The Optometrist's Guide to Strabismus:
Reorganizing Space, Time and the Visual Process

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Course Supplement:
VT Activities which support 4-D Brain Processing!

Multi-sensory Integration Techniques

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Sensory Integration in VT: Examples

- Thumb-Pinky Vergence Rock
- Pointer and straw (or Menorah Explorah)
  - Hold straw parallel to facial plane; do not limit to primary gaze
- (R/G) Keystone Basic Binocular Series
  - Use tactile feedback, touching picture
- Bilateral integration: Chalkboard circles/ walking rail
- Gross motor: Marsden Ball/ Bunt ball (Discussed w looming)
- Ocular Proprioception/ Visual:
  - Monocular Lens Rock (Discussed under Monocular Depth cues)
- Vectograms: with tactile counterparts … or dual pointers
  - Visual/**TACTILE** feedback… Visual/**AUDITORY** feedback

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Thumb-Pinky Vergence Rock

- Thumb-Pinky Vergence Rock
  - Body organization and symmetry
  - Body localization/ extension
  - Body orientation
  - Ocular proprioception
  - Tactile feedback paired with ocular proprioception
  - Visual feedback via physiological diplopia

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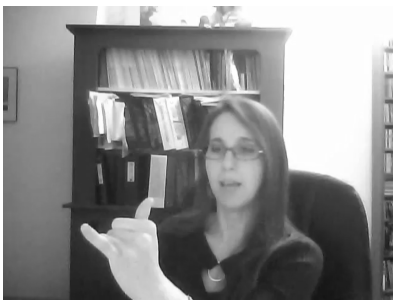
Thumb-Pinky Vergence Rock



http://www.youtube.com/watch?v=JFHib67xVMs

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Pointer/Straw or Menorah Explorah

- Hold straw parallel to facial plane, but do not limit to primary gaze
- With menorah, patient can work independently.
  - Use finger; aim vertically rather than horizontally
- Arm extension supports depth/distance awareness
- Phys dpl for visual biofeedback
- Tactile feedback on edge of candle-holder

Menorah Explorah

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(R/G) Keystone Basic Binocular Series

- Use tactile feedback, touching picture
- Fingertip faces picture, glide over BI targets
- Fingertip faces upwards, seems to run into BO targets
- Feel as if finger slips behind some BO targets
- Visual/tactile mis-match is appreciated

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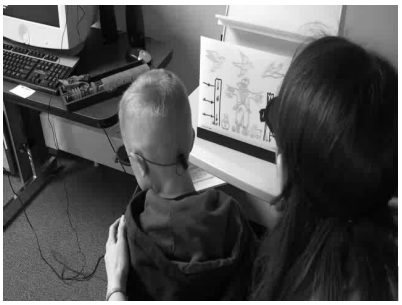

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Bilateral integration & Vision

- Chalkboard circles
  - Peripheral visual awareness synchronizes with movement of the body/ arms in space.
  - Visual feedback in the process improves image quality.
  - Also improves body organization and motor control.
- Walking Rail
  - Optic flow
  - Vision as a stabilizer for balance.
  - Increase peripheral awareness (figure/ground); beanbag drop.

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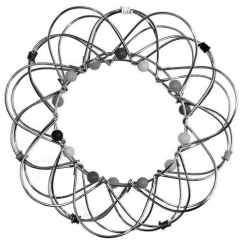
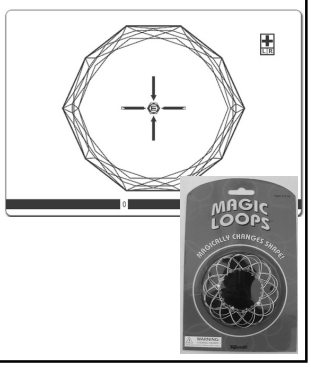
Stereo-tactile and Stereopsis Integration

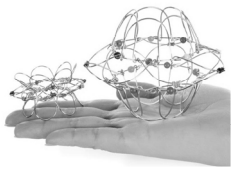
- Object manipulation is one of our first forms of "solid-seeing" (stereopsis).

