Visual Information Processing: A Hands on Approach
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Paul A. Harris, OD, FCVO, FACBO, FAAO
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Who Are We?
• Marc B. Taub OD, MS, FAAO, FCVO
  – PCO 2001, NOVA Residency in Pediatrics
  – SCO Chief of the Vision Therapy and Rehabilitation Service
  – Editor-in-Chief, Optometry & Visual Performance
• Paul A. Harris, OD, FCVO, FACBO, FAAO
  – SUNY 1979
  – Private Practice-Baltimore, MD
  – President, Optometric Extension Program
• Karen Kehbein, OD,
  – IU 2009, SCO Pediatric/Vision Therapy Residency
  – Instructor of Record-Pediatric Optometry Course

Where Do We Work?
• Southern College of Optometry
• Founded in 1922 in Memphis
• Four year program
• 500 students
• 7 residents
• 55 faculty
• Over 70,000 unique patient experiences per year
• Over 2,500 patient encounters per student

“The eyes do not tell people what they see, the brain tells the eyes what to look for.”
-Larry MacDonald, OD

Vision Is More Than Seeing 20/20

Vision is a Learned Process
• Definition of Learning—Webster’s dictionary: to acquire knowledge or skill
• “Vision is the process of interpreting what is seen, of gaining meaning and of understanding and integrating what has been seen with the information that is also received through touch, hearing and even taste and smell.”
  »Gerry Getman OD
Visual Perception/ Visual Information Processing

- **Perception**
  - an **ACTIVE** process of locating and extracting information from the environment.
- **Learning**
  - the process of acquiring information through experience and storing the information.
- **Thinking**
  - the process of manipulating the acquired information to solve problems.

Models of Visual Perceptual and Learning Development

- **Perceptual-Motor Theory**
  - Kephart Model
- **The Basic Sequence of Development**
  - G. N. Getman, O.D.
- **Skeffington’s Model of Vision**
- **Visual Information Processing Model**
  - Eric Borsting, O.D.

Perceptual-Motor Theory

- **Motor activity is the basis for the development of perception.**
  - The central core of Kephart's theory is that motoric responses to a child's environment is the central core to all behavior.
- **Perceptual-Motor match**
  - It relates to the discovery by the child that certain movements can affect his/her surroundings in a predictable way.
  - Certain movements, then, are learned and planned by the child for a particular purpose.

The Basic Sequence of Development

- Getman believed in a learning process of perceptual skills, like Kephart, but it differed in some fundamental ways.
  - 1. Vision perception is the supreme skill for mastering complex concepts.
  - 2. These perceptual skills gradually develop from actual contact and motor learning.
- **The development of learning follow a sequence in the pre-school years.**
- Getman's theories are more visually oriented than Kephart's.

Skeffington’s Model of Vision

- **Visual-Spatial Skills**
- **Visual-Analysis Skills**
- **Visual-Motor Integration Skills**
- **Auditory-Visual Integration Skills**
Signs and Symptoms of Visual Spatial Skill Deficiency

- Delayed development of gross motor skills
- Decreased
  - coordination
  - balance
  - ball playing skills
- Confusion of right and left
- Letter reversal errors when writing and/or reading
- Inconsistent dominant handedness
- Difficulty in tasks requiring crossing of midline
- Poor spacing between letters and words when printing or handwriting

Auditory-Visual Integration Deficits: Signs and Symptoms

- Difficulty with sound-symbol associations
- Difficulty learning to read phonoetically
- Poor spelling ability
- Slow reading

Visual-Motor Integration Signs and Symptoms

- Difficulty copying from the board
- Sloppy drawing or writing skills
- Poor spacing and inability to stay on lines
- Erases excessively
- Can respond orally but not produce answers in writing
- Difficulty completing written assignments in allotted period of time
- Difficulty writing numbers in columns for math problems

Stations

- Station 1-Dr. Paul Harris
  - Developmental Test of Visual Perception-2
  - Form boards
  - Groffman Tracing
  - Motor Free Perceptual Test III (MVFT-III)
  - Test of Visual Perceptual Skills (TVPS)

- Station 2-Dr. Karen Kehbein
  - Auditory-Visual Integration Test (Birch Belmont)
  - Rapid Automated Naming and Rapid Alternating Stimulus Tests (BAN/RAS)
  - Developmental Eye Movement Test (DEMT)
  - Peabody Picture Vocabulary
  - Visual-Aural Digit Span Test (VADS)

- Station 3-Dr. Marc Taub
  - Finger Left Right
  - Jordan Left Right
  - Gardner Left Right
  - Wold Sentence Copy Test
  - Beery Buktenka Test of Visual Motor Integration (VMI)

Thank You

Any questions?

