4.3 Visual Fields

The Visual Fields Assessment focuses on screening assessments that can be completed bedside, in the clinic, or in the home. Two tests are included: a gross measurement of the peripheral field using the Two-Person Kinetic confrontation Test, and a more precise measurement of the central visual field using the Damato Campimeter.

4.3.1 Assessment Considerations

4.3.1.1 Visual Field Test Requirements

The process of measuring the visual field is known as perimetry. There are many types of perimeters. The tests vary from bedside assessments that provide a gross indication of field loss to the very precise imaging of a microperimeter that uses real time imaging to measure the central twenty degrees of the visual field. All perimetry testing-regardless of type-has three requirements:

1. The client must fixate on a central target during the test.
2. A second target(s) of a specific size and brightness is presented in a designated area of the visual field.
3. The client must acknowledge when the second target appears without breaking fixation on the central target.

The client's ability to stay fixated on the central target while targets appear in different areas of the visual field is critical to obtaining an accurate measurement. The client must also be able to sustain attention over an extended period of time. These attention requirements must be considered when selecting the best assessments to screen for a visual field deficit.

4.3.1.2 Clients with Low Visual Attention

Accurate perimetry testing depends on the client's ability to attain and sustain attention throughout the test. Any limitation in the client's attentional capability will reduce test accuracy. The test environment should be free from auditory and visual distractions. Test the client when they are well rested and alert. If the client is able to attend for only a few minutes, considering administering the assessment in short segments over a period of several days. Always use clinical observations to supplement the results from the screening assessments.

4.3.1.3 Importance of Clinical Observations

Always begin the evaluation with questions and observations about difficulties completing daily activities using the checklists in the first section of the assessment form. Clients with fluctuating and/or limited attention, and deficits in language and cognition, may provide unreliable perimetry results. Observing the client and listening to their perception of their difficulty completing activities can provide clues as to the location and extent of a possible field deficit. Client and family reports of difficulty completing activities that depend on an intact visual field

(navigating through environments, reading, directing the hand in activities) provide insight into presence of a visual field deficit. Observations can also help distinguish whether the client has a left hemianopia or left neglect.

Another reason that clinical observations are important is that clients with visual field deficits often cannot describe how their vision has changed due to the influence of perceptual completion on visual processing (see section 2.4.3.1). Persons with visual field deficits see a perceptually completed visual field without gaps or missing information. There is no black curtain or black spot indicating the area of field loss. Furthermore, the person believes what they see and acts on this erroneous information.[102] However when questioned about their activities, clients often report experiences that suggest visual field loss. Some examples include collisions or close calls with objects on the blind side, disorientation when moving through an environment, difficulty reading and writing, and clumsiness with fine motor tasks. The client may also report an awareness that *"there is something wrong with my vision"* but attribute their difficulties to a change in acuity or depth perception. Generally, only the most astute client who experiments with their vision can describe the location and extent of a field deficit.

4.3.1.4 Cheating and Test Accuracy

Impaired ability to generate and sustain attention increases the chance that the client will cheat on the assessments by looking for the second target. Cheating by looking for the second target can cause a false positive where the client identifies a target that would not be seen if they had stayed fixated on the central target. False positives reduce the test's ability to detect the field deficit and the client may appear to have less field loss than is actually present. The instructions for the Two-Person Kinetic Confrontation test and the Damato Campimeter include procedures to reduce the incidence of cheating. The Two-Person Kinetic test includes a front examiner to observe for cheating on the test; the Damato Campimeter positions the examiner facing the client to observe for eye movement towards the target window to see the black dot. Instructions for both tests encourage the examiner to "prime" the client to attend to the central target before testing a field location. Following these directions will increase the reliability and accuracy of the test results.

Using an optimal target also decreases cheating and increases test accuracy. It is important that ONLY a lighted penlight be used as the target for the Two-Person Kinetic Confrontation Test. This is because the examiner brings the target from behind the client's head and moves it towards the nose. The rod photoreceptor cells in the peripheral retina will be the first to detect the target. These photoreceptors detect light, and motion and the bright moving light of the penlight provides the optimal target to activate them. Substituting your low contrast index finger or a pen as the target forces the client to rely only on movement to detect the target. The client may not detect the target as quickly resulting in two undesirable outcomes: 1) the client-anticipating the target's appearance but not seeing it-may be tempted to cheat and look for it reducing the reliability of the test or 2) the client may not identify the target until it moves further into the central field suggesting a deficit in the client's peripheral visual field that is not really there (e.g., a false positive). Replacing the front examiner's flower design card with a

boring target like a pen, also encourages cheating simply because it is difficult to sustain attention on boring targets.

Moving the target at the correct speed also decreases cheating and increases accuracy. If the penlight is moved too slowly, the client will be tempted to look for it. If the penlight is moved too quickly, the client may not be able to respond fast enough to identify it until the target has moved forward. When this occurs, the client will appear to have more or less deficit in the peripheral field than is actually present.

4.3.1.5 Screening vs. Diagnostic Evaluation

Screening Assessments: The Two-Person Kinetic Test is an example of a confrontation test, where the examiner confronts the field by presenting a moving or static target as the client fixates a central target. Confrontation tests are "bedside" screening assessments that can be completed quickly using little equipment. Although they are widely used to screen for visual field, it is important **not** to assign them the same significance as a diagnostic test. Under close scrutiny, the confrontation test been shown to be unreliable in detecting visual field loss. Trobe, et al.[240] compared the results of confrontation testing by an ophthalmologist to results from a diagnostic Goldmann perimetry test and found that confrontation testing missed almost 50% of the visual field deficits detected by the perimeter test. They concluded that confrontation testing can indicate the presence of a gross defect in the visual field but lacks the sensitivity to stand alone as the only assessment of the visual field. If a significant deficit is present, the test likely will confirm its presence, however subtle or partial changes in the visual field, especially when macular sparing has occurred, can easily go undetected (see sections 2.4.2 and 4.3.1.8). The results of a screening assessment **must be** confirmed with a diagnostic evaluation.

