

# Article ▶ Vision Therapy Procedures for Tunneling

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## ABSTRACT

Tunneling is a form of an exclusive concentration and is a common spatial adaptation. Treatment strategies for tunneling and the overall visual process will be addressed. Strategies include diaphragmatic breathing, syntonics, and vision therapy activities that stress working in real space with lenses and prisms. Objectives, observations, expected responses, modifications, and questions for the patient are discussed for each vision therapy activity.

**Keywords:** aniso glasses, diaphragmatic breathing, dissociating glasses, hanging onto space, tunneling

## Vision Therapy Procedures for Tunneling

Tunneling is defined as a form of an exclusive concentration and is a common spatial adaptation. The patient seems to be solely aware of that on which they are centering and blocks or ignores all other sensory input. It is both a sensory and motor phenomenon that is pervasive in our culture and presents concurrently with all refractive, binocular, and monocular conditions. Tunneling is a common symptom of visual perceiving, processing, and performance issues. Tunneling affects all sensory systems and is caused by physical, physiological, or intellectual/psychological stress. The symptoms affect how we think, speak, listen, and move. If tunneling is not addressed, it can affect an individual's ability to see the bigger picture quickly and easily.<sup>1</sup>

### Impact of Stress

Before the treatment of tunneling is described, there are other factors that need to be discussed. A highly significant factor is the impact of stress on the individual. The stress can be physical, physiological, or intellectual/psychological. Regardless of the source of the stress, in my experience, these individuals exhibit diminished breathing; more specifically, chest breathing, shallow breathing, or breath holding becomes apparent. In addition, individuals under stress begin to constrict their visual fields.<sup>2</sup> It is a functional field constriction as opposed to pathological change. Consequently, the foundation for treatment of tunneling and associated vision problems includes diaphragmatic breathing and "hanging onto space."

Diaphragmatic breathing is emphasized for all office and home vision therapy (VT) activities. It is recommended to inhale and to exhale through the nose. For children, we ask them to pretend that they are taking in air through their nose and blowing up their belly like a balloon. For some patients, diaphragmatic breathing is begun in a prone position with hands on stomach and fingertips touching. As we inhale, the fingertips should start to move apart, and then they should come together as we exhale. The chest should remain still. Inhaling should take at least four seconds and exhaling about six seconds. As patients become more skilled in breathing,

inhaling and exhaling for 8-10 seconds or more is achieved. It is important not to hold our breath because this creates stress. We are striving to regulate our breathing. Diaphragmatic breathing not only allows us to be calmer and provides oxygen to the brain for conscious activity, but it also allows us to regulate movement.<sup>3</sup> Diaphragmatic breathing can be easily incorporated in office and home activities.

The other fundamental is "hanging onto space." When hanging onto space, we center on an object and should simultaneously be aware of our surroundings, i.e., the total spatial volume, including the space behind us. In my experience, space develops in the following sequence: first, forwards or away from us along the Z-axis; second, sideways along the X-axis; third, up and down along the Y-axis; and fourth, behind us. If the patient is not ready to be aware of the space behind them and places too much effort on being aware of that space, the awareness of the other areas of space becomes compromised.

Additionally, in VT it is beneficial to have patients remove their shoes upon entering the therapy area. We want patients to experience the proprioceptive feedback of their feet touching the floor. There are many receptors at the bottom of the feet having to do with balance and posture. For patients wearing orthotics, if they are more comfortable with their orthotics, it is recommended that they wear gym shoes with their orthotics during VT.

It is also best for patients to remove their habitual lenses. The quickest way to change performance is to take the patient out of their habitual world. When standing, it is important to keep the knees slightly bent and not locked. If we lock our knees, this creates undue body/mind stress or tension in general.

Another important factor to consider in the treatment of tunneling is working in real space vs. instrument space. Real space is more natural and expansive; good posture is emphasized in support of stable vision. When working in instrument space, we are working in a more limited environment, artificial or virtual in that it is a two-dimensional representation of a three-dimensional world. Posture is often seated or standing in place, so limited feedback is available.

## Questions

Lastly, from a behavioral perspective and in my perspective, our obligation to the patient at the highest level is to plant questions in their heads without giving them the answers, i.e., telling them what they should be seeing. The questions for the patient for the following activities may appear repetitive or redundant; however, different patients often require different triggers to elicit awareness or a change in performance. Thus, the same question is asked in a different manner.

## Pre-testing

Prior to doing syntonics or a VT activity, the following is suggested to demonstrate the effect of these treatment methods, to inspire patients, and to prepare patients for a very rewarding experience:

1. Look out a window as far away as possible without any glasses or contact lenses and answer the following questions:
  - a.) Does space appear flat or three-dimensional?
  - b.) Am I seeing in small or big chunks?
2. Walk forwards and backwards, monitoring how your body feels while looking straight ahead. Be aware of balance, posture, weight distribution, groundedness, and any tension in the shoulders, neck, and/or back.
3. Read a short passage aloud occasionally.

## Post-testing

The above pre-testing is repeated after any of the following activities.

## Treatment

In my experience, syntonics is often the quickest way to open up the visual field and ideally is commenced along with performance lenses and VT at the start. I find that syntonics can either allow the patient to be ready for VT by opening up the visual field, or it creates many changes in performance from cognitive, motor, and/or emotional systems by bringing the sympathetic and parasympathetic nervous systems into balance.<sup>4</sup>

The College of Syntonics has an annual conference, and preceding the conference, registrants can learn how to bring syntonics into their practices. The *Journal of Behavioral Optometry* had an excellent article by Larry Wallace, OD on syntonics including treatment strategies.<sup>5</sup>

## Vision Therapy Activities

There are hundreds of VT activities. I am going to present some activities that I have found extremely useful in opening up functional visual fields and establishing a competent vision system. These activities go beyond treating tunneling because they all emphasize vision as a process and have the potential to affect overall visual performance in a very positive manner. I believe that the following activities are highly effective

because they provide significant feedback to the patient. To maximize efficacy of the VT procedures, we want to emphasize diaphragmatic breathing, hanging onto space, and visualizing whenever possible during the performance of the activities. When visualizing, it is recommended to visualize in space rather than our heads. Our heads are too small. In my practice, visualizing in real space allows for an easier transition to actual performance because of more appropriate spatial configurations.

In addition, I find that inner chatter is counterproductive because it is as if the information is going through another filter before it is processed. Talking to ourselves appears to take us out of the immediate experience of heightened awareness. Patients are encouraged not to talk to themselves but instead to breathe diaphragmatically, to hang onto space, and to visualize when applicable. In this way, patients learn to trust what they see in short order, to move along more quickly, and they are calmer.

