Evaluation and Treatment of Visual Perceptual Dysfunction

“Say Eye”

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VISION AND ITS IMPORTANCE

- primary sensory system used to acquire info about the environment.
- the first system to alert us to danger/anticipatory.
- affects decision-making/planning for situations, social interactions, motor/postural control.
- conveys a significant amount of information in seconds and provides instant identification of objects.
- Speed of processing is critical for safe function in dynamic environments.
- One needs vision to PERCEIVE what is in the environment.
  (The visual perception of space, familiar objects, and familiar faces)
HOW VISUAL PERCEPTUAL PROCESSING IS ORGANIZED:

- Adaptation Through Vision
- Visual Cognition
- Visual Memory
- Pattern Recognition
- Scanning
- Attention = Alert and Attending
- Oculomotor Control
- Visual Fields
- Visual Acuity
HOW VISUAL PERCEPTUAL PROCESSING IS ORGANIZED

- Full visual/perceptual functioning enables us to adapt to the environment.
- All areas have to work together to function — if we disrupt lower levels, it will affect all above levels.
- This is why a visual field deficit, inattention/neglect, or oculomotor impairment affects visual perceptual function.
WHAT IS A VISUAL FIELD DEFICIT?

- most common visual deficit.
- most common type is a homonymous hemianopia.
- Homonymous hemianopia is a result of lesions that put pressure on the optic tract.
- Right Homonymous Hemianopia:
  is in the left nasal and right peripheral fields, and
- Left Homonymous Hemianopia:
  is in the right nasal and left peripheral fields.
WHAT IS A VISUAL FIELD DEFICIT?

Vision info travels by Optic nerves
To the Optic Chiasma:
  Info from nasal sides cross
  Info from temporal fields do not
Then Visual Info travels to the
  Lateral Geniculate Bodies
    (Relay Centers)
Then Visual Info travels to
  midbrain/thalamus
Then to the Visual Cortex:
  Occipital Lobes
Lesions in any of these areas:
  Homonymous Hemianopsia

Taken from Guide Dog Association Website
WHAT IS INATTENTION/NEGLECT?

- Neglect is a SEVERE form of inattention—so severe that it is almost always combined with a Visual Field Deficit.

Left Hemisphere directs attention to the Right extrapersonal space
--If this pathway is damaged=Right Visual Inattention
** NOT RIGHT NEGLECT!!
because the Right Hemisphere also attends to the Right.

NO SUCH THING AS A “TRUE” RIGHT NEGLECT UNLESS THERE HAS BEEN A PREVIOUS INFARCT/DEFICIT INVOLVING RIGHT VISUAL FIELDS
WHAT IS INATTENTION/NEGLECT?

- Right hemisphere directs attention to BOTH Right and Left extrapersonal space
  - Infarcts in Right Hemisphere may cause:
    - Left inattention (if infarct is less severe)
    - Right inattention
    - Left neglect: if infarct is very significant and wipes out the pathway completely to Left extrapersonal space

WHY LEFT NEGLECT?

No other part of the brain attends to Left extrapersonal space.
WHAT IS INATTENTION/NEGLIGENCE?

- The insult/lesion has to affect the cortex of the brain for inattention/neglect
  (not optic tracts as in Visual Field Deficit).
- R brain (usually) specializes in:
  spatial perception and memory
- L brain (usually) specializes in
  speech/language development
- The most common areas of infarct resulting in inattention/neglect are parietal and frontal lobes
  (which assist with development of attention).
EVALUATION: VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Visual Search Tests

**LOOK AT THE VISUAL SEARCH PATTERN—this is how you can tell if a patient has a:**

Visual Field Deficit vs. Inattention/Neglect

If a patient misses items on the left, DOES NOT mean that he/she has a left neglect—they may have a left Visual Field Deficit.

We MUST look at the visual search pattern.
How many large stars are there?
NORMAL SEARCH PATTERNS

HORIZONTAL LEFT TO RIGHT

HORIZONTAL RECTILINEAR

VERTICAL RECTILINEAR

VERTICAL TOP TO BOTTOM
**Copying:**

- Model: A clock.
- Patient's copy: A clock showing the time.
- House drawing.
- Flower drawing.

