

4.5 Additional Attention/Vision Assessments

These 7 short assessments help you gain more insight into the client's ability to attend and use vision to complete activities. Three assessments were developed specifically for the biVABA: *Telephone Number Copy Test*, *ScanBoard*, and *ScanCourse*. The other four assessments can be readily accessed for free or purchased.

4.5.1 Assessment Considerations for biVABA Assessments

4.5.1.1 Which biVABA Assessments are Appropriate for Clients with Suspected Neglect?

All three assessments provide additional insight into a client's ability to attend. The ScanBoard, because of its simple design, will not detect subtle changes in attention. It is best used to assess a client in the very early stages of recovery in conjunction with the Catherine Bergego Scale (see section 4.5.5.2 and Appendix D). The ScanCourse requires that the client be able to walk or independently move their wheelchair through the course. It is the only biVABA assessment that looks at the client's ability to combine visual attention with movement and can provide good insight into the client's ability to use visual attention for navigation. The Telephone Number Copy Test (see section 4.5.2) provides information about the client's ability to selectively attend to detail and sustain attention. It is also the only assessment that evaluates the client's ability to accurately read numbers-an important component of I-ADLs like financial management, medication management and meal preparation. When combined with the Pepper Visual Skills for Reading Test (see section 4.5.5.3), it provides a comprehensive assessment of a client's ability to use vision for reading. The test is not appropriate for a client with alexia, agraphia or other forms of aphasia that affect reading, or a client with uncorrected visual acuity and/or oculomotor impairment.

4.5.1.2 Which biVABA Assessments are Appropriate for Clients with Suspected Hemianopia?

All three assessments can provide additional insight into how hemianopia may disrupt the client's search pattern. The Telephone Number Copy Test adds insight into the client's accuracy identifying numbers-a common challenge for clients with left or right hemianopia (2.4.3.2). The ScanCourse (see section 4.5.4). provides useful information on whether the client turns the head far enough into the blind field to locate needed information during ambulation-necessary for orientation and safe navigation through environments Observing certain patterns on the ScanBoard (4.5.4.2) can help confirm the presence of hemianopia in the early stages of recovery.

4.5.1.3 Why do the Telephone Number Copy Test and ScanCourse Provide Do-Overs?

These assessments provide the opportunity to observe the client's ability to complete tasks that place greater demands on attention. The Telephone Number Copy Test requires the ability to

sustain attention to complete a detailed task that requires sequencing; the ScanCourse is a dual attention task that requires the ability to shift attention from side to side while walking. Providing a **do-over** on these more difficult tasks enables you to observe whether the client can use feedback to improve performance. A client who benefits from feedback demonstrates the ability to use attention/cognition to compensate for vision impairment and thus good rehabilitation potential. A client who is unable to use feedback to improve performance will require more task modification and structure to compensate for their attention deficit. This valuable information helps you set an appropriate rehabilitation goal.

4.5.2 Telephone Number Copy Test Instructions

Test Items:

- Visual Attention Assessment form
- Paper copy of the Telephone Number Copy Test
- Black medium point ink pen
- Timer

International Users: You may modify the test form to create numbers that correspond to the format used in your country. Be sure that you use 18-point size bolded font on the telephone numbers to match the test, and that the spacing on your form is the same. Use the Visual Attention Assessment form to record the client's performance.

Environment: well-lighted room with the light source directed from behind the client onto the tabletop to evenly illuminate the test; ensure that the light source does not shine directly into the client's eyes. This test requires the client's full concentration; ensure that the room is free from visual, auditory, and physical distractions.

Procedure:

1. Use the Visual Attention Assessment Form to record the client's performance
2. Seat the client comfortably at a well illuminated writing surface. If the client wears prescription eyewear or over-the-counter eyeglasses for reading, they **must be worn for this assessment**.
3. Place the test at the client's midline.
4. Hand the client the black medium point ink pen.
5. Instruct the client to copy each telephone number on the left side of the page onto the line next to it and to place the pen on the table when finished.
6. The client may reposition the form. Note these changes on the recording form.
7. Begin timing when the client begins reading the first telephone number.
8. Observe and record client's search strategy to identify the numbers and copy the telephone number on the corresponding line on the form.
9. Provide verbal, physical, or visual cues if the client is struggling.