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Southern College of Optometry
Memphis, Tennessee
• Developmental Eye Movement Test (DEM)
  o Visual verbal format to test saccades
  o Determines possible problem with saccades
  o Additionally looks at Rapid Automated Naming (RAN)
  o Patient asked to call off a series of numbers as quickly as possible
    ▪ 2 vertical tests
    ▪ 1 horizontal test
  o Not allowed to use finger or ruler as a guide
  o Time to complete each test is recorded as well as the errors
  o Compare the horizontal and vertical scores
  o Four possible outcomes:
    ▪ Normal vertical and horizontal
    ▪ Slow vertical and horizontal
      • Decreased RAN
    ▪ Normal vertical; slow to very slow horizontal
      • Classic saccadic dysfunction
    ▪ Slow vertical; normal horizontal
      • Paradoxical

• Developmental Test of Visual-Motor Integration (BEERY-VMI)
  o VIPA test
  o Good normative data and scoring criteria
  o Used by professionals outside of optometry
  o 24 shapes with increasing difficulty are copied
    ▪ Stop after 3 consecutive errors
    ▪ If not sure wrong, keep going
    ▪ No erasing
    ▪ Never say “draw”, instead say “make one like this”
  o Kids 2-3 years old asked to copy scribbles
  o Scoring is very complex and detailed
• **Developmental Test of Visual Perception (DTVP-2)**
  - Revised version of Frostig with better norms and reliability
  - Ages 4-11
  - 8 subtests: Eye-Hand Coordination, Copying, Spatial Relations, Position in Space, Figure-Ground, Visual Closure, Visual-Motor Speed, and Form Constancy
  - Eye-Hand Coordination subtest
    - Three forms are completed
    - Straight line—Line pattern—Large Oval
    - Scoring is based on distance from the center of the line
    - Segments within each to see how far kid was off in the various sections

• **Form Boards**
  - Three boards; 3 piece, 6 piece and 12 piece
    - Watch for visually guided behavior
    - Watch for use of hands: lead-support (pick up with non-dominant hand and place the piece with the dominant hands).
    - Capable of handling the pieces with the diagonals.

• **Jordan Left-Right Reversal Test**
  - Three Components:
    - Part I-Ages 5-12 years of age
      - Child recognizes correctly orientated and reversed letters and numbers.
    - Part II-Ages 9-12
      - Part IIA= Child recognizes reversed letter in a word.
      - Part IIB=Child recognizes reversed word in a sentence.
    - No Time Limit.
    - Erasing and changing mistakes are allowed.
    - Some of the lines will have more than one answer and other lines will have no reversals.
• **Gardner Reversal Frequency Test**
  
  o Quick and easy, standardized on normal and learning disabled children.
  o Three parts
    • **Execution**
    • tests child’s ability to write numbers and letters that are dictated/called out.
    • **Recognition**
    • tests child’s ability to retrieve an internal visual picture of letters and numbers which are written backwards (reversed)
    • **Matching**
    • tests child’s ability to discriminate a given letter or number presented from four similar choices
  o There is no time limit
  o Mean, ranges, percentile ranks and standard deviations are provided.
  o Ages: part 1-14yo, part 2-14yo, part 3-8yo

• **Groffman Visual Tracing**
  
  o Ages 7 and up
  o A single page with five intertwined lines that are to be followed with the eyes only.
  The following areas are tested.
    • Figure-ground
    • Visual attention
    • Visual concentration
  o Has two forms of equal difficulty and can be used to see how lenses affect visual performance.
  o Amount of head vs. eye movement is a key factor to observe.

