

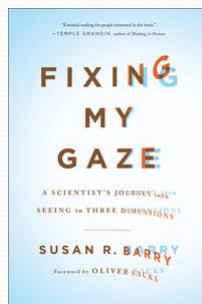
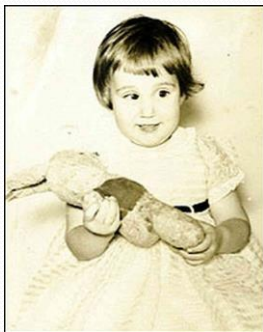


Vision Therapy for the Management of Small Angle Esotropia

Debbie Luk, BSc(Hons), OD, FCOVD

Objectives

- Adults with Small Angle ET Case
- Therapy used for Improving Functional Vision
- Patient's perspective of gaining 3D vision



John 28 yo – March 2013

CC: Wants to be a police officer, but failed visual requirement 3 years ago and *really* wants to re-apply.



Vision Standards

VISION STANDARDS FOR POLICE OFFICER APPLICANTS

OPTOMETRIST / OPTHALMOLOGIST	NAME OF OPTOMETRIST/OPHTHALMOLOGIST	DATE OF EXAMINATION YY YY MM DD
ADDRESS OF OPTOMETRIST / OPTHALMOLOGIST	TELEPHONE NUMBER	
UNCORRECTED VISUAL ACUITY – NORMAL At least 20/40 (6/12) with both eyes open	Uncorrected VA: 20/40 QU	APPLICANT STANDARD <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
FARSIGHTEDNESS – NORMAL Not greater than +2.00 D, spherical	Less than +2.00D spherical equiv	APPLICANT STANDARD <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
BEST CORRECTED VISUAL ACUITY – NORMAL At least 20/20 (6/6) with both eyes open	BCVA: 20/20 QU	APPLICANT STANDARD <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
COLOUR VISION – NORMAL Pass Ishihara (Book or Titmus) without any Chromagen lenses	Normal Colour Vision on Ishihara/ D15	APPLICANT STANDARD <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
DEPTH PERCEPTION – NORMAL Stereo acuity of 80 seconds of arc or better	Stereoacuity: .80"	APPLICANT STANDARD <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
LATERAL PHORIA FAR – NORMAL No more than 5 eso or 5 exo If No – please provide additional information, which documents that the person is unlikely to experience double vision when fatigued or functioning in reduced visual environments...	Distance Phoria: 5 eso – 5 exo	APPLICANT STANDARD <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
LATERAL PHORIA NEAR – NORMAL No more than 6 eso or 10 exo If No – please provide additional information, which documents that the person is unlikely to experience double vision when fatigued or functioning in reduced visual environments...	Near Phoria: 6 eso – 10 exo	APPLICANT STANDARD <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO

PERIPHERAL VISION Peripheral visual field limits with a 5 mm white target at 33cm (or a target with similar angular size with respect to the candidate's viewing distance) should be no less than the limits given below. In addition, no blind spots should be the physiological blind spot. Limits for the superior and inferior arc:	Peripheral Vision	APPLICANT STANDARD <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
<ul style="list-style-type: none"> Temporal (0° meridian) 75° Superior-temporal (45° meridian) 40° Superior (90° meridian) 35° Superior-nasal (135° meridian) 35° Nasal (180° meridian) 45° Nasal-inferior (225° meridian) 35° Inferior (270° meridian) 55° Inferior-temporal (315° meridian) 70° 		
OCULAR DISEASE – NORMAL Free from diseases that impact visual performance above, or visual system.	Ocular Health	APPLICANT STANDARD <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
CORRECTIVE SURGERY HAS THE PATIENT EVER HAD CORRECTIVE SURGERY?	Good Contrast Acuity if they had Corrective Sx	APPLICANT STANDARD <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
PROCEDURE TYPE – Please indicate which procedure was used.		PROCEDURE MM DD
<input type="checkbox"/> Corneal Refractive Surgery <input type="checkbox"/> Pseudophakic Intra-C Lenses <input type="checkbox"/> Phakic Intra-Ocular L Implants (Pilot) <input type="checkbox"/> Orthokeratology, Cor Transplants, and Intra Stromalcorneal Rings		Allow, however, the candidate must meet the requirements and provide specific documentation on vision stability and night vision using Recruit Selection Standards approved by the Alberta Police.
NIGHT VISION – Only required Obtain minimum score binocularly with, or without, corrective lenses: 1. Bailey-Lovie Low logMAR 2. Bailey-Lovie High logMAR 3. Bailey-Lovie Low logMAR		APPLICANT STANDARD <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO

How are standards chosen?