**Spontaneous drawing:**

- Face drawing.
  - A circle with numbers (1-12) around it.
<table>
<thead>
<tr>
<th>VISUAL FIELD DEFICIT</th>
<th>SEARCH PATTERN</th>
<th>DESIGN COPY</th>
<th>SCAN COURSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Abbreviated search pattern</td>
<td>Intact</td>
<td>First trial=errors Second trial= tell patient number of errors and they will increase score</td>
<td></td>
</tr>
<tr>
<td>B. Organized</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>C. Re-scanning</td>
<td></td>
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<td>D. Appropriate length of time</td>
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<tr>
<td>A. Disorganized</td>
<td>Impaired—leave out details (ex leave off petals, no #’s on left side of clock, longer petals on good side)</td>
<td>First trial=multiple errors</td>
<td>Second trial= little or no change</td>
</tr>
<tr>
<td>B. Reduced effort, little or no rescan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Quick performance</td>
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RESEARCH ADDRESSING VISUAL SEARCH PATTERNS


- 41 clients Who suffered a “first ever” right CVA were divided into a neglect group of 18 and a non neglect group of 23. The search pattern of these clients were compared to the search pattern of healthy controls (n=34). The search patterns were compared, and the results showed:

  - “Patients with visuospatial neglect showed a greater proportion of repeated readings of the same target, shorter search sequences, and more shifts between horizontal, vertical, and diagonal search.” “No statistically significant differences were found between the no-neglect group and the healthy controls”
RESEARCH ADDRESSING VISUAL SEARCH PATTERNS


• Purpose of the study was to compare the visual scanning patterns of neglect patients, right-hemisphere control participants, and healthy control participants in peripersonal and extrapersonal space.

• “Unsystemic search pattern that doesn’t imitate the strategic ‘reading’ pattern of healthy individuals” (pertaining to those with neglect)

• “The neglect group began reporting targets further to the right of the search field, made proportionally more and larger vertical shifts with fewer horizontal shift, smaller left-ward shifts and shorter search sequences in one plane before changing direction”
EVAL OF VISUAL PERCEPTUAL DYSFUNCTION

Other assessments include:

**Motor Free Visual Perceptual Test**
- Assesses visual reaction time
- Assesses visual discrimination, visual closure, figure ground, visual memory.
- If a patient has a Visual Field Deficit or Inattention/neglect, they will usually miss detail on either right or left visual field during this assessment.
VISUAL PERCEPTION

- MVPT Sample: “Which one is different?”

MVPT Available from:
- Therapro [www.theraproducts.com](http://www.theraproducts.com)
- Western Psychological Services [www.Portal.wpspublish.com](http://www.Portal.wpspublish.com)
“Look at the top figure, now find the one exactly like it below?”
MVPT SAMPLE (FORM CONSTANCY)

“Look at the top figure, now find it below”
MVPT SAMPLE (VISUAL MEMORY)

“Look at this one”
MVPT SAMPLE (VISUAL MEMORY)

“Now find it here”
MVPT SAMPLE (VISUAL CLOSURE)
VISUAL/PERCEPTUAL EVALUATION

Useful Field of View Test

http://www.visualawareness.com/Pages/C_tour.html
VISUAL/PERCEPTUAL EVALUATION

Stereo Optic

Tests:
Visual Acuity
Color Perception
Road sign recognition
Depth Perception
Peripheral Vision

3539 N. Kenton Avenue Chicago, IL 60641 email: sales@stereooptical.com
phone: 1.773.777.2869 or 1.800.344.9500
TRAILMAKING B TEST
DIVIDED ATTENTION TEST
Subjects who performed poorly on both the MVPT and the Trailmaking B tests were 22 times more likely to fail the on-road driving eval. The MVPT is one of the most significant predictors of driving capabilities.


New Test: Visual Inattention/Neglect

Baking Tray Test

- Place 16 1 inch cubes in a box in front of client with a large cookie sheet (75x100cm, approx 29.5”x40”)
- Instructions: “Place the cubes on the entire tray as if they were muffins to bake”
- Score cubes on left side vs right side (cubes in midline = .5 points for left and right)
- Left neglect = more cubes on right than left
New Test: Visual Inattention/Neglect

Baking Tray Test

Research Articles:
Appelros P(1), Karlsson GM, Thorwalls A, Tham K, Nydevik I.