• **Motor Free Perceptual Test-III (MVPT – III)**
  
  o Ages 4 to 95 years old and above
A single raw score is obtained which can be converted to a standard score, percentile rank or age equivalent

- Spatial Relationships
- Visual Discrimination
- Figure-Ground
- Visual Closure
- Visual Memory

**Piaget Right-Left Awareness Test**

- Performed in free-space
- Norms are age-based (ages 5-11)
- Five sections done in increasing difficulty
- Patient must pass all parts of each Subset/Section to pass a section
  - Section 1: Patient shows right/left on their body
  - Section 2: Patient shows right/left on doctor’s body
  - Section 3: Patient shows which is right/left with two objects
  - Section 4: Patient shows which is right/left with two objects on the doctor
  - Section 5: Patient shows right/left with three objects

**Peabody Picture Vocabulary Test (PPVT)**

- Receptive vocabulary test
  - Tests if the patient understands the language
- Examiner says the word
- Patient points to the picture from 4 options that matches the meaning of word
  - Does not require a spoken response
- Can be used for ages 2 years 6 months through adulthood

**Rapid Automatized Naming and Rapid Alternating Stimulus Tests (RAN/RAS)**

- Measures naming speed
  - Ability to perceive a visual symbol and verbally name it
• Looks at accuracy and speed of naming
  o 6 subtests:
    ▪ RAN Objects
    ▪ RAN Colors
    ▪ RAN Numbers
    ▪ RAN Letters
    ▪ RAS 2-set
    ▪ RAS 3-set
  o Patient looks at visual presentation of different objects and has to quickly and accurately name them in order
  o Used for ages 5 yo to 18 years 11 months

• Sentence Copy Test (Wold)
  o Helpful for evaluating spatial organization/handwriting/spacing
  o Do kids really see the whole word or are they copying letter by letter?
  o Standardized test graded on number of symbols completed in 60 sec.
  o Subjective interpretation should be noted
    ▪ Spacing of words and letters
    ▪ Completing words on the given line
    ▪ Letter development
    ▪ Were all words actually copied in the correct order

• Test of Visual Perceptual Skills (TVPS)
  o Ages 4-0 to 18-0 years old.
  o No time limit to answer questions.
  o Each subset can be scored individually or as a whole test
    ▪ Visual Discrimination
    ▪ Visual Memory
    ▪ Visual Spatial Relationships
    ▪ Visual Form Constancy
    ▪ Visual Sequential Memory
- Visual Figure-Ground
- Visual Closure
  - Recognition Test/ Multiple Choice Test
  - You must say instruction set verbatim!
  - Stop test when:
    - If four answer choices= 3 out of 4 consecutive answers wrong
    - If five answer choices=4 out of 5 consecutive answers wrong

**• Visual-Auditory Integration (Birch-Belmont)**
  - Ability to integrate an auditory sequential pattern with a visual counterpart
  - Patterns are tapped out away from the person so that they hear the pattern
  - The visual representation is chosen from a selection of dot patterns.
  - First 10 patterns used for ages 6-9 yo
    - All 20 patterns used for patients above 9 yo

**• Visual-Aural Digit Span**
  - Assess ability to recall information
    - Number sequences on an index card presented aurally or visually
  - 4 parts of the test:
    - Aural presentation, oral recall
    - Visual presentation, oral recall
    - Aural presentation, written recall
    - Visual presentation, written recall
  - Can isolate problem areas with input (aural or visual) and recall (oral or written)
  - Useful for ages 5 years 6 months to 10 years old
NOTE: During your education a series of “performance tests” are presented. It is too much to expect that all tests will or should be run on all patients. Several tests which are considered core tests are presented, which typically are done most of the time on nearly all patients suspected of having LRVP’s. It is felt that one should have all of these tests in one’s arsenal, but that the majority of these tests will be kept in reserve and used when specific behaviors are observed during the rest of the testing or based on things that are brought up in the case history. In order to feel comfortable with each of the non-core tests, it is recommended that they be done at some point in time on 50 consecutive cases to gain experience with the testing instrument and on the types of observations you will be making during that test. After a particular testing instrument has become a part of your arsenal, then use the following guide to help in deciding when to bring that test into use. It is also recognized that the following is a small subset of all of the possible tests that could be used to gain insight into visual performance and visual development. When equivalences have been found, substitutions for portions of tests listed here or for entire tests are encouraged. If substitutions are made, it may be more difficult to perform a comprehensive case consult if the instructor is not familiar with the test instruments you have used.