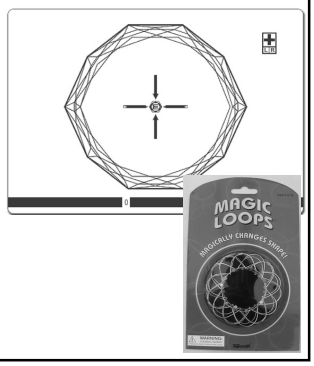




Stereo-tactile and Stereopsis Integration

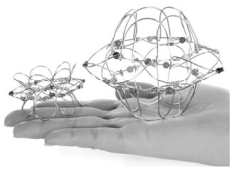
- As babies, we put objects in our mouths to learn about feel, texture, size, shape, etc.
- As we mature, we can use our palms, full of interacting sensors, to provide feedback on shape and depth.

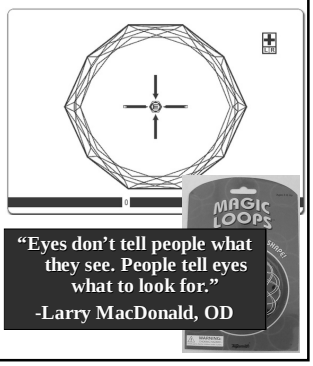




Stereo-tactile and Stereopsis Integration

- Reshape these "Magic Loops" to match the contour of the object in the vectogram. (**Gem**, right)
- Helps to push appreciation of stereopsis while holding the solid shape in hand.





"Eyes don't tell people what they see. People tell eyes what to look for."
-Larry MacDonald, OD

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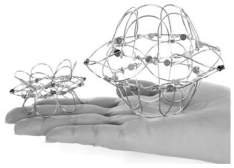

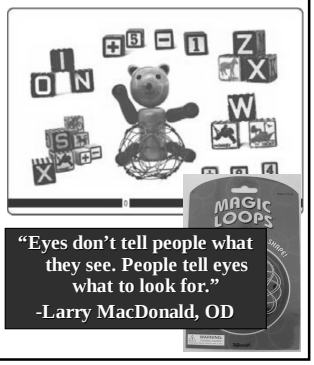

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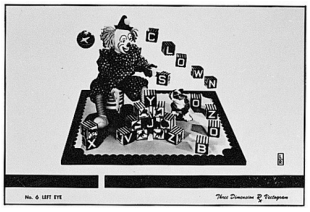
Visual-Auditory Integration

- Sound localization can be a powerful mode of spatial processing.
- Instead of localizing floating aspects of a vectogram image with one pointer, TRY USING TWO!



- Localize with one pointer, and then tap on it with a 2nd pointer.
- Provides tactile/ vibrational stimulation *along with* **auditory localization**!

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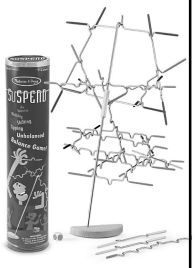
Bonus Games and Activities

- Suspend
  - Understanding physics of balance
    - Fulcrum… series of fulcrums
    - Stick length ~ weight
    - De-stabilize / **Re**-stabilize
  - Shifting 3-D structure with each move, stimulates depth perception



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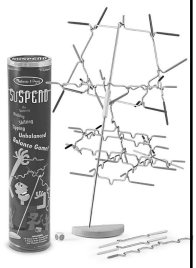
Bonus Games and Activities

- Suspend
  - Utilizes Sensory Integration:
    - Visual motor planning
    - Modulation of touch, placement
    - Eye-hand coordination
  - Different appearance from different vantages, encourages 4-D Thinking to process as a **solid** and plan the next move:
    - In order to create consistent, stable perspective of the structure, expand attention to include larger area of space.
  - Stimulates Central-Peripheral Integration:
    - Effect of placing or REMOVING a stick: Changes local and non-local areas of structure.



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Video demo,
Using Suspend in VT:

Part 1: http://youtu.be/LqC2RLWUejo Part 2: http://youtu.be/lbS7fVBjlΨU

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Visually-guided Fine Motor Control: Buzz Game

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Central-Peripheral Organization

- Develop visual-spatial organization skills in order to build an internal construct of their 4-D space/time world.
  - Enables them to use *top-down processing* to integrate their spatial perception with how the world is "supposed to look," facilitating the development of stereopsis.
- Stereopsis begins with the use of non-central retina.
- Simultaneously *seeing* center and periphery engages active use of peripheral retina.
- VT activities which build central-peripheral organization create the potential for stereoscopic vision.