Examples of Verbal Cues:

- *"Remember there are 7 numbers in a telephone number."*
- *"Remember to look at the numbers closely, some numbers look alike."*

Examples of Physical Cues:

- Gently turn the client's head towards the left or right side of the test form.
- Place the client's hand on the left or right side of the test form to draw attention that side.
- Point to the left or right border of the test form.
- Point to the copying line.

Examples of Other Cues:

- Draw a bright red anchoring line on the left side of the test form, remind the client to look for the red line (this cue often works well for the client with hemianopia but not the client with neglect).
- Provide an auditory cue (side such as a chiming ring tone on your phone) on the neglecting side to draw attention to that side.

10. Stop timing when the client places the pen on the table.
11. Count and record the number of errors (misidentifications or omissions) the client made copying the individual numbers.
12. There are 80 possible errors on the test: 70 individual numbers and 10 dashes.
13. *Omission* is leaving a number/dash out of the sequence.
14. *Misidentification* is writing down an incorrect number.
15. If the client copied down a number incorrectly but immediately corrected the error without cuing, note this on the recording form but do not count it as an error.
16. Inform the client of the number of individual errors they made copying down the numbers and instruct the client to find and correct all of the errors.
17. Begin timing when the client begins to search the test to locate the first error.
18. Record the number of errors made both before and after self-correction on the recording form.
19. Record the percentage of correctly copied telephone numbers before and after self-correction. Each telephone number is considered a single item when calculating the percentage. For example: There are 10 telephone numbers on the test; a client who copies down 8 of the telephone numbers correctly would have a test accuracy of 80%.

Instructions to the Client:

Before the test begins:

"There are 10 telephone numbers on this page. Read each telephone number carefully and copy it down on the blank line next to it [indicate the line]. When you finish place your pen on the table. Try to be as accurate as you can, I am going to count the number of errors you make in copying the numbers."

After the client completes the test-if errors are made:

"You made ___ errors in copying down the numbers. Please recheck your work and try to find and correct your errors. When you have finished, place your pen on the table."

4.5.2.1 Interpreting Client Performance on the Telephone Number Copy Test

The ability to accurately read numbers and copy down a sequence of numbers is a component of financial management, written communications, and medication management. Poor accuracy could cause the client to make mistakes that may go initially go undetected until the client receives feedback on their error (for example, the wrong amount paid on a bill). Slowness in reading numbers increases effort and lengthens the time required to complete occupations like financial management. These challenges may cause the client to question their ability to complete these important tasks and increase their reliance on others.

4.5.2.1.1 Key Observations on the Telephone Number Copy Test

The client uses the fingers on the non-dominant hand to maintain their place and guide their search across the line as they copy the telephone numbers. Use of this strategy suggests that the client may have a hemianopia that is affecting the fovea. Persons with hemianopia must alter their search strategy to compensate for the vision loss. Using this strategy improves accuracy BUT it also increases copying time which can cause frustration and fatigue.

The client copies a number incorrectly but immediately corrects the error. Persons with normal visual attention sometimes write down the wrong number or transpose numbers. Realizing and correcting the mistake suggests good capability to attend and accurately identify numbers.

The client omits one digit in the number sequence. This may suggest the presence of a hemianopia or other central visual field deficit or inattention. Clients with hemianopia sometimes leave out a digit when copying a sequence of numbers and do not detect the error until they recheck their work. A client with inattention may not locate the error on recheck.

The client writes down a similar but incorrect number. This may suggest the presence of a hemianopia or other central visual field deficit. Persons with hemianopia may write down a similar but incorrect number because they do not see the entire number. For example, a client with left hemianopia may see a 3 or 9 when viewing an 8 and a client with a right hemianopia may see a 6 when viewing an 8. The numbers most often misidentified are 3,6,5,8,9, and 4. Persons with hemianopia most often make mistakes reading numbers located on the affected side and persons with neglect make mistakes on the neglecting side. The client with hemianopia should be able to locate and correct errors when rechecking their work, whereas the client with neglect may not be able to correct their errors.

The client omits the first number(s) in the sequence. This may suggest the presence of a left hemianopia or neglect. If the error is due to solely to hemianopia, the client will likely locate the error when rechecking their work and correct it. If neglect is present, the client may not locate the error on the recheck even with cuing.

