

Current Case Presentations in Functional Vision Care

M.H. ESTHER HAN, OD, FCOVD, FAAO, Dipl ABO
 ASSOCIATE CLINICAL PROFESSOR, SUNY COLLEGE OF OPTOMETRY
 EASTERN STATES OPTOMETRIC CONGRESS
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Financial Disclosures....

I do not have any relevant financial relationships with any commercial interests.


Case 1

VIRTUAL REALITY (VR) & STRABISMUS THERAPY?

Case 1: 39-year-old Asian Female

**Chinese speaking only*

- ▶ Chief Complaint:
 - ▶ Eye turns inwards; frontal headaches and eyestrain; eye soreness; some dizziness when she does not sleep well
 - ▶ Distance vision blur; print moves around while reading, constant double vision since 7 years old
 - ▶ **Wants to try virtual reality (Vivid Vision) to treat her strabismus**
 - ▶ Wants to consider strabismus surgery as well to cosmetically treat her esotropia
- ▶ Ocular, Medical History:
 - ▶ No history of strabismus surgery; Takes an anti-anxiety medication; Reports a history of insomnia

Findings	Initial Exam
Distance Uncorrected VA:	OD: 20/20 OS: 20/20
Cover Test (with and without correction)	DCT: 18-20 CAET NCT: 8-10 CAET
Refraction:	OD: +1.25-0.50x095 20/20 OS: +1.25-0.50x085 20/20
Extraocular Motilities:	A pattern eso, mild abduction deficit OS 
Accommodative Testing:	Fused Cross Cylinder: +0.75D Amplitudes: 2.50D OD/OS Facility: 0 cpm OD/OS
Worth 4 Dot:	OS suppression at near, intermediate, far

Case 1: Additional History

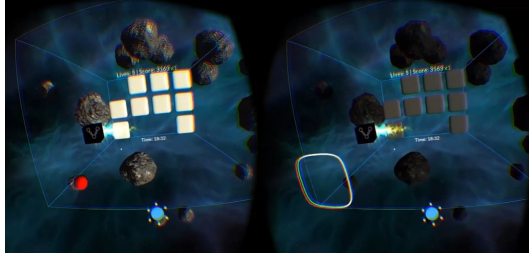
- ▶ Occupation: Answers phone at restaurant
- ▶ Does not use computer at work
- ▶ Uses phone and holds it very close
- ▶ Does not read a lot due to strain

Case 1: Vivid Vision Video



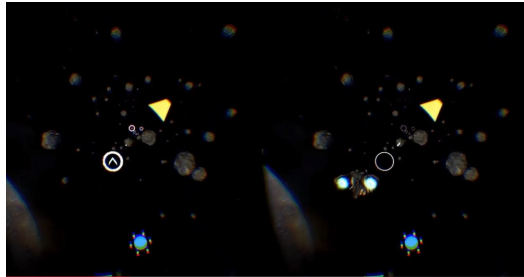
Case 1: Trial of VR

- ▶ **Breaker:** Set with the following parameters with 12 base in (BI), 0.4 ball size. Blur with small ball size.
- ▶ **Ring Runner:** Initial suppression OS (Could not see colors in rings). No longer suppressing when parameter was set to blur the right eye's image.
- ▶ **Bubbles:** Increasing base in prism and stimuli doubles at 25 BI.



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Case 1: Post VR Trial

- ▶ Trial: 30 minutes
 - ▶ Some dizziness and blur report, no prescription was used; Felt fine after a few minutes
- ▶ DCT: 12 CAET, 80% LET
- ▶ NCT: ortho to 4 LET

Case 1: Plan Considerations

- ▶ CAET, Divergence Insufficiency-type
 - ▶ Patient is only Chinese speaking and demonstrates poor compliance with recommendations.
 - ▶ Requesting Vivid Vision to treat her strabismus
- ▶ Accommodative Infacility: severe
- ▶ Final prescription:
 - ▶ OD: +0.25 OS: +0.25 Add: +0.75
 - ▶ Patient unable to tolerate the plus and the astigmatic prescription
- ▶ Moderate blepharitis and dry eye
 - ▶ Artificial tears

Case 1: Outcome

- ▶ Patient completed about **6 sessions**
 - ▶ Mainly using VR
 - ▶ Non-compliant with other home therapy given
 - ▶ Non-compliant with spectacles
- ▶ Alignment:
 - ▶ DCT: 10-12 AET
 - ▶ NCT: 4-8 EP
- ▶ Symptoms: Improved visual comfort after each training session.

