vision Research (2019)

- Although 79% of children show at least a 2-line improvement after 4 months of patching (Repka et al., 2003), 25% of these children will regress to some degree once the patch is removed (Holmes et al., 2004).
- Numerous studies demonstrating that balancing the information seen by the two eyes can promote binocular function and lead to a re-establishment of binocular vision further support this idea.

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Fellow Eye Deficits in Amblyopia

Eileen E Birch, Krista R Kelly, and Deborah E Glaschi
Journal of Binocular Vision and Ocular Motility (2019)

Abstract

- Amblyopia is a neurodevelopmental disorder of the visual system, as a result of discordant visual experience during infancy or early childhood.
- Because amblyopia is typically defined as monocularly reduced visual acuity accompanied by one or more known amblyogenic factors, it is often assumed that the fellow eye is normal and sufficient for tasks like reading and eye-hand coordination.
- Recent scientific evidence of ocular motor, visual, and visuomotor deficits that are present with fellow eye monocular viewing and with binocular viewing calls this assumption into question.

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Fellow Eye Deficits in Amblyopia

Eileen E Birch, Krista R Kelly, and Deborah E Glaschi
Journal of Binocular Vision and Ocular Motility (2019)

Abstract

- This clinical update reviews the research that has revealed fellow ocular motor and visual deficits and the effect that these deficits have on an amblyopic child's visuomotor and visuocognitive skills.
- We need to understand how to prevent and rehabilitate the effects of amblyopia not only on the nonpreferred eye but also on the fellow eye.

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Fellow Eye Deficits in Amblyopia

Eileen E Birch, Krista R Kelly, and Deborah E Glaschi
Journal of Binocular Vision and Ocular Motility (2019)

Fellow Eye Deficits and Amblyopia Treatment

- Fellow eye motion-defined form perception deficits have been reported to be resistant to rehabilitation by patching but responsive to binocular amblyopia treatment.
- More effective treatments for amblyopia may target suppression, by requiring integration of information between the two eyes to play dichoptic games or watch dichoptic videos.

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Fellow Eye Deficits in Amblyopia

Eileen E Birch, Krista R Kelly, and Deborah E Glaschi
Journal of Binocular Vision and Ocular Motility (2019)

Conclusion

- ...we have discovered that the fellow eye also has visual deficits and that these deficits affect an amblyopic child's visuomotor and visuocognitive skills. We need to understand how to prevent and rehabilitate the effects of amblyopia not only on the nonpreferred eye but also on the fellow eye.

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So what do we do instead?

Prioritize binocular skills

- Amblyopia's root cause lies in neural tissue
- Treat it at the cause (brain) for the best outcome
- Better compliance
- Whichever Rx gets best stereo/Worth 4 Dot
 - Even if VA is decreased!

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Tips

- Small changes can make big improvements
- ($\pm 0.25 - 0.50$)
- Push plus unless patient is Exo
- Improvement can be made quickly
- Common for pt to accept an Rx with less aniso

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How about some cases??

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HB – 7 year old girl



- History:
 - Referred from another OD for amblyopia
 - Full-term pregnancy
 - Milestones on time
 - 2nd Grade- no academic issues
 - Likes to read
 - Passed pediatrician screenings
 - Parents report good at sports, not clumsy
- Information from referring OD
 - Ocular health unremarkable
 - Rx +2.25 -0.75 x 171
+4.25 -0.25 x 040
 - Distance VA 20/30 20/70
 - Near VA 20/30 20/30
 - No Rx given

HB – 7 year old girl Initial Eval



- Stereo- 70 sec
- Worth 4 Dot
 - Distance- 2
 - 3 ft- 4
 - Harmon- 4
- Unaided VA
 - Distance 20/20 -1
 - 20/80
 - Near 20/20
 - 20/80 +
- Cover Test
 - Distance- 2 EP
 - Near- 6 EP
- Vergence ranges
 - Break was good, recovery was low
- DEM
 - Oculomotor Dysfunction
- Auto Refraction
 - +2.00 -0.50 x 176
 - +4.50 -0.25 x 050
- Subjective
 - +1.25 -0.75 x 180 20/20
 - +4.75 -0.75 x 050 20/40
 - Stereo 25 sec!
- RX Subj, wear full time, Monitor in 6-8 weeks
- Rx Motion and bilateral activities

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HB – 7 year old girl 1st follow up