The client omits the first number after the dash. For example, instead of 884-2633, the client writes 884-633. This error is uncommon and has only been observed in clients with hemianopia.

The client drifts on the line when writing down the numbers. This may suggest a hemianopia that extends into the fovea. Clients with a complete hemianopia located on the same side as their dominant hand, often drift on the line. This occurs because the field deficit prevents them from seeing to monitor their pen tip. The same handwriting behavior is observed in clients with central scotoma from an age-related eye disease like macular degeneration.

The client's performance improves in response to cuing. This is an important observation because it shows that the client can modify attention to improve performance. Most persons with hemianopia possess this capability but persons with neglect lack it. Determine the type of cues that work best for the client and incorporate them into interventions.

The client does not respond to cues to improve performance. This is an important observation because it shows that the client is unable to use attention to improve performance. Most persons with hemianopia possess this capability but persons with neglect lack it.

The client doesn't locate errors when rechecking performance. This suggests neglect. Clients with neglect are often unable to focus their attention to locate errors when rechecking their accuracy while clients with hemianopia can use attention to correct errors.

4.5.3 ScanBoard Instructions

This assessment was developed for the biVABA to screen whether the client employs an organized and symmetrical strategy to search for visual information in extrapersonal space (defined as reaching space).^{260, 267} The test consists of 10 numbers arranged in a "butterfly" pattern on a large plastic board (see Figure 4.5.1). Acceptable inter-rater and test-retest reliability, and test validity was shown on a sample of adults with and without stroke.²⁶⁰

Test Items:

Visual Attention Assessment form
ScanBoard
easel (optional)

Environment: well-lighted room with the light source directed from behind the client to evenly illuminate the surface of the Board; ensure that the light source does not shine directly into the client's eyes. This test requires the client's full concentration; ensure that the room is free from visual, auditory, and physical distractions.

Procedure:

1. Seat the client comfortably in a posturally secure seated position with good midline orientation.
2. The client should be wearing eyeglasses if needed to see at a distance.

3. Position the ScanBoard on a table or easel. Make sure the board is positioned at eye level at the client's midline and within arm's reach so that the client can easily touch each number on the board.
4. Instruct the client to point out the numbers on the board as he/she sees them and tell you when finished.
5. The client may either point to or touch the numbers on the board to show their location.
6. The client does not have to verbally state the number as it is pointed out.
7. On the assessment form, use the line under each number, to order in which the client identified the numbers (see Figure 4.5.1).
8. Do **not** cue the client during the test and allow the client to indicate when finished.
9. Stop the test if the client begins to point out the numbers in numerical sequence (e.g., 1,2,3...). Instruct the client to begin again and point out the numbers as he/she sees them-not in sequence.

Figure 4.5.1: ScanBoard recording form.

6					3
	_____				_____
	5			7	
		_____		_____	
		1		0	
2		_____	_____		8
_____					_____
	4			9	
	_____			_____	

Instructions to the Client:

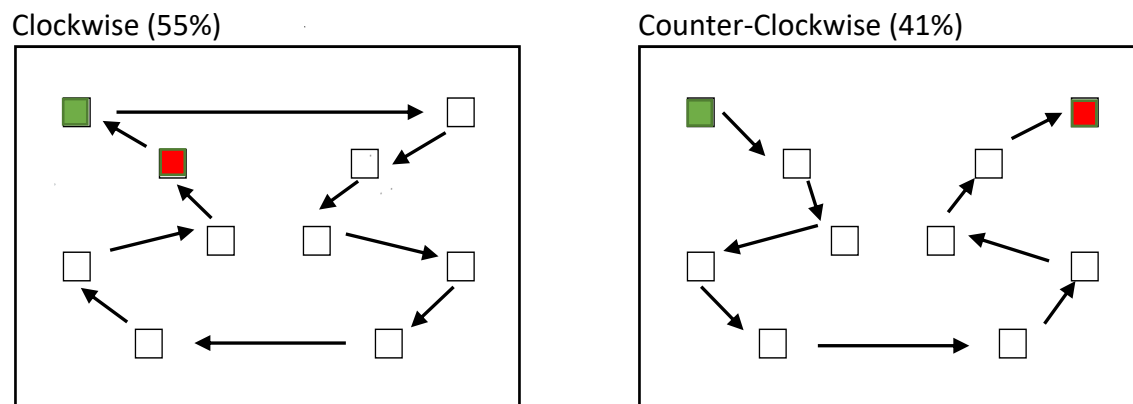
"There are 10 numbers on this board. Point out the numbers to me as you see them. Do not try to point them out in order-just point to them as you see them. Point slowly because I will be writing down the numbers you see. Stop when you have seen every number."