<table>
<thead>
<tr>
<th>Performance Test</th>
<th>Visual Abilities Probed</th>
<th>When Done: Triggering Observations</th>
<th>Benefits/Pros</th>
<th>Limitations/Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYSOA King-Devick Saccadic Test</td>
<td>Eye movements for reading, Left-right top-down sequencing,</td>
<td><strong>Core Test</strong>&lt;br&gt;Age 5.5 and up with some type of</td>
<td>Very fast&lt;br&gt;Easy to grade&lt;br&gt;Norms from age 6-14&lt;br&gt;Easy to relate to public&lt;br&gt;Can give in a tiered fashion (can stop as soon as difficulties have been identified)</td>
<td>Must know number names.&lt;br&gt;Must be verbal.</td>
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<td></td>
<td>Rapid automated naming</td>
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<tr>
<td>Groffman Visual Tracing Test</td>
<td>Sustained visual attention Visual concentration Figure-ground</td>
<td><strong>Core Test</strong>&lt;br&gt;Age 5.5 and up with some type of</td>
<td>Easy to administer, grade and relate to the public. 2 forms are available allowing testing with and without lenses with the ability to compare scores directly.</td>
<td>Child can go into overload on this test. This is diagnostic but must be ready to stop if they move into “flight”. Less useful for patients who score below age 7 or above age 12.</td>
</tr>
<tr>
<td>Test Original</td>
<td>Visual tracking Eye movements for handwriting</td>
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</tr>
<tr>
<td>Groffman Visual Tracing Test</td>
<td>Sustained visual attention Visual concentration Figure-ground</td>
<td><strong>If you cannot obtain the original use this test.</strong>&lt;br&gt;Age 5.0 and up with some type of complaint related to school or reading performance. Handwriting problems Visual attention problems ADD/ADHD in history</td>
<td>Easy to administer, grade and relate to the public.</td>
<td>This version has only one form not allowing immediate comparisons from the “with” to “without” glasses conditions. NOTE: due to variable length lines you cannot use the same test form but track a different line on each form. Too many separate pages to shuffle through.</td>
</tr>
<tr>
<td>Test New</td>
<td>Visual tracking Eye movements for handwriting</td>
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<tr>
<td>Wold Sentence Copy Test</td>
<td>Copying skills Pencil grip/writing posture observation</td>
<td><strong>Core Test</strong>&lt;br&gt;Age 6.5 and up with some type of</td>
<td>Can be stopped at any time. Allows for the observation of many aspects of visual</td>
<td>Can go on for a long time if some children are made to finish the entire</td>
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<tr>
<td></td>
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<td>complaint related to school or reading</td>
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<tr>
<td>Test</td>
<td>Description</td>
<td>Benefits</td>
<td>Notes</td>
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<tr>
<td><strong>Developmental Eye Movements (DEM)</strong></td>
<td>Eye movements for reading, Left-right top-down sequencing, Rapid automated naming</td>
<td>Recommended later in a VT-2 program in cases where most things seem to be improving but the times on the NYSOA KD Test remain slow and there appears to be some difficulty in oral reading.</td>
<td>Takes longer to do than the NYSOA KD test. Requires some calculations to be done to derive scores. Entire test must be completed to yield scores, therefore is fairly time consuming.</td>
<td></td>
</tr>
<tr>
<td><strong>Developmental Test of Visual Perception II Eye-Hand Coordination Subtest</strong></td>
<td>Eye-hand coordination Sustained visual attention Vigilance</td>
<td>Whenever handwriting or copying from the blackboard is mentioned in the history as a problem.</td>
<td>Takes too long to grade the test.</td>
<td></td>
</tr>
<tr>
<td><strong>Motor Free Visual Perception Test Original MVPT</strong></td>
<td>Visual perception Visual problem solving Figure-ground Visual memory Visual completions</td>
<td>Any question of academic placement or when asked for recommendations on academic placement for a young child: age 4.0 – 9.0. Used in cases when all else looks poor but you want to see to what degree the lights on inside. Very good test for head injured patients and some non-verbal patients</td>
<td>In some cases takes a long time. In some cases they go into visual overload in some areas. Have to watch for impulsivity and may have to modify testing protocols to determine if they can solve the problems in the test.</td>
<td></td>
</tr>
<tr>
<td><strong>Motor Free Visual Perception Test MVPT-III</strong></td>
<td>Same as above</td>
<td>Same as above with a wider age range: to age 18.</td>
