

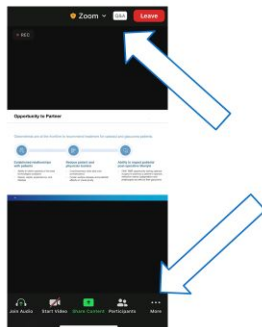


A Refresher on Binocular Vision

Dr. Valerie Lam

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Speaker Bio

Dr. Lam practices at Insight Vision Center Optometry in Costa Mesa, CA. She completed her Pediatrics and Vision Therapy residency at the Southern California College of Optometry, at Marshall B. Ketchum University. She is passionate about helping treat binocular vision problems and helping patients love the way they see!



Financial Disclosures

- Nothing to Disclose

A Refresher on Binocular Vision

— Valerie Lam, FAAO, FCOVD —



My 9 Year Journey to Learning Binocular Vision

2012- Graduated SCCO

2013- Completed SCCO's Pediatric and Vision Therapy Residency

2015- FAAO



2017- FCOVD



Yet I am still at the base of the mountain!



“We’re here to give patients a lifetime of healthy vision so that they LOVE the way they SEE.”

Insight Vision Center Optometry

We help patients love the way they see by...

Getting rid of annoying double vision

Taking away headaches

Improving depth perception

Helping a child read faster

Improving Eye Hand Coordination

Eliminating Amblyopia

Review of non-strabismic binocular vision disorders

Patient #1 - Gunnar

History: 7 YO boy referred for binocular testing. He is not achieving up to his full potential. Is labeled as "lazy" and is working below his potential. Blinks his eyes constantly. Skips lines when reading. Possible double vision when reading. Letter reversals.

DVA sc: OD 20/20 OS 20/20

MRx: OD +1.00 (20/20) OS +0.75 (20/20)

Ocular health: WNL

Stereo: 125" RDS, 50" LD

Patient #1 - Gunnar



CT: (D) ortho (N) 10 XP

NPC: 6 cm

Vergence Ranges:

BI: x/6/4

BO: x/20/8

DEM: Vertical 11% Horizontal 34% Ratio 59% Errors 69% * skipped one line

Accommodation: NRA +2.25 PRA -0.75 could not perform facility with +/-2.00

Patient #1 - Gunnar

Visual Information Processing Evaluation:

Piaget Left/Right Awareness Test	<6 years old
Jordan Left Right Reversal Test	57%
Test of Visual Perceptual Skills	Form Constancy: 50% Sequential Memory: 37% Closure: 25%
Beery Visual Motor Integration	27%
Wold Sentence Copy	10 words/min

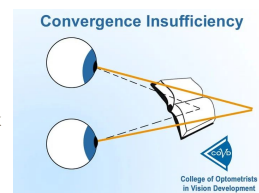
First Impression...

- Gunnar has "perfect" vision, there's not much of a vision problem here
- No glasses needed, rx is low hyperopia and he is still 20/20 UCVA
- It's the schools job to help this kid with reading
- See him back in a year

Follow the numbers or follow the symptoms?

Classic definition of Convergence Insufficiency as according to the CITT Study:

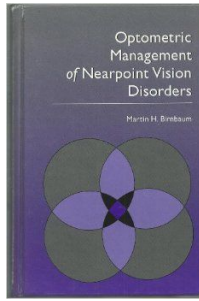
- Exophoria at near at least 4Δ greater than at far
- Insufficient positive fusional convergence at near
- A receded near point of convergence of ≥ 6 cm break
- CI Symptom Survey score ≥ 16



Could there be subclassifications of Convergence Insufficiency?

1. Classic Convergence Insufficiency: Duane White Classification following the CITT criteria
2. Non-classic Convergence Insufficiency
 - basic exo, ortho, or even eso at near
 - Unstable binocular vision at near with symptoms greater at near than distance
3. Developmental Convergence Insufficiency
 - May have seemingly normal binocular testing, however poorer function at near than at distance on binocular testing

Eso in Convergence Insufficiency?!?

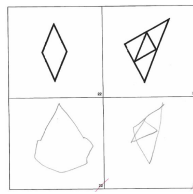


Optometric Management of Nearpoint Vision Disorders
 Birnbaum MH. Optometric management of nearpoint vision disorders. Boston: Butterworth-Heinemann, 1993:60.