License Plate

- 20/40 unidentifiable > 3 car lengths

Facial Recognition

- 20/40 = questionable identification

Shoot-No-Shoot Decisions

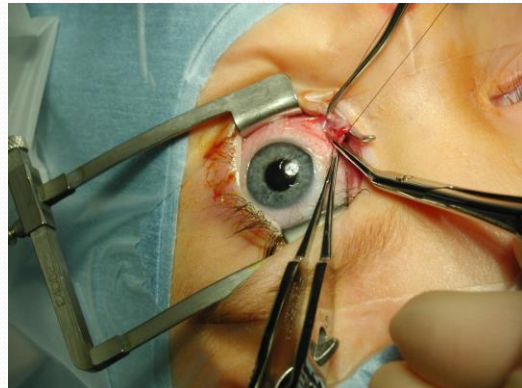
- ↑Errors > 20/40
- 80% of shooting incidents w/n 20 ft
- Detection ↑with use of two vs one eye

Literature suggests 20/40 –
20/20 vision required

↓VA = less accurate and
slower responses

John's Ocular History

- Infantile Esotropia





Infantile vs Accommodative ET

Presents **< 1 year**

Risks factors

Genetics, Prematurity, Peri-natal complications, developmental delay, CP

Treatment

EOM Surgery, Botox, VT?

Presents **2.5 yrs**

Causation

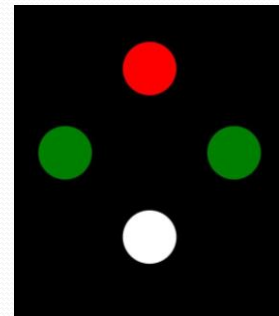
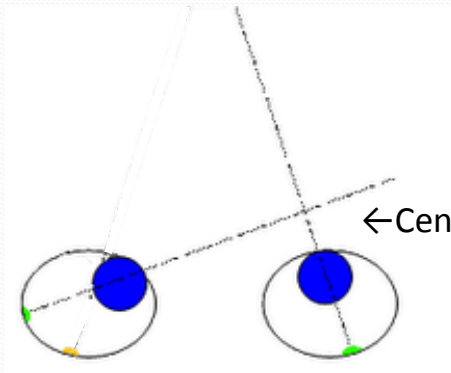
High refractive error
High AC/A

Treatment

Glasses

No Tx increased risk of non-accommodative component

VT for Infantile Esotropia?

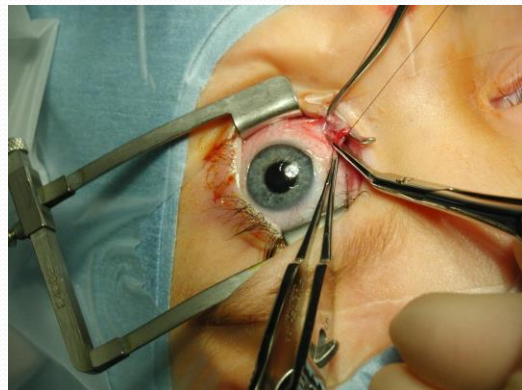


Prescribing Accommodative ET

- Rx least amount of plus to get them ortho
- Cyclo – wait full 40 minutes
- Cover Test with TF and Ranges

John's Ocular History

- Infantile Esotropia
- **Bilateral Strab Surgery** (age 1)
- No hx of patching
- Glasses since age 4 yo



Long Term Outcome of Strab Sx

Any type of Strab

- 20-30% of those undergoing strab sx will require a 2nd surgery and of these, another 20-30% may need a 3rd surgery

Strab Sx for Older Pt

No Sensory/Functional Improvement

- N= 17, 8yo+
 - All had monocular response to Bagolini lenses,
- Post-op 88% had central suppression with Bagolini lenses
- All 17 had no sensory fusion, either preoperatively or postoperatively on W4D or synoptophore, and no stereopsis with the Titmus stereo test.

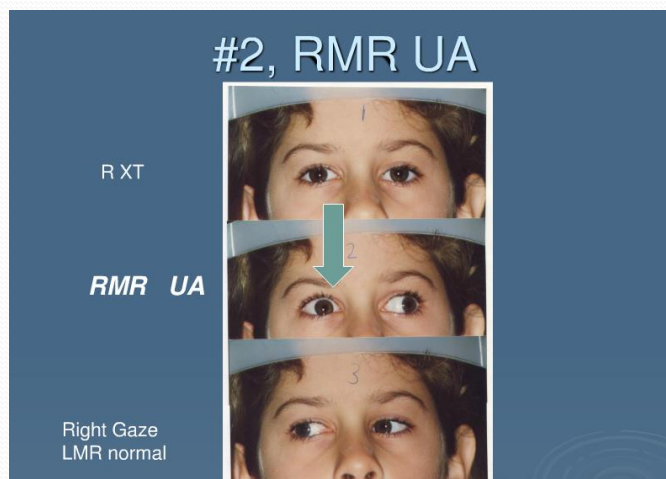
Murray AD, Orpen J, Calcutt C. 2007 Changes in the functional binocular status of older children and adults with previously untreated infantile esotropia following late surgical realignment. [JAAPOS](#). Apr;11(2):125-30.