<td>Extra time to do the new plates.</td>
<td></td>
</tr>
<tr>
<td><strong>Jordan Left Right Reversal Test Original</strong></td>
<td>Laterality Directionality Reversals</td>
<td>Whenever the complaint of reversals, doesn’t know left from right, has trouble giving/following direction, is part of the history. Any observation during the testing of not knowing left from right. Do if the child is 5.5 or older.</td>
<td>The test norms go only to age 12. Part 3 has been criticized heavily as possibly not really testing what it purports to test.</td>
<td></td>
</tr>
<tr>
<td><strong>Jordan Left Right Reversal Test 1990 Edition</strong></td>
<td>Same as above</td>
<td>Same as above</td>
<td>Same as above. However, this has many more test items on part 1. It now</td>
<td></td>
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<tr>
<td>Test Description</td>
<td>Subtests</td>
<td>Description</td>
<td>Benefits</td>
<td>Limitations</td>
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<tr>
<td>Piaget Left Right Test</td>
<td>Laterality, Directionality</td>
<td>Whenever the complaint of reversals, doesn’t know left from right, has trouble giving/following direction, is part of the history. Any observation during the testing of not knowing left from right. Useful if the patient does not know their letters or numbers yet or if they did very poorly on the Jordan Left Right Reversal test and you want to find what level they are at.</td>
<td>Quick and easy to perform</td>
<td>Norms give rather wide ranges with levels of certainty. It would be nice to have a tighter set of norms.</td>
</tr>
<tr>
<td>Daugherty Oral Copy Test – Articulation</td>
<td>Auditory Articulation</td>
<td>Done when the parents seem unaware of any speech problem but the patient does not speak clearly</td>
<td>Easy to do</td>
<td>Takes very little time</td>
</tr>
<tr>
<td>Daugherty Oral Copy Test – Short term memory</td>
<td>Short term auditory memory</td>
<td>Done when the parents seem unaware of any speech problem but the patient does not speak clearly or when there has been difficulty with the child following oral directions</td>
<td>Easy to do</td>
<td>Takes very little time</td>
</tr>
<tr>
<td>MKM</td>
<td>High level binocularity, Rapid word recognition, Left-right top-down sequencing</td>
<td>Used if a binocular effect on reading is a concern.</td>
<td>Easy to sell the public on what a binocular problem can cause</td>
<td>May have similar results after VT in spite of making huge behavioral changes. Makes test-retest a bit dicey.</td>
</tr>
<tr>
<td>Beery Developmental Test of Visual-Motor Integration (VMI)</td>
<td>Visual perception, Spatial organization, Eye-hand coordination</td>
<td>Used if Wold is not used and good for lower level performers on paper and pencil tasks.</td>
<td>Tightly standardized data and useful to communicate with OT’s and educators.</td>
<td>Difficult to communicate to the public interpretation of results. Takes a long time to do. Difficult to factor out the degree to which a problem with manipulating a writing implement might be causing the difficulty.</td>
</tr>
<tr>
<td>Wachs Inventory of Piaget’s Developmental Tasks</td>
<td>Visual perception problems, Visual thinking, Problem solving</td>
<td>Used with older patients and/or TBI/ABI patients later in therapy if their progress appears to be stuck in some areas of visual thinking and visual problem solving.</td>
<td>Helps to plan specific vision therapy activities to remediate the issues identified.</td>
<td>Takes a long time to perform the test.</td>
</tr>
<tr>
<td>Copy Forms</td>
<td>Visual perception, Spatial organization, Eye-hand coordination</td>
<td>Not currently used</td>
<td>Has been used as a tool help to assess school readiness.</td>
<td>Difficult to communicate to the public interpretation of results. Takes a long time.</td>
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<tr>
<td>Test Name</td>
<td>Description</td>
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<tr>
<td>Monroe – Visual Three Memory Test*</td>
<td>Short term visual memory</td>
<td>In cases where spelling has specifically been mentioned as a problem area. Is easy to perform and does not take long to do. Must ask the person how they attempted to perform the test. The score is not a direct score of Visual Memory but a test score. The might have used alternate strategies!</td>
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<tr>
<td>Gates Oral Reading Diagnostic Test*</td>
<td>Oral reading without comprehension. “Barking at print” Decoding strategies Top-down or bottom-up reading style</td>