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Central-Peripheral Integration Activities

- Look Ready Touch Back (Schrock)
- Slotnick Scramble
- Eyeport (Liberman)
- Visual-spatial memory games
  - Simultaneous or sequential, with delay or distraction
- Side-by-Side Vectograms
  - relative depth – different vectos sliding by each other: Topper/Clown, Qts/Clown, Qts/ No.9
  - relative size – the same vecto (Clown/Clown)
- Vectos with pointer
  - Diplopia on pointer or image: inaccurate localization.
- Oculomotor:
  - Eye excursions: Greenwald ball track/ Hart chart (Nasal to temporal for ET's, Temporal to nasal for XT's)
  - Wayne Saccadic Fixator/ Accuvision board

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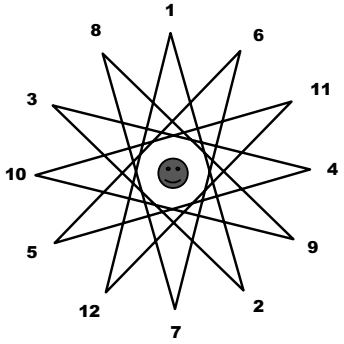
Look Ready Touch Back



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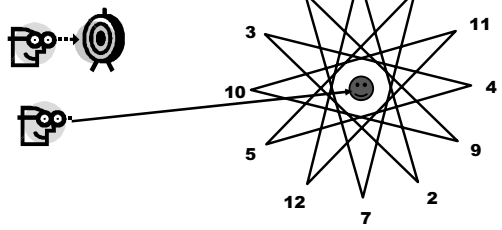
Look Ready Touch Back

Eyes begin at center



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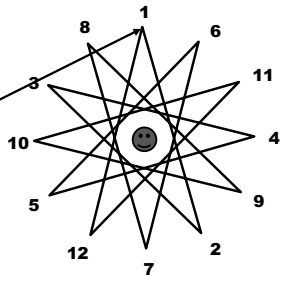
Look Ready Touch Back

"LOOK"



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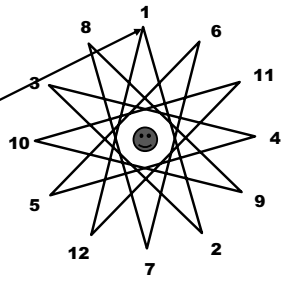
Look Ready Touch Back

"READY"



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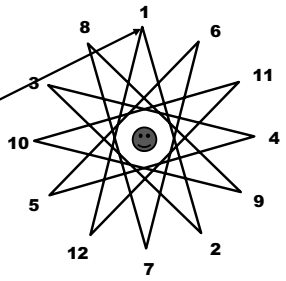
Look Ready Touch Back

"TOUCH"



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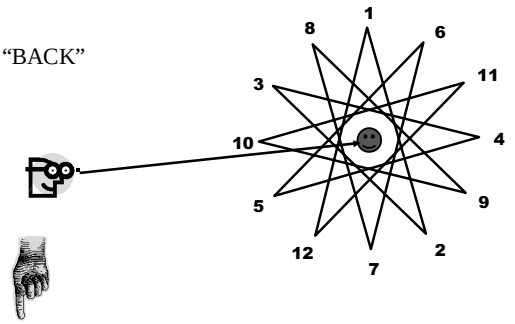
Look Ready Touch Back

"BACK"



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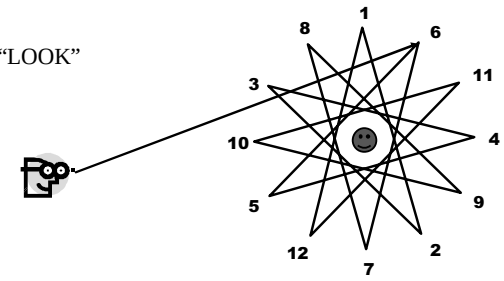
Look Ready Touch Back

"LOOK"



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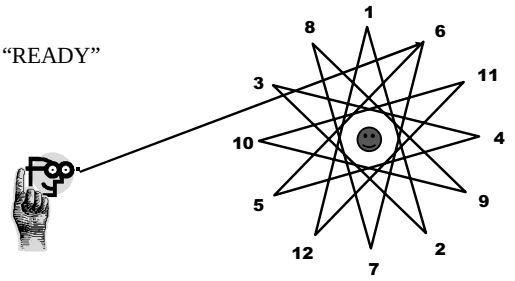
Look Ready Touch Back

"READY"