Diagnostic Evaluation. Testing is completed using either a static or kinetic presentation of the target. In *static presentation*, the target appears in a specified area of the visual field without moving to that location. In a kinetic presentation, the target silently moves in from the periphery until it is identified. In addition to determining the size and location of a visual field deficit, a diagnostic test also measures the sensitivity (or acuity) within the field by testing visual thresholds at various points in the field. Every point within the visual field has a visual threshold-determined by the weakest stimuli that is just visible at that location under specified testing conditions. Visual threshold is the lowest at the fovea (indicating the greatest acuity) and highest in the periphery (indicating lower acuity). Eye doctors use a computerized bowl perimeter such to obtain a definitive diagnosis of a hemianopia or other field deficit. The *Humphrey Visual Field Analyzer* is the gold standard perimeter in the United States. To complete the test, the client places the chin on a chin rest and fixates on a central target inside the bowl-shaped device. As the client fixates the central target, a second lighted target is silently displayed inside the bowl at varying locations and intensities. The client responds to each seen target by pushing a small button. When diagnosing a field deficit, lighted targets are often presented in over a hundred locations within the field using a step threshold sequence where the intensity of the target is incrementally increased until the target is detected. The

result is an accurate measurement of the areas of absolute loss (no response) and relative loss (decreased retinal sensitivity) within the field.

Two barriers are often encountered in completing the diagnostic evaluation using an instrument like the Humphrey. First, diagnostic testing requires sustained visual fixation over an extended period of time-sometimes up to 30 minutes per eye. Persons with brain injury commonly experience limited visual attention especially in the acute stages of recovery and may not be able to reliably complete a diagnostic perimetry test. Secondly, the client must be referred out to the eye doctor's office to complete the testing. These requirements often delay the definitive diagnosis weeks to months into the recovery period depending on the severity of the brain injury. Bruce et al.[34] estimated that a median of 5 months was required to complete an accurate diagnostic evaluation of the visual field in persons with traumatic brain injury. Knowing this, eye doctors often delay completing diagnostic testing early in recovery and suggest waiting 6 months. This recommendation isn't based on recovery as very little recovery of field occurs after 4 weeks, (see section 2.4.2) but instead on the ability to obtain an accurate (no cheating) diagnostic test. In most cases therefore, screening assessments must be used until the client has sufficient visual attention to complete a diagnostic perimetry test.

4.3.1.6 Relative Visual Field Losses

Visual field loss can range from complete loss (an absolute deficit) where the retinal field is unresponsive to light no matter how bright the target is, to a partial loss (relative deficit) where the retinal field may respond when shown a very bright target. It is not uncommon for both types of deficits to be present within the affected field following brain injury. Clients with relative field losses may respond inconsistently during field testing depending on the visibility of the target. Bright targets like the moving penlight on the 2-Person Kinetic Confrontation Test and the black dot on the Damato Campimeter are more likely to elicit a response than the examiner's low contrast wiggling finger. It is also important to administer the assessments in an environment with good non-glaring light. The results from the screening assessment should always be compared with clinical observations. It is difficult to identify relative visual deficits, so if the screening assessment shows no deficit but the clinical observations suggest that a deficit is present, the clinical observations should carry the greater weight in deciding whether the client has a visual field deficit.

4.3.1.7 Hemianopia vs. Other Types of Visual Field Deficit

All types of visual field deficit are possible following acquired brain injury, but hemianopia is the most commonly documented field deficit in both stroke and TBI (see section 2.4.2). Hemianopia is defined as blindness in one half of the visual field-either left or right field or superior or inferior field. A complete hemianopia affects the entire visual field-central and peripheral on one side. The client loses 50% of the visual field. The term homonymous means that the same amount of visual field deficit is present in both eyes.

4.3.1.8 Macular Sparing

Some clients with hemianopia experience macular sparing where they retain 5-25 degrees of the central visual field but lose the peripheral field (see section 2.4.2). The client with macular sparing will report fewer difficulties with reading, writing and other activities dependent on the central visual field and will likely do well on the Damato Campimeter. But the client may have challenges with safe navigation and driving. It is important to always assess the peripheral visual field using the Two Person Kinetic Confrontation test.

4.3.1.9 Phantom Vision and Other Co-Impairments

Persons with visual field deficit can experience co-impairments including light sensitivity, reduced contrast sensitivity, and phantom vision. Light sensitivity and reduced contrast sensitivity *occur from the brain injury*, whereas phantom vision (also called Charles Bonnet Syndrome-CBS) results *from the vision impairment*. Phantom vision is a unique visual disturbance that can occur when there has been significant vision loss.[162] It is common in persons with age-related eye diseases and can occur in persons with hemianopia.[91, 246] During a phantom vision episode, the person sees images that aren't there. The person may see a formed image such as a Cheshire cat sitting on the television or see a pattern of flashing or swirling lights (aka photopsia). No sounds or smells accompany the image, and the person knows that it is not real. The images typically appear only periodically for just a few minutes. The exact cause of phantom vision is still unknown. But eye doctors agree that it is a benign condition that often occurs in persons with significant vision impairment and does not signal that the person's vision is changing. The client experiencing phantom vision may be reluctant to mention these odd episodes to family or health care providers. Asking whether the client "sometimes see things that aren't really there" provides an opportunity to educate the client about phantom vision and provide reassurance that it is common, and the images will likely stop appearing after a while.