<td>Done when reading has been indicated as a problem area for the patient to determine the type of reading style and to see to what degree a reading specialist might need to be involved with the patient. Is easy to perform and derive a grade level. 2 forms are available allowing one to be done with lenses and the other without for comparison. May frustrate a very poor reader. Takes a long time to complete with a very good reader.</td>
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<tr>
<td>Spelling Survey*</td>
<td>Spelling ability and style</td>
<td>Done when spelling has specifically been mentioned on the questionnaire or in the history. Is easy to perform and quick to administer. Since score is usually 3 months lower than the Oral Reading score it gives an added level of certainty to the scores on that test.</td>
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<tr>
<td>ReadAlyzer/Visagraph</td>
<td>Visual mechanics for reading; fixations, regressions, average duration of fixation, reading speed</td>
<td><strong>Core Test</strong> Used when there are any complaints about reading and the patient reads at least at a 3rd grade level or higher. Used with many head injured patients as well. Powerful sales tool. Gives finely graded performance statistics from which goals for treatment can be set. Good for before and after measures. Device is self-calibrating and does the analysis itself. Report graphs are easy to understand. Must be done correctly. Some aspects of the test have been built up to be more than the device is actually capable of measuring. Be careful to not get drawn into these overly high levels of complication.</td>
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<tr>
<td>Birch-Belmont Test of Auditory-Visual Integration</td>
<td>Visual symbol – sound pattern matching</td>
<td>Used if the vertical DEM score is well below expected or there are spelling problems in the history. When there are problems with spelling and there are speech and language issues. It is done to see to what degree there could be crossover problems between the two major systems. Difficult to administer properly without computerized version. Hard to relate to the public exactly what is going on and what the results mean.</td>
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<tr>
<td>TVPS non motor original and adult versions – Gardner</td>
<td>Visual discrimination Visual form constancy Visual spatial relations</td>
<td>Any question of academic placement or when asked for recommendations on academic placement for a young Used by OT’s and educator’s facilitating communication with them. Takes a long time to administer and is complicated to score.</td>
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<tr>
<td>Test</td>
<td>Function</td>
<td>Notes</td>
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<tr>
<td>Figure-ground</td>
<td>Visual memory</td>
<td>child: age 7.0 – adult. Used in cases when all else looks poor but you want to see to what degree the lights on inside. Very good test for head injured patients and some non-verbal patients. The patient must fail 3 out of 4 or 4 out or 5 depending on the number of options given.</td>
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<tr>
<td>Visual memory</td>
<td>Sequential memory</td>
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<tr>
<td>Sequential memory</td>
<td>Visual closure</td>
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<tr>
<td>Visual closure</td>
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<tr>
<td>3, 6 and, 12 piece form puzzles</td>
<td>Visual perception</td>
<td>Useful for a younger population (late 2 to age 5).</td>
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<tr>
<td>Visual perception</td>
<td>Visual problem solving</td>
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<tr>
<td>Visual problem solving</td>
<td>Eye-hand coordination</td>
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<tr>
<td>Eye-hand coordination</td>
<td>Degree of visually-guided behavior</td>
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<tr>
<td>Getman Visual Recall Test</td>
<td>Short term visual memory</td>
<td>When spelling or visual recall have been identified as problem areas and/or when the Monroe results are difficult to interpret. Norms go from Grade K to 7. May be difficult to communicate the results in some situations.</td>
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<tr>
<td>Getman Visual Manipulation Test</td>
<td>Short term visual memory and the ability to manipulate those stored visual images</td>
<td>When spelling is a problem and/or when a person is interested in sports vision, as the test looks at visual manipulations and perspective changes. Norms go from Grade K to 8. Some children have difficulty understanding the directions.</td>
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<tr>
<td>Rapid Automated Naming/Rapid Alternating Stimulus</td>