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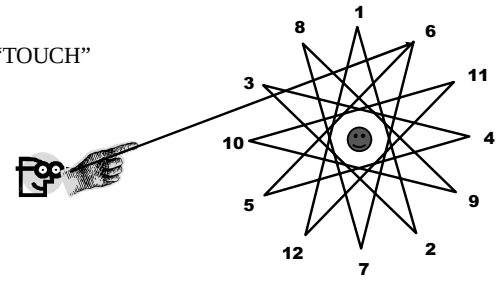
Look Ready Touch Back

"TOUCH"



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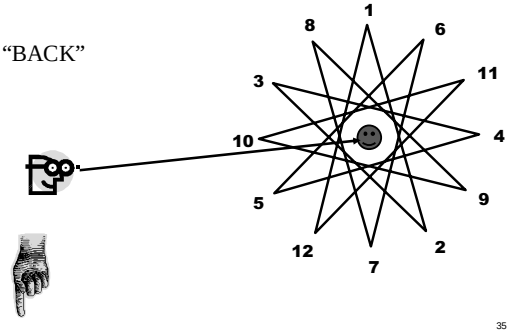
Look Ready Touch Back

"BACK"



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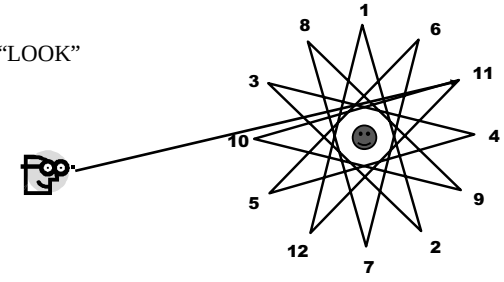
Look Ready Touch Back

"LOOK"



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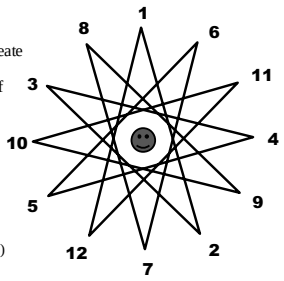
Look Ready Touch Back

- Metronome pulses @ 60 in the background
- Place on door edge or jamb to create 3-D plane challenge
- Monitor accuracy of touch (tip of star) in x, y and z planes
- Can use space fixator
- Step up through:
  - Dominant hand
  - RH CW, LH CCW
  - RH CCW, LH CW
  - Alternating hands
  - Ipsi/contra foot with touch
  - Change direction on cue (1 snap)
  - Change foot pairing on cue (2 snaps)
  - Change either direction or foot:
    - Be ready for either cue
  - Continue with distractions



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Slotnick Scramble

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Slotnick Scramble

- Visual-Vestibular Integration
- Central-Peripheral Integration
  - In Space
  - In *TIME*
- *Article in JBO*
  - *http://oepf.org/sites/default/files/journals/jbo-volume-21-issue-3/21-3%20Slotnick.pdf*

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Eyeport

Eyeport

- Oscillate between red/blue (Program 1)
- Reach-grasp-release between OD and OS
- Respond; Do not predict: Access peripheral retina
- Lights are at regular intervals
- Perception of asymmetric spacing between consecutive lights indicates eyes are not coincidently pointing on light (MFBF target)
  - red-to-blue vs
  - blue-to-red
  - Directional asymmetry L-to-R vs R-to-L, etc

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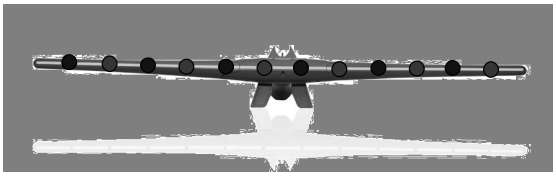
Eyeport – consecutive (Program 1)



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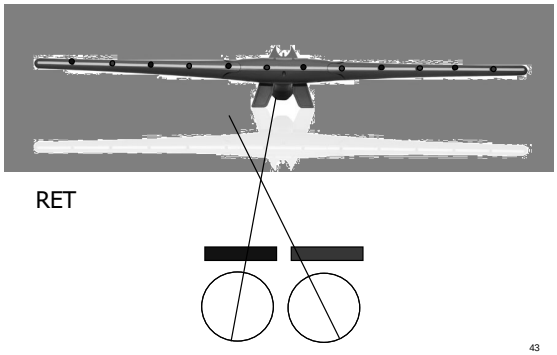
Eyeport – consecutive (Program 1)



