

# ***DYNAMIC VISUAL SKILLS***

Sports Specific Application

**SPORT SPECIFIC**  
**BADMINTON**



## SPORTS VISION - AND BADMINTON

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration under Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Time. (For more in-depth explanations, see the attached Visual Skills definition sheet.) These are all learned skills that can be improved with practice.

The following is a comprehensive breakdown of the dynamic visual skills associated with badminton.

### ACCOMMODATION AND CONVERGENCE

Well-developed accommodative skills are important in badminton because both the shuttlecock and the opponent are in constant, rapid movement and the player must be able to shift focus from the near to far or to intermediate targets instantaneously throughout the contest.

Eye tracking ability is also important. Quick, accurate saccades (or eye movements) are needed to rapidly survey the changing locations and movements of the opponent and the shuttle in relationship to the net, boundary lines, etc. Studies have shown that if the head must move to aid in eye tracking, the performance is not only less efficient, but balance is thrown off too.

#### Activities

- Brock string
- BIM/BOP
- Near/Far Hart Charts
- Window Rock
- Vectograms

### ANTICIPATION TIMING

The visual system provides an individual with the information needed in order to act, as well as the information needed to judge when to act. Timing is the key to effective performance. Most efforts fail not because the physical movements were wrong, but because they were made at the wrong time. Remember, the ability to anticipate is a major factor in high level competitive activities, and even superior speed, size and reflexes cannot compensate for the insufficient processing of the visual information regarding *when* to perform.

For example, the 3 essential elements to a big hit are impact, follow-through and timing. A smash in badminton is more like a severe punch in boxing than a smash in tennis. You need to generate a lot of power through a short range very quickly, but that power comes not from the build-up, but from the impact and the follow-through, so you try to leave the smash until the last possible moment to get maximum power behind it. **Hence, anticipation timing!**

#### Activities

- Ball batting with Metronome
- Percon Saccades
- Penny Drop

Suspended Ball  
Ball toss/catch  
Bal-A-Vis-X  
Hart Chart with Metronome

## **CONCENTRATION**

Maintaining a high level of concentration/focus in a fast-moving sport like badminton is essential, especially when receiving a serve or playing at the net. Even a slight lapse may mean losing a point in a game in which every point is important.

It is also vital to maintain that high level of focus on the key visual cues such as the shuttlecock, the opponent, the net, etc. and to not be distracted by irrelevant things such as the crowd.

### Activities

Rush Hour  
Space Fixator  
Continuous Motion  
Stroop Chart  
Tandem Walk  
Infinity Walk while reading Hart Chart  
Bal-A-Vis-X

## **DEPTH PERCEPTION**

Depth perception is necessary for accurate shot placement, evaluating the defensive positions of the opponent and judgement of whether a hit to you will land in or out of bounds, thus, helping you decide whether or not to return. It also assists in judgement of the speed and trajectory of the opponent's shot.

### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reaches out and touch various target held by therapist at various distances
- Ball toss/catch with various size balls at various distances
- Brock String
- Projected Quoits

## **EYE FATIGUE**

Badminton is a very fatiguing sport which requires excellent conditioning. Physical fatigue can greatly affect concentration, initiation speed and eye-hand coordination. Eye fatigue can also affect performance levels in much the same way. When the muscles in our eyes feel tired or strained, we feel the fatigue all over. Just like a weightlifting routine is used to increase physical endurance, visual exercises can be used to strengthen the eye muscles and thereby reduce eye fatigue.

### Activities

- Brock String
- Projected Quoits
- Missing Letter Charts
- Stroop Chart
- Vectograms
- Hart Charts, various
- Scanning Trails
- Marsden Ball

## **EYE-HAND COORDINATION**

This skill is vital in any racquet sport since the process of hitting a moving object with a racquet primarily requires eye-hand coordination. Our hands, feet and body respond to the information the eyes have sent to the brain. If this information is incorrect, even to the slightest degree, there is a good chance that we will err in our physical response. Almost every sport error, or poorly executed play, can be attributed to faulty visual judgement, and it is visual judgement alone that determines eye-hand coordination.

### Activities

Ball Tap  
Ball Batting  
Bean Bag Toss/Catch  
Space Fixator  
Ball toss/catch with X-Trainer chart  
Ball toss/catch in hallway while tapping peripheral targets  
Bal-a-vis-x (rhythmic bounce to floor/catch 2 balls with partner)

### **INITIATION/ VISUAL REACTION SPEED**

The more rapidly a badminton player processes visual information, the faster he/she can position their body to hit the shuttle effectively with power. Excellent visual reaction time helps a player return a serve, a smash, play effectively at the net or simply make a return into the opponent's comet.

#### Activities

Bal-a-Vis X- One or two bean bag toss/catch  
Ball toss/catch from various distances, heights and angles  
Ball Batting  
Ball Tap

### **PERIPHERAL VISION/AWARENESS**

This is an essential skill for a badminton player whether on defense or on the attack. The attacking player has to be distinctly aware of the speed and position of the oncoming shuttle in order to secure correct contact as well as remaining peripherally aware of the opponent's position and the location of the court boundaries.

The defensive player must concentrate centrally on the attacking player's court position and the likely direction the shuttlecock will come off his opponent's racket. Meanwhile, he must be peripherally aware of the net and boundary lines of the court, etc. These factors all hold true for doubles too. However, in doubles, the players have the additional complication of being peripherally aware of where their partner's body and rackets are.

#### Activities

Brock String  
Marsden Ball  
Lora's Card  
Bean Bag toss to peripheral targets on floor  
Tandem walk in hall with hand tap to targets on wall  
Circular toss/catch with suspended ball  
Prism work

## ACTIVITIES

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).
2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick.

Metronome (optional)

1. The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
2. The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
3. The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
4. The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

1. The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
2. The patient taps the ball with alternate hands, maintaining a steady rhythm
3. Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

1. Therapist stands opposite patient.
2. Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
2. Have patient fix eyes on distant target.



3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/-2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.
5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3<sup>^</sup> (6, F).
6. The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.
7. Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.

5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.

The goal is to see the string form an “X” at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
2. Using the number worksheet, have the patient circle the number “1” as long as needed until they find number “2” then without picking up the pencil, circle number “2” and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number “30”.
3. The pencil should be moving at all times; do not lift the pencil up from the paper.

Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counter-clockwise. Circle numbers in reverse sequence, starting at 30.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

### **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

1. 4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the

- first row of each section, progressing through each row of each section. Load by increasing separation of sections.
2. Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.
  3. Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).
  4. Have patient read first/last letters, all odd or all even letters, etc.
  5. Walk Aways: Pt reads chart while walking to and away from the chart.
  6. Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from  $-.50$  to  $-5.0$  are placed within reach of the patient.
5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.
7. Switch the patch and repeat the procedure on the opposite eye.

### **Lora's Card- trains the visual skill of fixation ability**

Materials: Lora's Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.
3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
4. When shifting focus from near to far, ensure the letters are clear before moving on.

Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Missing Letter Charts- trains the visual skill of eye fatigue**

Materials: Chart with scattered letters

Patient reads chart vertically or horizontally

### **Penny Drop- trains the visual skill of eye tracking activities**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
2. The therapist moves the container continuously in all directions within reach of the patient.
3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times.

When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

### **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

1. Set metronome at appropriate pace for patient.
2. Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.
3. Work towards increasing the rhythm of the metronome.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of "straight-ahead" and the objective direction of straight ahead. They may feel "out of synch" with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as "bases left or 'bases right" can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopeters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

## **Projected Quoits- trains the visual skill of accommodation and convergence**

Materials: Quoits vectogram, overhead projector, screen

Convergence Therapy Set the Quoits vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3 $\Delta$  Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."
2. Once the patient can perform these steps, while the Vectograms slides are set at 3 $\Delta$  Base out, slowly separate the targets to 6 $\Delta$  Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.
3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.
4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.
5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.
6. After 6-8 $\Delta$  Base-in, the target will be too far behind the targets for the patient to point.
7. The patient should be able see one set of Quoits by looking beyond the Vectogram at the central letter chart on the wall.
8. If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoits at letter "L". Endpoint 25 $\Delta$  Base-out. and 12 $\Delta$  Base-in.

## **Reach and Touch Targets- trains the visual skill of depth perception**

Materials: Assorted small to medium objects i.e. colorful pencils, pens, balls

1. Therapist sits or stands opposite from the patient.
2. Therapist holds a target for patient to reach out and touch then returns hand to start position.