For all activities, patients are instructed that the highest level of performance is being aware of the following: the space around them, body posture, where they are centering, and what they are doing. Patients are praised for their efforts in awareness. When patients are successful in accomplishing an activity, they recognize it. However, I have observed that by emphasizing awareness over performance, the patient's anxiety and frustration in dealing with a challenging activity are reduced greatly. The patient becomes more available to work with and quickly brings the changes that they have made in their vision and emotional well-being to their lives.

When dissociating (doubling) glasses are necessary, the following pairs are recommended:

1st Pair:

1. OD Pl=6<sup>Δ</sup> BU & OS Pl=6<sup>Δ</sup> BD
2. OD Pl=6<sup>Δ</sup> BD & OS Pl=6<sup>Δ</sup> BU

2nd Pair:

1. OD Pl=10<sup>Δ</sup> BU & OS Pl=10<sup>Δ</sup> BD
2. OD Pl=10<sup>Δ</sup> BD & OS Pl=10<sup>Δ</sup> BU

3rd Pair:

1. OD Pl=4<sup>Δ</sup> BU & OS Pl=4<sup>Δ</sup> BD
2. OD Pl=4<sup>Δ</sup> BD & OS Pl=4<sup>Δ</sup> BU

*Observations & Questions:* There is an observation section following some activities and a question section following all activities. A star (\*) has been added to indicate when the question or observation is relevant to tunneling.

## Hand Game (Three-dimensional Harmon Circles)

*Objective:* To comprehend what it means to hang onto space, to develop the ability to center, and simultaneously to be aware of the space around us as we direct and monitor movement.



**Figure 1.** The staff person's hands are leading and moving very slowly opposite one another on the X, Y, and Z axes. It is important to stay within the patient's visible range, with the patient keeping their hands always 1" away from the staff's hands.

*Posture:*

1. The therapist stands/sits 16-20" from the patient, who is standing, so heads are at eye level.
2. The therapist holds hands up with palms facing the patient. The patient holds hands up with palms facing the therapist. The therapist and the patient move hands towards one another until 1" apart and midway between them.

*Procedure:*

1. The patient is instructed to center his or her eyes on the therapist's eyes and simultaneously to be aware of the room.
2. While maintaining eye contact, the patient is then asked to describe what is seen in the space around him or her while working to see the total spatial volume simultaneously.
3. The patient is then instructed to move his or her hands with the therapist's hands and keep them 1" away from the therapist's hands at all times while centering on the therapist's eyes. The therapist's hands are moved very slowly in the same direction (Figure 1), the opposite direction, and in and out. Also, the therapist can keep one hand stationary while moving the other hand. It is important not to move too far out into the periphery where the hands can no longer be seen.
4. For preschoolers, their hands can be touching the therapist's hands, and then after the patient becomes comfortable with the activity, only the fingertips should be touching.

*Observations:*

1. Does the patient have delayed reactions?\*
2. Does the patient follow more easily with one hand than the other?\*
3. Does the patient twist, turn, or tighten their torso instead of just moving their arms?



**Figure 2.** Starting position with staff positioned below the patient so that the patient can see all around them, including the mirror in front of them.

*Questions:*

1. Ask the patient what they observed about their performance as they did the activity.\*
2. If any of the above observations are made (or any others), ask the patient what they can do differently.
3. Ask the patient if they are breathing all the time when they are doing the activity. If not breathing, ask what they can do to change that.\*
4. Ask the patient if they are aware of the therapist's hands and the room at the same time or in a fragmented fashion? If fragmented, ask what they can do to change that.\*

The Hand Game is an activity I created and initially used for all patients. As patients progress in office training, the Hand Game is used as needed, i.e., when good central-peripheral organization is lacking. The Hand Game is also recommended for all children for home training purposes.

**Wolff Pursuits**

*Objective:* To develop fluid and controlled eye movement, binocularity, centering, and identification and simultaneously to be able to center and to be aware of the total spatial volume.

This activity was originated by Bruce Wolff. OEP published a paper on this activity by John Streff during his time at the S.A. Noel Center in Lancaster, Ohio.<sup>6</sup> This activity can be done with the patient either on their back, seated, or standing. Standing is the highest level because it requires the most postural control while vision is free to operate. The equipment required is a set of Wolff wands, a full-length mirror 3-4 feet wide, an eye patch, and a pair of opposite dissociating glasses (doubling glasses). The powers of the dissociating glasses are  $PI=6^{\Delta}$



**Figure 3.** It is important for both the patient and staff to be comfortably positioned. The patient is standing with feet shoulder width apart and knees slightly bent.

BU OD/Pl=6<sup>Δ</sup> BD OS and Pl=6<sup>Δ</sup> BD OD/Pl=6<sup>Δ</sup> BU OS. If patients have difficulty seeing double with the glasses, increase the power to 10<sup>Δ</sup> and return to 6<sup>Δ</sup> when it is easily done. When patients can perform easily with the 6<sup>Δ</sup> glasses, do the activity with 4<sup>Δ</sup>. Ideally for the activity, the patient is facing a wide (3-4 foot) floor-length mirror with the therapist sitting in between. The mirror allows the patient to have the potential to be more aware of the space in his or her surroundings, including him- or herself, added awareness of the wands moving in the mirror, and the space behind him or her. Of course, the patient also wants to be aware of the space outside the mirror. It helps to increase awareness early on by placing a foam rubber noodle lengthwise one foot from each side of the mirror.

For children having inadequate control of their bodies and/or eye movement, begin the activity in the supine position. All of the rest of the patients start the activity standing. The ideal standing posture is with feet parallel and aligned under the armpits, with knees slightly bent and never locked.<sup>7,8</sup>

First, the activity is done monocularly for two minutes with an eye patch. The patched eye is always kept open even though it is covered. This is done to reduce unintended body tension. The patient is asked to follow the wand moved by the therapist, which is moved slowly (Figure 2). Most doctors or therapists tend to move the wand too quickly in the beginning. Patients are encouraged to keep their eyes wide open. The wand is moved in large circles in all the cardinal meridians. By moving the wand in circles, the patient is continually asked to change centering (vergence) and identification (accommodation) in order to do the task well. The silver wand is used as the primary

target because it has a higher reflective surface than the gold wand. The patient is asked to describe what he or she sees. The objective is to make the wand and the surrounding space equally clear. For some patients, that may mean first making the wand and the surrounding space equally blurred and then working towards clarity. The patient is asked if he or she can feel the patched eye moving the same as the uncovered eye. If the patient reports that the eyes feel like they are moving unequally, move the silver wand around the open eye while touching the skin very slowly. This helps heighten proprioceptive awareness of each eye moving. At the end of each monocular period, location or saccadic skills are introduced. The patient is instructed to follow the silver wand as a gold wand is introduced. They are to change gaze to the gold wand when “gold” is called out and to return to the silver when “silver” is called out. Five or six movements are done. Usually, one wand is kept near the midline, while the other one is moved to randomly-selected positions. We want the head to remain stable and straight during the whole procedure, and the patient should maintain good posture. The same sequence is now repeated with the other eye for two minutes.