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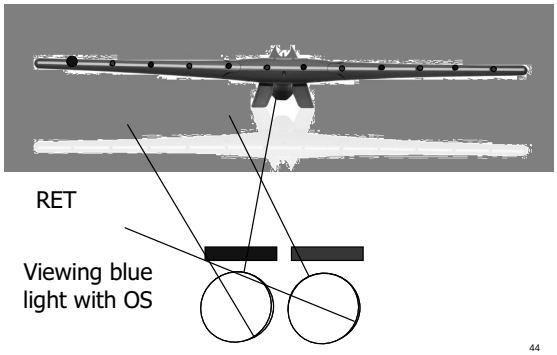
Eyeport – consecutive (Program 1)



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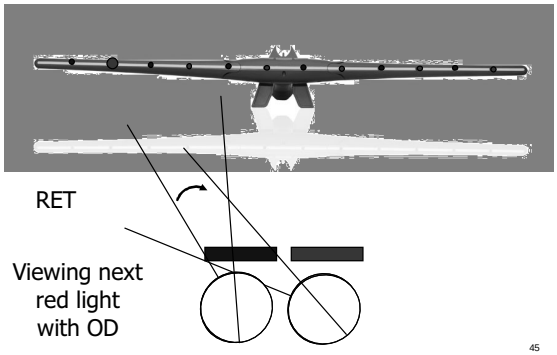
Eyeport – consecutive (Program 1)



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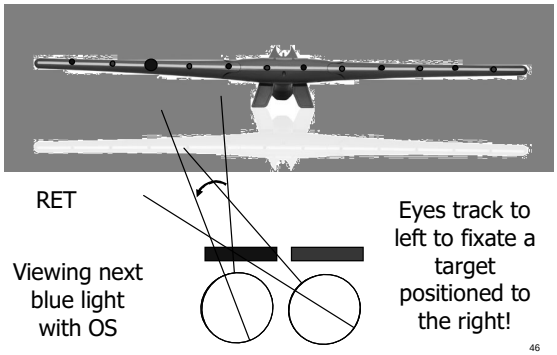
Eyeport – consecutive (Program 1)



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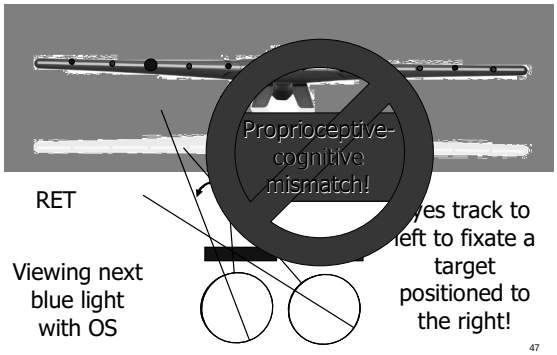
Eyeport – consecutive (Program 1)



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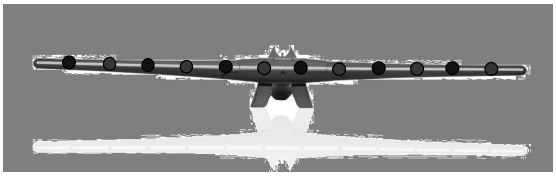
Eyeport – Program 2



- Creates peripheral stimulation with varying degrees of eccentricity
- Staggers presentation to opposite eye/ same eye
- Staggers presentation to temporal retina/nasal retina

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Central-Peripheral Integration in Visual Processing/ Memory

- The advantage of vision is the ability to process a set of data simultaneously
- Any procedure which builds simultaneous visual processing supports the building of a 4-D brain.
- Central-Peripheral Integration activities help a patient learn to process detail as well as context (figure as well as ground) over a large area of space.
  - Multi-Matrix Game
  - Puzzle Art and Puzzle Art 3-D
  - www.Lumosity.com:
    - Birdwatching; Eagle Eye
    - Space Junk
    - Top Chimp
    - Memory Matrix
    - Monster Garden

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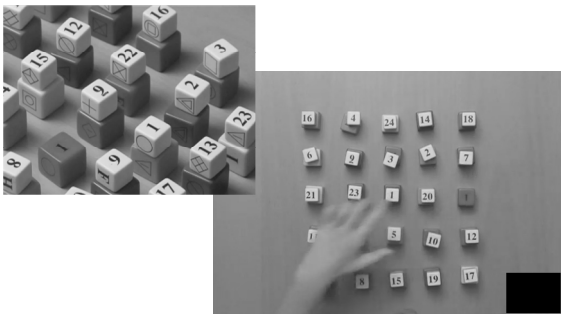
Multi-Matrix Game



http://www.youtube.com/watch?v=A1-2Vwas2_E

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Multi-Matrix Game

- Global Processing
- Central/Peripheral organization
- Bimanual integration and body awareness/extension
- 3-D pick-up and placement challenge
- Peripheral awareness
  - Figure/Ground
  - Visualize next number/shape/letter and find location in peripheral retina.
- Prime on the next *several* moves (4-D thinking and planning)
  - Visual-spatial memory and spatial organization
- Use **dots** to shift to **spatial thinking**/ pure visual processing
- Countless loading opportunities
  - #'s: Sums, differences;
  - Objects: visual memory; vestibular (card behind)