Reduced high contrast acuity and oculomotor impairment are not typical co-impairments. If the assessment identifies deficits in these areas, refer the client to the eye doctor to address them.

4.3.1.10 Visual Fields Assessments

The Two-Person Kinetic Confrontation test and the Damato Campimeter help to identify the possible location of the visual field deficit. This is important information but in order to set the most appropriate intervention goals, the OT must determine how the deficit affects the client's ability to complete daily occupations. Remember a visual field deficit is likely to be a permanent deficit and the client's ability to compensate for it in daily occupations is the key to successfully living with it. Section 4.5.1.2 describes additional assessments that provide insight into the client's ability complete occupations typically affected by a visual field deficit.

4.3.2 Test Instructions

General Instructions to the Client:

"I am going to give you some tests to find out if you can see objects in all areas of your visual field. The visual field is everything that you can see when you look straight ahead [use your hands to illustrate the width of the visual field]. A brain injury can cause blindness in a part of your vision-sometimes just in one eye and sometimes in both eyes. It is difficult for a person to figure out if their eyes have been affected. These tests will help me to find out if you have lost some vision in your eyes. It is important to find that out because visual field loss can cause problems with reading, walking, and driving. I will test one eye at a time."

4.3.2.1 Two-Person Kinetic Confrontation Test

The assessment provides a gross screening of the visual field using a moving target presented in 4 locations: right and left sides to screen for hemianopia and superior and inferior sides to screen for altitudinal deficits.

Test items:

Visual Fields Assessment form
Patch occluder
Penlight target (NO substitutions! See section 4.3.1.4)
biVABA flower card design or a similar interesting target that is large enough to be seen at 1 meter without eyeglasses

Test Environment: If needed-dim the room lighting to enhance penlight visibility. Room lighting must be sufficient for the front examiner to view the client's eye for cheating during fixation. This test requires the client's full concentration; ensure that the room is free from visual, auditory and physical distractions.

Procedure:

1. The test requires a front and rear examiner:
    - **The front examiner** is an extra person whose sole job is to make sure that the client maintains fixation at all times on the central target during the test and does not "cheat" by looking for the penlight target. This person can be a family member, a student or other person capable of completing this task. The front examiner sits directly across and approximately 1 meter from the client. The examiner holds a visible target (e.g., the biVABA flower design card) directly in front of the client's face at eye level and encourages the client to stay focused on the card throughout the test. The examiner observes the client's eyes and alerts the rear examiner if the client breaks fixation on the target and looks for the penlight (see Figure 4.1).
    - **The rear examiner** is the OT who tests the client's visual field with the penlight. The rear examiner stands behind (or to the side of the client if needed) and

moves the lighted penlight forward toward the client's nose. The examiner holds the lighted penlight within **2 inches** of the client's head in order to provide a very bright target. The examiner moves the target at a not-too-fast, not-too-slow pace from behind the ear towards the nose moving the penlight in a tight arc to keep it close to the client's head at all times.

Figure 4.1: Examiner positions for 2-Person Kinetic Confrontation Test

2. Seat the client comfortably with eyeglasses **off**, if worn.
3. Test each eye separately.
4. Use the patch occluder to cover the untested eye.
5. The rear examiner shows the lighted penlight to the client and explains how the penlight will start behind the client's ear and move forward toward the client's nose.
6. The rear examiner holds the penlight and stands behind the client.
7. The rear examiner instructs the client to fixate on the front target and say "now" or raise a hand to indicate they see the light when it appears.
8. As the client fixates the front examiner's target, the rear examiner brings the lighted penlight forward moving in an arc-keeping the penlight **close to the client's head**. *(Note: if the target is moved too fast, the client will not be able to respond quickly enough to obtain an accurate field measurement).*
9. The front examiner observes the client's eye during the test to ensure that the client maintains fixation on the target and does not look for the penlight.
10. When the client indicates seeing the penlight target, the rear examiner notes the location and records it on the recording form (Figure 4.1).
11. The rear examiner moves the penlight forward using the positions of the clock as a guide: 3 o'clock, 9 o'clock, 12 o'clock and 6 o'clock. The 3 o'clock position is located on the client's right side and the 9 o'clock position is located on the client's left side.
12. To help the client attend throughout the test, "reset" the client's attention for each test location by reminding them to focus on the front target (see section 4.3.1.4).
13. When presenting the penlight from the 6 o'clock location, stand on the client's occluded side and position the **unlit** penlight at stomach level far enough away from the client's

body to ensure the light isn't directed up under the client's chin or up their nostril. Turn on the penlight when the light is in position.

14. If the client breaks fixation and looks for the penlight during the test, **do not** record the response and present the penlight in that location again at the end of the test.
15. **To test the right eye***:* occlude the client's left eye with the eye patch.
16. **To test the left eye***:* occlude the client's right eye with the eye patch.
17. **To test the right and left half of the visual field:** move the penlight from the 3 o'clock and 9 o'clock positions.
18. **To test the superior and inferior half of the visual field:** move the penlight from the 12 o'clock and 6'clock positions.