3. Therapist moves and holds target at another distance, patient then reaches out and touches target.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

1. Choose a card appropriate for the patient.
2. Patient places game pieces on game board as shown on selected game card.
3. Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

1. Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
2. There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
3. Have the patient look at the letter "A" and, using only his/her eyes, follow the curved line from "A" to the correct number on the right side of the page, and call out the number.
4. Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
5. Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

1. Hold the sequential tracker at the patient's reading distance. It may be supported by a book stand or taped to a window for rear illumination.
2. Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.
3. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long sweep back to the first target on the left.
4. Repeat the sequence five times, rest for half a minute, then repeat.  
Strive for both speed and accuracy, but of the two, accuracy is the most important.

Eliminate any regressions (looking back at targets already passed over).  
Maintain a rhythmic shift from target to target. Rhythm is more important than speed.  
Begin with the metronome set at a slower speed to master control of the eye movements.  
Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the “thinking spot” and the starting position.
2. Instruct patient to “think about” number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to “look at” number. Watch the patient’s eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.
4. Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.
5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

1. The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.
2. The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.



### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

1. Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
2. Patient names the color of ink on printed words rather than reading the words.
3. Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

1. Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
2. Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

### **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

### **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoit Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an "R" aligned over an "L". 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to  $3\Delta$  Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the

- patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."
8. Once the patient can perform these steps, while the Vectograms slides are set at  $3\Delta$  Base out, have the patient slowly separate the targets to  $6\Delta$  Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty:
    - a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.
4. Continue until the patient has read the entire chart.

**SPORT SPECIFIC**

**BASEBALL**



## **SPORTS VISION - AND BASEBALL/SOFTBALL**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration under Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Time (or Initiation Speed).

The following is a comprehensive breakdown of the dynamic visual skills associated with baseball.

### **ACCOMMODATION (CONVERGENCE/DIVERGENCE) and EYE TRACKING**

Focusing flexibility and eye-tracking ... that ability to keep both eyes working in unison as they track rapidly moving objects is one of the most important skills to master for the game of baseball. Improving your ability to keep your eye on the ball, right up to the point of contact, will make you a better and more consistent hitter/catcher. If you take your eyes off the ball before impact with the bat, or before it's in your glove, the eyes will lead the head, body and hands out of position.

#### Accommodation activities:

- Brock String
- BIM/BOP
- Near/Far Hart Charts
- Window Rock
- Vectograms

#### Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-vis-x/Ball Tosses and Catches
- Sequential Tracker
- Scanning Trails Chart

#### Divergence Activities

- Binasal Occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule

## **EYE ALIGNMENT**

Alignment can impact your perception of where the ball is in free space and subsequently impact the timing of your actions. If the eyes aim in front of the ball, this can result in an early swing, a ball thrown short or a glove placed in front of the ball; if the eyes aim behind the ball, this can result in a late swing, a ball being over-thrown or a glove placed too far forward. In both cases, the athletes will probably exhibit inconsistent performances.

### Activities

- Brock string
- Lifesaver Cards
- JND
- Space Fixator
- Eye stretches with clothespins and rings
- Eye pointing in front of mirror
- Prisms
- VOR activities

## **ANTICIPATION TIMING**

The visual system provides an individual with the information needed in order to act, as well as the information needed to judge when to act. In baseball, like many other dynamic sports, timing is the key to effective performance. Most efforts will fail not because the physical movements were wrong, but because they were made at the wrong time. In baseball, the ability to anticipate the exact moment to swing may be directly linked to your eye alignment and depth perception as much as your skill at swinging the bat. If your eyes are not pointed precisely at the distance the ball is, your brain perceives it at a different distance than it is. If you perceive the ball closer, you will swing early. If you perceive the ball farther, you will swing late.

### Activities

- Ball batting with metronome
- Percon saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

## **CONCENTRATION**

The ability to maintain a high level of focus on a specific task or key target, in spite of distractions, while also maintaining total awareness of what is happening peripherally.

When you commit an error on an easy ground ball it may be that you are distracted by things that are happening around you. Our eyes normally react to anything that happens in our field of vision ... spectators or other participants. It's important to screen out these distractions and stay focused on the ball.

### Activities

- Rush Hour
- Space Fixator
- Continuous Motion
- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-vis-x

## **DEPTH PERCEPTION**

This is another vitally important visual skill for a baseball player. The outfielder must have the most highly refined depth perception of any player on the field as it is essential when judging an arc of the ball, when overhead catching and when throwing the ball accurately. But it's also crucial for the batter as it will help him/her to recognize the spin of a curveball or the speed of a fastball right out of the pitcher's hand instead of well after the release and at the velocity that pitchers throw, those extra feet are critical. It helps the pitcher to locate their spots better; balls hit in the gap are easier to pick up for outfielders. Infielders can make more skilled plays by seeing the ball off the bat quicker.

### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances
- Brock String
- Projected Quits

## **DYNAMIC ACUITY**

Vision in motion, or the ability to see, interpret and react instantaneously to a rapidly moving object, while you, the observer, are also in motion. This is the single most important skill an athlete needs to have the competitive edge.

Hitting a baseball is the most difficult feat in sports. A pitch comes at eighty to one hundred miles per hour. If it is thrown at 80 MPH, it will take 4/10 of a second for the ball to reach home plate. It takes 2/10 of a second to just swing the bat, which leaves the batter less than that amount of time to decide whether to swing at the ball. Ted Williams said that he could see the spin on the ball from the time it left the pitchers hand: only great dynamic acuity would allow him to do that.

### Activities

- Hart Charts, various
- Penny Drop
- Stroop Chart
- Rope Pull with letter/number chart

Hart Chart with Infinity Walk  
4 corners chart with toe tap to dyna disc  
Head turn left/right to targets with tandem walk  
Small Stroop chart on stationary bike

### **EYE-HAND COORDINATION**

Swinging a “round bat at a round ball” and making contact with that 'sweet spot' that will allow the batter to hit a home run or even a multiple-base run, is an incredibly difficult skill, and if the player can do that on a consistent basis, he/she has great eye-hand coordination. But beyond that, this skill is also important to catching and fielding the ball, whether it's in the air or on the ground.

#### Activities

Ball Tap  
Ball Batting  
Bean Bag Toss/Catch  
Space Fixator  
Ball toss/catch with X-Trainer chart  
Ball toss/catch in hallway while tapping peripheral targets  
Bal-a-vis-x (rhythmic bounce to floor/catch 2 balls with partner)

### **PERIPHERAL AWARENESS**

A well-developed peripheral field helps the athlete to see everything at once, to maintain the whole pattern, to sense the flow of the play, even as they move within it. The catcher must be aware of every base runner so that he can make the decision to throw the ball or hold onto it. The pitcher must be aware of what's happening on first when he's getting ready to throw so that they can try to catch a runner on the way to second, etc.

#### Activities

Brock String  
Marsden Ball  
Lora's Card  
Bean Bag toss to peripheral targets on floor  
Tandem walk in hall with hand tap to targets on wall  
Circular toss/catch with suspended ball  
Prism work

### **SPEED AND SPAN OF RECOGNITION**

How much of the game the athlete is able to see and follow at a glance? Being aware of the whole field and every action can help an athlete make the right plays more consistently. And even an extra split second faster in recognizing the pitch or throwing the ball for an out can change the outcome of the game.



#### Activities

Near/far Memory Game

Ace to King Card Game

2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.

### **VISUAL REACTION TIME/INITIATION SPEED**

This is the amount of time that it takes to process the visual information, make a decision and initiate a physical response. It's the filler between the 'read and react' in every dynamic pursuit. In other words, once we have read the play, we need to process what we've seen and make a decision so that we can react, hopefully in an effective and timely manner. Increasing the speed of decision-making and the consequent initiation of a player's physical movements will make their responses faster and more effective.

#### Activities

Near/far Memory Game

Ace to King Card Game

2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.

### **VISUALIZATION**

The act or process by which one creates a visual image based on his/her recollection of visual memory of an object, location, event or action. Visualization may serve as a training procedure, a mental rehearsal of a performance. It is a physiologically learned skill, and as such, visualization helps to shorten the learning curve. Research suggests that mental imagery can produce certain changes in visual motor coordination that persist even after the images are no longer formed. The findings also suggest that the utilization of mental imagery, to precipitate such changes, may have important practical implications.

This process may be most applicable to the pitcher as he can mentally rehearse a perfect slider or fast ball, etc.