Strab Sx for Older Pt

- Kim S et al.
 - n = 43, 18yo +
 - Strab > 10 yrs without prior sx
 - Improvement seen in 80% exotropes, 30% esotropes
 - Improvement = ~**450**+/-815 seconds of arc (sec) in exotropes and **1000**+/-1337 sec in esotropes

Kim S, Yi ST, Cho YA. 2005. Postoperative Recovery of Stereopsis in Longstanding Adults Constant Horizontal Strabismus. *J Korean Ophthalmol Soc.* Nov;46(11):1831-1836

Consecutive XT



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Core defect in consec XT

- Usually medial rectus underaction
- R_x : Have to make MR function normal [or near-normal] for satisfactory long term result

Kowal, L, Wong E. 2011 Consecutive Exotropia <http://www.docstoc.com/docs/108101013/Consecutive-Exotropia-1-General-comments-2-Surgical-audit>

Related Documents Embed Search Document Search

The Number of Placebo Controlled, Double Blind, Prospective, and Randomized Strabismus Surgery Outcome Clinical Trials: None!

Dominick M. Maino, OD, MEd, FAAO, FCOVD-A

Editor

Keywords: double blind, clinical trials, placebo controlled, prospective, randomized, Strabismus surgery outcomes.

Recently a colleague of mine asked if I knew of any placebo controlled, double blind, prospective and randomized strabismus surgery outcome clinical trials (RCT). Are there one or more clinical trials that note the efficacy of strabismus surgery? This is an important question to ask for several reasons. One reason is that allopathic medicine continues to insist that optometry must have clinical trials completed before we can conduct optometric vision therapy for our patients with binocular vision anomalies and/or learning related vision problems. The second reason is that if our ophthalmology (OMD) colleagues require us to have such evidence based treatment, then it

must follow that they have many such clinical trials to support the surgical intervention of a child with strabismus and that these clinical trials reflect the highest level of evidence based medicine. Finally, the most important reason is that if we refer a patient for surgical intervention, it would be most appropriate to have evidence based research supporting this surgical intervention.

Unfortunately when my colleague asked me about supporting clinical trials for the efficacy of strabismus surgery, I had to tell him that I did not know of any clinical trials offhand, but would see what I could find out. I then went to PubMed and conducted a literature search for placebo controlled, double blind, prospective and randomized strabismus surgery outcome clinical trials ... and found none! I did find articles about globe perforation during strabismus surgery,¹ strabismus surgery for

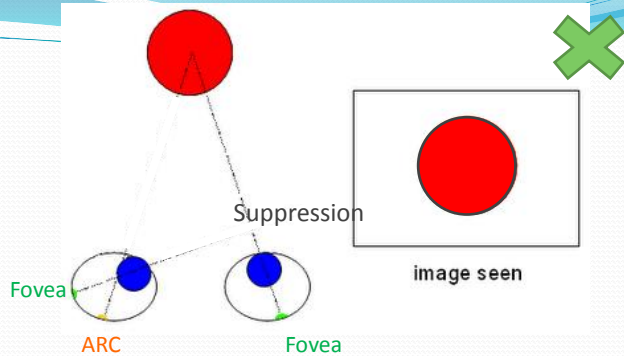
“ ... I hope medicine crafts its surgical art so that the patients' outcomes yield higher success rates, fewer complications ... and yes, one or more evidenced based, placebo controlled, double blind, prospective and randomized strabismus surgery outcome efficacy clinical trial ... ”

So what is the best age?

- Patching until equal VA OU
- VT
 - Maturity
 - Cooperation
 - Parents' Support

Prognosis Factors?

- Prognosis Factors
 - Correspondence
 - Direction
 - Frequency
 - Magnitude



Prognostic Factors

- Age ?
 - Well-known case: Sue Barry, a neuroscientist who developed stereopsis through vision therapy in her 50s
 - She describes from a patient's perspective what it feels like when she gained 3D vision.