- Convergence Insufficiency patients can overconverge and manifest an eso
- Convergence Insufficiency is an adaptive buffer to nearpoint stress and esophoria

Basic Skills Case in Vision Therapy

1. Gunnar has poor accommodation skills
2. Convergence could be strengthened, poor divergence ranges
3. Room for improvement in tracking skills
4. Still has confusion with letter reversals and is confused on spatial orientation
5. Poor visual motor integration and writing skills



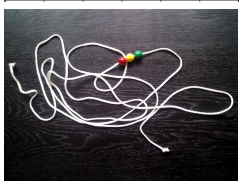
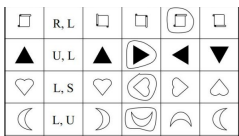
Four men and a jolly boy came out of the black and pink house quickly to see the bright violet sun, but the sun was hidden behind a cloud.

*Four men and

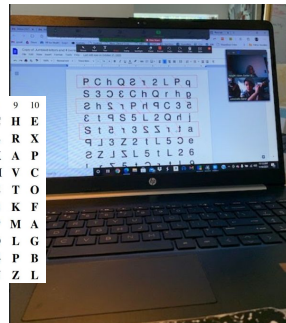
Gunnar in Vision Therapy



Gunnar in Vision Therapy



1	2	3	4	5	6	7	8	9	10	
A	O	F	N	P	V	D	T	C	H	E
B	Y	B	A	K	O	E	Z	L	R	X
C	E	T	H	W	F	M	B	K	A	P
D	B	X	F	R	T	O	S	M	V	C
E	R	A	D	V	S	X	P	E	T	O
F	M	P	O	E	A	N	C	B	K	F
G	C	R	G	D	B	K	E	P	M	A
H	F	X	P	S	M	A	R	D	L	G
I	T	M	U	A	X	S	O	G	P	B
J	H	O	S	N	C	T	K	U	Z	L



Patient #1 - Gunnar - Post Therapy

CT: (D) ortho (N) 10 XP

NPC: TTN

Vergence Ranges:

BI: x/14/12

BO: x/30/25

DEM: Vertical 16% Horizontal 68% Ratio 85% Errors 66%

Accommodation: NRA +2.00 PRA -4.00 Facility 12 cycles/min

Patient #1 - Gunnar - Post Therapy


Visual Information Processing Evaluation:

Piaget Left/Right Awareness Test	10 year old
Jordan Left Right Reversal Test	75%
Test of Visual Perceptual Skills	Form Constancy: 98% Sequential Memory: 50% Closure: 75%
Beery Visual Motor Integration	55%
Wold Sentence Copy	57 words/min

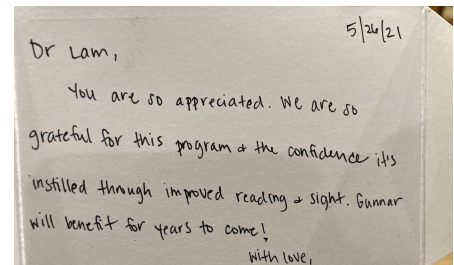
Patient #1 - Gunnar - Post Therapy

- Blinking has stopped
- Not skipping lines when reading
- No more double vision
- Letter reversals gone
- Overall better academic achievement

What should you do...

- Low plus reading glasses can be very helpful to aid with reading fluency and posture 
- SCCO oculomotor test (1-4 + scale) OR NSUCO Oculomotor test (1-5 scale)
- Check NPC, not just the number but qualitative assessment
- Ask about how child is doing in school and reading, look for near point stress

Why we do what we do...



Review of Refractive Amblyopia

Patient #2- Beckett

History: 7 YO boy comes for an eye exam due to blurry vision. He was prescribed glasses from another OD but doesn't like to wear them.

Hab rx: OD +4.25 (20/60) OS Plano (20/20)

MRx: OD +4.00 (20/50) OS +0.50 (20/20)

Cyclo: OD +5.50 OS +1.50

Ocular health: WNL

Stereo: 500" RDS, shallow suppression with W4D

CT: (D) 3 EP (N) 3 EP

First Impression...