#### Activities

Rush Hour

Color Cubes

Three-D I Spy

Parquetry

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

3. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).
4. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick. Metronome (optional)

5. The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.

6. The therapist holds the string with the suspended ball approximately three feet away from the patient, so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
7. The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
8. The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

4. The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
5. The patient taps the ball with alternate hands, maintaining a steady rhythm
6. Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

3. Therapist stands opposite patient.
4. Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- d. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- e. Incorporate step ups (using a stable wooden box or step-up platform).
- f. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

4. Patient and therapist stand facing each other.
5. Toss and catch the ball while therapist gradually steps forward or backward.
6. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

6. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
7. Have patient fix eyes on distant target.
8. Have patient toss bean bags to targets using peripheral vision.
9. Load task by changing arrangement and/or size of targets, add balance activity.
10. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

8. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
9. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/-2.00 flippers.
10. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
11. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.
12. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3^ (6, F).
13. The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.
14. Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.

1. Use patient’s existing glasses or a pair of dollar store readers with the lenses removed.
2. Add cloudy scotch tape to the edge of the iris.
3. Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
4. The width of the tape is based on what the patient indicates is most comfortable.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.
6. The goal is to see the string form an “X” at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Color Cubes- trains the visual skill of visualization**

Materials: Color Cubes game

1. Choose card appropriate for patient.
2. Instruct patient to recreate the structure displayed on the card.

Modifications for cognitive activities:

Increase demand: Carry on a conversation with patient while performing the task, work in a busy environment, interrupt task and restart, or have the patient perform a task while standing or seated on Swiss ball as appropriate.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

4. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
5. Using the number worksheet, have the patient circle the number “1” as long as needed until they find number “2” then without picking up the pencil, circle number “2” and continue

circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number “30”.

6. The pencil should be moving at all times; do not lift the pencil up from the paper.

Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Eye Pointing in Front of Mirror- trains the visual skill of eye alignment**

Materials: Pen or small object to use as a target, medium mirror setting on tabletop or tall mirror setting on the floor.

1. Patient holds the target approximately 16” directly in front of them.
2. Place the patient in front of the mirror.
3. Patient first places both eyes on the target held in hand, then move eyes to look at the target in the mirror, placing emphasis on maintaining good eye alignment with each change of fixation.

### **Eye Stretches with clothespins and rings- trains the visual skill of eye motility**

Materials: Assorted colors of pipe cleaners shaped into rings, clothes pins colored with markers to coordinate with the rings

1. Patient and therapist sit opposite of each other. Patient is given clothes pins to clip onto pipe cleaner rings held by therapist. The therapist intermittently moves the ring in the cardinal positions. The patient uses eye movement only to locate the ring as it is moved into various positions, reaching to clip the clothespin onto the ring.

### **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.
3. Read Hart Chart vertically, horizontally or first and last letter of each row or column.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

3. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
4. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

### **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

7. 4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.
8. Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.
9. Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).
10. Have patient read first/last letters, all odd or all even letters, etc.
11. Walk Aways: Patient reads chart while walking to and away from the chart.
12. Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

### **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure "8".
3. Instruct patient to walk in a figure "8" pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items

on a flashcard or even to toss a ball back and forth as they cross the center of the figure “8”. 3. Have patient catch a ball each time he/she crosses the “x” in the infinity pattern.

### **Just Noticeable Difference (JND)- trains the visual skill of eye alignment**

Materials: Single prism lens (20dioptor to 8 diopter), distant target (5’-6’), near target (arm’s length), occluder or patch

#### Monocular Activity:

1. With one eye patched/covered, place prism lens over one eye.
2. Ask the patient what they noticed. The image will shift toward the apex (thinner part of the lens).
3. Ask them which way they felt their eye move.
4. Repeat in all four directions (up, down, left, right).
5. During another session, reduce the power of the prism and ask what they notice.

#### Binocular Activity:

1. Now keeping both eyes open with the single prism lens only in front of the one eye.
2. Ask the patient what they notice now.
3. The patient should see 2 “vertical” images with base up and base down prism.
4. The patient should see 2 images “side by side” with base in and base out prism.
5. (Watch their eyes) ask if the 2 images stay there or did they move into one image?
6. Switch the prism to the other eye, what did they notice?
7. If the images are diagonal, you know your patient has some vertical misalignment, (or simply, the single lens is being held crooked).

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

8. Patient stands in a relaxed balanced posture.
9. A patch is placed over one eye.
10. The patient is instructed to look at a target in the distance.
11. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.
12. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
13. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.
14. Switch the patch and repeat the procedure on the opposite eye.

### **Lifesaver Card- trains the visual skill of eye alignment**

Materials: Life Saver Card



1. Use only the bottom set of lifesavers on the card. It may be helpful to clip a blank white paper over the others.
2. The patient holds a pencil centered between the lower edges of the bottom circles. The patient looks directly at the tip of the lead and observes the circles on either side without looking directly at them.
3. The patient slowly moves the pencil toward their nose (always looking at the pencil tip and keeping it centered between the two lifesavers) until they see four circles.
4. The patient continues moving the pencil toward their nose and observes the inner two circles approach each other until they overlap and superimpose. They should then see three circles. The patient should stop moving the pencil at this point.
5. The middle circle should appear smaller and closer than the original two circles.
6. The patient should try to make the letters on the circle appear clear and in focus on the middle circle by looking far away, remembering to keep their eyes crossed.
7. The patient then proceeds to the next set of circles, continuing thru the card in the same fashion as previously described.

Increase demand: Once the patient has mastered all the levels of the circles, they can try to gently move their head in “no” or “yes” fashion maintaining fusion.

### **Lora’s Card- trains the visual skill of fixation ability**

Materials: Lora’s Card

8. Place the card at reading distance (elbow to knuckle).
9. Keep eyes focused at the central fixation dot.
10. Peripherally locate each letter in alphabetical order.
11. Touch each letter as it is located, and check for accuracy (look at it).
12. Refixate the central target before peripherally locating the next letter in order.
13. Load task by locating every other letter, reverse sequence, spell words or add a
14. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

4. Patient and therapist stand opposite of each other.
5. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
6. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

5. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
6. Patient holds the small chart in his/her hand at eye level, so the top line of the distant chart is just visible over the top of the near card.
7. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
8. When shifting focus from near to far, ensure the letters are clear before moving on.

Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

### **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
2. Place three or four objects on the table in front of you (near to far).
3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
4. Block the patient's view of the objects with a folder.
5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
6. Ask the patient to identify the objects out of order until all of the objects are identified.
7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.  
Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

### **Parquetry Blocks- trains the visual skill of visualization**

Materials: Parquetry Blocks set

1. Choose pattern appropriate for patient ability.
2. Instruct patient to place block directly on the pattern.
3. Set the pattern on the table, instruct patient to replicate the pattern directly on the table.

Decrease demand: Use the simple black and white patterns, instruct patient to match the shape only.

Increase demand: Rotate the pattern left/right, flip pattern or recreate the pattern from memory.

### **Penny Drop- trains the visual skill of eye tracking activities**

Materials: One penny, one cup, and a clicker or bell.

4. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
5. The therapist moves the container continuously in all directions within reach of the patient.
6. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times.

When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

### **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

4. Set metronome at appropriate pace for patient.
5. Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.
6. Work towards increasing the rhythm of the metronome.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of "straight-ahead" and the objective direction of straight ahead. They may feel "out of synch" with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as "bases left or 'bases right" can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

3. Start with a low diopter prism such as a 2 or 3 diopter.

4. Trial various diopters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

### **Projected Quoits- trains the visual skill of accommodation and convergence**

Materials: Quoits vectogram, overhead projector, screen

Convergence Therapy Set the Quoits vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3 $\Delta$  Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

9. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."
10. Once the patient can perform these steps, while the Vectograms slides are set at 3 $\Delta$  Base out, slowly separate the targets to 6 $\Delta$  Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.
11. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.
12. Divergence Therapy: For divergence, separate the targets so that the letters are shown.
13. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.
14. After 6-8 $\Delta$  Base-in, the target will be too far behind the targets for the patient to point.
15. The patient should be able see one set of Quoits by looking beyond the Vectogram at the central letter chart on the wall.
16. If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoits at letter "L". Endpoint 25 $\Delta$  Base-out. and 12 $\Delta$  Base-in.

### **Reach and Touch Targets- trains the visual skill of depth perception**

Materials: Assorted small to medium objects i.e. colorful pencils, pens, balls

4. Therapist sits or stands opposite from the patient.
5. Therapist holds a target for patient to reach out and touch then returns hand to start position.
6. Therapist moves and holds target at another distance, patient then reaches out and touches target.