TEDxPioneerValley - Sue Barry - Fixing My Gaze

<https://www.youtube.com/watch?v=XCCtphdXhq8>

Back to John's Visual Findings

Uncorrected

- VA 20/20 D&N

Refraction

- OD +2.00ds
- OS +2.00ds

Cover Test

- D: 2-4 pd CRET
- N: 6 pd CRET

Stereoacuity

- Near: None
- Distance= 200"



Police Stereo Requirements

Stereo Requirements
70- 100"

RCMP - 100"

British Columbia - no std

Alberta - 80"

Calgary - 80"

Saskatchewan - normal BV

Manitoba - 70"

Ontario - 80"

Quebec - 100"

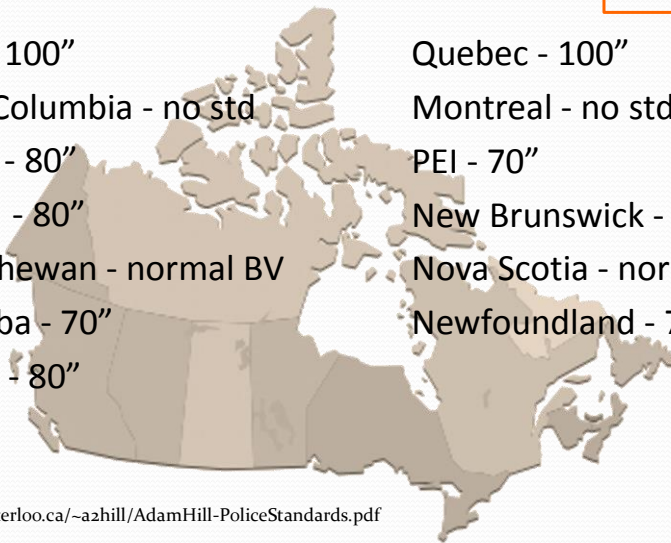
Montreal - no std

PEI - 70"

New Brunswick - 70"

Nova Scotia - normal BV

Newfoundland - 70"

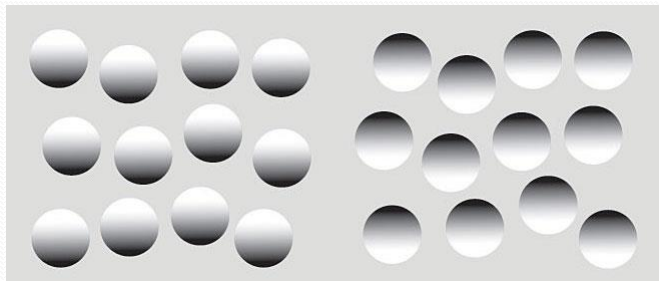


<http://www.science.uwaterloo.ca/~azhill/AdamHill-PoliceStandards.pdf>

Stereo and Job Performance

- "Little evidence that stereoacuity measurements with standard office tests of stereopsis give a true and complete indication of depth perception ability for a given task."

"...because stereoacuity tests, in their quest to only measure stereoacuity, attempt to eliminate other depth cues such as monocular cues that are present in real-life situations."

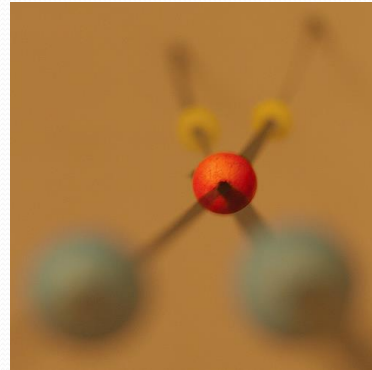


Long, J, Siu C. 2005

<http://www.scientificamerican.com/article/seeing-is-believing-aug-08/>

Depth Perception ≠ Stereopsis

- Monocular Cues
 - Colour, texture, size, overlap etc
- Binocular Cues
 - Retinal Disparity and Convergence



John's Visual Findings Continued

Fusional Ranges

- BI Distance: OD supp
- BO Distance: OD supp
- BI near: OD supp
- BO near: x/18/10

Acc'd Facility

- BAF w/ supp: 8cpm
- MAR OD 11 cpm, OS 16cpm

Amps

- OD 7.75D OS 8.75D
- Min amps for age 8D

Stereoacuity Goals?