Instructions to the Client:

> *"We are going to use two people to give you this* test. *[Name]will sit in front of you and hold this target for you to look at [indicate flower design card]. While you look at the target, I am going to stand behind you and move this penlight from behind your ear towards the front of your face. As soon as you see the light from the penlight, please raise your hand or say "now". It is VERY IMPORTANT that you keep your eye focused on the target that [Name] is holding at all times during the test and that you do not try to look for the light. If you move your eye to look for the light the test is not accurate. [Name] will be watching your eye to make sure that you do not move your eye to look."*

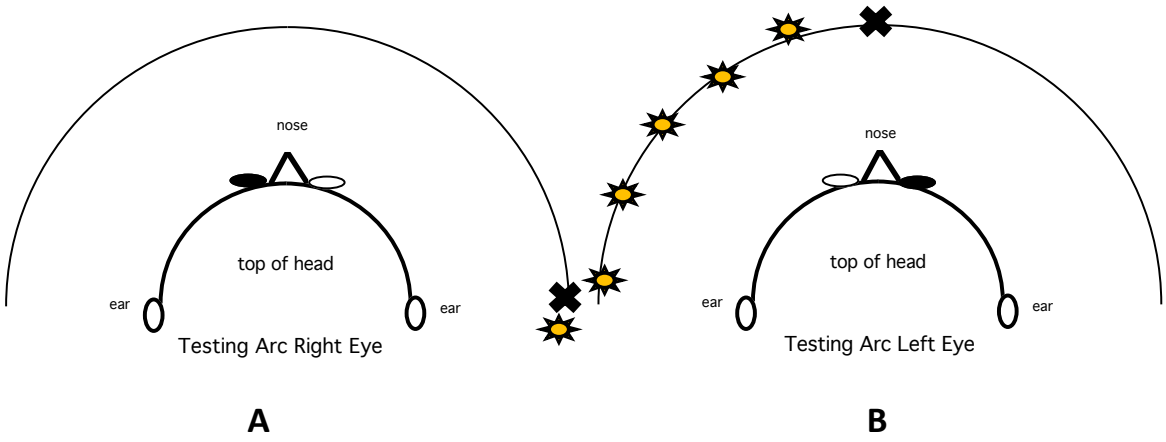
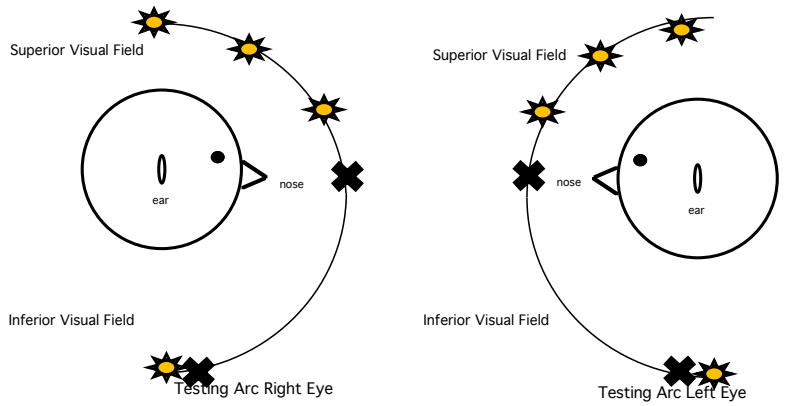


Figure 4.2: Illustration of a left hemianopia on the recording form. ✹ indicates the penlight as it moves toward the nose. **X** indicates the location where the client indicated first seeing the penlight. The client acknowledged the penlight as soon as it appeared on the right side when testing the right eye **(A)** and when it moved into the right field in front of the face **(B)** when testing the left eye. ⬬ indicates the location of the occluder on the eye.



A **B**

Figure 4.3: Illustration of a superior field deficit on the recording form. ✸ indicates the penlight as it moves toward the nose. **X** indicates the location where the client indicated first seeing the penlight. The client acknowledged the penlight as soon as it moved into the inferior field in front of the face in both eyes **(A)** and when it appeared in the inferior field in both eyes **(B)**. The figure does not show the occluder on the untested eye.

4.3.2.2 Damato 30 Point Multifixation Campimeter

The Damato 30-Point Multifixation Campimeter provides a more precise alternative to confrontation testing of the central visual field. The test was designed by Bertil Damato, MD, PhD, FRCOpht. Dr. Damato's goal was to provide a simple, portable, and accurate perimetric measurement of the central visual field. The advantage of the test for assessing clients with brain injury is that the examiner does not have to place second target in different locations and the client does not need to sustain fixation for more than a few seconds. This increases the reliability of the test by minimizing both examiner and client error.

The test chart shown in Figure 4.4 consists of numbered targets that test 30 points in the **central** visual field. The second target is a 6-mm black dot that is shown in a centrally placed window on the chart. The test uses a unique strategy that relies on moving the eye rather than the target. The examiner instructs the client to fixate on one of the numbered targets on the chart, then moves the black dot into the central window. The client indicates when the dot appears. If the client does not see the black dot, that point within the visual field is recorded as a loss on the recording form. The client successively moves the eye to view each numbered target until the entire central field is mapped. The campimeter's ability to identify central field deficits was compared against the gold standard Humphrey Visual Field Analyzer and found to have a sensitivity of 81% and a specificity of 72% suggesting good accuracy.[200]

4.3.2.2.1 Campimeter Components

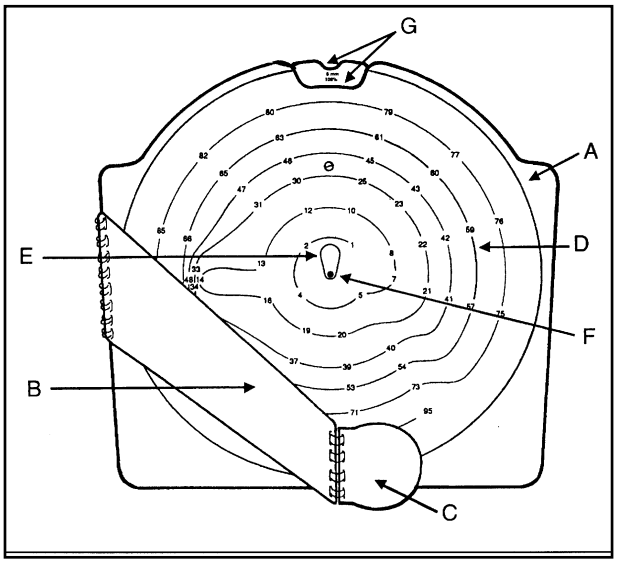


Figure 4.4: The Damato Multifixation Campimeter (*Illustration courtesy of Bertil Damato M.D.)*

A) *Test chart.* The chart is made of a hard, white plastic laminate printed with a circular test grid of black numbers. The chart is printed on both sides. One side of the chart is used to test the right eye and the other to test the left eye. The surface should be kept free of dirt and smudges. See Appendix K for cleaning instructions.