4.5.3.1 Interpreting the Client's Performance on the ScanBoard

4.5.3.1.1 Effective Search Strategies on the ScanBoard

Warren²⁶⁰ compared the Scanboard performances of a cohort of adults with stroke, and an age and sex-matched control group of adults without brain injury. The study found that participants in the control group used organized, sequential search patterns to quickly identify the 10 numbers. The control group participants predominantly used one of three patterns: clockwise (55%), counterclockwise (41%), and back and forth linear pattern (4%). Figure 4.5.2 shows the two most prevalent patterns. Sixty-five percent of the participants began search on the upper left side of the board and used a left-to-right and top-to-bottom strategy to locate the numbers.

Figure 4.5.2: Examples of the two most prevalent search patterns used by the control group.
*Green square is the starting position; red square is the ending position.

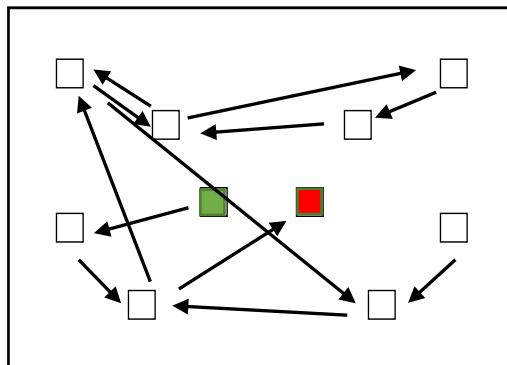


A client with normal visual attention may show a variation of these patterns. Their performance is considered to be normal if the pattern includes these elements: 1) the pattern is organized and predictable 2) the pattern is initiated from left to right 3) all numbers are identified and are identified only once.

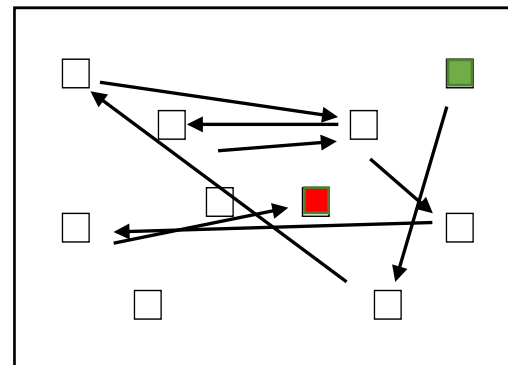
4.5.3.1.2 Ineffective Search Strategies on the ScanBoard

The Warren²⁶⁰ study found that 48% of participants with stroke used search patterns that resulted in omitting numbers (often on one side of the board) or pointing out the same number more than once. Thirty-five percent initiated search on the right side of the board (compared to 8% in the control group) and 13% showed no discernible pattern when searching the board. The difference between the stroke and control groups was statistically significant ($p < .01$). Figure 4.5.3 illustrates 2 examples of the ineffective search strategies observed in the Warren study.

FIGURE 4.5.3: Examples of Ineffective search strategies used by participants with stroke
*Green square is the starting position; red square is the ending position.



Client initiates pattern in center left; uses random pattern; points to numbers 6,5,0,9,4 twice.



Client initiates pattern on upper right; uses random pattern and omits numbers 4 and 0.

4.5.3.1.3 Key Observations on the ScanBoard

The client uses an unpredictable and random search pattern. A random search pattern strongly suggests neglect especially when searching such a simple arrangement of numbers. This client likely will have significant difficulty locating items for ADLs and other activities.

The client initiates the search pattern from the right side of the board. The normal search strategy is a left to right strategy. Observing the client begin on the right side of the board suggests neglect especially if the client proceeds to use a disorganized and incomplete search pattern and omits targets on the left side. If the client begins on the right side but executes an organized, predictable, and complete pattern to locate targets it may suggest left hemianopia.