Case 1: Outcome, medical update

- ▶ Recent bloodwork: mild anemia; high cholesterol, no thyroid issues
- ▶ Seeing a psychotherapist for 8-9 years for sleep disorder; questionable bipolar; insomnia and takes sleeping pills.
- ▶ Symptoms heavily related with her sleeping conditions, reports great stress with running restaurant business, dealing with 3 children and spousal relationship.
- ▶ Does report dry mouth and has been more compliant with the artificial tears. Reported significantly less severe dry eye symptoms.

Case 1: Conclusions

- ▶ Incorporating virtual reality when functionally treating an esotropia of small to moderate angle.
- ▶ Emotional, psychological, autoimmune considerations when treating adult strabismics.
- ▶ Additional treatment options?

Case 1: References

- ▶ Fortenbacher DL, Bartolini A, Dornbos B, and Tran, T. Vision therapy and virtual reality applications. *Advances in Ophthalmology and Optometry*. 2018; 3(1): 39–59.
- ▶ Backus BT, Dornbos BD, Tran TA, Blaha JB, and Gupta MZ. Use of virtual reality to assess and treat weakness in human stereoscopic vision. *Electronic Imaging*. 2018; 4: 109-1-109-6.
- ▶ Li J, Thompson B, Deng D, Chan L.Y.L, Yu M, Hess RF. Dichoptic training enables the adult amblyopic brain to learn. *Curr Biol* 2013; 23: 308–309.

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ADVANCES IN OPHTHALMOLOGY AND OPTOMETRY

Vision Therapy and Virtual Reality Applications

Dan L. Fortenbacher, OD, FCOVD^{h*}, Alyssa Bartolini, OD^b, Brian Dornbos, OD^c, Tuan Tran, OD^d

^aWow Vision Therapy, 2968 Division Street, Saint Joseph, MI 49885, USA; ^bWow Vision Therapy, 3152 Peregrine Drive Northeast, Suite G205, Grand Rapids, MI 49525, USA; ^cVivid Vision, 525 York Street, San Francisco, CA 94110, USA

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Use of virtual reality to assess and treat weakness in human stereoscopic vision

Benjamin T. Backus, Brian D. Dornbos, Tuan A. Tran, James B. Blaha, Manish Z. Gupta
Wow Vision, Inc.
San Francisco, California, USA

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FOUR

Correspondences
Dichoptic training enables the adult amblyopic brain to learn

Jinrong Li¹, Benjamin Thompson¹,
Daming Deng¹, Liu Y. Chan¹,
Mihai Yu¹, and Robert F Hess¹

Case Two

EXOTROPIA & MYOPIA PROGRESSION/ WHAT TO TREAT FIRST?


Case 2: Ten-year-old Asian male

Myopia Care Assess Your Child's Risk of Developing Myopia

Using a simple questionnaire, it can estimate the level of risk. This allows early intervention, increasing the probability of a successful outcome.

Answer the 5 simple questions and add up the points.

1. How old is your child and is he or she myopic (short-sighted, nearsighted)?
 Yes and younger than 10 years Yes and 10 years or older No
(Children who wear glasses have not had their eyes checked for a longer period of the eye, i.e. a higher myopia diagnosis.)
2. How many hours per day does he/she spend with close vision tasks? (Time in school not included)
 1 hour 2 hours more than 2 hours
3. What is the distance to the book/mobile phone/tablet when reading?
 less than 10 cm 10 - 25 cm more than 25 cm
The amount of time a child/teenager uses hand-held electronic devices may contribute to myopia progression. Handheld devices include mobile phones, tablet devices, hand-held games and reading.
4. How many hours per day does the child/young adult play outside in natural daylight?
 1 hour 2 hours more than 2 hours
Outdoor activities have been shown to reduce the onset of myopia and help reduce risk of myopia eye disease.
5. Are the parents or one parent myopic?
 none one of the two both parents
Genetics play an important role in developing myopia in the next generation. This information helps when the calculator of myopia risk.