B) *Side arm*. The rigid side arm and eye cover helps the client maintain the correct viewing distance of 13 inches (33.3 cm) from the chart. It is important that this distance be maintained during the test to ensure the accuracy of the field measurement. The arm also ensures that the tested eye is viewing the correct test grid.

C) *Eye cover*. The eye cover is used to occlude vision in the untested eye. It is important that the field in each eye be tested monocularly to obtain an accurate measurement. If the client is unable to keep the eye cover in place, use an eye patch in combination with the cover to ensure that the untested eye remains occluded throughout the test.

D) *Test grid.* The test grid consists of 30 target numbers providing 30 test points within the 30-degree central visual field. The fixation targets are numbered to simplify communication with the client and recording of the results. The numbering is random to ensure that the client actually looks at the numbers without guessing. The lines linking the numbers direct the eye movements from one fixation target to the next. The test grid for the right eye is printed on one side of the chart and the test grid for the left eye is printed on the other side of the chart.

E) *Target window*. This window frames the second (black dot) target for the test. The window is shaped to minimize shadow on the circle and is 10 mm wide to ensure an error of less than 1 degree in placement of the second target during the test.
F) *Target*. A 6 mm black dot is used as the second target for the test. The dot has 100 % contrast and is large enough to be detected by clients with reduced acuity. The dot is printed on a movable disc so that it can appear and disappear within the window.

G) *Finger notches on the target disc*. The target disc is moved back and forth to display and remove the black dot from the window. Notches on the disc help the examiner accurately position and move their finger to present the target. This ensures that minimal cues are given to the client as to when the target appears.

4.3.2.2.2 **Test Instructions**

Test Items:

Damato 30 Point Multifixation Campimeter
Damato Campimeter plastic recording form template-use this to make a paper copy to record performance
Book stand (optional)
Eye patch or clip-on occluder (optional)

Environment: well-lighted room with the light source directed from behind the client onto the chart to evenly illuminate its surface; 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 Damato recording form template to make a paper recording form.
2. Seat the client comfortably at a table wearing eyeglasses **IF** needed to identify the numbers on the chart. Eyeglasses will make it more difficult to observe whether the client cheats by moving the eyes toward the target window-use eyeglasses only if needed.
3. Instruct the client to hold the campimeter upright on the table top or use a book stand.
4. Stand behind the chart and face the client so you can observe the client's eyes to ensure the client fixates on the number and doesn't look to the window in anticipation of the dot appearing.
5. Instruct the client to position the eye cover. Fold the eye cover inward to occlude the untested eye. *(Note: use an eye patch or clip-on occluder in conjunction with the side arm if the client is unable to use the eye-cover to occlude the eye)*.
6. Continue to use side arm to maintain the correct distance from the chart (Figure 4.5).
7. Make sure that there are no shadows on the chart surface.
8. Adjust the card so that it faces the client squarely, with the target window directly in front of the eye being tested (Figure 4.5).
9. Tilt the card backward and forward until the client feels comfortable (Figure 4.5).

10. Make sure that neither the chart nor the client's head is tilted sideways (Figure 4.7)
11. **When positioned correctly, the tip of the client's nose should be pointing at the target window** (see Figure 4.6).
12. **Provide a practice session** before you start the test.
    - Make sure the target window is blank. Instruct the client to focus on the window and say "Now" when the black dot appears in the window, then move the black dot into the window. Repeat this step several times until the client responds every time the dot is shown. *(Note: if it is difficult to move the dot into the window-check your hand position on the chart-you may be inadvertently squeezing the front and back sides of the chart together making it difficult to move the target disc).*
    - Point to random numbers on the chart and ask the client to identify them. Repeat this step several times. If the client consistently identifies the numbers, continue onto the test. See section 4.3.2.2.3 if the client is unable to see or accurately identify the numbers.
13. Begin the test.
14. Show the client the number 1 on the grid.
15. Instruct the client to keep looking at the number 1 and to say "now" when the black dot appears.
16. Move the dot into the target window while watching the client's eye closely to ensure the client remains fixated on the number.
17. If client doesn't see the dot, **place a black mark** over that number on the assessment form **or write down the number** (Figure 4.8).
18. Remove the black the dot from the window.
19. Instruct client read aloud the next number.
20. **Prime and refocus** the client's attention by reminding them to keep focusing on the number (repeat this with every new test location-you can't repeat it enough).
21. When you are sure that the client is focused on the number, move the black dot into the target window.
22. If you are unsure whether the client was attending, immediately retest the number before moving onto the next number.
23. Repeat this process until the client has viewed all numbers.
24. To help identify cheating:
    - Vary the delay before presenting the black dot so that the client cannot guess when it will appear.
    - Present a blank window periodically to ensure the client's responses are genuine.

Testing the Blind Spot

1. The blind spot is used to ensure that the client's head is properly positioned, and the eye is aligned with the center of the chart.
2. The numbers 8, 29, 31 on the chart indicate areas where the natural blind spot will occur.
3. The client should **not see** the black dot at one of these locations if the head is properly aligned on the chart.
4. Test number 8 first; if the client sees the black dot at this location, test numbers 29, 31

5. If the client sees the black dot at all three locations, check the client's head to make sure it is properly positioned (the tip of the nose is directly opposite and pointing towards the target window).
6. If the client continues to **see** the black dot at all blind spot locations but you are sure that the head is aligned properly-continue with the test.