Next, the dissociating glasses are used for two minutes with each pair (Figure 3). The silver wand is again moved in the same manner as above. The objectives now include: a) making both wands real and solid. If one is more real and solid, instruct the patient to look at the less real one and to breathe and blink to make it clear, then look between the two wands and see if they can maintain the equality of the wands; b) make the wands and surrounding space equally clear (or blurred initially); c) make the wands align; d) make the wands the same distance from themselves (they may need to look closer or further away initially before moving to the plane of the wands). The last part is the location skill, which is the same as when the activity is done monocularly. The only difference when the patient is asked to change gaze is that the plural is used, i.e., “golds” or “silvers.” Repeat with opposite dissociating glasses.

\*Emphasize to the patient that they should strive to see the entire tableau simultaneously rather than in a fragmented fashion during all parts of the activity. Always keep the eyes wide open and breathe diaphragmatically.

#### Questions:

1. Does the eye that is patched move the same as the eye that is open?\*
2. Do your eyes move smoothly?\*
3. Do you ever hold your breath?\*
4. Are the eye movements the same, independent of which eye is patched?\*
5. Are you aware of the space around the wand and of the space behind you?\*



**Figure 4.** Starting position of Streff Walk with patient centering on her eyes in the mirror and being aware of all the space around her.

6. Are you aware of all space including the wands and the mirror simultaneously?\*
7. Does the wand stay the same size, or does it get bigger and smaller?\*
8. When wearing doubling glasses, do both of the wands appear solid and real? Are they the same distance from you? Are they aligned all the time, sometimes, in certain positions, or not in certain positions?
9. Are you maintaining your posture?\*
10. Are the wand(s) clear?
11. Is the room clear?
12. Are the wand(s) and room equally clear or blurred?\*
13. Can you make everything clear or equally blurred?\*
14. Are there any differences with one eye patched compared to the other?
15. Are there any differences between the two dissociating glasses?

### Streff Walk

*Objective:* To develop visually-directed and visually-monitored movement, to recognize and to become sensitive to spatial changes, to be able to control static and dynamic body posture, to develop controlled and fluid eye movements, and to be able to organize a large volume of space in order to develop degrees of freedom between the vision and vestibular systems.

#### *Materials:*

- Set of yoked prism glasses: Pl=15<sup>Δ</sup> BR OU, Pl=15<sup>Δ</sup> BL OU, Pl=15<sup>Δ</sup> BU OU, Pl=15<sup>Δ</sup> BD OU
- Full-length mirror, 3-4 feet wide

*Procedure:* Stand 10 feet in front of the mirror. Center on your eyes in the mirror, and very slowly bend forward at the waist (Figure 4). As you are bending forward, move your eyes slowly down the mirror to the floor below. When your back is parallel to the floor, move your head and eyes down towards your right foot. Look at the big toe

of the right foot. Slowly pick up the left foot, raising the knee as high as possible while maintaining steady balance. Place the left foot down gently with the heel first, directly in front of the other foot, all the while keeping your eyes on the big toe of the right foot. If this is too difficult, place your foot off to the side. The goal is eventually to place one foot directly in front of the other. After the step is complete, slowly lift your head up while moving your eyes along the floor from your big toe to the mirror. Then, raise your body up from the waist as you move your eyes up the mirror, again centering on your eyes.

Prior to taking a step, shift your weight to the hip above the foot that is going to stay still. This will be helpful in maintaining effortless balance.

Repeat the process for a total of three steps forward and three steps backward. Note: when going forward, look at the forward foot's big toe and step with the rear foot forward, landing heel first. When taking steps backward, center on the rear foot's big toe, and with the front foot step backward, landing toe then heel. Always be aware of the space all around you—in front, to the sides, and behind as you are centering on the big toe.

- While looking at the mirror, prior to any movement, take in a long, even, and relaxed breath.
- Bending forward, breathe out through the nose smoothly and evenly.
- Looking at the front/back foot's big toe, take a breath.
- While stepping forward/backward, breathe out.
- After the foot lands, breathe in.
- While raising your head and back, breathe out.

The patient is encouraged to consider the following questions throughout the activity:

- What do I see?\*
- Can I look straight ahead and see the whole room as it appears, including the space behind me?\*
- What do I feel?\*
- Any spatial or size changes?\*
- Do I experience my body differently?\*

The patient should strive for the following:

1. Keep feet straight
2. Hang arms loose
3. Use hips for balance
4. Work slowly
5. Breathe slowly
6. Simultaneously be aware of all of the space around you
7. Feel your feet touching the ground
8. See how space and body have changed with each pair of glasses

### Questions:

1. What do you see?\*
2. Are you aware of the space around you?\*
3. Are you using the mirror to be aware of the space behind you?
4. Do the room, walls, and floor always appear the same?\*
5. Are you seeing the changes in the entire room?\*
6. Is the whole wall directly in front of you, appearing the same distance from you?\*
7. How do you use your body to keep balance?
8. Are you breathing or holding your breath?\*
9. Do you move your upper body to keep balance?
10. Are you shifting your hips to keep your balance?
11. Are you light-footed or heavy-footed with your steps?\*

### Observations with yoked prisms:

BU: Space appears to be displaced downward as if closer, objects at distance appear closer. Near (down) space is reduced and distance (up) is amplified, you feel taller (center of gravity shifted forward). If facing the center of a wall, the bottom portion of the wall pops out.

BD: Space appears to be displaced upward as if further away. Near (down) space is amplified and distance (up) is reduced, you feel shorter (center of gravity shifted back). If facing the center of a wall, the top portion of the wall pops out.

BR: Space appears to be displaced toward the left, the right side of space is expanded, and the left side of space is compressed. The right side of space is slanted downward; the center of gravity is shifted to the right. The left side of the body feels constricted, and the right side of the body feels expanded (right arm and leg feel longer and lighter), allowing increased mobility. If facing the center of a wall, the right side of space appears further away, and the left side appears closer.