- Wearing glasses fulltime
- Says things are better, likes wearing them
- Stereo
 - 50 seconds
- Worth 4 Dot
 - Distance- 4
 - 3 ft- 4
 - Harmon- 4
- Aided VA
 - Distance 20/20
 - 20/40 Single Line 20/25 -1
- Habitual Rx
 - +1.25 -0.75 x 180
 - +4.75 -0.75 x 050
- Subjective
 - +1.50 -0.75 x 180 20/20
 - +4.50 -0.75 x 050 20/25
 - Stereo 25 sec
- Conclusion
 - Update Rx for improved stereo
 - Monitor in 6-8 weeks

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HB – 7 year old girl 2nd follow up



- Wearing glasses fulltime, all As at school
- Mom says she can tell she has a harder time when she takes glasses off.
- Stereo
 - 20 seconds
 - Missed 7 and 8
- Worth 4 Dot
 - Distance- 4
 - 3 ft- 4
 - Harmon- 4
- Aided VA
 - Distance 20/20 -1
 - 20/30 Single Line 20/25 +2
 - Near 20/20
 - 20/20 -2
- Habitual Rx
 - +1.50 -0.75 x 180
 - +4.50 -0.75 x 050
- Conclusion
 - No change to Rx
 - Monitor in 3-4 months

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HB – 7 year old girl 3rd follow up



- Happy with her glasses, wears fulltime
- Stereo
 - 20 seconds
- Worth 4 Dot
 - Distance- 4
 - 3 ft- 4
 - Harmon- 4
- Aided VA
 - Distance 20/20 -1
 - 20/25 +2
 - Near 20/20
 - 20/25
- Habitual Rx
 - +1.50 -0.75 x 180
 - +4.50 -0.75 x 050
- Conclusion
 - No change to Rx
 - Monitor in 6 months
 - If stable, return to referring OD for routine eyecare

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HB – 7 year old girl Summary



Initial Appointment	Final Appointment
- Stereo- 70 sec - Worth 4 Dot - Distance- 2 3 ft- 4 - Harmon- 4	- Stereo- 20 sec - Worth 4 Dot - Distance- 4 3 ft- 4 - Harmon- 4
Unaided: Rx: +2.25 -0.75 x 171 20/20 +4.25 -0.25 x 040 20/40	+1.50 -0.75 x 180 20/20 +4.50 -0.75 x 050 20/25+2

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CO- 7 year old boy



- History:
 - Referred from another OD for amblyopia
 - Full-term pregnancy
 - Milestones on time
 - 2nd Grade- no academic issues
 - Does not like to read
- Information from referring OD
 - Glasses from previous OD are broken
 - Ocular health unremarkable
 - Rx +1.50 -2.00 x 012 -0.25 sph
 - Distance VA 20/40+ 20/20
 - Near VA 20/60 20/20
- No Rx given

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CO- 7 year old boy Initial Eval



- Stereo- 20 sec
- Worth 4 Dot
 - Distance- 4
 - 3 ft- 4
 - Harmon- 4
- Unaided VA
 - Distance 20/30 -2/+1 20/20
 - Near 20/50 20/20
- Cover Test
 - Distance- 1 XP
 - Near- 3 XP
- Vergence ranges
- Suppression
- Previous Rx
 - +1.50 -2.00 x 012 -0.25 sph
- Subjective
 - +1.75 -1.75 x 120 +0.75

Rx Subj, wear full time, Monitor in 6-8 weeks
Rx Motion and Bilateral activities

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CO- 7 year old boy 1st Follow Up



- Wearing glasses fulltime, but doesn't like them
 - Says things are blurry far away
- Stereo
 - 25 seconds
- Worth 4 Dot
 - Distance- 4
 - 3 ft- 4
 - Harmon- 4
- Aided VA
 - Distance 20/40
 - 20/20
 - Near 20/70
 - 20/25
- Subjective
 - +1.50 -2.25 x 180 20/30 +1
 - +0.75 20/20
- Conclusion
 - Update Rx for improved VA, Pt happy with trial frame
 - Monitor in 6-8 weeks
 - Consider VT if not improved

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CO- 7 year old boy
2nd Follow Up



- Wears glasses most of the time, says glasses are helping. Getting better, but still a little blurry up close.
- Stereo
 - 30 seconds
- Worth 4 Dot
 - Distance- 4
 - 3 ft- 4
 - Harmon- 4
- Aided VA
 - Distance 20/25 -2/+1
20/20 -1
 - Near 20/25
20/20
- Conclusion
 - Great VA improvement, stereo reduced but tired from falling asleep in the car.
 - Monitor in 3 months, f/u with how school is going and if VT is desired