Testing the Field of the Right Eye

1. Place the eye-cover in the client's **left hand** and have the client hold the **right** edge of the chart with the **right hand**.
2. Instruct the client to cover the left eye by holding the cover (folded inward), against the client's closed eyelid or against the eyeglass lens.

Testing the Field of the Left Eye

1. Turn the chart over.
2. Place the eye-cover in the client's **right hand** and have the client hold the **left** edge of the chart with the **left hand**.
3. Instruct the client to cover the right eye by holding the cover (folded inward) against the closed eyelid or against the eyeglass lens.

Instructions to the Client:

"This test will carefully measure whether you have lost vision in the very center part of your field, the area you use to read and identify objects. I will test this by having you focus on a number on this chart [show a number] and then tell me when you see this black dot appear [show the black dot in the target window]. I will test each eye separately so you will need to cover one eye during the test. To cover your eye you will hold this [show side arm with eye cover] against your eye. It is very important that you follow these instructions, so we will practice several times before you take the test."

"Hold the cover against your eye."
"Look at the number "1" and keep looking at it."
"Say 'now' when you see the black dot appears."

Figure illustrations are courtesy of Bertil Damato, MD

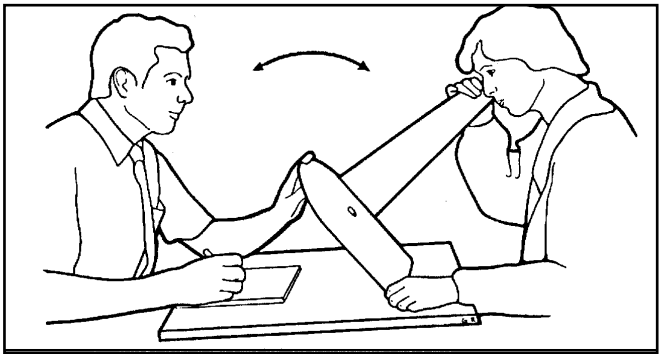


Figure 4.5: **Correct position**. Adjust the chart so it faces the client squarely and tilt the chart backward and forward until client feels comfortable.

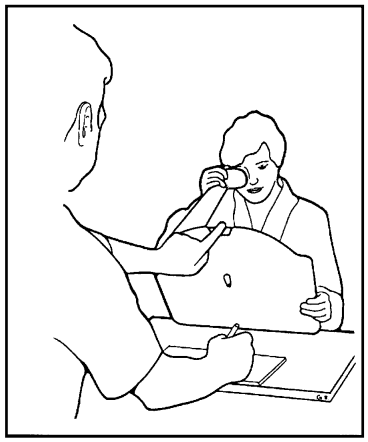


Figure 4.6: **Correct position**. Make sure that the tip of the client's nose is pointing at the target window.

Figure 4.7: Incorrect position. Monitor the client's head to make sure the **client does not** tilt or turn it during the test.

4.3.2.2.3 Modifications for Difficult-to-Test Clients

The instructions can be modified to test clients with limitations in cognition, language, attention without significantly altering the validity and reliability of the test.

1. *If the client has difficulty seeing the number target or maintaining focus*. Use a laser pointer or small sticker on your finger tip as the fixation target instead of the number.
2. *If the client has difficulty sustaining attention or limited endurance*. Reduce the number of test locations from 30 to 15. Have the client fixate on every other number to keep the targets evenly distributed throughout the field. Reducing the number of targets will reduce the sensitivity of the test to identify discrete deficits but it still provides a gross indication of a field deficit in the central visual field.
3. *If the client has difficulty sustaining attention or limited endurance*. Break the test into short segments and give it over several days.
4. *If the client has difficulty speaking*. Instruct the client to raise a finger to indicate when the black dot appears.

4.3.2.2.4 Recording the Client's Performance

Dr. Damato designed the recording form to accommodate the unique way the chart is constructed (where the eye moves to a location and target always appears in the central field). The recording form is turned one way to record the results and the other way to report the results (see Figure 4.8). The orientation of the form is clearly labeled. Position the form to read "this way up to record results" when you administer the test. After recording the client's results, rotate the form to read "This way up to interpret results."

The circles on the test form represent the field diagrams for each eye. On the field diagram, mark each target number with a black dot if the client **did not see** the black dot when it appeared as the client fixated the number (Figure 4.8). When the assessment is complete, the arrangement of black dots on the field diagram display the client's visual field deficit.