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Central-Peripheral Organization

- Puzzle Art 3-D

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Puzzle Art 3-D

- Trains figure/ground and central/peripheral concepts
- Use with or without 3-D glasses
- 3-D glasses create differential placement of color by *diffraction*
- Creates relative BI and BO of ***color***
  - Vectograms and anaglyphs create BI/BO of *form*
- Can work on pattern matching via **stereo-contour**, not just on color patterns and form

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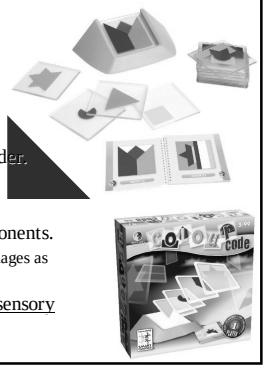
2-D Targets with 3-D Thinking

- Color Code
  - Utilizes Monocular Depth Cue: Occlusion
  - Given a flat image
  - Need to recreate the image using color plates in the appropriate order.
  - Trains patient to think in depth: Must tease apart a flat image into consecutively ordered components.
    - Teaches the mind to entertain flat images as separated in depth.
  - Tactile manipulation provides a sensory integration component.



Stimulate Simultaneous Processing: Supports Thinking in 4 Dimensions

- www.Lumosity.com
- Necessary to simultaneously process:
  - Center and periphery
  - Figure and ground
  - Part and whole
  - Spatial and sequential

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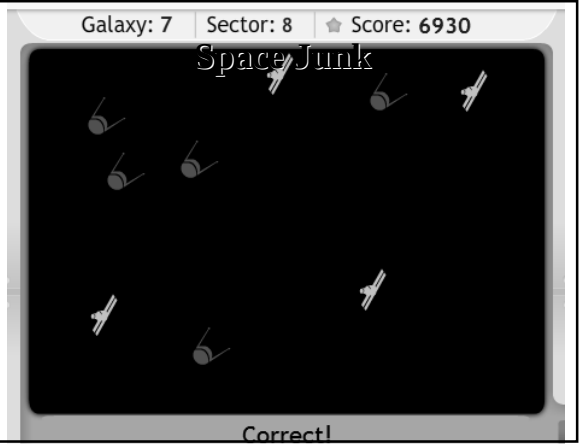