### **Rope Pull With Chart- trains the visual skill of dynamic visual acuity**

Materials: Heavy Rope, letter and number chart or shapes chart

1. Post chart at eye level for patient
2. Patient pulls rope hand over hand while reading chart.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

5. Choose a card appropriate for the patient.
6. Patient places game pieces on game board as shown on selected game card.
7. Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skills of accommodation and convergence**

Materials: Scanning Trails charts

6. Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
7. There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
8. Have the patient look at the letter "A" and, using only his/her eyes, follow the curved line from "A" to the correct number on the right side of the page, and call out the number.
9. Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
10. Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

4. Hold the sequential tracker at the patient's reading distance. It may be supported by a book stand or taped to a window for rear illumination.
5. Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.
6. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long

- sweep back to the first target on the left.
8. Repeat the sequence five times, rest for half a minute, then repeat.  
Strive for both speed and accuracy, but of the two, accuracy is the most important.  
Eliminate any regressions (looking back at targets already passed over).  
Maintain a rhythmic shift from target to target. Rhythm is more important than speed.  
Begin with the metronome set at a slower speed to master control of the eye movements.  
Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

6. Instruct patient to look at the center dot which is the “thinking spot” and the starting position.
7. Instruct patient to “think about” number 1 and visualize where it is while maintaining fixation on the center dot.
8. Instruct the patient to “look at” number. Watch the patient’s eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.
9. Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.
10. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: Instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

3. The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.
4. The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

4. Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
5. Patient names the color of ink on printed words rather than reading the words.
6. Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

3. Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
4. Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

### **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

5. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
6. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
7. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
8. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

### **Three D I Spy- trains the visual skill of visualization**

Materials: “Three-D I Spy” game

1. Choose a several clue cards and the coordinating cards.
2. Scatter the coordinating cards.
3. Give patient one clue card
4. Instruct patient to find the coordinating cards based on either the picture or verbal clues provided on the clue card.

Increase demand by eliminating the clue cards, with the therapist give the patient verbal clues only.

### **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoits Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an “R” aligned over an “L”. 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.



7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to 3Δ Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."

8. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, have the patient slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty: Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **VOR- trains the visual skill of eye motility**

Materials: Pen or fixation target

1. Hold an object in front of the patient. Instruct patient to rotate head left/right smoothly while maintaining fixation on the object. Have the patient maintain fixation on the object while moving only his/her head.
2. Instruct patient to tilt chin up and down while maintaining fixation on the object.

Start with 5-7 repetitions as tolerated. Work up to 2 sets of 10 reps each without experiencing symptoms.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

5. The patient stands in front of a window facing out into the distance fixating on a target.
6. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
7. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.
8. Continue until the patient has read the entire chart.

**SPORT SPECIFIC**  
**BASKETBALL**



## **SPORTS VISION - AND BASKETBALL**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration Under Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Speed. (For more in-depth explanation, see the attached Visual Skills definition sheet.) These are all learned skills that can be improved with practice.

As basketball is a sport of almost constant motion, for the players and the ball, well developed dynamic acuity is just as significant as good static acuity.

## **ACCOMMODATION AND CONVERGENCE**

Players must be able to change focus instantaneously as the ball comes toward them or is thrown away from them. Quick, accurate saccades (or eye movements) are needed to rapidly survey the locations and movements of the other nine players and the ball in relationship to the basket, boundary lines, etc.

### Accommodation activities:

- Brock string
- BIM/BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

### Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-vis-x/ball toss and catch
- Sequential Tracker
- Scanning Trails chart

### Divergence Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule
- Projected Quoits

## **ANTICIPATION TIMING**

It is of crucial importance for a player to make the right move at the right time. Therefore, perfect timing is essential. A player must anticipate exactly when to catch a pass, when to go for a rebound, when to intercept a pass, etc.

### Activities

- Ball batting with metronome
- Person saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

## **CONCENTRATION**

Maintaining a high level of concentration in a fast paced, action-filled game is essential in order to deliver a great performance. A slight lapse in concentration can lead to turnovers or missing easy lay-ups and free throws. It could also result in losing the game, or series or even worse, the championship. The team that can establish an intense level of concentration and maintain it for forty-eight minutes is the one that will go further than the rest.

### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-vis-x
- Rush Hour
- Continuous Motion

## **DEPTH PERCEPTION**

Having accurate depth perception is vital for such skills as shooting (especially from the three-point range); passing, specifically to players on the other side of the court on a breakaway; and for evaluating the defensive positions of opponents. Good depth perception can minimize passes or shots that are too long, that fall short of the rim, or are not high enough.

Knowing where you are, relative to other objects (spatial localization) is also very important in basketball because the traffic patterns on the court can become very congested and because it's such a fast moving sport, with both the athletes and targets (especially in passing the ball) in constant motion. Obviously, the baskets are stationary, but the player is usually shooting at this target while he or she is moving laterally, vertically, transversely or "all of the above".

#### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances Brock String
- Projected Quoits

### **DYNAMIC VISUAL ACUITY**

Sharp dynamic visual acuity is extremely important for a sport like basketball, since both the athletes and the ball are in constant motion.

#### Activities

- Hart Charts, various
- Penny Drop
- Stroop Chart
- Rope Pull with letter/number chart
- Hart Chart with Infinity Walk
- 4 corners chart with toe tap to dyna disc
- Head turn left/right to targets with tandem walk
- Small Stroop chart on stationary bike

### **EYE FATIGUE AND PERFORMANCE LEVELS**

Since basketball is a very fatiguing sport that requires a lot of running and jumping, eye 'fitness' is very important. As your eyes become tired, so does the rest of your body. Therefore, eye exercises which strengthen eye muscles, will allow you to perform for longer periods of time with reduced eye fatigue.

#### Activities

- Brock String
- Projected Quoits
- Missing Letter Charts
- Stroop Chart
- Vectograms
- Hart Charts, various
- Scanning Trails
- Marsden Ball

## **EYE-HAND COORDINATION**

This is a basic skill that must be perfected in a basketball player, since their whole game revolves around shooting, passing and catching a ball. Poor eye-hand coordination can lead to missed baskets, uncaught passes, fumbles and unnecessary turnovers.

### Activities

- Ball Tap
- Ball Batting
- Bean Bag Toss/Catch
- Space Fixator
- Ball toss/catch with X-Trainer chart
- Ball toss/catch in hallway while tapping peripheral targets
- Bal-a-vis-x (rhythmic bounce to floor/catch 2 balls with partner)

## **FIXATION ABILITY**

Fixation is critical for accurately shooting at the desired target. The basketball player must focus quickly on his/her target (ex. The back of the rim or bank point on the backboard) and then execute the shot and follow through by retaining fixation on the spot after the shot is released.

### Activities

- Lora's Card
- Space Fixator
- Flashlight Tag
- Brock String
- VOR activities
- AIT

## **PERIPHERAL VISION/AWARENESS**

This is an essential skill for a basketball player on both defense and offense. The offensive player has to look directly at his opponent's eyes while being peripherally aware of the basketball he's dribbling, an open man to pass to, other defensive players trying to steal the ball from him, etc. The defensive man must concentrate centrally on the offensive man he's guarding, while being peripherally aware of screens (picks), his position on the court in relationship to his man and the basket, how much time is on the shot clock, where the ball is on the court, etc.

### Activities

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

## **SPEED AND SPAN OF RECOGNITION**

It is vital for a player to recognize the opportunity for certain play development as quickly as possible. The players only have fractions of a second to get a shot off, to make a pinpoint pass in traffic situations, to block a shot or to recognize a certain offensive or defensive set up.

### Activities

Near/far Memory Game

Ace to King Card Game

Two ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.

## **VISUAL REACTION SPEED**

Since basketball is such a fast-moving sport, the players have to be able to react to any situation that rises as quickly as possible. If their reactions are automatic, it will help in plays such as interceptions and rebounds.

### Activities

Bal a Vis X- One or two bean bag toss/catch

Ball toss/catch from various distances, heights and angles

Ball Batting

Ball Tap

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **AIT- trains visual skill of fixation ability**

Materials: After Image Trainer, patch, solid colored target such as a suspended ball, smiley face posted on the wall

1. Patch one eye
2. Flash the After Image Trainer on the eye.
3. Instruct patient to blink rapidly 3 times.
4. Instruct patient to place the after image on the target. If the target is a smiley face ask patient to place the after image on the smile or eye of the smiley face.
5. Remove patch from eye and repeat steps 1-4 with the alternate eye.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral:



goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).

2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick. Metronome (optional)

1. The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
2. The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
3. The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
4. The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

1. The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
2. The patient taps the ball with alternate hands, maintaining a steady rhythm
3. Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

1. Therapist stands opposite patient.

2. Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

**Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

**Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

**BIM/BOP- trains the visual skill of Accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/- 2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.

5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3<sup>Δ</sup> (6, F).
6. The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.
7. Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.