BL: Space appears to be displaced toward the right, the left side of space is expanded, and the right side is compressed. The left side of space is slanted downward; the center of gravity is shifted to the left. The right side of the body feels constricted, and the left side of the body feels expanded (left arm and leg are longer and lighter), allowing for increased mobility. If facing the center of a wall, the left side of space appears further away, and the right side of space appears closer.

\*If the patient reports the opposite or paradoxical spatial changes, they are typically tunneling. The space in which the activity is done may be too big for them readily to organize. Try repeating the activity in a more narrow space like a hallway. When the activity can be done easily in a narrow space, then return to the larger space. Play the hand game often and encourage the patient to “hang



Figure 5. Dowels elevated 45° from horizontal.

onto space.” Also, placing foam noodles a few feet on either side of the mirror and encouraging the patient to be aware of the noodles as they center on their eyes in the mirror may be helpful.

### Prism and Dowels

*Objective:* To develop coordination of the two visual channels, to recognize and to become sensitive to likenesses and differences, to see space in an organized manner, to develop a solid space world, to organize a large amount of information quickly, and to communicate said information effectively.

This is another Bruce Wolff activity. Two approximately 3-foot dowels and dissociating glasses are used again. Rob Fox discussed this activity in his *JBO* article.<sup>9</sup> A dowel is held in each hand at three primary levels: below the waist, at the waist, and at shoulder level. From these primary positions, the dowels are positioned 45 degrees downward, straight ahead, and 45 degrees upward (Figure 5). The patient is wearing a pair of dissociating glasses and is asked what he or she sees. This is a wonderful time for the patient to learn how to use vision to organize what he or she perceives and effectively to communicate this information. The patient is to describe what he or she sees as if the listener (therapist) is blind. The listener wants to be able to paint a picture of what the patient is seeing. If the patient is not describing what he or she is seeing, from the bigger picture to the smaller picture, or giving details in appropriate steps, the listener reports that they are confused or that they just do not get it. Emphasize to the patient that the proper foundation or big picture is necessary for the listener to make this picture. The listener then draws a picture of what he/she thinks is being described using small circles to indicate the dowels. Ideally, the patient sees 4 dowels (two coming from each hand or hands), and the dowels are lined up on each side and appear to be the same size. However, all kinds of responses are possible. Typically, in the beginning, the dowels are not the same size or are not aligned on each side. If the patient has a problem seeing



**Figure 6.** This is an example of a patient employing extending arms all the way out and turning arms inward to accomplish matching and/or alignment.

4 dowels easily, use the 10<sup>Δ</sup> dissociating glasses; another alternative is to have the patient bend the elbows outward so that the dowels, instead of being perpendicular to the patient, are now angled inward towards the midline. For some patients, this makes it much easier to see the 4 dowels. As the activity becomes easier, return to the original way of following the procedure. If the patient reports that the dowels are of unequal length, the doctor or therapist can recommend looking further away in space and seeing if the patient can find the place where they can center to get the dowels to be the same length. If the dowels only grow so much, have the patient bend the arms at the elbows. The arms are now pointed inward to where the dowels are going to meet (Figure 6). The patient is centering at this point, hanging onto space, and breathing. The hands are turned inward as much as necessary until the dowels are equal in length. If the dowels are equal in length but not lined up on each side, the patient can tilt and/or turn their head until the dowels are lined up. Once that is achieved, the patient can see how much they can bring the arms back to the straight ahead position with minimal bending. Then the patient attempts to do the same with the head position. Finally, without any adjustments, the dowels are slowly brought together at the point where the patient is centering in space. Ideally, the dowels touch once they are brought together.

This is then repeated at each primary position with the dowels pointed 45 degrees downward, straight ahead, and 45 degrees upward. The patient wants to work towards doing the activity without having to bend the elbows or tilt or turn the head, i.e., using only their vision to make changes. Additionally, bringing the dowels together diagonally can be added while varying which arm is held higher. Another variation is having the patient walk and bring the dowels together every other step. The dowels are brought together in random areas in space, exploring all the cardinal positions. The objective is always to have the dowels appear the same size and aligned and to have all

four dowels meet when centering them. The head should be kept fairly stable, so it is important not to get too far into the periphery where diplopia cannot be maintained.

#### Questions:

1. How many dowels do you see?\*
2. Do they look the same or different?
3. What similarities do you see?
4. What differences do you see?
5. If you change, where you are looking? What differences do you see?
6. Are you breathing throughout the activity?\*
7. Are you always hanging onto space? What is different when you hang onto space?\*
8. Do you need to alter your body alignment to make the dowels appear more equal and aligned?

#### Prism & Stick

*Objective:* To develop the ability to coordinate the information from each visual channel efficiently and comfortably, i.e., centering and identification skills; to learn accurate spatial projection; to recognize similarities, differences, and patterns; to organize spatial changes; to be able to organize a large volume of space; to see space as a unit; to learn to move the eyes in a controlled and fluid manner; and to use breathing to regulate movement.

#### Materials:

1. Two opposite pairs of dissociating glasses
2. Dowel (placed vertically on a stand)
3. Two 8" x 11" sheets of paper, one red and one green
4. A large "X" cut from poster board; each line of the "X" is about 10-12 inches long and about 2½ inches wide

Ideally, the activity is initially done in a hallway or screened-in area, and the "X" is placed on a window if possible (a wall if no window is available). The red and green papers are placed on the side walls opposite one another, with one color placed ahead of the other (12-24 inches) so that they are not exactly opposite one another.

#### Procedure:

Stand with your feet under your armpits and your knees slightly bent, with at least 8-10 feet of space in front of you and facing an X positioned at eye level (Figure 7). The dowel is placed on a stand (Figure 8). If a stand is not available, children under 13 years old should hold the dowel vertically at the Harmon distance, and children over 13 should hold the dowel 13-16" in front of their face. The dowel is held with the fingertips of each hand and hands 6" apart. The top of the dowel is across from the nose.



**Figure 7.** Demonstration of the set up of the procedure.

Look at the dowel with doubling glasses on. Two dowels are to be seen. Can you align them? If necessary, tilt or turn your head to align. Tilt or turn minimally, attempting to reduce tilting or turning as you do the activity. As you look at the dowels, can you see how the Xs are positioned? Look at the dowels for a minimum of 5 seconds as you breathe in diaphragmatically through your nose. Move your eyes from the dowels to the Xs while exhaling. The eyes are to arrive at the Xs at the same time while all the air is completely expelled through the nose. You want to exhale as slowly as possible as you move your eyes through space. Do both the Xs move equally and align? Does your head have to be tilted to align? As you moved from the dowels to the Xs, what did the dowels do? Inhale as you center on the Xs, slowly straighten your head, very slowly breathe out diaphragmatically through your nose, and look back across the room to the dowels. What do the dowels do as you move your eyes across the room? What do the Xs do as you move your eyes to the dowels? Do you have to tilt your head to align the dowels? Hold for 5 seconds, straighten your head, and as you are breathing out, move your eyes back to the Xs very slowly. What changes in the room do you see as you move back and forth? Remember to move your eyes only on exhaling and as slowly as possible. Report the changes as you are moving your eyes. The patient works 4 minutes with each pair of doubling glasses.

