

## 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

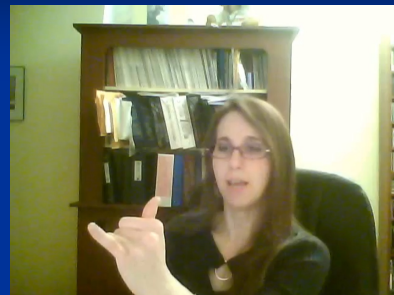
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### Thumb-Pinky Vergence Rock

- 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=J\\_ib\\_xVMs](http://www.youtube.com/watch?v=J_ib_xVMs)

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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

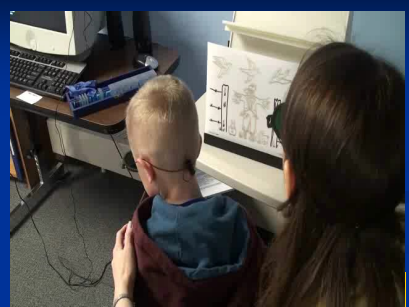


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### (R/G) Keystone Basic Binocular Series

- 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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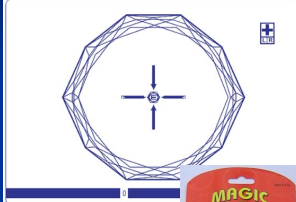
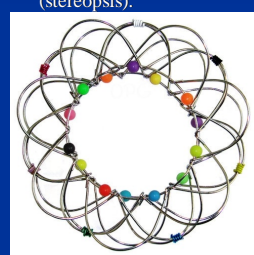
### Bilateral integration & Vision

- 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).



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### 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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### 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 2<sup>nd</sup> 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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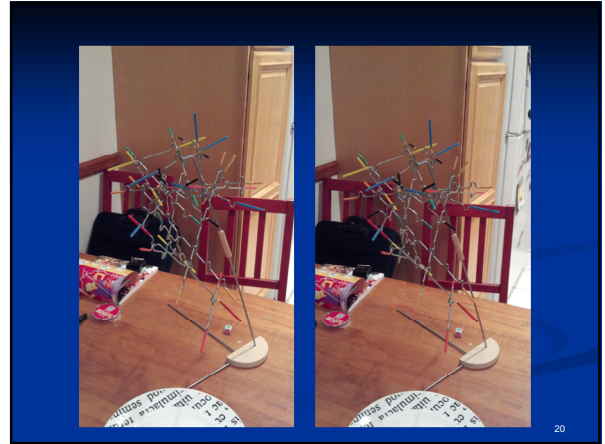
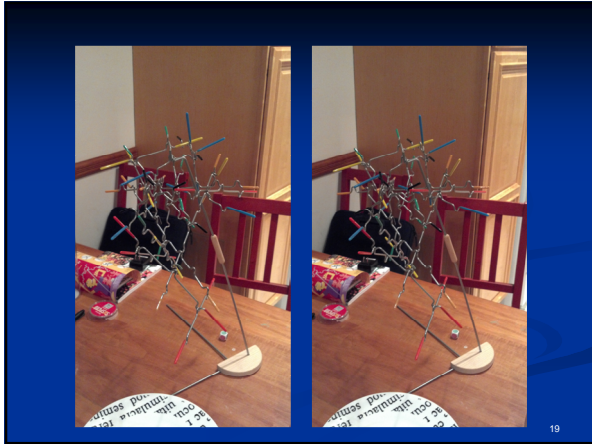
### Bonus Games and Activities

- 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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# The Optometrist's Guide: Supplement: VT Activities



Video demo,  
Using Suspend in VT:  
Part 1: [http://youtu.be/LqC2RL\\_Uejo](http://youtu.be/LqC2RL_Uejo) Part 2: <http://youtu.be/lbS7fVBj1VU>

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## Visually-guided Fine Motor Control: Buzz Game

## 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.

### Central-Peripheral Integration Activities

- Look Ready Touch Back (Schrock)
- Slotnick Scramble
- Eyeport (Lieberman)
- 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/ Accuvison 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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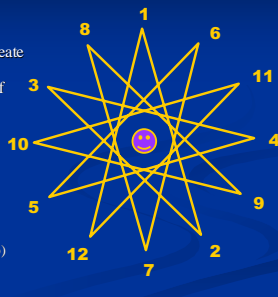
### Look Ready Touch Back

"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://oeof.org/sites/default/files/journals/jbo-volume-21-issue-3/21-3%20Slotnick.pdf>

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### Eyeport

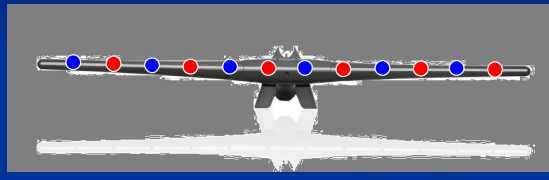



### Eyeport

- 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 coincidentally 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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VT Activities