Tham, Kerstin, Tegner, Richard.
Neuropsychological Rehabilitation, Volume 6, Number 1, 1 January 1996, pp. 19-26(8).
The baking tray task: a test of spatial neglect.
How can OT’s help?
NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Optokinetic Stimulation

- Watch left moving stimuli
- Or have the stimuli in the background while client works on a task

https://youtu.be/rKm04X-gd2I
https://youtu.be/TBTsHAbXqTI?list=PLvarjGxxcIWWnwRdR5k5_X5kuzxnkDZqZj
https://youtu.be/rAhYv6NdmLo
NEW TREATMENTS: VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Optokinetic Stimulation

Research demonstrates:

- Improved performance on neglect tests and auditory attention tests
- Increased awareness of neglect behaviors

NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Sensory Stimulation-
Neck Vibration

- Vibration to left (contralesional) posterior neck muscles during visual scanning tasks

NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Sensory Stimulation- Neck Vibration

To determine correct placement:

- In complete darkness
- Vibrate below occipital bone behind ear
- The ideal position was one which elicited a maximum illusion of horizontal rightward displacement of red laser light
- Use the flat 2cm diameter head of mini vibrator
NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Sensory Stimulation- Neck Vibration

Research demonstrates:
Improved performance on cancellation tests, retained for a year
Neck vibration for 5 minutes before OT, reduced neglect, but was not retained.
Therefore: use vibration during OT while doing visual scanning tasks
NEW TREATMENTS: VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Limb Activation

- Have client do movements in left space with left limb
- Can be with scanning activities
- Can be with e-stim to assist movement of arm
- Do NOT use the right arm at the same time or it eliminates the effect
NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Limb Activation

Research demonstrates:
- Using the left arm in a task can reduce left neglect on that task
- Some research indicates decrease in neglect, others show no effect
NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Limb Activation Research:


NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Prisms on Glasses

- Horizontally displaced prisms to move vision to the left
- Use with reaching tasks to have error correction
- Improves gradual realignment of visual sensorimotor system
- Can purchase clip on prisms for glasses
- Can purchase stick on prisms for glasses
- Neuro Ophthalmologist to make custom glasses with prisms
NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT
NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Prisms on Glasses

Research Demonstrates:
• Positive effects, even after intervention has ended
• Best with training sessions such as with OT
  Need attention to the left in tasks, otherwise no effect
NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Prisms on Glasses Research:


NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Mirror Box

Patients perform movements of the unimpaired limb while watching its mirror reflection superimposed over the unseen impaired limb, thus creating a visual illusion of enhanced movement capability of the impaired limb.
NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Mirror Therapy Research

• Results: Mirror Therapy patients improved significantly more than control group in sensory and hemineglect scores

• Mirror Therapy promotes recovery from severe hemiparesis: a randomized controlled trial.

NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Eye Patching

- Block Visual input from right
- Facilitates attention to left
- Use with visual scanning tasks
NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Eye Patching Research Review

Right eye only patching: mixed results
Right Hemifield Patching:
- Most effective with other Rehab techniques
- More effective than just using our other treatment techniques
NEW TREATMENTS:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLIGENCE

Eye Patching Research


TREATMENT:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Wayne Saccadic Fixator
"Circle of Lights":
• Visual Search training
• Rapid eye-hand coordination
• Visual Spatial integration
• Visual Reaction time
TREATMENT:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Use of iPad

- Visual Attention Lite
  (free application illustrating Visual Attention TherAppy)
- “Tap the Frog”
- “Bug Smasher”
- Mazes
- Word Search
- Card Games/Solitaire
- MANY MORE!!
TREATMENT:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Educate patient/family to increase awareness of Compensatory techniques

- scanning pattern with normal search patterns
- Anchoring techniques
- visual and motor activities
- conscious attention to detail  ex. Cards, dominos, crafts
- Incorporate into ADL’s
TREATMENT:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Activities to Retrain and Reinforce Scanning Patterns