Points: 

This test is a short version of the free online questionnaire from Myopia Care.

Chief Complaint: Left eye turning out intermittently for the last year, closes one eye when playing games on iPad; left eye is blurred even with new (first pair) glasses he just picked up last week.

Myopia Questionnaire:

- ▶ Wearing glasses at age 10
- ▶ Mother, siblings are myopic
- ▶ No history of myopia control treatment
- ▶ About 70 hours/week near work
- ▶ About 4-6 hours/week outside

▶ Ocular and medical history: Motion sickness in a moving car or bus

Case 2:

Findings	Initial Exam
Entering VA cc	OD: 20/20 OS: 20/40
Current Spectacles	OD: Plano-0.50x178 OS: -1.25 DS

*Picked up glasses a week ago.

Case 2: Refractive Analysis

Findings	Initial Exam
Distance VA	Uncorrected: OD: 20/20 OS: 20/200 Best-corrected: OD: 20/20 OS: 20/20
Refraction	OD: Plano-0.50x017 20/20 OS: -2.00-0.50x167 20/20
Cycloplegic Auto-refraction	OD: Plano-0.75x023 OS: -2.00-0.25x173
Baseline: Axial Length	OD: 24.62mm OS: 25.68mm
Keratometry	OD 42.83/41.42@006 OS 42.57/41.19@170
Horizontal Visible Iris Diameter (HVID)	OD 13.5mm OS 13.2mm
Ocular health with DFE	Unremarkable OD/OS

Case 2: Control Score

Intermittent Exotropia Control Scale

- 5 = Constant exotropia
- 4 = Exotropia >50% of the exam before dissociation
- 3 = Exotropia <50% of the exam before dissociation
- 2 = No exotropia unless dissociated, recovers in >5 seconds
- 1 = No exotropia unless dissociated, recovers in 1-5 seconds
- 0 = No exotropia unless dissociated, recovers in <1 second (phoria)

Brian G. Mohny & Jonathan M. Holmes (2006) An Office-Based Scale for Assessing Control in Intermittent Exotropia, Strabismus, 14:3, 147-150

Case 2: Sensorimotor Analysis

Findings	Initial Exam
Cover Test	Distance: 25 ILXT, CS 1-2 Near: 30 XP, CS 0
Near Point of Convergence	To the nose with both accommodative & non-accommodative targets
Stereacuity	RDS: 125 sec; Wirt: 20 sec
Worth 4 Dot	Flat Fusion at all distances, dim illumination
Von Graefe Phoria	Distance: Variable exo, 3 RH Near: 8 exo
Vergence Ranges (Phoropter)	Distance: BI x/24/14 BO 22/18/-12 Near: BI unable to measure BO x/22/-18

Case 2: Sensorimotor Analysis

Findings	Initial Exam
MEM	+0.50D OD/OS
Accommodative Amplitudes	OD: 12.00D OS: 11.50D
Accommodative Facility	OD/OS: 13 cpm OU: 9 cpm (difficulty with plus)

Case 2: Diagnoses

- ▶ Intermittent Left Exotropia, Basic Exo-type
- ▶ Myopia OS, referred for myopia control
 - ▶ What is the order of treatment or how can both be addressed based upon current evidence based treatment recommendations?
 - ▶ Atropine? CRT? Multifocal SCL?

Case 2: Treatment and Management

- ▶ Spectacle prescription was increased:
 - ▶ OD: Plano-0.50x017 OS: -2.00-0.50x067
- ▶ Optometric vision therapy was recommended: 20-25 sessions
- ▶ Myopia Control Clinic
 - ▶ VTI NaturalVue Multifocal BC 8.3 OD: -0.25DS OS: -2.00DS



Case 2: Conclusions

- ▶ A multifocal soft contact lens modality was chosen as a myopia control treatment for this young patient with intermittent left exotropia.
 - ▶ Wearing SCLs for 4 months.
- ▶ Now the patient can initiate the optometric vision therapy program that was recommended.
 - ▶ Surprise!! Re-evaluation was performed and now optometric vision therapy is no longer indicated!