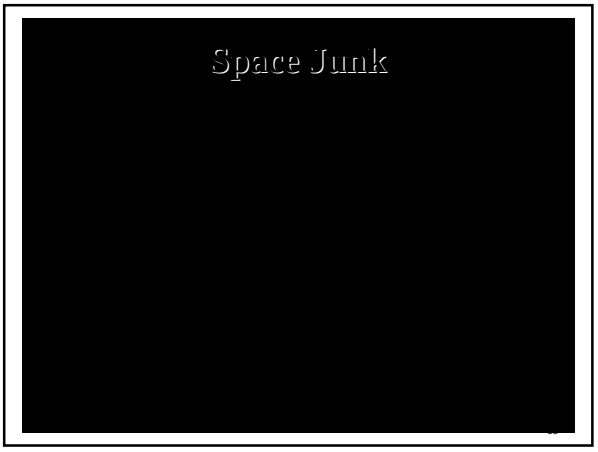

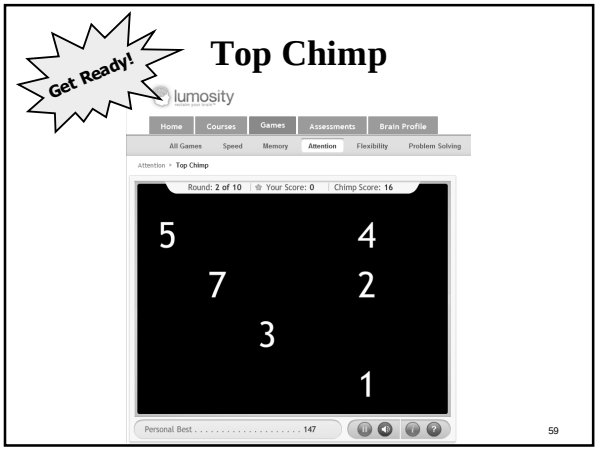

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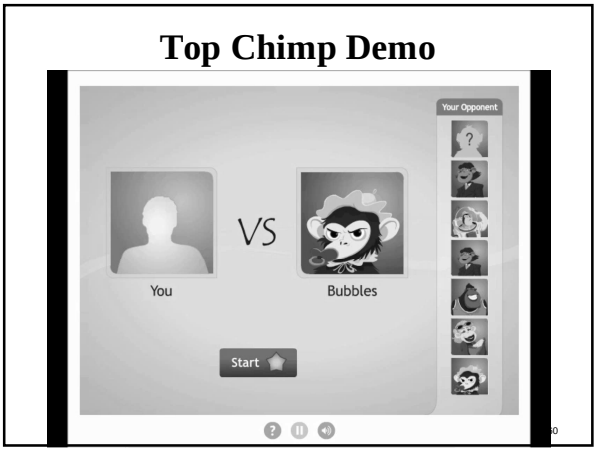
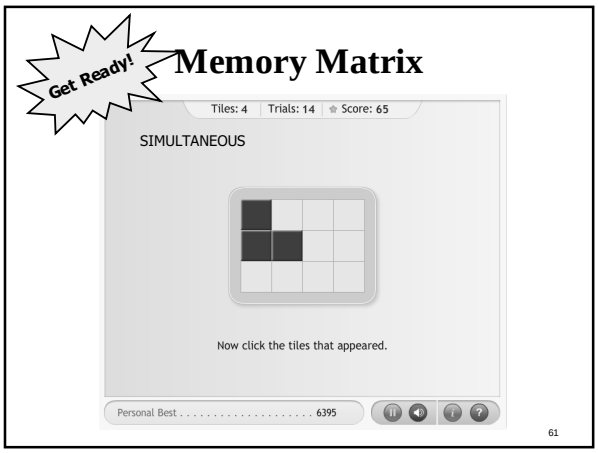
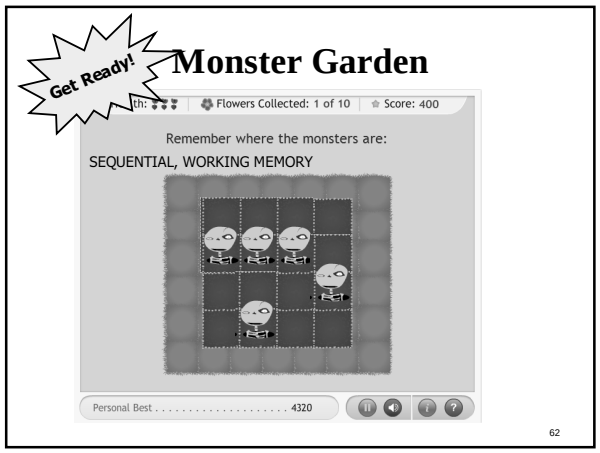
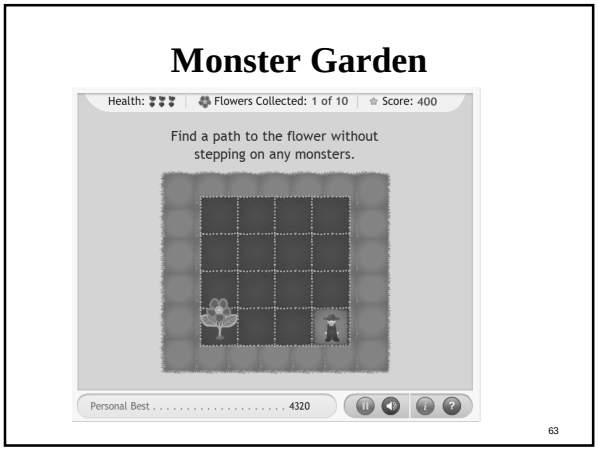
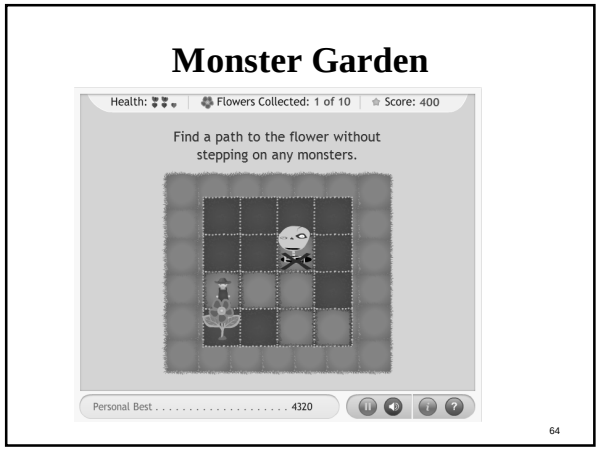
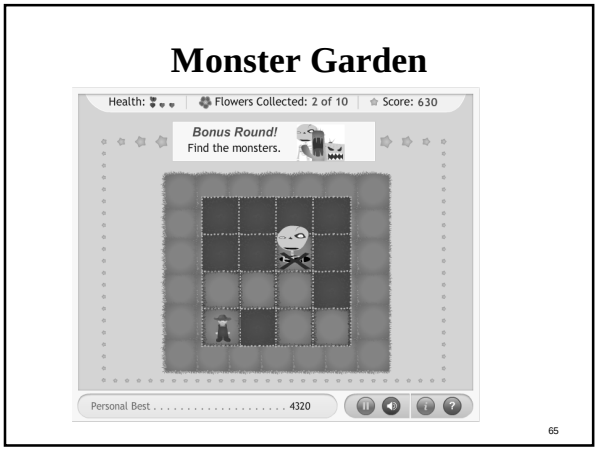