- Solitaire and double solitaire
- Concentration with Playing Cards
- Matching games with 2 decks of playing cards
- Needlepoint or Latchet Hook
- Dominoes, Lotto, Triominoes, etc
- Search and Find/Where’s Waldo
- Drawing tasks using a ruler
- Video games with moving targets
- Cutting activities with scissors
- Scrabble
- Connect Four
- Weaving
- Puzzles
- Crossword Puzzles
- Tracing Exercises
- Pinball game
- Balloon batting
- Tic Tac Toe
- Word searches
TREATMENT:

VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

- Scan course—look for brightly colored functional objects placed around the room. Encourage pt to shift their gaze from R to L.
- Locate room numbers in hallway, or pictures on wall, etc.
- Kitchen: find all appliances, open cupboards and find requested items.
- Find bathroom. Provide brightly colored visual cues.
- Find clothing for the day—they will have to locate dresser drawers on both R and L side. You may start with drawers being labeled.
- Shopping—find requested item
- Brightly colored hula hoops on floor—throw bean bags into center of hula hoop on L, than R
- THE LIST GOES ON ☺ Any other ideas?
TREATMENT:
VISUAL FIELD DEFICIT AND INATTENTION/NEGLECT

Environment Centered Approach for Low Potential Rehab Patient

- Modify the environment: Reduce background pattern, increase illumination, increase background contrast
- If patient is unable to learn compensation techniques: Don’t place objects on the left - that limits function as objects disappear to the patient.
- Place objects on the right in their field of vision: -increases function/brain performance -patient can engage in the activity, which allows for building of synaptic connections.
DIPLOPIA
DIPLOPIA

Subjective complaint of seeing 2 images instead of one - often referred to as double-vision

Can be:
- side by side
- one on top of the other
- slanted
- 1 eye or both eyes
- Quadrants? R/L, top/bottom
- Head position may make it worse
Functional Implications of Diplopia

1. ADL’s can become more difficult/dysmetria
2. Reading can become slowed
3. Headaches are common
4. Mobility/balance can be affected

Everything will take more effort & really exhaust a person.

We cannot make diplopia go away.

We can help the person MANAGE Diplopia in order to complete ADL’s more efficiently.
TREATMENT OF DIPLOPIA

- 90% of cases of diplopia clear up in about 6 months.
- If a patient closes one eye, and the diplopia disappears, or is reduced, then occlusion procedures will be helpful.
- If a patient closes one eye during periods of diplopia, and the diplopia is still present, this patient will need to be referred to their eye care professional.

Evaluate for dominant eye:
- Roll of paper to look through
- Hole in a piece of paper
TREATMENT OF DIPLOPIA

2 methods to help manage the symptoms of diplopia:
- Total Occlusion
- Partial Occlusion

These procedures help MANAGE the symptoms of diplopia—they do not help increase the rate of healing/brain recovery.
TREATMENT OF DIPLOPIA

TOTAL OCCLUSION-Blocks visual image to one eye.

- A patch, clip on occluder, or opaque tape is used to block visual input to one eye.
- Alternate between eyes Every 1-2 hours to increase comfort decrease weakening of eye muscles
- Not recommended as strongly as partial occlusion.
TREATMENT OF DIPLOPIA

PARTIAL OCCLUSION

Opaque material (tape) is applied to a portion of the lens to block visual stimulation.

Do not tape over the pupil of the eye.

Occlude the central visual field - nasal portion: where patients are generally most bothered by diplopia

Do not block Peripheral vision:

leave intact for orientation of space and balance.
TREATMENT OF DIPLOPIA

Partial Occlusion

- Do on the of the non dominant eye
- The amount of tape applied to the lens depends on what is effective for the patient
- The amount of tape may be reduced as diplopia decreases, down to spot occlusion
TREATMENT OF DIPLOPIA

- Eye AROM exercises are to be performed daily to strengthen the eyes:
  - Eye tracking
  - Convergence
  - Saccades
TREATMENT OF DIPLOPIA

Prism Eye Glasses

- Help eyes to work together
- The prism shifts the image slightly
QUESTIONS ARE WELCOME!!

THANKS FOR ATTENDING!!