The client identifies numbers only on the right side of the board. This may suggest a left hemianopia if the client used an organized search pattern to locate targets on the right side and abbreviated search towards the left side. This observation suggests neglect if in addition to missing numbers on the left side-the client uses a random, disorganized search pattern (see section 2.5.2.2).

The client identifies numbers only on the left side of the board. If the client's search pattern is organized and initiated from the left side, this abbreviated pattern suggests the presence of a right hemianopia. It suggests neglect if client combines the abbreviated pattern with a disorganized, random search pattern.

The client identifies the same number more than once. If combined with a random search pattern, the client may not realize that the number was previously identified. If the client

repetitively selects the same number, it may indicate perseveration. Both observations suggest neglect (see section 2.5.2.2).

4.5.4 ScanCourse Instructions

The ScanCourse is a structured task analysis that provides an opportunity to observe the client's ability to complete a dual attention task that combines visual search with ambulation. Lund et al.¹⁴² studied the measurement properties of the ScanCourse on a sample of 48 participants with neurological impairment. The researchers standardized the ScanCourse directions and course layout to complete the study; a copy of their research manual is available in Appendix E. The study found that the ScanCourse showed high interrater reliability and test-retest reliability and good validity for assessing the ability to complete a dual task of sequentially following and identifying a path of targets.

Test Items:

Visual Attention Assessment form

*3" by 5" plain index cards (21)

*21 1-inch black vinyl stick-on letters/numbers or a black marker to create target cards

*Tape or mounting putty to attach the target cards to the wall

**These items are not included in the biVABA*

Environment: Well-lighted hallway with even illumination (no shadows on the walls). Avoid florescent lighting if possible. The hallway should be lightly traveled and long enough to place the 10 test targets in various locations about 2-3 feet apart on each side of the hallway. If needed use an adjoining hallway to extend the course. This test requires the client's full concentration; ensure that the hallway is free from visual, auditory, and physical distractions.

Procedure:

1. Set up the course (do not let the client view this step).
2. Assemble 21 target cards: place a single letter or number on each card (use card 21 as an example to show the client what the targets look like). Note: stick on "Post it" notes can be used as the target card when you need to temporarily attach the cards to the wall-this works well when testing in the client's home. You can use colors or symbols on the target card instead of numbers or letters for clients with reading difficulties or the client can simply point to the cards (see section 4.5 4.1).
 - Attach 10 cards along each side of a long hallway or corridor.
 - Randomly place the cards at: floor level, eye level, waist level, above eye level locations. Vary the spacing of the cards-some close together, others farther apart)
3. Bring the client to one end of the hallway.
4. Instruct the client to identify the targets while walking down the hallway. The client must identify the cards while moving; stopping to identify the target is counted as an error.

5. Follow the client down the hallway and keep a silent count of the number of targets missed on each side of the hallway. *The client does not have to accurately identify the target; the client only must accurately locate the card.*
6. If the client did not locate all of the cards, calculate the percentage of correct responses on each side of the hallway (e.g., 8/10 cards located on the right indicates 80% accuracy in locating the targets on the right side).
Record the number and percentage of targets located by the client on the Visual Attention Assessment form under Trial 1.
7. If the client did not locate 100% of the targets, provide this feedback to the client [see example of instructions to the client below] and instruct the client to walk down the hallway again to see if the client can improve their performance.
8. Repeat the test (Trial 2) with the client reversing course and walking down the hallway in the opposite direction of the first trial.
9. Re-calculate the percentage of accurate results and record the percentage on the recording form under Trial 2.

Instructions to the Client:

“This is a test to see how well you can search for targets when you are walking. I have placed 20 cards with [number/letters] on them like this one [show example] in various locations on both sides of this hallway. You must read out the [number/letter] on the cards as you walk by them. Do not stop and look for the cards, you must continue walking and read the [number/letter] on the card as you walk by.”

If the client makes errors on Trial 1

“You missed [X number of targets] on the right side and [X number of targets] on the left side. It may be because... [Provide specific feedback such as-you didn’t turn your head far enough to the left side... you were looking at your feet...]. Let’s try it again, this time be sure to ... [repeat feedback].”