*Modifications:*

1. For children 6-8 years old, if there is a lot of fidgeting or difficulty breathing appropriately, the activity is initially done in the prone position. The therapist holds the dowel in front of the patient, and a target is placed on the ceiling. Emphasize moving the eyes very slowly with breathing and observing the changes the Xs and dowels make as they are moved from one to the other.



**Figure 8.** Patient standing in front of the near target placed at nose level height.

2. For children 6-8 years old who become fidgety, do the activity with the patient sitting erect with their feet on a stool and their forearms resting on their legs.
3. For adults and children who have difficulty verbally organizing the information quickly, it is helpful to communicate by holding their hands apart about 6" and moving them further apart or closer together to indicate the changes. The patient ideally demonstrates the changes, beginning with the length, then width, then height without pausing. The objective is to see the changes as a unit. When that can be done easily, request that the patient now do it verbally.
4. If the patient has difficulty seeing changes in the length, the therapist can stand facing the patient. The therapist stands closer than the X. The patient uses the therapist's head as the new target. In this "shorter space," it is often easier to see the change in length.
5. If the patient has difficulty seeing changes in the width of the room, have the therapist stand in front of one of the red or green sheets. A bigger target can make it easier to observe the room widening and narrowing.
6. If the patient has difficulty seeing the changes in height, hang an object from the ceiling and place a traffic cone on the floor below the ceiling target.
7. If the dowels or Xs do not move equally together or apart, have the patient do the activity visualizing the dowel and the X, and move from one target to the other very slowly in conjunction with breathing. Feel whether each eye is moving at the same speed and with equal smoothness. If speed or smoothness is unequal, ask the patient to visualize breathing through the eye that is not moving as well until both eyes are equal.



8. When the activity can be done easily, the dowel is placed in front of a window, and the patient stands with the same posture and the same distance from the dowel. The distance target is now an object outside the window and as far away as the patient can easily identify an object. The activity is repeated as before.

*Questions:*

1. How are the dowels positioned when you look at the Xs? What are the Xs doing as you look to the dowels?\*
2. When you move your eyes from the dowels to the Xs, is the movement slow and fluid?\*
3. When you move from the Xs to the dowels, is the movement slow and fluid?\*
4. Is one direction easier than the other?\*
5. What patterns/relationships in the space do you see? (Guide the patient to recognize the pairs in the room, i.e., 2 dowels, 2 Xs, 2 red sheets, 2 green sheets, and how the pairs move.)\*
6. Do all the objects appear double?\*
7. Do all the double targets appear real and solid?
8. When moving across the room in either direction, do your eyes get there first, or are you out of breath first? (Expected: the eyes complete the movement, and the patient is out of breath at the same time.)
9. How does space change as you move your eyes from the dowels to the Xs and then back? (Expected changes: as the patient looks to the Xs, the room becomes wider and shorter; as the patient looks to the dowels, the room becomes longer, narrower, and taller. If the patient is not “hanging onto space,” the opposite changes will be reported.)\*
10. How do the side targets (the red pair of sheets and the green pair of sheets) appear to change as you move across the room in each direction?\*
11. Do the length, width, and height changes occur simultaneously?
12. What do you observe about the dowels or the Xs as they move apart and together (i.e., are they moving equally in amount and speed)?
13. Do the dowels align easily, or do you have to tilt your head or change where you are looking?
14. Do the Xs align easily, or do you have to tilt your head or change where you are looking?
15. Does the room change as a unit or in a fragmented fashion?
16. If the X is on a window, are you aware of what is happening outside the window as you move your eyes back and forth?\*

**KEY:** As you move from one pair of targets to the other, be aware of how the other pair of targets is changing. This is the anchor for seeing all of the other changes.

*Expected responses:*

1. Coordinate the eye movements with breathing.
2. Eyes move fluidly without pausing or fragmenting.
3. Eyes move slowly and in a straight line.
4. Perform the movements without blinking.
5. See changes as the eyes are moving rather than when they have reached the next targets.
6. See space change as a unit.
7. When moving from the Xs to the dowels, space appears longer (length), narrower (width), and taller (height).
8. When moving the eyes from the dowels to the Xs, space appears shorter (length), wider (width), and shorter (height).
9. Dowels and Xs move apart and come together with equal movement and speed.
10. Eyes reach the next targets at the same time that all of the air is expelled.
11. Alignment of the dowels or the Xs is done easily, without head tilt or looking closer or further away.

\*If there is difficulty getting both dowels and both Xs to move smoothly and equally, work with the eyes closed. We want the patient to feel whether each eye is moving slowly and smoothly. Use breathing to control the movement. The goal is feeling equal movement. Repeat the activity with eyes open and emphasize feeling the eyes making the movement without being concerned about the spatial changes. Once this is accomplished, feel the eyes moving and see the room change as a unit simultaneously, i.e., length, width, and height.

\*If there is difficulty seeing the height changes, place a different color sheet of paper or a traffic cone on the floor in the middle of the space. Above the paper, place a hanging target. This will allow the patient more easily to recognize the changes.

**Aniso Lenses**

*Objective:* To learn to organize space appropriately, to enhance awareness by recognizing and becoming sensitive to spatial and body changes, to reduce body tension and to enhance static and dynamic posture by working through vision.

*Materials:*

1. Plus and minus lenses: +/-5.00, +/-1.00, +/-0.75, +/-0.50, +/-0.25 (If using lens blanks, Velcro to safety frame)
2. Safety frame or trial frame

*Pre-test*

1. As usual, remove your shoes and habitual lenses. Stand with your feet below your armpits, parallel and with your knees slightly bent. Close your eyes. Describe

your posture: erect, leaning forward, backward, to the right or to the left. Is your weight equally distributed or heavier on one side? Is there any muscle tension in your shoulders, neck, or back?

2. Lie on your back. Without placing a hand there to measure, estimate how much space is between your neck and the floor and between your waist and the floor. Indicate the space by holding up a hand and separating your fingers. Do both legs feel equal in weight and length?
3. Walk forwards and backwards and estimate the level of body tension, groundedness, ease of walking, and spatial awareness.