1. Use patient's existing glasses or a pair of dollar store readers with the lenses removed.
2. Add cloudy scotch tape to the edge of the iris.
3. Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
4. The width of the tape is based on what the patient indicates is most comfortable.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.
6. The goal is to see the string form an "X" at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
2. Using the number worksheet, have the patient circle the number “1” as long as needed until they find number “2” then without picking up the pencil, circle number “2” and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number “30”.
3. The pencil should be moving at all times; do not lift the pencil up from the paper.

Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.

Read Hart Chart vertically, horizontally or first and last letter of each row or column.

### **Flashlight Tag- trains the visual skill of fixation ability**

Materials: Two flashlights

1. In a darkened area, shine a flashlight around the room—on the floor, walls, and ceiling.
2. Include smooth movements as well as jumps in the pattern.
3. Have patient shine a second light directly on your beam.
4. Work on the patient’s accuracy in following the lead beam. Go slowly at first and then increase speed

If patient has trouble doing this exercise with both eyes, have him/her cover one eye. Continue to work this activity with one eye at a time until performance improves; then work both eyes.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

## **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

- 1.4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.
- 2.Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.
- 3.Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).
- 4.Have patient read first/last letters, all odd or all even letters, etc.
- 5.Walk Aways: Patient reads chart while walking to and away from the chart.
- 6.Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

## **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure “8”.
3. Instruct patient to walk in a figure “8” pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure “8”. 3. Have patient catch a ball each time he/she crosses the “x” in the infinity pattern.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.
5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.
7. Switch the patch and repeat the procedure on the opposite eye.

### **Lora's Card- trains the visual skill of fixation ability**

Materials: Lora's Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Missing Letter Charts- trains the visual skill of eye fatigue**

Materials: Chart with scattered letters

1. Patient reads chart vertically or horizontally

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.
3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
4. When shifting focus from near to far, ensure the letters are clear before moving on.

Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

### **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
2. Place three or four objects on the table in front of you (near to far).
3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
4. Block the patient's view of the objects with a folder.
5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
6. Ask the patient to identify the objects out of order until all of the objects are identified.
7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.  
Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

### **Penny Drop- trains the visual skill of eye tracking activities**

Materials: One penny, one cup, and a clicker or bell.

- 1.The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
- 2.The therapist moves the container continuously in all directions within reach of the patient.
- 3.The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times. When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

### **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

- 1.Set metronome at appropriate pace for patient.
- 2.Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.
- 3.Work towards increasing the rhythm of the metronome.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of "straight-ahead" and the objective direction of straight ahead. They may feel "out of synch" with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as "bases left or 'bases right" can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

- 1.Start with a low diopter prism such as a 2 or 3 diopter.
- 2.Trial various diopters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.



## **Projected Quoits- trains the visual skill of accommodation and convergence**

Materials: Quoits vectogram, overhead projector, screen

Convergence Therapy Set the Quoits vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3 $\Delta$  Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."

2. Once the patient can perform these steps, while the Vectograms slides are set at 3 $\Delta$  Base out, slowly separate the targets to 6 $\Delta$  Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.

3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.

4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.

5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.

6. After 6-8 $\Delta$  Base-in, the target will be too far behind the targets for the patient to point.

7. The patient should be able see one set of Quoits by looking beyond the Vectogram at the central letter chart on the wall.

8. If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoits at letter "L". Endpoint 25 $\Delta$  Base-out. and 12 $\Delta$  Base-in.

## **Rope Pull With Chart- trains the visual skill of dynamic visual acuity**

Materials: Heavy Rope, letter and number chart or shapes chart

1. Post chart at eye level for patient

2. Patient pulls rope hand over hand while reading chart.

## **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

1. Choose a card appropriate for the patient.

2. Patient places game pieces on game board as shown on selected game card.
3. Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

1. Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
2. There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
3. Have the patient look at the letter "A" and, using only his/her eyes, follow the curved line from "A" to the correct number on the right side of the page, and call out the number.
4. Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
5. Continue until each letter has been matched to the appropriate number.

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the "thinking spot" and the starting position.
2. Instruct patient to "think about" number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to "look at" number. Watch the patient's eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.
4. Instruct the patient to "touch" number 1 then return to eyes and finger to start position of the center dot.
5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

- 1.The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.
- 2.The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

- 1.Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
- 2.Patient names the color of ink on printed words rather than reading the words.
- 3.Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

- 1.Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
- 2.Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

### **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

## **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoiets Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an “R” aligned over an “L”. 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps.  
tip One: Tell the patient to separate the sheets to  $3\Delta$  Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one target. Stress to the patient the

importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."

8. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, have the patient slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **VOR- trains the visual skill of eye motility**

Materials: Pen or fixation target

1. Hold an object in front of the patient. Instruct patient to rotate head left/right smoothly while maintaining fixation on the object. Have the patient maintain fixation on the object while moving only his/her head.

2. Instruct patient to tilt chin up and down while maintaining fixation on the object.

Start with 5-7 repetitions as tolerated. Work up to 2 sets of 10 reps each without experiencing symptoms.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.
4. Continue until the patient has read the entire chart.

**SPORT SPECIFIC**  
**BOXING**



## **SPORTS VISION - AND BOXING**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration under Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Speed. (For more in-depth explanations, see the attached Visual Skills definition sheet.) These are all learned skills that can be improved with practice.

The following is an explanation of the most relative dynamic visual skills associated with boxing.

### **ANTICIPATION TIMING**

Since timing is the key to effective performance, knowing the right time to throw a punch is very crucial. It is also important not to over-commit yourself in response to an opponent's feints.

#### Activities

- Ball batting with metronome
- Percon saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

### **CONCENTRATION**

It is essential to be able to focus through distraction and maintain a high level of concentration throughout the bout, not allowing crowd noise, flashing lights or an opponent's taunting to be a distraction from the task at hand. A slight deficiency or lapse in concentration can mean mental or physical error, which could mean the loss of a bout- or worse- injury.

#### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-vis-x
- Rush Hour
- Continuous Motion

## **DEPTH PERCEPTION**

The ability to deliver an effective blow is much more complicated than it may appear to the casual observer. It involves a snapping and twisting motion that makes it necessary to determine the exact distance of an opponent in order to deliver the blow with maximum power.

### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reaches out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances Brock String
- Projected Quoits

## **EYE-HAND/BODY/FOOT COORDINATION**

Total coordination is essential to the maintenance of good balance. Fighters, therefore, have an obvious need to integrate a sense of balance with the visual motor system. Eye-Hand coordination is also one of the keys to landing effective punches within the scoring range.

### Activities

- Step ups/side lunges with ball toss/catch
- Infinity walk with ball toss/catch
- Infinity Walk with Hart Chart
- Tandem Walk with Peripheral Touch
- Bola Ball
- Motor Mimic with Hart Charts

## **EYE FATIGUE**

Boxing is a very fatiguing sport, especially when both fighters are evenly matched in weight, skills, and conditioning. Professional bouts for championships can go fifteen three-minute rounds. With only a one-minute rest between rounds, physical fatigue is guaranteed. This drain of energy can greatly affect concentration, visual reaction time and eye-hand coordination. Eye fatigue can also affect performance levels in much the same way. When the muscles in our eyes feel tired or strained, we feel the fatigue all over. Just as we use weightlifting routines to improve physical endurance levels, we can also use a program of visual exercises to enhance your eye muscles, and thereby reduce fatigue.

### Activities

- Brock String
- Projected Quoits
- Missing Letter Charts
- Stroop Chart
- Vectograms
- Hart Charts, various
- Scanning Trails
- Marsden Ball



## **EYE MOTILITY**

Eye tracking ability is important for a boxer if he plans to hit a moving opponent who is not only bobbing and weaving in front of him, but around the ring as well. Quick, accurate saccades (or eye movements) are needed to center in on the moving target's vulnerable areas.

### Activities

- Eye Stretches
- Vertical/Horizontal, Diagonal Saccades
- Alternating Hart Charts, 4 corners charts
- X-Trainer chart with Infinity Walk
- Fitz's Fixator
- Space Fixator
- VOR

## **PERIPHERAL VISION AND AWARENESS**

This is helpful to a boxer on both defense and in his attack. Most boxer's soft center is their opponent's upper torso to chin area while being peripherally aware of both glove and body movement. When peripheral vision is reduced or hindered by a cut or mouse on the orbit of the eye, the boxer is in greater danger of further injury because he can't see the blows coming (especially hooks) to defend against them. It is also imperative for the boxer to always know where he is in the ring relative to the ropes, the other boxer, and the referee, and he can't take his eyes off the opponent to determine this, even for an instant.