4.5.4.1 Interpreting Client Performance on the ScanCourse Test

A person must be able to combine vision and ambulation to safely navigate an environment. A client who walks without monitoring surrounding environmental features is at risk for collisions, falls and disorientation (getting lost is a common complaint of persons with hemianopia). This client will require supervision in community environments. Driving is **not** an option for a client who performs poorly on this test.

4.5.4.2 Key Observations on the ScanCourse Test

The client misses targets only on one side of the hallway during Trial 1. This observation suggests the presence of a hemianopia or neglect. If after receiving feedback on Trial 1, the client accurately completes Trial 2, the errors committed on the first trial suggest inadequate compensation for a possible hemianopia and **not** inattention. If the client, after receiving

feedback on Trial 1, makes as many or more errors on Trial 2, it suggests the influence of neglect.

The client randomly misses targets on both sides of the hallway. This observation suggests difficulty attending due to non-lateralized inattention from neglect especially when observed in a client with right hemisphere injury (see section 4.4.1.5). A less common cause is the presence of significantly restricted peripheral vision (e.g., tunnel vision) from an anoxic brain injury, a bilateral optic nerve injury, glaucoma, or severe retinal disease.

The client must stop to locate and identify the target. This suggests that the client is unable to integrate vision with ambulation and must complete one or the other. Having to stop to search is observed in clients in early recovery from hemianopia. The behavior usually ceases following intervention that teaches the client to compensate for the hemianopia during ambulation.

The client misses cards placed in unexpected locations. This suggests that the client does not monitor the entire visual environment while walking. It is observed in clients in early recovery from hemianopia who tend to look straight ahead or at the floor when traversing the course. The behavior usually ceases following intervention that teaches the client to compensate for the hemianopia during ambulation.

The client misidentifies the target on the card. The intent of the ScanCourse is to determine if the client can and will turn the head both directions to locate targets in sequence. Accuracy in identifying the target on the card is a secondary concern. Therefore, misidentifying the target is NOT considered an error on this test. You can use colors or symbols on the target card instead of numbers or letters if the client has alexia or the client can simply point to the cards. That said, you may have reasons for requiring that client accurately identify the target. For example, you may want to assess the client's attention to detail. Modify the test as needed to provide the observations that you feel will enhance your understanding of the client's strengths and weaknesses in this dual task.

4.5.5 Additional Assessments to Identify Functional Limitations

These assessments help you gain additional insight into how the client's vision affects their ability to complete daily occupations.

4.5.5.1 Self-Report Assessment of Functional Visual Performance

Persons with hemianopia typically only have difficulty completing ADLs that rely on vision to complete. The *Self-Report Assessment of Functional Visual Performance* (SRAFVP) is a standardized assessment developed specifically to measure a client's ability to complete vision-dependent activities of daily living. Originally developed to assess ADL performance in older adults with age-related eye disease,²⁴⁸ Mennem et al.¹⁵¹ validated the assessment on persons

with hemianopia. The Mennem¹⁵¹ study found that the assessment accurately measured vision dependent ADLs in three areas: reading, eye-hand coordination, and mobility.

The SRAFP uses an interview format that allows the client to identify the ADLs that they most value. The assessment covers 38 basic and instrumental vision dependent ADLs. The SRAFP toolkit is available as a free download from the Occupational Therapy Department, University of Alabama at Birmingham (www.uab.edu/shp/ot/post-professional/low-vision-gc/student-resources). **NOTE:** be sure to download the **original SRAFP** (not the R-SRAFP) to use the assessment with clients with hemianopia.