First pair of glasses: OD -1.00; OS +1.00

Second pair of glasses: OD +1.00; OS -1.00

*Procedure:*

Put on the first pair of glasses for 3-4 minutes. Stand in place and then walk and answer the questions “What do I see? What do I feel?” Initially, it is often easier to experience the changes in the body with the eyes closed walking in a circumscribed area. If the patient needs help to elicit body changes, ask the following: “Compare the sides of the body—what differences do you notice? Which side is heavier? Which side is longer? Does one arm feel longer or heavier than the other side? How about the legs?” Next, the therapist holds his or her hands with palms facing the patient about 12” apart, and the patient, standing 2 feet away, centers on the therapist’s eyes (Figure 9). The patient is asked to describe the hands they see. If the patient needs help to elicit size and spatial changes, ask the following questions: “Which hand is closer? Which hand is smaller?”

Ideally, the patient reports that the side of the body wearing the minus lenses is heavier and shorter and that objects on that side appear smaller and closer. If patients are finding it challenging to experience the appropriate responses, increase the power of the lenses to +/-5.00. Once the appropriate responses can be achieved, return to +/-1.00.

Additionally, if the patient has difficulty achieving the SILO response, have the patient hold a bean bag in the hand on the minus side near the therapist’s hand on the opposing side. Have the patient pull the bean bag closer and squeeze the bean bag as they pull it in. For the entire time, the patient is centering on the therapist’s eyes and “hanging onto space.” After 3-4 minutes, put on the second pair of glasses. Remove after 3-4 minutes.

*Post testing:* Repeat pretest.

Next session, repeat with same pair of lenses.



**Figure 9.** Patient is doing the Aniso Lenses activity with plus and minus lenses.

Next two sessions:

First pair: OD -0.75; OS +0.75

Second pair: OD +0.75; OS -0.75

Next two sessions:

First pair: OD -0.50; OS +0.50

Second pair: OD +0.50; OS -0.50

Next two sessions:

First pair: OD -0.25; OS +0.25

Second pair: OD +0.25; OS -0.25

After you go through all the lenses, repeat the entire process, one session for each set of glasses. As you go through the lenses again, the patient is often much more sensitive to what he or she sees and feels.

*Expected Responses:*

1. SILO
2. At the post-testing, the patient reports their body sinking more into the ground, i.e., less separation between their neck and the floor and less separation between their waist and the floor.

*Questions:*

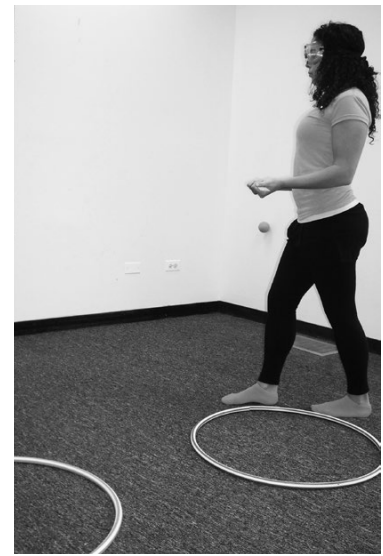
1. With the lenses on, how does the right side of your body from head to toe compare to the left side? Is it the same with your eyes open or closed, stationary or moving?\*



**Figure 10.** Starting position adjacent to Hula Hoops.



**Figure 11.** Position of feet and body, with rotation of hips, as orienting through the middle of the Hula Hoops.



**Figure 12.** Patient is staying adjacent to the Hula Hoops as she walks.

2. With the lenses on, when looking at a target in front of you, does the space on the right side or the left side of the target appear the same or different?\*( It may help if you place a trampoline on its edge leaning against a wall with an X in the middle and “noodles” or chairs on either side to elicit a SILO response. The patient is asked which noodle is closer while centering on the X.)
3. With the lenses on, are you breathing?\*
4. With the lenses on, are you hanging onto space?\*
5. What do you observe (see and feel) when you remove the lenses at the end of the activity? How does your posture change when standing or lying down? When walking, how do you experience your body and space?

### Infinity Walk

*Objective:* To learn visually-directed and visually-monitored control of body movement through space, degrees of freedom between where centering and control of body movement, spatial and body awareness, visualization, enhanced peripheral-central organization, increased peripheral awareness, and visual-vestibular integration.

#### *Materials:*

1. 2 chairs
2. 2 Hula Hoops
3. Full-length mirror 3-4 feet wide
4. Yardstick or 3-foot dowel
5. +/-1.00 lenses Velcroed to a safety frame

*Placement:* Position two chairs 3 feet apart so that the floor space covered is about 5 feet by 9 feet.

*Time:* Activity is done for 8 minutes.

*Lenses:* Wear the plus lens on the right eye and the minus lens on the left eye for 4 minutes. For the next 4 minutes, reverse the lenses.

#### *Procedure:*

1. Facing the mirror, stand at the outside of either chair, centering on your eyes in the mirror. Walk in a continuous figure eight pattern, keeping the two circles of the eight well rounded. Always look towards your eyes in the mirror as you walk, even when outside the range of the mirror.
2. Walk around one circle in the clockwise direction and the other circle in the counter-clockwise direction as you cross in between the circles. Half the time the right eye and ear are closer to the target, and half the time the left eye and ear are closer.
3. Add the yardstick or dowel. Place your arms in front of your body, armpit distance apart with palms up and holding the yardstick. Continue doing the activity, keeping the yardstick in front of your body in the direction you are walking. After about 1 minute, change the position of your hands. Place your palms so that they are facing downward, armpit distance apart and holding the yardstick. Do this for one minute. Thereafter, change position of your hands after each minute.
4. Always center on your eyes in the mirror. Be aware of the space between you and your image and all the space around you both inside and outside the mirror, including behind you.
5. When all of the above can be done easily, replace the chairs with Hula Hoops with a 16-inch separation between hoops. When you are unable to view the

- hoops in the mirror, visualize them and the space around them.
- Do the activity again; this time in the starting position, you are facing away from the mirror, but your head is turned toward the mirror. Each time your head is again facing away from the mirror, quickly turn your head so that your head can be facing towards the mirror while your body is moving away from the mirror (Figures 10-12).

*Expected Responses:*

- It is important to rotate your hips towards the target rather than just your head as you move through the space between the chairs/Hula Hoops. In addition, always place one foot in front of the other to avoid walking sideways as you move between the chairs/Hula Hoops.
- Pace is slow and constant.
- Steps are the same size.
- Keep the same distance from the Hula Hoops throughout the activity.
- Center in the mirror on your eyes; when outside the range of the mirror, visualize looking in the same spot.