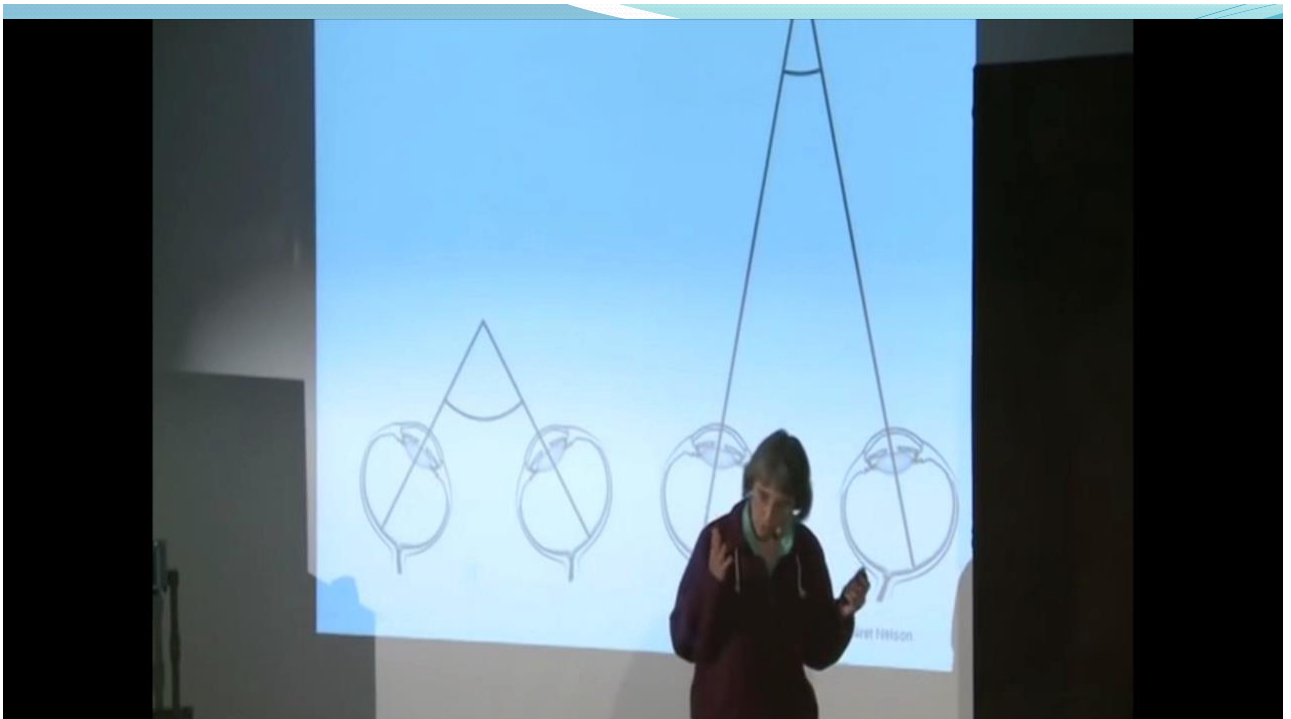
Normal subjects can detect up to 2-10 sec of arc



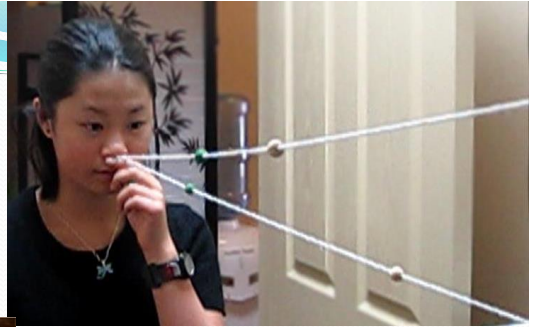
Microstrabs

- Motor fusion amplitudes can be normalized
- NRC with peripheral binocular stimuli and ARC with central fusion stimuli.
- Can get local stereoacuity (Wirt Circles) ~80"
- Will not get global (RDS) stereoacuity

Harwerth R, Fredenburg P. 2003. Binocular Vision with Primary Microstrabismus. Invest. Ophthalmol 42:93-4306.
<http://www.iovs.org/content/44/10/4293.long>