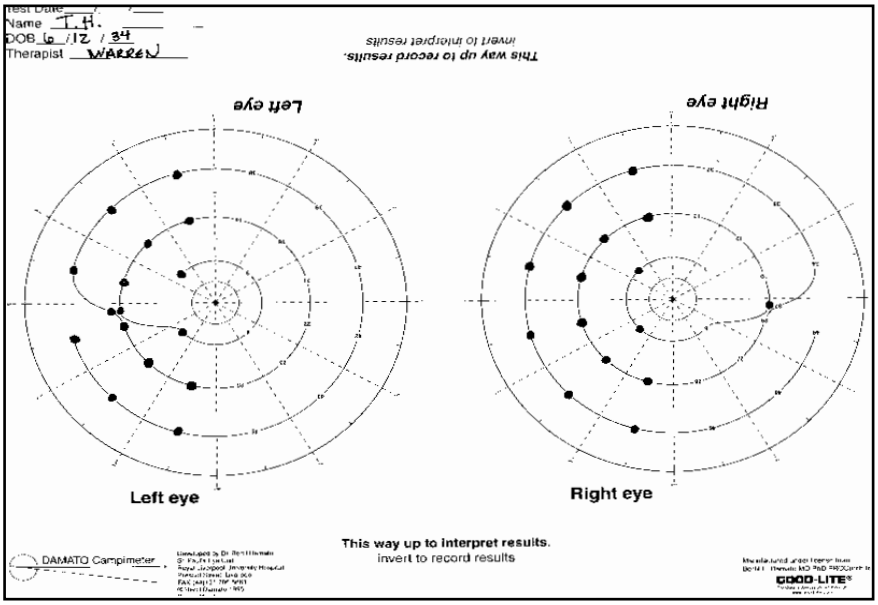


Figure 4.8: This example shows a left homonymous hemianopia in the central visual field. Note: field diagrams are interpreted as the viewer sees them-the left side of the diagram indicates the left side of visual field deficit and so on.

4.3.3 Interpreting the Client's Performance on the Assessments

4.3.3.1 Key Client Complaints/Observations

The client demonstrates or reports several behaviors that suggest navigation and orientation issues stemming from hemianopia or other visual field deficit (VFD). Carefully screen the client for a VFD in the peripheral field in one or both eyes. Consult with the rehab team especially PT and Nursing to determine if they have observed similar behaviors in the client.

The client demonstrates or reports several behaviors that suggest mobility issues stemming from hemianopia or other VFD. Carefully screen the client for a VFD in the peripheral field in one or both eyes. Consult with the rehab team especially PT and Nursing to determine if they have observed similar behaviors in the client.

The client demonstrates or reports several behaviors that suggest reading issues stemming from hemianopia or other VFD. Use the Damato campimeter to carefully screen the client for the presence of a VFD in the central field in one or both eyes. Recheck the client's high contrast visual acuity and reading acuity. Gather more information about the client's reading limitations using the Telephone Number Copy Test (see section 4.5.2), and the Pepper Visual Skills for Reading test (see section 4.5.5.3) if you have this assessment. You should also consult with the Speech Language Pathologist about your findings to discuss vision vs. language deficits.

The client demonstrates or reports behaviors that suggest eye/hand coordination issues stemming from hemianopia or other VFD. Deficits in eye/hand coordination are most likely to occur when the VFD is on the same side as the dominant hand (see sections 2.4.3.2 and 5.8.8).

4.3.3.2 Two Person Kinetic Confrontation Test

The client DOES NOT SEE the penlight in all locations on the LEFT SIDE (9 o'clock, 6 o'clock, 12 o'clock). This suggests the presence of a **left** hemianopia.

The client DOES NOT SEE the penlight in all locations on the RIGHT SIDE (3 o'clock, 6 o'clock, 12 o'clock). This suggests the presence of a **right** hemianopia.

The client DOES NOT SEE the penlight with either eye in the lower area of the visual field (6 o'clock position). This suggests a visual field deficit in the inferior field. When it affects both the left and right halves of the inferior field, it is characterized as an altitudinal defect. A complete loss of visual field in the lower visual field affects the client's ability to accurately monitor changes in the support surface and obstacles in the affected field, increasing falls risk and difficulty safely navigating environments.

The client DOES NOT SEE the penlight with either eye in the upper area of the visual field (12 o'clock position). This suggests a VFD in the superior field. When it affects both the left and right halves of the superior field, it is characterized as an altitudinal defect. A complete visual field deficit in the superior field affects the client's ability to orient to the environment and may cause difficulty navigating environments without getting lost.

The client DOES NOT SEE the penlight in the upper area of the visual field (12 o'clock position) but does see it in lower area of the visual field (6 o'clock position) on the RIGHT SIDE. This suggests a **right** quadrantanopia affecting the **superior** visual field. Quadrantanopia causes less field loss, and it is easier for the client to compensate for it. It may cause functional limitations only in specific conditions-as when a sign or object is located in the **RIGHT** upper field.

The client DOES NOT SEE the penlight in the upper area of the visual field (12 o'clock position) but DOES SEE IT in the lower area of the visual field (6 o'clock position) on the LEFT SIDE. This suggests a **left** quadrantanopia affecting the **superior** visual field. Quadrantanopia causes less field loss, and it is easier for the client to compensate for it. It may cause functional limitations only in specific conditions-as when a sign or object is located in the **LEFT** upper field.

The client DOES NOT SEE the penlight in the lower area of the visual field (6 o'clock position) but DOES SEE IT in the upper area of the visual field (12 o'clock position) on the RIGHT SIDE. This suggests a **right** quadrantanopia affecting the **inferior** visual field. Quadrantanopia causes less field loss, and it is easier for the client to compensate for it. It may cause functional limitations only in specific conditions-as when an object or barrier is located in the **RIGHT** lower field and may increase risk of collisions and falls.

The client DOES NOT SEE the penlight in the lower area of the visual field (6 o'clock position) but DOES SEE IT in the upper area of the visual field (12 o'clock position) on the LEFT SIDE. This suggests a **left** quadrantanopia affecting the **inferior** visual field. Quadrantanopia causes less field loss, and it is easier for the client to compensate for it. It may cause functional limitations only in specific conditions-as when an object or barrier is located in the **LEFT** lower field and may increase risk of collisions and falls.

The client DOES NOT SEE the penlight until it is almost directly in front of the shoulder on the left side. This suggests that the peripheral visual field is impaired on the **left side**, but the client may have **no deficit** in the central visual field (see section 4.2.1.8). Testing with the Damato Campimeter may help confirm that there is no central field deficit. Deficits confined to the peripheral visual field usually do not affect reading and other near vision tasks but can create significant problems in mobility and navigation.