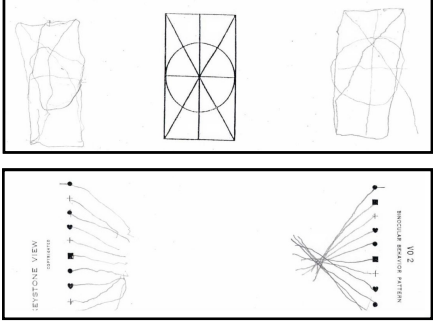
Case 2: Sensorimotor Analysis Re-evaluation

Findings	Initial Exam
Cover Test	Distance: ortho Near: ortho
Near Point of Convergence	To the nose with accommodative and non-accommodative targets
Worth 4 Dot	Flat Fusion at near and intermediate; OS suppression at distance
Von Graefe Phoria	Distance: 15 exo Near: 15 exo, 3 RH
Vergence Ranges (Phoropter)	Distance: BI x/32/5 BO >40 Near: BI x/36/30 BO >40
Vertical Ranges (Phoropter)	RS: 9/3 RI: 4/0 LS: 5/2 LI: 10/0

Case 2:

Findings	Initial Exam
FCC	+0.75D
Accommodative Amplitudes	OD: 8.75D OS: 9.75D
Accommodative Facility	OU: 14 cpm
Vergence Facility	12 cpm
Keystone Visual Skills (KVS)	Distance: Expected Near: Exo posture
Cheirotracing Test	exo
Van Order Test	exo

Case 2: Still exo posture



The diagrams show three views of the eyes: a front view, a top-down view, and a side view. Below these are two diagrams of the visual axes. The left diagram is labeled 'BYSTONE VIEW' and shows the visual axes converging towards a point. The right diagram is labeled 'MUSCLE ANATOMY ANTONIONE' and shows the visual axes converging towards a point, with the text 'MUSCLE ANATOMY ANTONIONE' written vertically.

REF	Left Eye	Right Eye	CONCEPTS	CONCEPTS
Top 1 (200-000)	0.00	0.00	0.00	0.00
Top 2 (200-000)	0.00	0.00	0.00	0.00
Top 3 (200-000)	0.00	0.00	0.00	0.00
Top 4 (200-000)	0.00	0.00	0.00	0.00
Top 5 (200-000)	0.00	0.00	0.00	0.00
Top 6 (200-000)	0.00	0.00	0.00	0.00
Top 7 (200-000)	0.00	0.00	0.00	0.00
Top 8 (200-000)	0.00	0.00	0.00	0.00
Top 9 (200-000)	0.00	0.00	0.00	0.00
Top 10 (200-000)	0.00	0.00	0.00	0.00
Top 11 (200-000)	0.00	0.00	0.00	0.00
Top 12 (200-000)	0.00	0.00	0.00	0.00
Top 13 (200-000)	0.00	0.00	0.00	0.00
Top 14 (200-000)	0.00	0.00	0.00	0.00
Top 15 (200-000)	0.00	0.00	0.00	0.00
Top 16 (200-000)	0.00	0.00	0.00	0.00
Top 17 (200-000)	0.00	0.00	0.00	0.00
Top 18 (200-000)	0.00	0.00	0.00	0.00
Top 19 (200-000)	0.00	0.00	0.00	0.00
Top 20 (200-000)	0.00	0.00	0.00	0.00
Top 21 (200-000)	0.00	0.00	0.00	0.00
Top 22 (200-000)	0.00	0.00	0.00	0.00
Top 23 (200-000)	0.00	0.00	0.00	0.00
Top 24 (200-000)	0.00	0.00	0.00	0.00
Top 25 (200-000)	0.00	0.00	0.00	0.00
Top 26 (200-000)	0.00	0.00	0.00	0.00
Top 27 (200-000)	0.00	0.00	0.00	0.00
Top 28 (200-000)	0.00	0.00	0.00	0.00
Top 29 (200-000)	0.00	0.00	0.00	0.00
Top 30 (200-000)	0.00	0.00	0.00	0.00