4.5.5.2 Catherine Bergego Scale

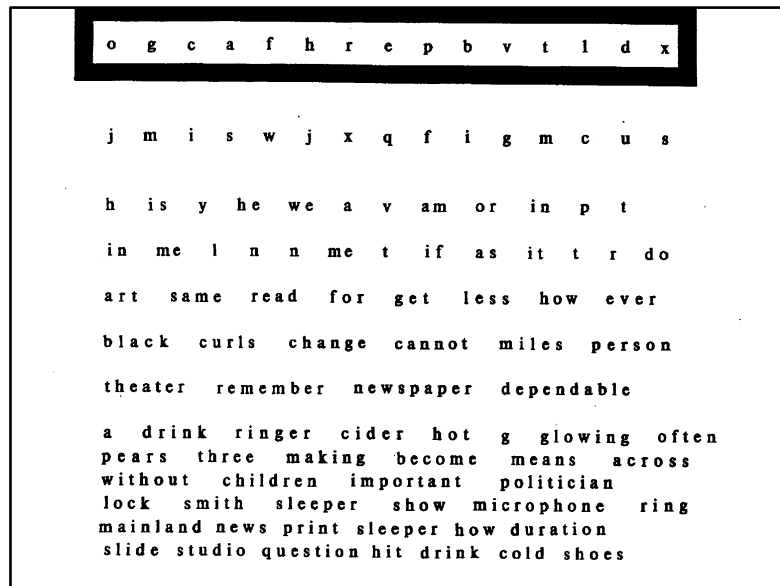
The Catherine Bergego Scale (see example in Appendix D) is a widely used assessment that measures the influence of neglect on the client's ability to complete basic ADLs and navigation. Azouvi et al.¹⁰ developed the assessment and subsequent studies have established its reliability and validity as a neglect assessment.^{143, 148} The OT observes the client complete ten ADL and mobility items and assigns each item a point value using a 4-point rating scale (0-no neglect, 1-mild neglect, 2-moderate neglect, 3-severe neglect). The points are summed to provide a cumulative score ranking the client's level of neglect: no neglect (0 points) mild neglect (1-10) moderate neglect (11-20), and severe neglect (21-30).

4.5.5.3 Pepper Visual Skills for Reading Test

The Visual Skills for Reading Test assesses the influence of central visual field loss on visual word recognition and reading. The test (better known as the Pepper Test) was developed to assess reading performance persons with macular scotoma from macular degeneration. The client reads single letters and words printed on a card (see Figure 4.5.4). The card contains words that can be transformed into another word if misread. Because the words don't appear within the context of a sentence, the person must rely solely on vision to identify the word. The test includes three versions in varying print sizes to accommodate clients with reduced acuity and to permit retest. The test measures reading accuracy and corrected reading rate and provides information on the prevalent types of reading errors.

Blaylock et al.²⁵ validated the Pepper test on persons with hemianopia and found that it provides an effective way to measure the interference of the visual field deficit on reading performance. Persons with hemianopia make errors on the Pepper test consistent with the side of their field deficit.^{25, 256} For example, a client with a left hemianopia may read the word "radish" as "dish" and a client with a right hemianopia may read the word "mustard" as "must." The Blaylock study found that persons with hemianopia demonstrated a lower reading speed, averaging 50-75 words per minute which is about 50 words less than persons without hemianopia and 75% of the participants made reading errors. Their most common errors included omissions (didn't see the word) and misidentifications. Similar types of errors may be observed on the *Warren Text* card (see section 4.1 3.1.4); and the *Telephone Number Copy Test* (see section 4.5.2).

Figure 4.5.4: Example of a Visual Skills for Reading Test card.



The VSRT is out of print, but the manufacturer still carries the instructions manual and scoring sheets for current users. Contact [Fork in the Road Vision Rehabilitation Services](#)

The [S-K Read Chart](#) manufactured by Precision Vision uses a similar format as the Pepper.

4.5.5.4 Light Boards

To safely navigate dynamic and complex community environments, the client must use a wide scanning strategy that quickly and efficiently covers the affected side. The client also must rapidly shift attention back and forth between the central and the peripheral visual fields to keep track of objects moving within the environment. A client who is compensating well for a hemianopia or inattention should be able to symmetrically search both the right and left halves of the visual field with equal speed when standing still or moving. Large interactive light boards, which are primarily used for intervention, provide an opportunity to compare the client's speed and efficiency in searching the right and left halves of the visual field and their ability to divide attention between the central and peripheral field. Clinics use many types of lightboards: some examples include the Dynavision D2²³ Bioness Integrated Therapy System²²² and the NVT.¹⁰³ The boards use a game format to engage the client while recording the number and speed at which targets are located on the board during the game. Most boards provide a variety of games at varying skill levels; select a game that tests the visual search capability you want to know more about.

If you don't have a light board, you can create a task analysis using a laser pointer to observe the client's search capability. Stand behind the client and randomly project the laser beam onto various locations on a blank white wall. Instruct the client to locate and touch the projected laser dot. Note the strategy and the time needed to locate the dot and compare performance between the blind and intact fields.