***The client DOES NOT SEE the penlight until it is almost directly in front of the shoulder on the right side*.** This suggests that the peripheral visual field is impaired on the **right side**, but the client may have **no deficit** in the central visual field (see section 4.2.1.8). Testing with the Damato Campimeter may help confirm that there is no central field deficit. Deficits confined to the peripheral visual field usually do not affect reading and other near vision tasks but can create significant problems in mobility and navigation.

The client DOES NOT SEE the penlight until it is directly in front of the face on BOTH SIDES. This suggests that the client may have tunnel vision. It is not a common visual field deficit, but it can occur with anoxic brain injuries, tumors, and other neurological and retinal conditions. Depending on the size of the intact central visual field, the client may have minimal problems reading and seeing visual details but significant problems with mobility and navigation.

The client repeatedly breaks fixation and must be continually redirected back to the test. This indicates that the client has poor attention, and the results of the test may not be accurate. The OT may need to rely on clinical observations to determine if a VFD may be present.

4.3.3.3 Damato 30 Point Multifixation Campimeter

Test interpretation is straight forward. The pattern of black dots on the field diagrams indicates the location and size of the visual field deficit (see figure 4.8). The client and family should be shown the field diagram. It is very important that the client and family understand the size and location of the deficit and whether it is in both eyes. To help the client/family visualize the deficit, shade in the field deficit, and draw a nose between the two diagrams on the recording form to provide a clearer picture of the size and boundaries of the deficit. This is also a good time to educate the client and family about visual field deficits. Be sure to cover these points: 1) the damage occurs in the brain on the opposite side of the field deficit, 2) the field loss is in both eyes, 3) it is not a problem with the eye but rather a problem with the brain receiving the image from the eye.

The recording form shows that the dots fill the entire RIGHT half of the visual field on both field diagrams. This suggests a **RIGHT** hemianopia affecting the central area of the visual field. Because the border of the field deficit is right next to fovea (the area used to see small details and color) it is likely the client will experience difficulty reading. If the hemianopia is on the same side as the dominant hand, the client may also have trouble monitoring the hand during writing and other fine motor activities.

The recording form shows that the dots fill the entire LEFT half of the visual field on both field diagrams. This suggests a **LEFT** hemianopia affecting the central area of the visual field. Because the border of the field deficit is right next to fovea (the area used to see small details and color) it is likely the client will experience difficulty reading. If the hemianopia is on the same side as the dominant hand, the client may also have trouble monitoring the hand during writing and other fine motor activities.

The field diagram shows the dots confined to a superior quadrant (quadrantanopia). This type of deficit usually causes fewer occupational limitations. If the deficit extends into the foveal area (inner ring of numbers on the field diagram) the client may experience reading difficulty. The client may also have difficulty locating objects/signage in that area of the upper field which may affect navigation and driving.

The field diagram shows the dots confined to an inferior quadrant (quadrantanopia). The client may be unable to accurately monitor changes in the support surface and obstacles in the affected field, increasing falls risk and difficulty safely navigating environments. The client may also experience difficulty reading if the deficit extends into the macular area.

The field diagram shows a half moon pattern of dots along the outer edge of the diagram on one side (target numbers in the 30s and 40s). If the Two Person Kinetic Confrontation Test suggests a peripheral deficit on this side, the client may have macular sparing, which occurs in about 30% of all hemianopias (see section 4.3.1.8). The client should experience few if any problems with reading and seeing visual details but may have difficulty with mobility and navigations.

The recording form shows black dots filing the superior quadrants on both field diagrams. An altitudinal defect affecting the superior quadrants of both eyes is a frequent corollary of traumatic brain injury.[243] Depending on how close the field deficit comes to the foveal area (inner ring of numbers), the client may experience difficulty seeing overhead signage and objects. This could create challenges with orientation and safe navigation. Driving performance should be very carefully evaluated. Depending on how close the field deficit comes to the foveal field (inner ring of numbers) it could also affect reading and page navigation.

The recording form shows black dots filling the inferior quadrants on both field diagrams. Depending on how close the field deficit comes to the foveal area (inner ring of numbers), the client may experience difficulty seeing objects on the floor and could contribute to falls. A complete loss of visual field in the lower visual field affects the client's ability to monitor the

support surface during ambulation and may cause significant limitations in mobility and significantly elevate the client's falls risk. Driving performance should be very carefully evaluated. Depending on how close the field deficit comes to the foveal field (inner ring of numbers) it could affect reading and page navigation.

The deficit is observed only in one eye. This indicates that the injury is anterior to (e.g., in front of) the optic chiasm and affecting the optic nerve or retina (see section 2.1.2.2 and 2.1.2.3). Common causes of this type of deficit include optic nerve trauma, retinal damage and central retinal artery occlusion (a stroke of the eye). If the entire central visual field has been affected and the Two Person Kinetic Confrontation Test shows vision loss on both sides in the same eye, the client has monocular vision. Persons with monocular vision often experience difficulty with mobility due to reduced peripheral vision and depth perception. If the involved eye is also the dominant eye, the client may experience fatigue and stress when completing reading and other near vision tasks.

The deficit appears in all four quadrants. Some brain injuries can involve the entire central field producing a "Swiss cheese" type field where the client retains "spotty islands" of vision scattered throughout the blind field. This client may have been diagnosed with cortical blindness. The client with this kind of deficit will have significant functional limitations in all daily activities from reading to mobility. Sophisticated testing using an automated perimeter like the Humphrey Visual Field Analyzer, or a microperimeter is needed to diagnose this visual field deficit.

The deficit is on the side of the client's dominant hand. The client may experience reduced eye hand coordination and have difficulty writing legibly, pouring, cutting and other tasks that require monitoring of the hand to complete.