### Activities:

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

## **SPEED OF RECOGNITION**

The faster a boxer can discern a feint (fake) from a real incoming punch of a certain type (hook, jab, uppercut, etc.), the more time he has to parry the blow and even perhaps counterpunch.

### Activities

- Near/far Memory Game
- Ace to King Card Game
- 2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.

## **VISUALIZATION**

The process of visualizing a specific opponent, or the particular style of an opponent (shadowboxing), and visually rehearsing every type of punch, combination, and defense, can dramatically improve overall performance.

### Activities

Rush Hour

Color Cubes

Three-D I Spy

Parquetry

Ace to King

Parquetry with rotation and flips

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).
2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick. Metronome (optional)

1. The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
2. The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
3. The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.

4. The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

1. Therapist stands opposite patient.
2. Toss and catch the ball at the appropriate challenge for the patient.

#### Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **Bola Ball- trains the visual skill of eye/hand/body/foot coordination**

Materials: Bola Ball

1. Instruct patient to toss Bola Ball vertically in air, as the Bola Ball flips end over end the patient is to catch the Bola Ball in midair.  
Alternate method: Patient and therapist stand facing each other, therapist tosses Bola Ball vertically in direction of patient, patient then catches Bola Ball.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

- 1.The patient should be seated or standing in a relaxed, balanced posture.
- 2.Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
- 3.Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
- 4.The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
- 5.The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.
- 6.The goal is to see the string form an “X” at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Color Cubes- trains the visual skill of visualization.**

Materials: Color Cubes game

- 1.Choose card appropriate for patient.
- 2.Instruct patient to recreate the structure displayed on the card.

Modifications for cognitive activities:

Increase demand: Carry on a conversation with patient while performing the task, work in a busy environment, interrupt task and restart, or have the patient perform a task while standing or seated on Swiss ball as appropriate.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

- 1.Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
- 2.Using the number worksheet, have the patient circle the number “1” as long as needed until they find number “2” then without picking up the pencil, circle number “2” and continue

circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number “30”.

3. The pencil should be moving at all times; do not lift the pencil up from the paper.

Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Eye Stretches with clothespins and rings- trains the visual skill of eye motility**

Materials: Assorted colors of pipe cleaners shaped into rings, clothes pins colored with markers to coordinate with the rings

1. Patient and therapist sit opposite of each other. Patient is given clothes pins to clip onto pipe cleaner rings held by therapist. The therapist intermittently moves the ring in the cardinal positions. The patient uses eye movement only to locate the ring as it is moved into various positions, reaching to clip the clothespin onto the ring.

### **Fitz’s Fixator- trains the visual skill of eye motility**

Materials: Fitz’s Fixator with coordinating cards, pen light or head lamp

1. Seat patient in front of chart posted on a wall.
2. Therapist shows the patient a card with a shape or number printed on it.
3. Instruct the patient to locate the coordinating shape or number on the chart with a pen light.

A head lamp may be also be used to locate the coordinating number/shapes.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.

2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

### **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

- 1.4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.
  2. Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.
  3. Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).
  4. Have patient read first/last letters, all odd or all even letters, etc.
  5. Walk Aways: Patient reads chart while walking to and away from the chart.
  6. Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.
- Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

**Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure "8".
3. Instruct patient to walk in a figure "8" pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure "8". 3. Have patient catch a ball each time he/she crosses the "x" in the infinity pattern.

**Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.

5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.
7. Switch the patch and repeat the procedure on the opposite eye.

### **Lora's Card- trains the visual skill of fixation ability**

Materials: Lora's Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Missing Letter Charts- trains the visual skill of eye fatigue**

Materials: Chart with scattered letters

1. Patient reads chart vertically or horizontally

### **Motor Mimic- trains the visual skill of eye-hand/body/foot coordination**



Materials: Hart Charts (optional)

1. Have the patient stand directly next to you and be sure to point out where both the left and right hands are for the patient and the therapist
2. Start the activity by either stomping a foot or slapping a hand and instructing the patient to do what you had just done.
3. Increase the difficulty of the task by adding more slaps and stomps to the combination making sure not to add to the pattern until the previous pattern was successfully completed.
4. Once the patient has successfully completed a series of four slaps and stomps move 90-degrees so that you are perpendicular to the student and continue as you initially did.
5. The final progression of this task is to stand directly across from the patient when completing a combination.

Increase demand: Add math facts to the pattern by calling out a number as you are slapping or stomping. Have the patient answer a question before allowing them to repeat the pattern. Slap and stomp to a beat while counting. Add cross lateral movements. Add Hart Charts.

### **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
  2. Place three or four objects on the table in front of you (near to far).
  3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
  4. Block the patient's view of the objects with a folder.
  5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
  6. Ask the patient to identify the objects out of order until all of the objects are identified.
  7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
  8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.
- Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

### **Parquetry Blocks- trains the visual skill of visualization**

Materials: Parquetry Blocks set

1. Choose pattern appropriate for patient ability.
2. Instruct patient to place block directly on the pattern.
3. Set the pattern on the table, instruct patient to replicate the pattern directly on the table.

Decrease demand: Use the simple black and white patterns, instruct patient to match the shape only.

Increase demand: Rotate the pattern left/right, flip pattern or recreate the pattern from memory.

### **Penny Drop- trains the visual skill of eye tracking**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
  2. The therapist moves the container continuously in all directions within reach of the patient.
  3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times.
- When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

### **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

1. Set metronome at appropriate pace for patient.
2. Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.
3. Work towards increasing the rhythm of the metronome.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of "straight-ahead" and the objective direction of straight ahead. They may feel "out of synch" with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as "bases left or 'bases right" can reduce this perceptual

mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

### **Projected Quoits- trains the visual skill of accommodation and convergence**

Materials: Quoits vectogram, overhead projector, screen

Convergence Therapy Set the Quoits vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3 $\Delta$  Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."
2. Once the patient can perform these steps, while the Vectograms slides are set at 3 $\Delta$  Base out, slowly separate the targets to 6 $\Delta$  Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.

3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.

4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.

5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.

6. After 6-8 $\Delta$  Base-in, the target will be too far behind the targets for the patient to point.

7. The patient should be able to see one set of Quoits by looking beyond the Vectogram at the central letter chart on the wall.

8. If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoits at letter "L".

Endpoint 25 $\Delta$  Base-out. and 12 $\Delta$  Base-in.

### **Reach and Touch Targets- trains the visual skill of depth perception**

Materials: Assorted small to medium objects i.e. colorful pencils, pens, balls

1. Therapist sits or stands opposite from the patient.
2. Therapist holds a target for patient to reach out and touch then returns hand to start position.
3. Therapist moves and holds target at another distance, patient then reaches out and touches target.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

1. Choose a card appropriate for the patient.
2. Patient places game pieces on game board as shown on selected game card.
3. Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

1. Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
2. There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
3. Have the patient look at the letter "A" and, using only his/her eyes, follow the curved line from "A" to the correct number on the right side of the page, and call out the number.
4. Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
5. Continue until each letter has been matched to the appropriate number.

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the "thinking spot" and the starting position.
2. Instruct patient to "think about" number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to "look at" number. Watch the patient's eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.

4. Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.

5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

1. The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.

2. The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

1. Patient stands or sits in front of large posted Stroop chart and reads chart as printed.

2. Patient names the color of ink on printed words rather than reading the words.

3. Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

1. Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size

of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.

2. Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

### **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

### **Three D I Spy- trains the visual skill of visualization**

Materials: "Three-D I Spy" game

1. Choose a several clue cards and the coordinating cards.
2. Scatter the coordinating cards.
3. Give patient one clue card
4. Instruct patient to find the coordinating cards based on either the picture or verbal clues provided on the clue card.

Increase demand by eliminating the clue cards, with the therapist give the patient verbal clues only.

### **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoit Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an "R" aligned over an "L". 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)]  
D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to 3Δ Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."
8. Once the patient can perform these steps, while the Vectogram slides are set at 3Δ Base out, have the patient slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

**VOR- trains the visual skill of eye motility**

Materials: Pen or fixation target

1. Hold an object in front of the patient. Instruct patient to rotate head left/right smoothly while maintaining fixation on the object. Have the patient maintain fixation on the object while moving only his/her head.

2. Instruct patient to tilt chin up and down while maintaining fixation on the object.

Start with 5-7 repetitions as tolerated. Work up to 2 sets of 10 reps each without experiencing symptoms.



**SPORT SPECIFIC**  
**FOOTBALL**



## **SPORTS VISION - AND FOOTBALL**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Speed. (For more in-depth explanations, see the attached Visual Skills definition sheet.) These are all learned skills that will improve with practice.

Football is a game that requires intense concentration and awareness of what is happening around the player. A slight deficiency or lapse in either of these areas can mean mental or physical error or much worse - injury!