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CO- 7 year old boy
3rd Follow Up



- Wearing glasses more than half of the time, Does not like wearing glasses- kind of annoying, kind of helps him see better, doesn't like how he looks
- Coordination- improving with this pair
- Stereo
 - 20 seconds
- Worth 4 Dot
 - 4/4/4
- Aided VA
 - Distance 20/25 +1
20/20
 - Near 20/20
20/20
- Conclusion
 - No change to Rx
 - Return to referring OD for continued care

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CO- 7 year old boy
Summary



Initial Appointment

- Stereo- 20 sec
- Worth 4 Dot
 - 4/4/4

+1.50 -2.00 x 012	20/40
-0.25 sph	20/20

Final Appointment

- Stereo- 20 sec
- Worth 4 Dot
 - 4/4/4

+1.50 -2.25 x 180	20/25 +1
+0.75	20/20

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Julia



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36 y/o Male
"Dan"



History

- Referred by his wife who complains he is clumsy and does not like to read.
- School teacher now 100% virtual
- Reports reading and tracking issues
- Played sports as a kid without problems
- Last Eye Exam in 2002
- No glasses
- COVID Symptom Survey Score: 50

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36 y/o Male
"Dan"



Initial Exam

- Slit lamp unremarkable
- "Before you do anything I have a blind spot in my left eye"
 - Visual Field- scotoma OS on CF
- Stereo "R and I"
- Worth 4 Dot 2/2/2
- VA Unaided

Distance	OD 20/20	OS 20/40 -2
Near	OD 20/20	OS 20/100
- Cover Test
 - Distance Ortho
 - Near 35pd Esophoria
- Suppression during all binocular tests
- Rx glasses based on subjective
 - +1.00 -0.50 x 150
 - +0.75 -0.50 x 025
- Follow up in 6-8 weeks
- Rx Motion and Bilateral activities

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36 y/o Male
"Dan"



1st Follow Up

- Wearing glasses for computer work
- Says they help him feel less tired
- Stereo with Rx
 - R and L taking turns
- Worth 4 Dot
 - Distance- 2 dots
 - Near- 4 dots
 - Harmons- 3 dots

VA Aided Distance	OD 20/20	OS 20/30 -2 Single line 20/25
Near	OD 20/20	OS 20/60 -2

- Conclusion:
No change to Rx
Monitor in 2-3 months

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ADD COVID SX SURVEY

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36 y/o Male
"Dan"



2nd Follow up

- Wearing glasses daily for computer work
- Stereo with Rx
 - "R Line L"
- Worth 4 Dot
 - Distance- 2 dots
 - Near- 5 dots
 - Harmons- 4 dots

VA Aided Distance	OD 20/20	OS 20/25 Single Letter 20/20
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- Updated Glasses for improved W4D
 - +1.00 -0.50 x 150
 - +1.50 -0.50 x 025
- Conclusion:
Wear updated Rx fulltime
Monitor in 2-3 months

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36 y/o Male
"Dan"



3rd Follow up

- "Wearing glasses most of the time, has had new lenses for at least 2 weeks. Noticed double the other day. Noticed the rain on the windshield more than ever before. Thinks he is seeing things further away clearer".
- Stereo with Rx
 - "R and L"
- Worth 4 Dot
 - Distance- 3 dots
 - Near- 2 dots
 - Harmons- 4 dots

VA Aided Distance	OD 20/20	OS 20/30 Single Letter 20/20
Near	OD 20/20	OS 20/25

- Conclusion:
No Change in Rx since only wearing for 2 weeks
Gave R/G chart for home VT
Monitor in 2-3 months

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36 y/o Male
"Dan"



4th Follow up

- "Says he is wearing glasses pretty much full time. Didn't wear them a day last weekend and said his eyes were more tired."
- Worth 4 Dot
 - Distance- 2 dots
 - Near- 4 dots
 - Harmons- 4 dots
- Stereo
 - R and L taking turns

VA Aided Distance	OD 20/20	OS 20/25 -2
Near	OD 20/20	OS 20/60

- Updated Glasses for improved W4D
 - +1.00 -0.50 x 150
 - +1.00 -0.50 x 025
- Conclusion:
Update Rx for improved binocular skills and VA
Monitor in 3 months

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36 y/o Male
"Dan"



5th Follow up

1 year from initial visit

- "Glasses are good"
- No complaints.
- Worth 4 Dot
 - Distance- 2 dots
 - Near- 3 dots
 - Harmons- 4 dots