- Patient has anisometropic amblyopia
- Cyclo him and prescribe the full aniso
- Try to get him to wear a contact lens in the right eye
- Patch 2 hours a day or use atropine

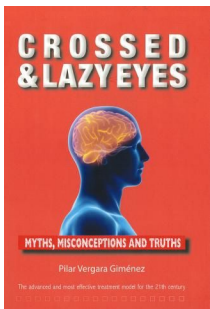
Amblyogenic Refractive Error- AOA

Isoametropia	Anisometropia
Diopters Astigmatism >2.50 D	Astigmatism >1.50 D
Hyperopia >5.00 D	Hyperopia >1.00 D
Myopia >8.00 D	Myopia >3.00 D



Amblyopia is a BINOCULAR problem, not a monocular one

New treatment strategies for amblyopia and strabismus



PERSPECTIVE

A Paradigm Shift in the Treatment of Amblyopia

Robert B. Saenz, OD, FCOVD
Pilar Vergara Giménez, OD, FCOVD
Edward J. Press, OD, FAGO, FCOVD

In the Structure of Scientific Revolutions, Thomas Kuhn notes that new ideas, sometimes based upon ones that have previously been discarded or overlooked, can influence a discipline to change its thinking about a particular subject. This happens neither easily nor overnight, Kuhn writes.

"If a paradigm is ever to change, it must give some fair opportunity, men who will develop it to the point where further arguments can be produced and multiplied."

Our goal in this perspective piece is to provide a network of support for a paradigm shift in the approach to treatment of amblyopia. Clear paradigm elements conceived of amblyopia as a binocular phenomenon. The National Eye Institute of the National Institute of Health in the United States (NIH/NEI) characterizes amblyopia as "a medical term used when the vision in one of the eyes is reduced because the eye and the brain are not working together properly."

Dr. Sherman's Landmark Paper

We trace the impetus for conceptualizing amblyopia as a binocular problem to the pioneering work of Dr. Arnold Sherman in a landmark paper published as a viewpoint in the journal of Behavioral Optometry in 1995. Dr. Sherman proposes that the visual acuity loss in amblyopia is only the monocular symptom of a binocular problem. The reference is both that he gave at a COVD meeting in 1997, during which he promoted the importance of teaching the patient to process visual information through the amblyopic eye with a binocular field, procedures that subsequently came to be known as MBF or monocular fusion in a binocular field. Binocular integration as an approach to amblyopia would become one of the guiding principles on the subject in the medical-legal contract in Vision Therapy when originally published in 1997.

By the 1990s decade, Dr. Sherman writes, "If binocular interference is the major biological factor in amblyopia development, treatment must be designed to eliminate it and achieve binocular cooperation. The binocular difficulty includes suppression as well as other symptoms that patients make to avoid binocular vision, and may include an increase in reflexive error in the amblyopic eye to facilitate suppression and eliminate binocular confusion." That is a crucial insight to conceptualizing anisometropia, particularly low to moderate hyperopic anisometropia as a maladaptation to binocular imbalance rather than as the underlying cause of amblyopia.

Coupling the observations that compliance with occlusion was poor and went against the gain of binocular integration, together with the concept of anisometropia as an indication to be recognized, led Dr. Sherman to suggest that amblyopia would be best treated without occlusion and with procedures for significantly less than the full amount of anisometropia.

© Vision Development & Rehabilitation, Volume 5, Issue 3 • September 2019



Take a closer look...



By changing the rx, patient is now:

OD: +3.00 (20/25+)

OS: +0.50 (20/20)

Stereo: 30" LD

Prescribe the right prescription that promotes better binocularity and increases depth perception

Prescribing full aniso is like punishing the amblyopic eye, it discourages it from wanting to contribute

Review of the Literature

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.[1] Amblyopia is an active process due to *suppression*, or the brain actively ignoring the information coming from one eye. In addition to poor visual acuity, people with amblyopia are more prone to have difficulties with depth perception, eye movements related to reading, and visual decision making while driving.[2]

1. Hess RF, et al. Binocular vision in amblyopia: structure, suppression and plasticity. *Ophthalmic Physiol Opt.* 2014 Mar;34(2):146-62

Review of the Literature

In a prospective study of cessation of treatment in children aged 3 to <8 years with successfully treated amblyopia due to anisometropia, strabismus or both, **we found the risk of amblyopia recurrence to be 24%.¹** We also found that patients treated with 6 to 8 hours of daily patching had a 4-fold greater odds of recurrence if patching was stopped abruptly rather than when it was reduced to 2 hours per day prior to cessation.¹

Factors Associated with Recurrence of Amblyopia on Cessation of Patching

Ophthalmology. 2007 Aug; 114(8): 1427-1432.

Thoughts on Patching



- Patching creates a monocular not binocular environment
- Opaque patching vs. black patching
- Opaque patching promotes MFBF instead of alternating suppression



What should you do...

Treat the amblyopia as a binocular problem and you will get better results with less regression.

Goals of Treatment:

- Break suppression
- Ensure equal performance between the right and left eye
- Improve binocularity and eye teaming
- Refine depth perception, eye hand coordination, and oculomotor skills

What should you do...