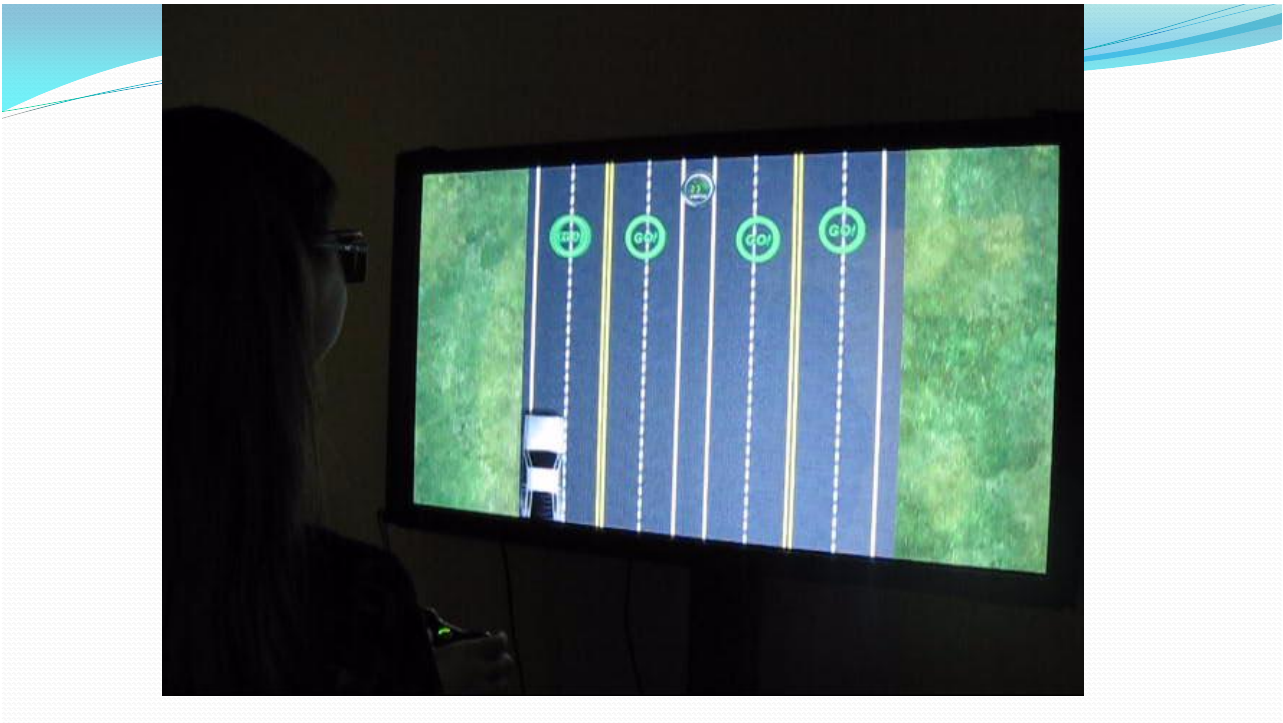
Vision Therapy

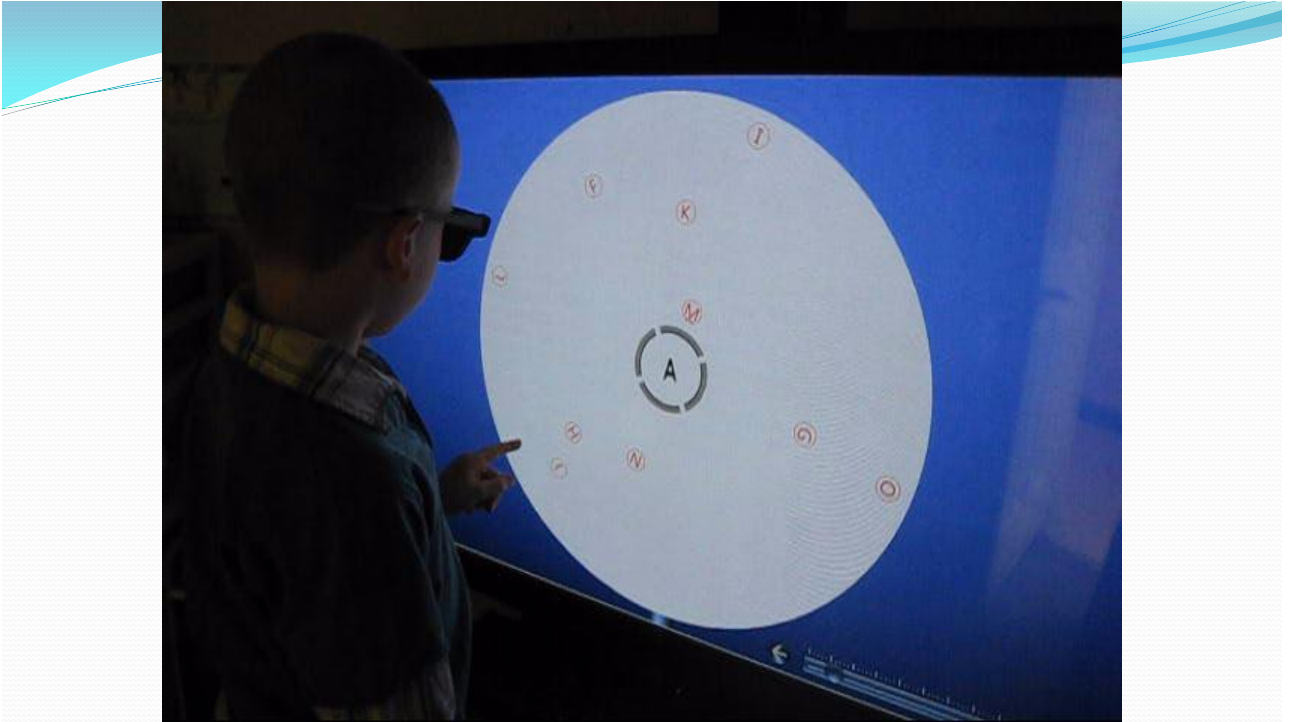


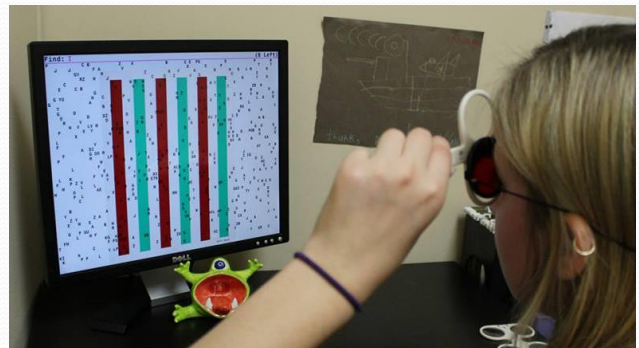
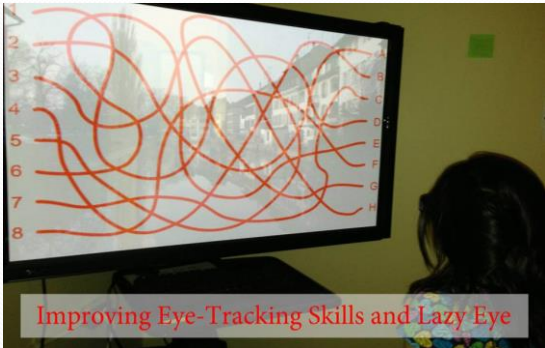
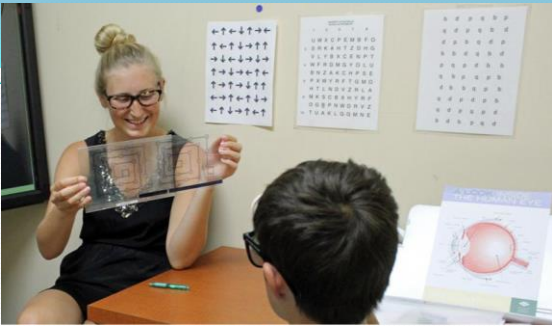
Vergence Parameters











Perceptual Learning

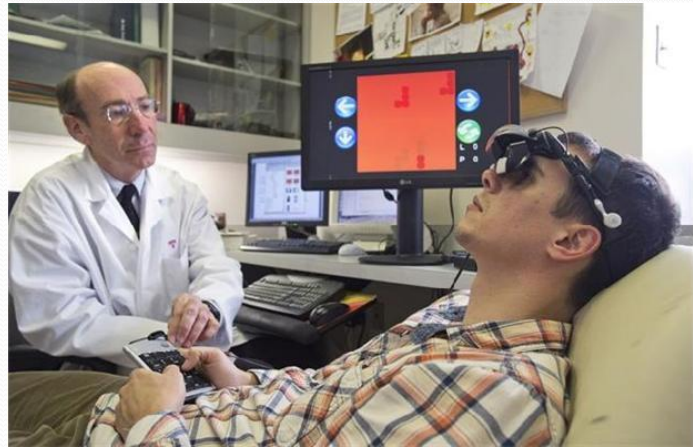
- **Perceptual learning** is the process of learning improved skills of perception
- Dennis Levi from Berkley
 - 2011 Charles F Prentice Medal ; Am Academy of Opt
 - Stereoblind or stereoanomalous recovered stereopsis
 - Positive subjective improvement in activities of daily living and sports



Dennis M. Levi (April 2005). "Perceptual learning in adults with amblyopia: A reevaluation of critical periods in human vision". *Developmental Psychobiology* 46(3). pp. 222–232
 Jian Ding; Dennis M. Levi (September 2011). "Recovery of stereopsis through perceptual learning in human adults with abnormal binocular vision". *Proceedings of the National Academy of Sciences of the United States of America* (PNAS) 108 (37). pp. 15035–15036..