Stereo	R and L taking turns
VA Aided Distance	OD 20/20
Near	OD 20/20
	OS 20/30

- Conclusion:
Happy with quality of life and vision for now. Consider VT at a later date.
Monitor in 6 months

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36 y/o Male
"Dan"

6 month f/u(08/11/25)

- Eyes are good, wearing glasses consistently
- Eyes feel more tired without glasses

- Worth 4 Dot
 - Distance- 2 dots
 - Near- 3 dots
 - Harmons- 4 dots

- Stereo
 - Can get R+L when relaxing eyes
- VA Aided

Distance	OD 20/20	OS 20/20 -1
Near	OD 20/20	OS 20/25
- Conclusion:
 - Happy with results
 - Will consider VT is desires more improvement in stereo
 - Refer back to OD for routine eyecare



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36 y/o Male
"Dan" Summary

- Initial evaluation
 - VA Unaided

Distance	OD 20/20	OS 20/40 -2
Near	OD 20/20	OS 20/100
 - Worth 4 Dot 2/2/2
 - COVD SS 50
- End Evaluation
 - VA Aided

Distance	OD 20/20	OS 20/20 -1
Near	OD 20/20	OS 20/25
 - Worth 4 Dot 2/3/4
 - COVD SS 23



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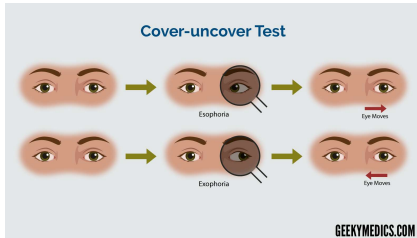
Strabismus

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Patching for a turn...

Cover-uncover Test



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Comitant strabismus etiology: extraocular muscle integrity and central nervous system involvement—a narrative review

Bernat Suryan-Grau1 · Lidia Quevedo1 · Manuel Rodríguez-Vallejo2 · Marc Argüés1

Greife's Archive for Clinical and Experimental Ophthalmology (2023)

- **Strabismus is not a condition in itself but the consequence of an underlying problem.**
- The majority of strabismus, 75–95% of all strabismus cases, are concomitant, nonrestrictive, non-paralytic, or developmental. ... They are generally believed to be caused by deficits in the central neural pathways involved in visual perception and oculomotor control.
- Classical and contemporary standard treatment for strabismus, i.e., EOMs surgery, acts exclusively at a peripheral level. EOM surgery consists of mechanically weakening or strengthening the muscles to correct the eye misalignment.

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Comitant strabismus etiology: extraocular muscle integrity and central nervous system involvement—a narrative review

Greife's Archive for Clinical and Experimental Ophthalmology (2023)

- In most strabismus cases, there is little or no evidence of abnormalities in the EOMs.
- The presence of co-existing CNS abnormalities suggests that the CNS plays a role in strabismus pathogenesis.
- Not being able to address the concomitant CNS abnormalities in strabismus could be the cause of surgical treatment varying and sometimes unsuccessful results, often with high recurrence and reoperation rates, all despite being a common and frequently implemented procedure worldwide.

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Comitant strabismus etiology: extraocular muscle integrity and central nervous system involvement—a narrative review

Grafte's Archive for Clinical and Experimental Ophthalmology (2023)

- **By surgically rearranging EOM position, no steps are taken to enhance control, nor to improve oculomotor and perceptual abilities.**
- Awareness of eye position could be increasingly limited due to the destruction of proprioceptive afferents.
- Considering that multiple causes, along the periphery-center axis, can be behind the ocular deviation, different treatment strategies tailored to the precise strabismus causes might be needed.
- **Some cases benefit from surgery, others from patch therapy, glasses prescription, vision therapy, and in some cases, the deviation can resolve spontaneously.**

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Collaborative Management of Strabismus

Del Campo, OD, FOVDR & Lenart, MD, PhD
Advances in Ophthalmology and Optometry, 2025

- 1 in 10 strabismus patients requires reoperation within 5 years.
- 31% of patients who achieved stable alignment at 12 months post-operatively experienced late decompensation on long-term follow-up. Of those, 54% required reoperation.
- Optometric vision therapy is specifically designed to address this sensorimotor instability building consistent binocular control and fusion across gaze positions through progressive neurological retraining.
- Without it, the brain tends to revert to its pre-surgical compensatory patterns, and the deviation drifts.