*Questions:*

- Can you always keep centering on your eyes in the mirror?
- Do you always maintain awareness of all the space around you, including the space outside the mirror and behind you?\*
- Can you visualize what you cannot see?\*
- Can you maintain simultaneous awareness of the whole room, or are you seeing the room in a fragmented fashion?
- If you do lose centering on the mirror, where does it occur?
- Is it easier to walk around one chair/Hula Hoop than the other?
- Can you feel your hips turning prior to getting to the intersection?
- Can you move easily in each direction as you move in a figure eight pattern?
- Are your feet always the same distance from the Hula Hoop? (Ideally, near the edge of the Hula Hoop without touching)\*
- Are your steps always the same size, or do they vary?\*
- Does your pace change as you move in and around the chairs/Hula Hoops? (Ideally, the activity is done slowly, and the pace is the same throughout.)\*
- Is it easier holding the yardstick in one position compared to the other?
- Does your breathing change as you walk?

- What can you do to make a change in what you are doing with your body, your steps, and how you are seeing space?
- Do you ever become turned around, i.e., facing in the opposite direction than you want to go?\*

**Balloon Play**

*Objective:* To develop the ability to visualize; to work on timing, visual motor integration, and visual auditory integration; to process a large amount of information at one time; to anticipate and to organize information in a timely fashion; and to work on the control of body in space through vision.

*Materials:* 2 round balloons 9-11" in diameter of different colors, +/-1.00 lenses Velcroed to a safety frame

*Procedure:* Hit the balloons with alternate hands at a height between waist and chest level and with palms facing upward. Ideally, the balloons are hit at the junction where the fingers meet the palm. Count aloud simultaneously as you hit the balloons. The activity is done for 4 minutes with OD +1.00 & OS -1.00. Then reverse the lenses and complete the activity for another 4 minutes.

*Expected Responses:*

We want patients to be precise as to their understanding, language, and communication of space. For example, if asked "where are you hitting the balloons?" answering "up" or "above them" is not specific enough. A more appropriate response is "one foot below the ceiling." That is also the spot or area on which they want to center, but have the patient experiment to find where it is easiest for them to center and to control the balloons. We want the patient to experiment and to find the most effective way to use their vision.

*Questions:*

- Can you control the balloons equally well with either hand?
- Are you always hitting the balloon underhanded and between chest and waist level?\*
- Are you hitting the balloon at the juncture where your fingers meet your palm?\*
- Are you hitting and counting simultaneously?
- How much movement of your body is required to keep control of the balloons?
- What can you do differently to reduce body movement?
- Where do the balloons go when you hit them? (We want the patient to be specific, e.g., 6" below the ceiling)
- Are the balloons always going to the same place?\*

9. Where do you have to hit the balloon in order to have the most control of the activity?
10. Where are you centering your vision during the activity?\*
11. Where do you think you have to center your vision to have the most control? (Encourage experimenting.)
12. Do the balloons ever collide? What can you do? (For example, visualize a screen between the balloons.)

## Trampoline

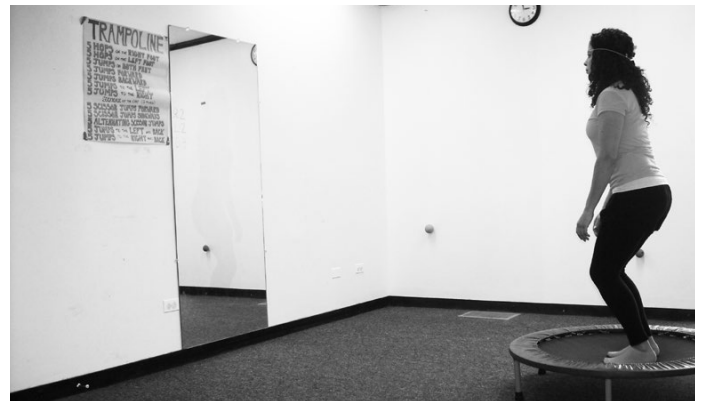
*Objective:* To learn visually-coordinated, visually-directed, and visually-monitored body coordination and rhythm, spatial and body awareness, and visualization.

*Materials:* Mini trampoline, eye patch, full-length mirror 3-4 feet wide, two water bottles

*Time:* 8-10 minutes

### Procedure:

1. Do all the steps with one eye patched, and then repeat with the other eye patched.
2. Center your vision on your eyes in the mirror and be aware of your surroundings; i.e., inside and outside the mirror, see the space and objects in your surroundings simultaneously rather than fragmented or one object at a time.
3. For all steps below, stand on the trampoline 6-10 feet or more from the mirror so that you can see your entire body in the mirror and the room behind you. Begin in a balanced posture with your knees bent and with your feet placed parallel and beneath your armpits (Figure 13).
4. Master each step before moving on to the next step.
5. The therapist slowly demonstrates each step for the patient.
6. Encourage visualizing the step in space; i.e., as if your twin was standing in front of you and doing the activity, prior to actually doing it.
7. At any point, if the instruction is too challenging, have the patient stop and try it first by just using their hands and then visualizing hopping or jumping and doing the step. If necessary, an intermediary step is having the patient get on their hands and knees next to the trampoline while still centering in the mirror, and do the step or sequence with their hands tapping on the trampoline.
8. Use the mirror as feedback to be aware of body control, arm movements, and head movements, and know where you are on the trampoline.
9. Do all parts of each step slowly because we want to get feedback in order to make the necessary changes.

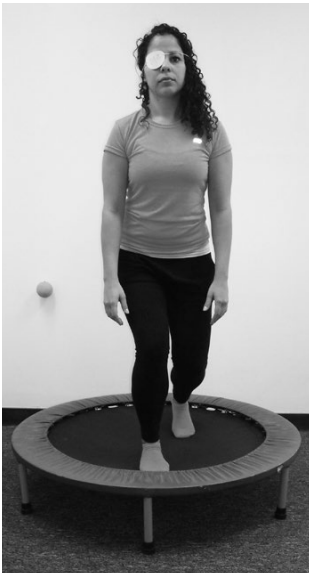


**Figure 13.** Proper standing position to start trampoline, with arms at sides and knees slightly bent.

10. Emphasize jumping from the balls of the feet, landing on the balls of the feet, and then rolling down to the heels.
11. Emphasize bending the knees with each jump and each landing and doing the procedure without stopping.
12. When jumping with both feet in the same direction, keep the feet parallel, with each foot making the same size step or movement.
13. After each step is completed, continue to keep the knees bent and move on to the next step.
14. Never lock the knees or keep the feet locked in the bent position as you are jumping.
15. Count and land simultaneously. (If there is a problem, have the patient tap on the trampoline mat with his or her hand and count simultaneously as the hand hits the mat. Then have the patient count when the hand is in the air so that they can experience the difference.)
16. If the patient pauses between parts of each step, have the patient tap with his or her hand on the trampoline mat with and without pausing.
17. When doing each step, if the patient goes beyond repeating 5 times, have the patient count louder to exaggerate the feedback.
18. Objective: see the image in the mirror as far back as you are in front of the mirror/hang onto space.
19. When counting, count loud enough so that the image in the mirror can hear you.