- Don't be afraid to cut the aniso if it gives them better binocularity and feels more comfortable
- Prescribe active therapy to help train the eyes to team better
- If occlusion is only option: prescribe an opaque patch instead of a black patch



Review of Esotropia

Patient #3- Bray

History: 5 YO girl referred for strabismus and amblyopia from neighboring OD. She is clumsy, falls a lot, bumps into things, hates reading.

DVA cc: OD 20/20 OS 20/200

MRx: OD +1.50 (20/20) OS +4.50 (20/100)

Cyclo: OD +3.50 OS +5.50

Changed Rx to: OD +3.50 OS +5.50 with +3.00 add

Ocular health: WNL

Stereo: none, OS suppression on W4D at distance and near

Patient #3- Bray

CT cc: (D) 14 CLET (N) 16 CLET

EF: unstable, eccentric fixation of the OS

NPC: UTT, suppression

Vergence Ranges: UTT, suppression

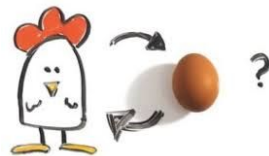
First Impression...

- Partially accommodative Esotropia
- Strabismic amblyopia
- OS suppression

What would you do?

Road 1: Treat the amblyopia first, then tackle the strabismus

Road 2: Treat the strabismus first, and then tackle the amblyopia



Paradigm shift

Traditional approach: Treat the amblyopia first, do intense patching to try to improve the VAs as much as possible, then try to train the esotropia later



Better monocular acuity, but will turn them into an alternator and may result in more diplopia

New approach: Treat the strabismus first, by making the patient more binocular improvements in acuity will follow



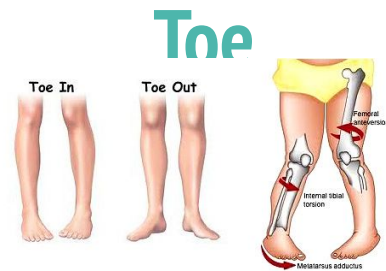
Promotes more lasting results, reduces binocular competition

Which will result in better vision and QOL for the patient?



Binocular vision will ultimately be more useful and comfortable for the patient

STRABISMUS Head to



Take a look at their posture in the exam chair



Redefining Pigeon Toed



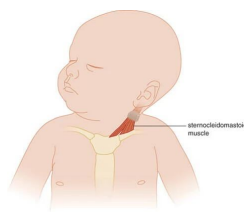
Background History

Child was born with torticollis and had a very weak left side ever since she was young.

Underwent heavy physical therapy to gain strength on that side.

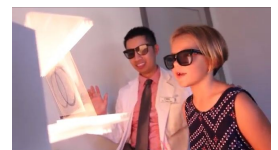
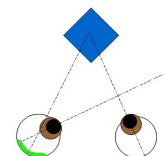
It took her a long time to learn how to walk and also to be able to shift weight from her left side to her right side (bilateral integration).

Also underwent physical therapy and chiropractics to straighten her neck out.



Vision Therapy

- Looking for strabismus throughout their body is very helpful in improving alignment
- Don't address monocular training first in cases of strabismic amblyopia
- Try to look for any point of binocularity (centration point) and start training there.



Post Therapy - 30 sessions

History: Likes reading now, not as clumsy, not bumping into things, less frustrated with vision

DVA cc: OD 20/20 OS 20/80

MRx: OD +3.50 (20/20) OS +5.50 (20/80)

Prescribed: OD +3.50 OS +5.50 with +3.00 add

Stereo: no RDS, but 4 dots on W4D at distance and near!!!

Patient #3- Bray

CT cc: (D) 6 CLET (N) 10 CLET

Vergence Ranges: BO x/30/18 BI x/12/6

Tracking: 85%

Review of the Literature

Esotropia is commonly infantile. Infantile esotropia is considered idiopathic, although an **anomaly of fusion is the suspected cause**. Accommodative esotropia, a common variety of acquired esotropia, develops between 2 yr and 4 yr of age and is associated with hyperopia. Sensory esotropia occurs when severe visual loss (due to conditions such as cataracts, optic nerve anomalies, or tumors) interferes with the brain's effort to maintain ocular alignment.

Merck Manuals

<https://www.merckmanuals.com/en-ca/professional/pediatrics/eye-defects-and-conditions-in-children/strabismus>

What should you do...