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Collaborative Management of Strabismus

Del Campo, OD, FOVDR & Lenart, MD, PhD
Advances in Ophthalmology and Optometry, 2025

- Incomitance, deviation that varies across gaze positions, is flagged in the literature as a significant predictor of reoperation risk.
- For these patients, the combination of surgical correction and post-operative optometric vision therapy directly targets both the mechanical and neurological dimensions of the condition.
- This is why the **collaborative approach** is most critical for the patients already identified as the highest reoperation risk.

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Collaborative Management of Strabismus

Del Campo, OD, FOVDR & Lenart, MD, PhD
Advances in Ophthalmology and Optometry, 2025

- Patients at Highest Risk for Reoperation / Best Candidates for Collaboration
 - Childhood-onset strabismus with cortical suppression or abnormal binocular correspondence
 - History of prior strabismus surgery
 - Absent or reduced stereopsis
 - Incomitant deviation
 - Large preoperative deviation angle
 - Surgical candidates without stable pre-operative fusion
 - Post-surgical patients not maintaining alignment

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How to get the best outcome without an eyepatch?

- Prioritize binocular vision
- Body Movement that stimulates binocular vision
- Bilateral activities
- Awareness of how the eyes are moving

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Strabismic Cases

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KZ- 6 y/o girl



History

- Referred from OD
- Mom says "eyes cross when focusing hard"
 - Can be either eye, crossed in
 - Started noticing it at age 4
 - Currently wearing glasses
- Premature at birth (4lb 3oz)
- Milestones on time
- No IEP

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KZ- 6 y/o girl Initial Eval



Stereo

- "a line and an L"

Cover Test

- Distance 10 EP
- Near 35 CAET

Aided VA

Distance	Near	Habitual Rx
OD 20/20 -1	20/20	+1.50 -0.75 x 075
OS 20/20	20/20	+1.50 -0.75 x 050

Rx given:

+2.50
+2.50 -0.50 x 050
ADD +2.00

Worth 4 Dot

- Distance- 4 dots
- 3ft -2 dots
- Harmons- 3 dots

No Change to W4D
Stereo- A Animals (400 sec)
Patient reports liking bifocal in office
Rx Motion and Bilateral activities
F/u in 6-8 weeks

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KZ- 6 y/o girl 1st Follow up



Stereo

- 50 sec

Cover Test

Distance	Near	5 IAET	40 IAET
Distance	Near	5 IAET	40 IAET

Aided VA

Distance	OD 20/30	OS 20/20 -
Distance	OD 20/30	OS 20/20 -

Habitual Rx

+2.50
+2.50 -0.50 x 050
ADD +2.00

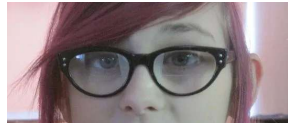
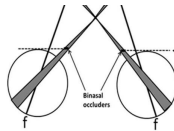
Conclusion

- No Change to Rx
- Binasal occlusion added
- Monitor in another 6-8 weeks

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Binasal Occlusion


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KZ- 6 y/o girl 2nd Follow up



Mom says she hasn't seen her eye turn since putting on the tape

Stereo

- 30 sec

Cover Test

Distance	Near	Esophoria	25 IAET
Distance	Near	Esophoria	25 IAET

Aided VA

Distance	OD 20/20 -2	OS 20/20 -2
Distance	OD 20/20 -2	OS 20/20 -2

Habitual Rx

+2.50
+2.50 -0.50 x 050
ADD +2.00

Conclusion

- No Change to Rx
- No Change to Binasal occlusion
- Monitor in another 3 months

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KZ- 6 y/o girl 2nd Follow up



Mom says she is reading great, sees eye turning once in a while

Stereo

- 20 sec!!

Cover Test

Distance	Near	Ortho	Esophoria
Distance	Near	Ortho	Esophoria

Aided VA

Distance	OD 20/40 +2	OS 20/25
Distance	OD 20/40 +2	OS 20/25

Habitual Rx

+2.50
+2.50 -0.50 x 050
ADD +2.00

Conclusion

- Update Rx for improved VA
- Remove occlusion (unless eye start to turn)
- Monitor in another 2-3 months

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KZ- 6 y/o girl 3rd Follow up



Mom says she hasn't noticed eyes turning.
Pt says she is seeing "normal" with update in Rx

Stereo
• 25 sec

Worth 4 Dot
• Distance- 4 dots
• 3ft -4 dots
• Harmons- 4 dots

Cover Test
• Distance Ortho
• Near Ortho

Aided VA
Distance
OD 20/20
OS 20/20

Habitual Rx
+2.00
+2.00 -0.50 x 050
ADD +2.00

Conclusion
• No change to RX
• Monitor in another 6 months

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KZ- 6 y/o girl Conclusion



After several more follow ups

- Stereo and Worth 4 Dot were relatively stable
- Currently in VT due to oculomotor and vergence problems
- At most recent f/u
 - 2-6 Esophoric at distance and near