### Step 1:

Five hops on the right foot; count each time the foot hits the mat. Hopping is the only part of the activity that is done fairly quickly; the hop is done just a little off the ground. If the patient is not staying in one place, they need to work on hanging onto space. It is helpful to place noodles vertically on either side of the mirror to increase awareness.



**Figure 14.** Patient looking in the mirror, getting feedback, and doing forward scissor jumps.

**Step 2:**  
Five hops on the left foot; same procedure as above.

**Step 3:**  
Five hops on both feet. Again, stay in the same place and land on the balls of the feet without stopping.

**Step 4:**  
Five jumps forward; count each time you return to the starting position. Start towards the back of the trampoline and make a small jump forward, then return to the starting position and count as you land.

**Step 5:**  
Five jumps backward; count each time you return to the starting position. Move towards the front of the trampoline before beginning.

**Step 6:**  
Five jumps to the right; count each time you return to the starting position. Move towards the left before beginning. Jump sideways, with both feet moving equally, and count when returning to the starting position.

**Step 7:**  
Five jumps to the left; count each time you return to the starting position. Move towards the right; jump sideways, with both feet moving equally, and count when returning to the starting position.

**Step 8:**  
Sequence of the day twice: right foot 2, left foot 1, both feet 4; do once then repeat. Do fluidly without stopping. The sequence is changed daily.

**Step 9:**  
Five scissor jumps forwards; count each time you return to the starting position. Begin with the feet together. Jump with one foot forward and the other going backward, and then jump and reverse that position (Figure 14). Next, jump and land with the feet together, and count as you land.

**Step 10:**  
Five scissor jumps sideways; count each time you return to the starting position. Begin with the feet together. Jump and move the feet apart laterally 12-24", then

cross over, one foot in front of the other. Next, jump and reverse that position, finally jumping and bringing the feet back to the starting position. Count as you land.

**Step 11:**  
Five alternating scissor jumps; count each time you return to the starting position.

Begin with the feet together, jump with one foot forward and the other foot backward, and then reverse that position. Next, jump with each foot going out to the side, then cross over with one foot over the other, then jump and reverse that position. Finally, jump and bring the feet back to the starting position, counting as you land.

**Step 12:**  
Five jumps to the right and back; count each time you return to the starting position. Place the target to the patient's right to center on. Jump and turn your body to the right, leading with the hips, and then return to the original position, counting as you land.

**Step 13:**  
Five jumps to the left and back; count each time you return to the starting position. Place the target to the patient's left to center on. Jump and turn your body to the left, leading with the hips, and then return to the original position, counting as you land.

#### *Expected Responses:*

1. Hop in the same place. If the patient is not landing in the same place, this indicates not "hanging onto space." Play Hand Game.
2. Jumps are to be the same size. Unequal size jumps indicate not hanging onto space or tunneling, i.e., not paying attention to feedback from the mirror and the body.
3. Count and land simultaneously. If not, the timing is off. Increase the feedback by having the patient count louder.
4. Hop or jump fluidly without pausing.
5. Hopping is the only portion of the activity done fairly quickly. All other portions of the activity are done at moderate speed. It is important not to go too fast or too slowly, to speed up, or to do the activity with pausing.
6. Complete each step standing with the knees bent. If the knees are locked, the patient will fall backwards or lose balance.
7. When jumping or hopping, the knees should move like a spring and not be locked in place.
8. When jumping or hopping, always land on the balls of the feet first, then come down on the heels. Avoid landing flat-footed.

- Arms are always to be hanging loose. If the patient is unable to relax the arms, have him or her hold a water bottle in each hand with their fingers at the top (half-filled for younger children).

*Questions:*

- Are the jumps always the same size?\*
- Is rhythm maintained?
- Are you always able to hang onto space?\*
- Are you always able to stay in the same place or to return to the same place?\*
- Are your arms relaxed and loose, or are you tensing your arms?\*
- Are you always keeping your knees bent and not locking them when you have completed doing each step 5 times?\*
- Are you projecting your voice to where you are looking, i.e., to your image in the mirror?\*
- Is your voice staying at the same level?
- Is your image always the same distance behind the mirror as you are in front of the mirror?\*
- Are you always landing on the balls of your feet?
- Are you always landing softly?
- Are you always centering on your eyes in the mirror? Are you simultaneously aware of the surroundings, or do you look elsewhere?\*

**Other recommend activities include MML (see Franke OEP papers) and Exploring Space (an AI Sutton activity).**

### Home Visual Training

#### *Thumb Pursuits*

See Franke VT OEP papers.<sup>10</sup> This is an excellent activity and is highly recommended for experiencing variations in spatial projection depending on which channel we are seeing through and/or which hand we are using, developing the ability to process a large volume of information, and developing controlled and fluid eye movements.

### Walking

*Objective:* To intentionally bring what you have learned into daily activities, i.e., hanging onto space, and to practice as an excellent maintenance activity.

*Time:* 15-30 minutes

*Procedure:* Center on an object in the distance that you can easily discern, and as you get closer, choose another object farther away. As you walk, be aware of the ground, the sky, and items beside you as you center on the object. We want to see everything simultaneously and not in a fragmented manner.

When this can be done easily, be aware of objects behind you. For example, if passing a hydrant, work on visualizing the hydrant while maintaining awareness of what is in front of you. This is very challenging, so take it very slowly. Remember to breathe diaphragmatically.

I view tunneling as a pervasive vision disorder and a common characteristic of all vision syndromes. Tunneling can occur in all dimensions of space, i.e., X, Y, and Z axes. Thus, tunneling can be a flattening or overall constriction of functional space. All of the aforementioned activities deal with vision as a process rather than working on a skills approach. Thus, the patient is being asked to work on the vision process for each activity. These activities were chosen because they stress the profound relationship between vision and posture; they maximize feedback to the patient, doctor, and therapist if the activity is being done appropriately; and they provide insight into the pervasiveness of vision in human performance.

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