1. Consider near plus to help with better alignment
 - a. reading/computer glasses
 - b. MF soft contacts for young ET/EP
 - c. Bifocals- sometimes
2. Look deeper for other associated etiologies associated with strabismus
3. Vestibular training very helpful
4. Binasal occlusion is an effective tool



When to refer?

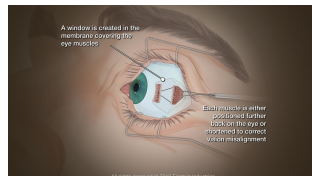
➔ Vision Therapy =

- if any indication of sensory fusion
- ARC is fine, helpful in treatment
- If suppression, but some zone of fusion
- Any age



➔ Surgery =

- Want cosmetic cure, not functional
- Angle of deviation too large?
- Success is within 10 pd of ortho
- Risk of reoperation



Review of Binocular Vision after Sclerals

Patient #4- Gilbert

History: 43 YO hispanic male, diagnosed with keratoconus 10 years ago and struggling with distorted vision OS. Has tried RGPs in the past but struggled with comfort.

DVA sc: OD 20/20 OS 20/200

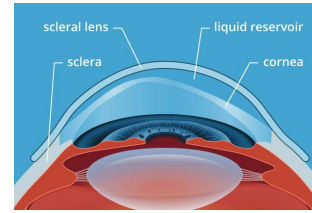
MRx: OD -0.75 -1.00 x075 (20/25) OS plano (20/200)

CT: 15 CLET (D) & (N) ** this is approx, due to poor fixation

Patient #4- Gilbert

Successful scleral lens fit, acuity now 20/20 in each eye!

Now, a 25 CLET (D) and 20 CLET (N)



Patient #4- Gilbert



CC: Double vision at distance, reading on the computer very difficult, sees shadows behind objects

Rx: plano 2 BO

plano 2 BO +2.50 add

32" LD stereo achievable through the +2.50 add

Patient #4- Gilbert

Subjective Centration Point: a point in free space where the eyes are able to obtain sensory fusion.

Easiest way to test: use a Worth 4 Dot or penlight with red filter

1. Bring it right up to their nose
2. Ask if all 4 dots seen
3. Slowly pull it away until the patient reports suppression or diplopia



Patient #4- Gilbert

Binocular Vision goal is to expand the range of their centration point



Post therapy 15 CLET (D) and ortho (N)

Centration point extended from 8 cm from his nose to 60 inches

Binocular function in longstanding Keratoconus

Anomalies of binocular function in patients with longstanding asymmetric keratoconus

Hooman Sherafat, Joy E S White, Kenneth W Pullum, Gillian G W Adams, John J Sloper, British Journal of Ophthalmology 2001;85:1057-1060

20 adult patients, longstanding asymmetric keratoconus managed with a scleral contact lens

No CIs on: all strab! Exotropia in 19 out of 20 of them



Binocular function in longstanding Keratoconus

With scleral lenses on:

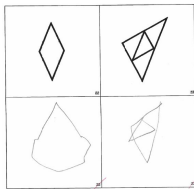
- 60% were strabismic still (12 patients)
- 70% had measurable stereo (14 patients) *200" arc or worse
- 30% had NO binocular function

What you should do...

1. Recheck Cover Test and Stereo after successful fitting of scleral lenses
2. Prism glasses and or reading glasses helpful over sclerals
3. Expect that binocular vision can be restored (no sensory issues) later onset
4. Vision therapy or surgery may be needed

Take Home Points

Patient #1: Look beyond 20/20, see the patient as a whole and how their visual system is contributing to their overall performance.



Take Home Points

Patient #2: See Amblyopia as a binocular problem, not a monocular one



Take Home Points

Patient #3: Strabismus occurs head to toe, consider the etiology when determining the appropriate treatment



Take Home Points

Patient #4: Don't forget about binocular function once you restore acuity in keratoconus patients with contact lenses



THANK YOU!

drlam@insightvisionoc.com



WOO UNIVERSITY

Thank you! Please join us for our next
COPE event



WOO UNIVERSITY

Presented by
Peter DeBry MD

PATIENT ADHERENCE
TO GLAUCOMA
MANAGEMENT

Date: December 8, 2021
Time: 7:00 PM - 8:00 PM PST
COPE: 1 CPE Approved CE credit



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Date: December 8, 2021
Time: 7:00 PM – 8:00 PM Pacific Time
Speaker: Dr. Peter DeBry
Topic: Patient Adherence to Glaucoma
Management
COPE: One hour live CE