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KH- 7-year-old girl

History

2nd grade
Expelled from school due to behavior

Full term, no complications
Milestones on time
Eyeturn noted since age 3, gotten worse

School work below average
(+) IEP
(+) ODD
(+) Anxiety Disorder



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KH-Initial Eval

Stereo- 70 sec

Aided VA 20/20
20/20

Worth 4 Dot
Distance 2/3
3ft 2/3
Harmon 2/3
Got very upset due to rapid alternating

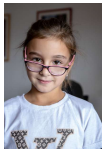
Pursuits-
Significant fixation losses
Head movement
(-) loading

Habitual Lenses
-7.25 -0.75 x 013
-7.25 -0.75 x 150

Large angle Rapid alternating Esotropia
Distance and Near

Too uncooperative for further testing.

Conclusion:
No change to distance Rx
+1.00 ADD - 4 dots at distance
Monitor in 8 weeks
Rx Motion and Bilateral activities



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KH-1st Follow up

Mom says she doing well with bifocal
Attending an alternative school now
Pt reported double to teacher at distance, no diplopia reported at near

Stereo- 30 sec

Aided VA - Uncooperative

Worth 4 Dot
Distance- 2/3
3ft- 2/3
Harmon- 5
Started hitting herself in the head

Habitual Lenses
-7.25 -0.75 x 013
-7.25 -0.75 x 150
ADD +1.00

Large angle Rapid alternating Esotropia
Less rapid, much improved with movement
Distance and Near

Wide binasal occlusion added to glasses
No change in Rx.
Monitor in 8-10 weeks



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KH-2nd Follow up

Broke glasses, but has still been wearing them
School said she is doing great with glasses
Mom says she is looking out overtop, sees OS turning sometimes when tired

Stereo- 30 sec

Aided VA -
20/25
20/50 poor cooperation

Worth 4 Dot
Distance- 5
3ft- 5
Harmon- 5
Able to fuse at near when shaking her head

Habitual Lenses
-7.25 -0.75 x 013
-7.25 -0.75 x 150
ADD +1.00

Large angle Rapid alternating Esotropia
Distance and Near

No Rx change
Pt subjectively preferred -1.00 over Rx OS
Binocular skills subjectively worse with over refraction.
Monitor 2-3 months for f/u



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KH-3rd Follow up

Says school is going well, took tape off because kids made fun of her, but she says she likes it and it helps

Stereo- 20 sec!

Aided VA -
20/25
20/50 poor cooperation

Worth 4 Dot
Distance 5
3ft 5
Harmon 5

Habitual Lenses
-7.25 -0.75 x 013
-7.25 -0.75 x 150
ADD +1.00

Large angle Rapid alternating Esotropia
Distance and Near
Now Intermittent at distance

No Rx change
Monitor in 3 months



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KH-4th Follow up

School is good, having fun with friends
Teachers are saying things are going well

Stereo- 20 sec!

Aided VA -
20/25 -2
20/40 +1

Worth 4 Dot
Distance- 5
3ft- 4
Harmon- 4

Habitual Lenses
-7.25 -0.75 x 013
-7.25 -0.75 x 150
ADD +1.00

Updated RX
-7.50 20/20
-7.50 20/25 +2
ADD +1.50

Update Rx
Monitor 8 weeks
Rx angels in the snow, stick and straw and motion



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KH- Conclusion

Initial Eval

Stereo- 70 sec

W4D- 2/3 rapid alternating

Constant rapid alternating ET

Expelled from school
Negative self talk
Uncooperative
Arguing with Mom

Follow Up Eval

Stereo- 20 sec

W4D- can get 4 dots all distances

Intermittent rapid alternating ET

Doing well at school
Willing to participate
Smiles



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Legislative Update

June 9, 2026

SB 720 passed out of the education committee with a party line vote. All Republicans voted yes with 3 Democrats voting no. One democrat was not in attendance. We need to work on gaining Democratic support.

The amended bill requires children to receive comprehensive eye exams upon entry into any PA school and upon initial entry into an IEP of 504 plan.

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BV-ODs are here to help!

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Resources

- ovdra.org (covd.org)
- OEPF.org
- Sanet series
- Keystonevisiondc.com

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