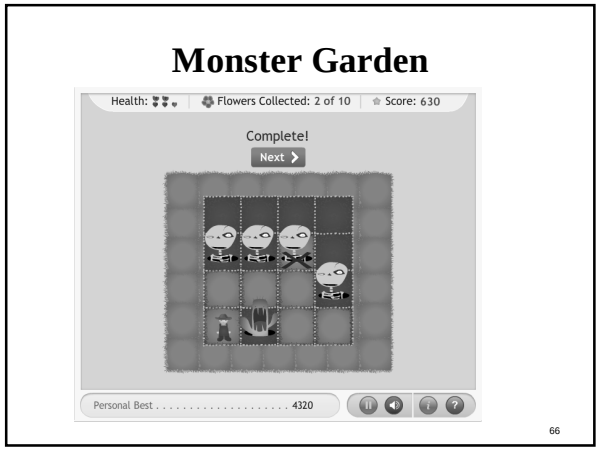

Get Ready!
Memory Matrix
Tiles: 4
Trials: 14
Score: 65
SIMULTANEOUS
Now click the tiles that appeared.
Personal Best 6395
61


Get Ready!
Monster Garden
Flowers Collected: 1 of 10
Score: 400
Remember where the monsters are:
SEQUENTIAL, WORKING MEMORY
Personal Best 4320
62


Monster Garden
Health:
Flowers Collected: 1 of 10
Score: 400
Find a path to the flower without stepping on any monsters.
Personal Best 4320
63


Monster Garden
Health:
Flowers Collected: 1 of 10
Score: 400
Find a path to the flower without stepping on any monsters.
Personal Best 4320
64


Monster Garden
Health:
Flowers Collected: 2 of 10
Score: 630
Bonus Round!
Find the monsters.
Personal Best 4320
65


Monster Garden
Health:
Flowers Collected: 2 of 10
Score: 630
Complete!
Next
Personal Best 4320
66

Monster Garden

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Summary

- The strabismic patient already has access to 4-Dimensional processing
- The goal of **perceptual therapy in strabismus** is to help **expand the 4-D construct** in the **space of the mind**
- Use top-down processing and discussion to help create the *potential* for 4-D spatial **thinking**
- **Goal**: **Visually-directed actions in a continuous, integrated space-world.**

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Summary

- Confirm and reinforce the **top-down scaffolding** with **4-dimensional bottom-up sensory experiences.**
- Use **monocular depth cues** to **reinforce** accuracy/ provide visual feedback on performance in binocular activities.
- Use **sensory integration** to marry other sensory experiences of depth with the ***visual*** sense of depth.
- Transfer depth appreciation from auditory, tactile and ocular proprioceptive senses to visual sense in **real space**.
- Build central-peripheral integration skills to **prepare the brain** for **simultaneous** and **stereoscopic processing** in all real-world arenas.

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Feedback Appreciated!

Thank you

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