Dpmt of Ophthalmology, Dr. R.F. Hess

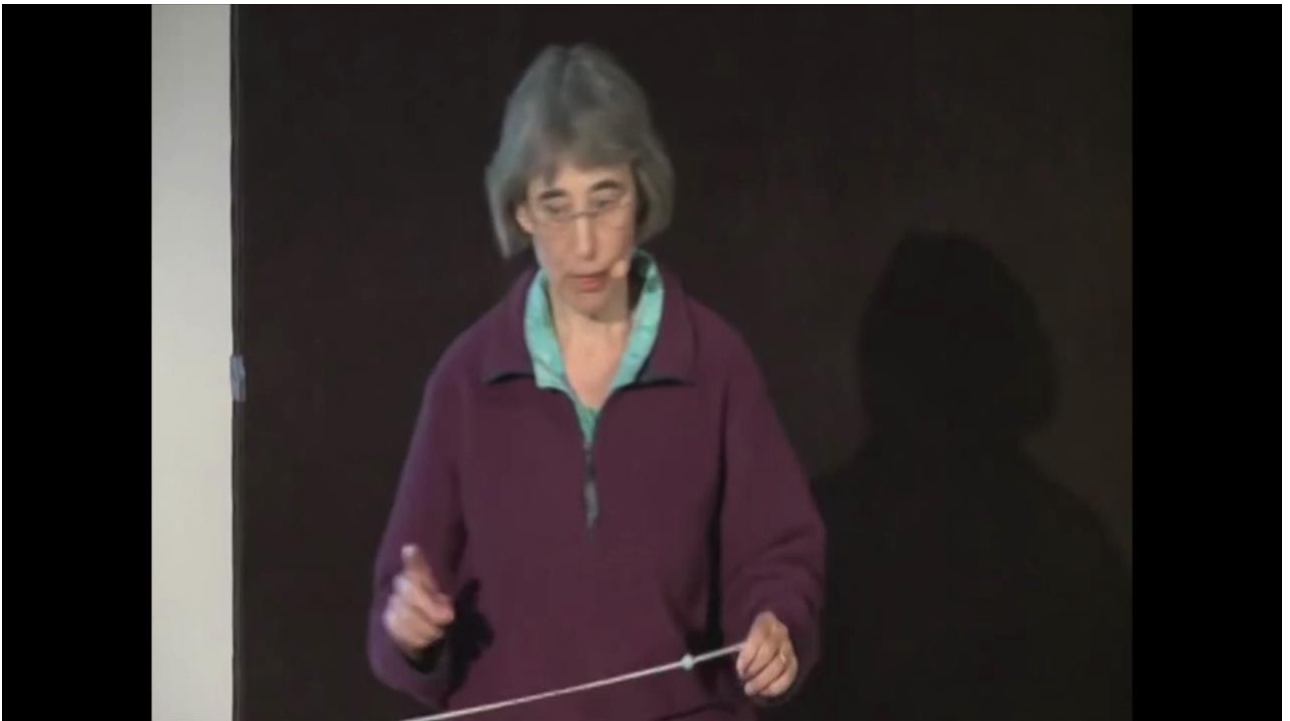


Retrieved from: <http://muhc.ca/newsroom/news/%E2%80%99Clazy-eye%E2%80%99D-disorder-%E2%80%993-promising-new-therapeutic-approach-1>
Hess R.F., Thompson B., Black J.M., Machara G., Zhang P., Bobier W.R., Cooperstock J.: An iPod treatment of amblyopia: an updated binocular approach. *Optometry*, 2012, Vol. 83, Nr. 2, pp. 87-94. Hess, R. F.; Thompson, B; Black, J. M.; Machara, G; Zhang, P; Bobier, W. R.; Cooperstock, J (2012). "An i Pod treatment of amblyopia: An updated binocular approach" *Optometry (St. Louis, Mo.)* 83 (2): 87-94.

	April 2013	June 2013	August 2013	November 2013
Accommodative Training	MAR +/- 1.00 D	MAR +/- 2.00 D	BAR +/- 1.50	BAR +/- 2.00
Anti-suppression	Suppression at 3 ft	Suppression at 5-6 ft	No Suppression	No Suppression
Brock String	Having troubles keeping X on bead	Can hold X for ~5-9 see before losing a string; brings X back with occlusion	Can bring X back without occlusion	Working on jump ductions
BI Fusional Range	OD sup.	x/5/4	x/10/7	x/21/18
Vectograms (BI)	Rope - P R&L Flickers Cannot appreciate float or SILO	Clown - P R&L Flickers Cannot appreciate float or SILO	Spirangle - M Less Flickering	Mother Goose - M or P Now trying with +/- 1.00D
Stereoacuity	None	200"	140"	80"

John's Progress

- Near Stereoacuity
 - March – None
 - June – 200"
 - August – 140"
 - Nov – 80"
- Maintenance therapy
 - Brock String
 - Vectogram
 - +/-1.50 Word Rock with RG bar readers



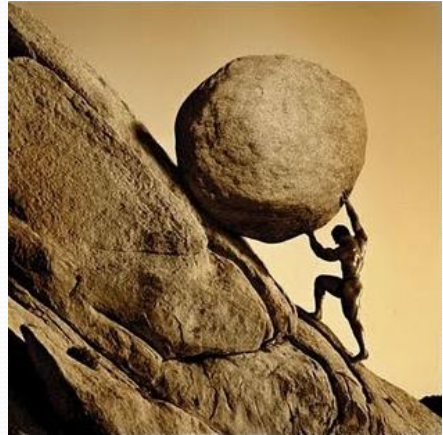
What is it like to gain 3D vision

- Immersed in a volume of space
- Even photographs (2D) have more depth
- Heightened awareness of other senses



What makes a good candidate?

- Drive
- Hard Working
- Self Awareness
- Right Training



Conclusion

- Small-Angle Esotropes can develop stereopsis through vision therapy
- Age is not a limiting factor
- Although patients with reduced stereopsis can appreciate depth perception, it is not to the same extent.
- Gaining stereo vision improves quality of life

Locating a Developmental Optometrist

www.covd.org -> Locate a Doctor



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