**Eyeport – consecutive (Program 1)**

RET

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**Eyeport – consecutive (Program 1)**

RET

Viewing blue light with S

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**Eyeport – consecutive (Program 1)**

RET

Viewing next red light with D

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**Eyeport – consecutive (Program 1)**

RET

Viewing next blue light with S

Eyes track to left to fixate a target positioned to the right

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**Eyeport – consecutive (Program 1)**

RET

Viewing next blue light with S

Eyes track to left to fixate a target positioned to the right

Proprioceptive-cognitive mismatch

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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](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.

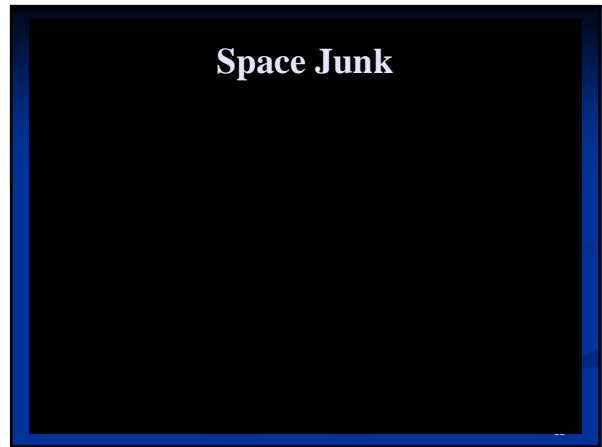
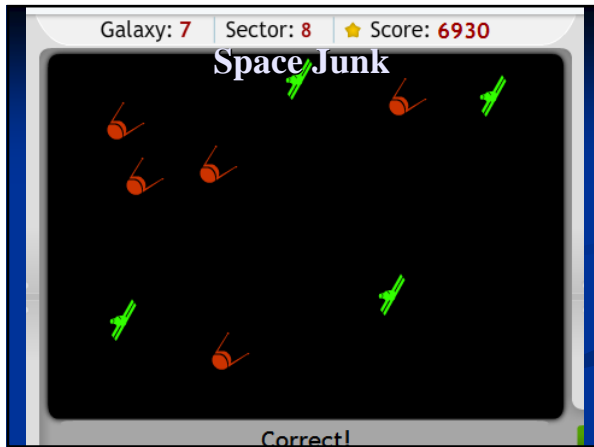
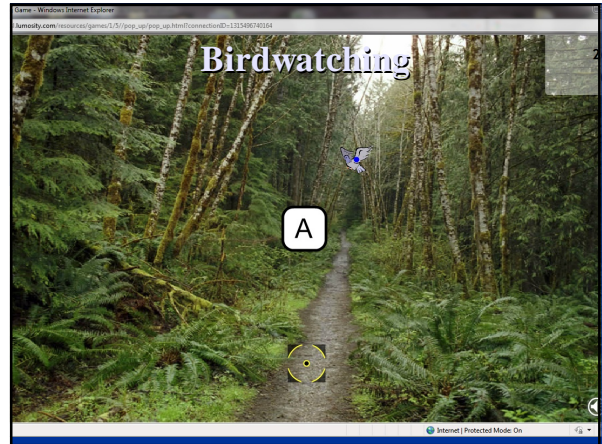


# The Optometrist's Guide: Supplement: VT Activities

## 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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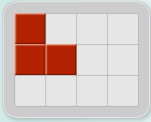


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**Get Ready!** **Memory Matrix**

Tiles: 4 | Trials: 14 | Score: 65

**SIMULTANEOUS**



Now click the tiles that appeared.

Personal Best: 6395

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**Get Ready!** **Monster Garden**

Health: 3/3 | Flowers Collected: 1 of 10 | Score: 400

Remember where the monsters are:

**SEQUENTIAL, REORGANIZING MEMORY**



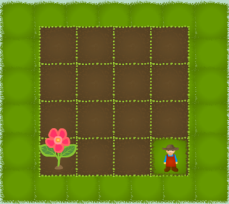
Personal Best: 4320

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**Monster Garden**

Health: 3/3 | 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: 3/3 | Flowers Collected: 1 of 10 | Score: 400

Find a path to the flower without stepping on any monsters.



Personal Best: 4320

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**Monster Garden**

Health: 3/3 | Flowers Collected: 2 of 10 | Score: 630

**Bonus Round!** Find the monsters.



Personal Best: 4320

65

**Monster Garden**

Health: 3/3 | Flowers Collected: 2 of 10 | Score: 630

Complete!

Next >



Personal Best: 4320

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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.**

## 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.

## Feedback Appreciated!

*Thank you*

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