<td>Rapid decoding, recall and verbal output of the names of symbols (letters, numbers or shapes) or colors.</td>
<td>When a person seems, in spite of having good eye movements, to take a long time to say out loud the name of a number, letter, or shape. To quantify this skill as opposed to ocular motor problems. Some cases of ABI/TBI which affect the left side of the brain.</td>
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<tr>
<td>Davis Scan Test</td>
<td>Visual Search</td>
<td>When a patient has difficulty with copying, skipping place, loss of place, and with figure-ground skills. Norms from age 5 to 15. Shows overshoot and undershoot with pencil. Good for patients with ABI/TBI and hemi fields and/or neglect or USI. Some time is involved in counting the “O’s” found.</td>
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<tr>
<td>NSUCO Eye Movement Test</td>
<td>Basic test of pursuits and saccades which affords recording the accuracy, amount of head and body movement and eyes free of the head movement.</td>
<td>Whenever you wish to quantify eye movements for study purposes or before and after treatment purposes. Converts eye movement observation to a numerical score that is easy to record and communicate to others and is good for before and after comparisons. May be more time consuming that current methods being done and few seem to do it routinely.</td>
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<tr>
<td>Gardner Reversal Frequency Test</td>
<td>Laterality</td>
<td>Whenever the complaint of reversals, doesn’t know left from right, has trouble giving/following direction, is part of the history. Any observation during the testing of Quick and easy, standardized on normal and learning disabled children. Mean, ranges, percentile ranks and standard deviations are Only goes up to age 8 on part 3.</td>
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<tr>
<td>Test Name</td>
<td>Inventory/Description</td>
<td>Use</td>
<td>Norms</td>
<td>Time Consideration</td>
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<tr>
<td>Gardner – Test of Auditory Perceptual Skills</td>
<td>Auditory Number Memory forward &amp; reversed, Sentence Memory, Word Memory, Interpretation of Directions, Word Discrimination &amp; Auditory Processing</td>
<td>When there is a history of poor school performance to see if visual auditory skills may contribute to the poor performance.</td>
<td>Norms for ages 4-12, useful to communicate with speech language pathologists</td>
<td>Time consuming to administer.</td>
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<tr>
<td>Gardner – Test of Auditory Perceptual Skills – Upper Level</td>
<td>Auditory Number Memory forward &amp; reversed, Sentence Memory, Word Memory, Interpretation of Directions, Word Discrimination &amp; Auditory Processing</td>
<td>When there is a history of poor school performance to see if visual auditory skills may contribute to the poor performance.</td>
<td>Norms for ages 12 -18, useful to communicate with speech language pathologists</td>
<td>Time consuming.</td>
</tr>
<tr>
<td>Full Range VMI</td>
<td>Visual perception Spatial organization Eye-hand coordination</td>
<td>When there is a complaint of poor school performance, specifically with writing or copying. If you haven’t performed the VMI or Wold sentence copy.</td>
<td>Norms for special education students up to ages 19-21. Tightly standardized data and useful to communicate with OT’s and educators. Includes norms appropriate for special education students in the 19-21 year age range. Its norms include adults as well as children and adolescents (i.e., a full range of individuals from 5 years through 74 years can now be assessed with a common test.)</td>
<td>Difficult to communicate to the public interpretation of results. Takes a long time to do. Difficult to factor out the degree to which a problem with manipulating a writing implement might be causing the difficulty.</td>
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<tr>
<td>Peabody Picture Vocabulary Test (PPVT)</td>
<td>Receptive Vocabulary Auditory-Visual Integration</td>
<td>Concern about language skills; useful for ages 2.6 up through adulthood</td>
<td>The patient does not have to orally respond, just had to point to a picture Has adult norms</td>
<td>Time consuming</td>
</tr>
<tr>
<td>Visual Aural Digit Span (VADS)</td>
<td>Memory Visual and Aural Input Oral and Written Output</td>
<td>Concern about memory skills; norms for 5.6 to 10yo</td>
<td>Assess both kinds of input (aural and visual) and both kinds of output (oral and written) to find the best combination for the patient</td>
<td>Norms only to age 10yo</td>
</tr>
</tbody>
</table>

- From the Handbook of Diagnostic Tests for the Developmental Optometrist by Raymond Lowry, OD