Case 2: References

IMI = "Interventions Myopia Institute"

- ▶ Gifford KL, Richdale K, Kang P, Aller TA, Lam CS, Liu YM, Michaud L, Mulder J, Orr JB, Rose KA, Saunders KJ, Seidel D, Tideman JW, Sankaridurg P. IMI – Clinical Management Guidelines Report. Invest. Ophthalmol. Vis. Sci. 2019; 60 (3):M184-M203.
- ▶ Wildsoet CF, Chia A, Cho P, Guggenheim JA, Polling JR, Read S, Sankaridurg P, Saw SM, Trier K, Walline JJ, Wu PC, Wolfssohn JS. IMI – Interventions for Controlling Myopia Onset and Progression Report. Invest. Ophthalmol. Vis. Sci. 2019; 60 (3): M106-M131.

Case 3

VISUAL SNOW SYNDROME

Case 3: 11-year-old Caucasian Female

- ▶ Chief Complaint:
 - ▶ Referred by neuro-ophthalmologist for filters to address visual snow, flickering lights colored spots, and prolonged after images (palinopsia).
 - ▶ Also reports horizontal diplopia when dehydrated, blurred vision, loss of place, not feeling grounded, slow shift of focus, eyes getting tired when reading, difficulty remembering what has been read, loss of balance, light sensitivity, and dizziness.
- ▶ Ocular and medical history: Brainstem brain cyst removed 4 months prior and then 1 month later, a surgery to repair a CSF leak was performed.
- ▶ Medications: None

Case 2: Sensorimotor Analysis Re-evaluation

Findings	Initial Exam
VA (uncorrected)	OD: 20/20 OS: 20/20
Retinoscopy	OD: +0.50 DS OS: +0.25 DS
Pupils	PERRL -APD
EOMs	Full and comitant OU
Accommodative	Within normal limits
Vergence	Within normal limits
Oculomotor	Within normal limits

Case 2: Intuitive Colorimeter

Trials of Chromatic Spectacles

Purple 6+4 Rose 6+4

Green 3 Turq 3

Entry Check Hue: 320 Sat: 25 Dye 1: N/A Dye 2: N/A Neutral: 1

Transmission of spectacles: 45% No attenuator

To obtain luminance as with spectacles: No attenuator

Calculation based on hue and satn entered above

No. trial lenses: 4 Consider UV blocker

Entry Check Hue: 180 Sat: 25 Dye 1: N/A Dye 2: N/A Neutral: 1

Transmission of spectacles: 45% No attenuator

To obtain luminance as with spectacles: No attenuator

Calculation based on hue and satn entered above

No. trial lenses: 2 Consider UV blocker

The above table shows the lenses used as they appear in the box.

Case 3: Tint Trial Subjective Responses

Tint	Subjective
Light Brown	30% reduction
10% Rose	25% reduction
20% Rose	15-20% reduction
Dark Gray/Brown/Blue	Worsened
Pink from optical	25% reduction
Cerium (Purple-Rose)	75% reduction

Case 3: Conclusions

- ▶ Limited literature exists about the assessment and management of visual snow symptoms.
- ▶ Specific wavelength tints determined using the Cerium Intuitive Colorimeter can significantly decrease the interference of visual snow when performing daily visual activities.

Case 3: References

- ▶ Ciuffreda KJ, Tannen B, Han MHE. Visual Snow Syndrome (VSS): An evolving neuro-optometric clinical perspective. *Vision Dev & Rehab* 2019;5(2):75-82.
- ▶ Yildiz FG, Turkyilmaz U, and Unal-Cevik I. The clinical characteristics and neurophysiological assessments of the occipital cortex in visual snow syndrome with or without migraine. *Headache: The Journal of Head and Face Pain* 2019; 59: 484-494.
- ▶ Schankin CJ, Maniyar FH, Digre KB, and Goadsby PJ, 'Visual snow' – a disorder distinct from persistent migraine aura. *Brain* 2014; 137(5): 1419–1428.



See you next year!