The following is a comprehensive breakdown of the dynamic skills associated with each position.

### **RECEIVERS**

#### **ACCOMMODATION & CONVERGENCE**

The ability of the eyes to track and constantly refocus on the ball as it approaches, so it doesn't become a blur.

Accommodation activities:

- Brock String
- BIM/BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-vis-x/ball toss and catch
- Sequential Tracker
- Scanning Trails chart

#### **CONCENTRATION**

The ability to focus on the ball through a maze of outstretched arms.

Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

## **DEPTH PERCEPTION**

Receivers must calculate exactly how far and fast the thrown ball is travelling so that they can adjust their own speed and location to be in the exact spot to catch the ball.

### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances
- Brock String
- Projected Quoits

## **EYE FATIGUE**

Football is a very fatiguing sport which requires excellent conditioning. Physical fatigue can greatly affect concentration, visual reaction time, and eye-hand coordination. Eye fatigue can also affect performance levels in much the same way. When the muscles in our eyes feel tired or strained, we feel the fatigue all over. Just like a weightlifting routine is used to increase physical endurance, visual exercises can be used to strengthen the eye muscles and thereby reduce fatigue.

### Activities

- Brock String
- Projected Quoits
- Missing Letter Charts
- Stroop Chart
- Vectograms
- Hart Charts, various
- Scanning Trails
- Marsden Ball

## **PERIPHERAL VISION/AWARENESS**

A receiver must possess this skill - as he extends to make the catch, he must be sure of the location of nearby opponents. This will help to avoid injuries or allow him to make the quick move to spring into the open after making the catch.

### Activities

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

## DEFENSIVE BACKS

### ACCOMMODATION & CONVERGENCE

The ability of the eyes to track and constantly refocus on the ball as it approaches - and not let it become a blur.

#### Accommodation activities:

- Brock String
- BIM/BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

#### Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-Vis-X-ball toss and catch
- Sequential Tracker
- Scanning Trails chart

#### Divergence Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule
- Projected Quoits

### ANTICIPATION TIMING

The skill of judging the cutoff point of the on-coming ball or ball carrier.

#### Activities

- Ball batting with metronome
- Percon saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

## **CONCENTRATION**

The ability to concentrate on the ball when it is in the air and make the interception. As the ball is not meant to go to the defensive back, it usually requires a great athletic effort to arrive in position to make the 'pick' and it is often accomplished through the distraction of waving arms and moving bodies.

### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

## **EYE-HAND COORDINATION**

This skill applies to catching (intercepting) the football as with receivers.

### Activities

- Ball Tap
- Ball Batting
- Bean Bag Toss/Catch
- Space Fixator
- Ball toss/catch with X-Trainer chart
- Ball toss/catch in hallway while tapping peripheral targets
- Bal-a-Vis-X (rhythmic bounce to floor/catch 2 balls with partner)

## **PERIPHERAL VISION/AWARENESS**

The ability to focus on the central object (the ball when it is in the air, the man in man to man coverage, the quarterback in zone coverage) and still be confident of the action happening around that object.

### Activities:

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

## LINEBACKERS

### CONCENTRATION

Lapses in this skill are extremely hazardous in this position as it is a high traffic area. It is also important to be able to concentrate on the 'keys' required to read each play with the many distractions associated with a high traffic area.

#### Activities

- Rush Hour
- Space Fixator
- Continuous Motion
- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X

### PERIPHERAL VISION AND AWARENESS

The player must be able to focus on his 'keys' while being aware of opponents in his area. One of the main concerns of the linebacker is the 'crack back' block. Early awareness and reaction to this potentially hazardous situation can greatly enhance his effectiveness and help to avoid injury.

#### Activities:

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

### SPEED & SPAN OF RECOGNITION

Line backing is a fast action/reaction position. The ability to take in visual information and instantaneously translate it into a physical reaction is vital to superior play.

#### Activities

- Near/far Memory Game
- Ace to King Card Game
- 2 ball (2 different colors) toss-patients catches color called out by trainer as balls are tossed.

### OTHER SKILLS

Line backing is a unique position in that the player must combine the skills of both the line and the defensive play. Therefore, he will employ the other skills not mentioned above but required specifically by the defensive backs and line.

## RUNNING BACKS

As the back handles the ball quite often in the game and can also be pass receiver, he must possess those visual skills which are acquired by the receivers such as Accommodation & Convergence, Concentration and Eye-Hand Coordination. Peripheral Awareness is also an important skill for the back as he must often be able to pick up blitzing linemen who have beaten their block. This skill is also required by the back while running the ball as he must be able to focus on where he is going and be able to see and recognize the action in his periphery. Speed & Span of Recognition is critically important to the ball carrier, as the more visual information he can take in, and the faster he can turn this into a physical reaction, the more effective his running will be.

## QUARTERBACKS

### ANTICIPATION TIMING

A widely used skill among quarterbacks. Exact anticipation timing can help a quarterback move out of the pocket just at the right time to avoid being sacked. It is also vital for releasing the ball on time to receivers and for completing a perfect hand-off to a running back.

#### Activities Ball

- Ball batting with metronome
- Percon saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

### CONCENTRATION

The quarterback has the most extensive and difficult reads to make as the success of each play originates on his accurate read of the defensive scheme. Any laps in concentration will result in a botched play, or worse, a fumble or interception. He must also be able to concentrate downfield on his receivers through the stress and distraction of the on-coming rush.

#### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

## **DEPTH PERCEPTION**

A critical skill in that he must be able to accurately judge the distance and speed of the receiver and throw the ball to the correct point. A short coming in this area will result in incompletions or interceptions.

### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances Brock String
  
- Projected Quoits

## **DIVERGENCE**

One of the most difficult dynamic visual skills is tracking an object that is moving away from the athlete. This is illustrated by the ability to accurately judge and complete the long pass. Quarterbacks that continuously struggle with this pass could have a deficiency in this skill.

### Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule

## **EYE-HAND COORDINATION**

The ability to throw a football where it should go, particularly while the quarterback is scrambling or off balance.

### Activities

- Ball Tap
- Ball Batting
- Bean Bag Toss/Catch
- Space Fixator
- Ball toss/catch with X-Trainer chart
- Ball toss/catch in hallway while tapping peripheral targets
- Bal-a-Vis-X (rhythmic bounce to floor/catch 2 balls with partner)



## **PERIPHERAL VISION/AWARENESS**

Also very important for the quarterback as he must be able to be aware of the rush surrounding him while concentrating on his downfield receivers. The quarterbacks who seem to step up in the pocket at the last instant to avoid a charging rusher possess this skill.

### Activities:

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

## **SPEED AND SPAN OF RECOGNITION**

The more instantaneously he is able to process the visual information which surrounds him, the more time he will have to choose the correct reaction and complete the play.

### Activities

- Near/far Memory Game
- Ace to King Card Game
- 2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).
2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick. Metronome (optional)

1. The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
2. The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
3. The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
4. The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

1. The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
2. The patient taps the ball with alternate hands, maintaining a steady rhythm
3. Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

1. Therapist stands opposite patient.
2. Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an "A" pattern on floor with the top of the "A" closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of Accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/- 2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.
5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3<sup>Δ</sup> (6, F).
6. The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.
7. Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.

1. Use patient's existing glasses or a pair of dollar store readers with the lenses removed.
2. Add cloudy scotch tape to the edge of the iris.
3. Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
4. The width of the tape is based on what the patient indicates is most comfortable.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.
6. The goal is to see the string form an "X" at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
2. Using the number worksheet, have the patient circle the number "1" as long as needed until they find number "2" then without picking up the pencil, circle number "2" and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number "30".
3. The pencil should be moving at all times; do not lift the pencil up from the paper.

Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.
3. Read Hart Chart vertically, horizontally or first and last letter of each row or column.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

### **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

1. 4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.
2. Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.
3. Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).
4. Have patient read first/last letters, all odd or all even letters, etc.
5. Walk Aways: Patient reads chart while walking to and away from the chart.
6. Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

### **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure "8".
3. Instruct patient to walk in a figure "8" pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixate without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure "8". 3. Have patient catch a ball each time he/she crosses the "x" in the infinity pattern.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.
5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.
7. Switch the patch and repeat the procedure on the opposite eye.

### **Lora's Card- trains the visual skill of fixation ability**

Materials: Lora's Card

1. Place the card at reading distance (elbow to knuckle).

2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Missing Letter Charts- trains the visual skill of eye fatigue**

Materials: Chart with scattered letters

Patient reads chart vertically or horizontally

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.
3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
4. When shifting focus from near to far, ensure the letters are clear before moving on.

Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.



## **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
2. Place three or four objects on the table in front of you (near to far).
3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
4. Block the patient's view of the objects with a folder.
5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
6. Ask the patient to identify the objects out of order until all of the objects are identified.
7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.

Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

## **Penny Drop- trains the visual skill of eye tracking**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
2. The therapist moves the container continuously in all directions within reach of the patient.
3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times. When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

## **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

1. Set metronome at appropriate pace for patient.
2. Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.
3. Work towards increasing the rhythm of the metronome.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of “straight-ahead” and the objective direction of straight ahead. They may feel “out of synch” with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as “bases left or ‘bases right” can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

### **Projected Quoiets- trains the visual skill of accommodation and convergence**

Materials: Quoiets vectogram, overhead projector, screen

Convergence Therapy Set the Quoiets vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3Δ Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."
2. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.
3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.
4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.

5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.
6. After 6-8 $\Delta$  Base-in, the target will be too far behind the targets for the patient to point.
7. The patient should be able to see one set of Quojis by looking beyond the Vectogram at the central letter chart on the wall.
8. If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quojis at letter "L". Endpoint 25 $\Delta$  Base-out. and 12 $\Delta$  Base-in.

### **Reach and Touch Targets- trains the visual skill of depth perception**

Materials: Assorted small to medium objects i.e. colorful pencils, pens, balls

1. Therapist sits or stands opposite from the patient.
2. Therapist holds a target for patient to reach out and touch then returns hand to start position.
3. Therapist moves and holds target at another distance, patient then reaches out and touches target.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

1. Choose a card appropriate for the patient.
2. Patient places game pieces on game board as shown on selected game card.
3. Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

1. Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
2. There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
3. Have the patient look at the letter "A" and, using only his/her eyes, follow the curved line from "A" to the correct number on the right side of the page, and call out the number.

4. Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
5. Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

1. Hold the sequential tracker at the patient's reading distance. It may be supported by a book stand or taped to a window for rear illumination.
2. Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.
3. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long sweep back to the first target on the left.
4. Repeat the sequence five times, rest for half a minute, then repeat.  
Strive for both speed and accuracy, but of the two, accuracy is the most important. Eliminate any regressions (looking back at targets already passed over). Maintain a rhythmic shift from target to target. Rhythm is more important than speed. Begin with the metronome set at a slower speed to master control of the eye movements. Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the "thinking spot" and the starting position.
2. Instruct patient to "think about" number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to "look at" number. Watch the patient's eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.
4. Instruct the patient to "touch" number 1 then return to eyes and finger to start position of the center dot.
5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

- 1.The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.
- 2.The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

- 1.Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
- 2.Patient names the color of ink on printed words rather than reading the words.
- 3.Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

- 1.Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
- 2.Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

## **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

## **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoi's Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an "R" aligned over an "L". 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.

6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.

7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to 3Δ Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."

8. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, have the patient slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.
4. Continue until the patient has read the entire chart.

**SPORT SPECIFIC**  
**GOLF**





## **SPORTS VISION - AND GOLF**

Sports Vision enhancement training is an integral part of a total athletic training program. Surprisingly, the visual dynamics of golf are similar to those of other individual and team sports; good ocular motor (eye muscle) skills, along with increased concentration capabilities, can dramatically improve a golfer's performance on the course. Conversely, if visual information is inaccurate, it can throw off the body's timing and cause a decrease in performance. If a golfer has a perfect stance, a flawless backswing and an uncanny talent for hitting the sweet spot, but is still unable to properly pinpoint the target, the overall skill set falls apart. Whether you're a pro, amateur, or simply one of the millions of men and women in love with the game of golf, improved visual skills can make your next trip to the golf course a more rewarding and pleasant experience.

The following is a comprehensive outline of the most important dynamic visual skills for golf.

### **CONCENTRATION**

The ability to stay focused and maintain peak performance levels even during adverse conditions.

#### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

### **DEPTH PERCEPTION**

If depth perception is not optimal, the ability to estimate distances will be impaired. When trained properly, depth perception acts as a valuable aid in estimating yardage and in selecting the proper club.

If the golf player doesn't estimate the distance correctly, assessing the green as well as making the correct putt will be difficult. The player will therefore have a tendency to either hit the ball too short or too long and possibly too much to the left or right.

When hitting the ball, it is also important to have your dominant eye facing forward. If you are using your non-dominant eye as your aiming eye, it will be the one primarily measuring the distance and 'signaling' to the brain. It is not significant whether binocular vision is fully optimal at this point, but if the dominant eye is not quite optimized, it will lead to a shifting of the estimation of distance.

#### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances

Ball toss/catch with various size balls at various distances  
Brock String  
Projected Quoits

### **EYE-HAND/FOOT/BODY COORDINATION**

Watching a professional golfer tee off is a thing of beauty. He addresses the ball, legs apart. The club appears to be an extension of his hands and arms as he begins the backswing head down, eyes on the ball, knees slightly flexed, arms firm. All muscles work in concert with one another, producing one fluid movement, as he makes the downswing, hitting the club head perfectly on the ball and continuing with his follow-through to complete the circle. This is often referred to as the "connection theory" and is a result of good eye-hand-body coordination.

#### Activities

Step ups/side lunges with ball toss/catch  
Infinity walk with ball toss/catch  
Infinity Walk with Hart Chart  
Tandem Walk with Peripheral Touch  
Bola Ball  
Motor Mimic with Hart Charts

### **FIXATION ABILITY**

The ability to fine focus on a target, quickly and accurately, using a series of eye movements. The ability to properly focus on the ball and the target, whether three feet or 300 yards away is essential in making good contact between the club head and the ball. Fine focusing techniques can help both in hitting the sweet spot and stroking a smoother putt.

#### Activities

Lora's Card  
Space Fixator  
Flashlight Tag  
Brock String  
VOR  
AIT

### **FOCUSING AND TRACKING**

The ability to effectively shift one's focus near and far is particularly linked to putting performance. A player misses a putt because he or she doesn't read the proper break. Also, if the eye muscles are not correctly coordinated, pursuing the ball with the eyes in the downfall will be difficult. The ball will appear to be there, only to 'vanish' and then re-appear.

#### Activities

Make infinity pattern in air with right hand then left hand then both hands together, eyes remain on thumb of hand making infinity pattern.  
Letter find on swinging Marsden ball

Trail Making Charts  
Sequential Tracker  
Continuous Motion

## **PERIPHERAL AWARENESS**

Being aware of the primary target (the ball) while simultaneously knowing where you want to direct the ball with your club is obviously an important skill to master.

### Activities

Brock String  
Marsden Ball  
Lora's Card  
Bean Bag toss to peripheral targets on floor  
Tandem walk in hall with hand tap to targets on wall  
Circular toss/catch with suspended ball  
Prism work

## **VISUALIZATION**

This is the process of seeing yourself performing an athletic activity. Goal-oriented visual imagery techniques are used to help develop consistency in performance. Simply stated, if you can imagine yourself performing a proper swing often enough, you will tend to actually perform the swing in a like manner. Many trainers have their students practice with their eyes closed while visualizing the path they want the ball to take.

### Activities

Rush Hour  
Color Cubes  
Three-D I Spy  
Parquetry  
Ace to King  
Parquetry with rotation and flips  
Rush Hour

### **Typical Symptoms That May Be Related to Poor Dynamic Visual Skills:**

- Difficulty estimating distances.
- Difficulty reading the greens.
- Problems staying focused, especially under stress.
- Poor eye-hand coordination.

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **AIT- trains visual skill of fixation ability**

Materials: After Image Trainer, patch, solid colored target such as a suspended ball, smiley face posted on the wall

1. Patch one eye
2. Flash the After Image Trainer on the eye.
3. Instruct patient to blink rapidly 3 times.
4. Instruct patient to place the after image on the target. If the target is a smiley face ask patient to place the after image on the smile or eye of the smiley face.
5. Remove patch from eye and repeat steps 1-4 with the alternate eye.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).

2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

1. Therapist stands opposite patient.
2. Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an "A" pattern on floor with the top of the "A" closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **Bola Ball- trains the visual skill of eye/hand/body/foot coordination**

Materials: Bola Ball

1. Instruct patient to toss Bola Ball vertically in air, as the Bola Ball flips end over end the patient is to catch the Bola Ball in midair.  
Alternate method: Patient and therapist stand facing each other, therapist tosses Bola Ball vertically in direction of patient, patient then catches Bola Ball.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

- 1.The patient should be seated or standing in a relaxed, balanced posture.
- 2.Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
- 3.Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
- 4.The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
- 5.The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.
- 6.The goal is to see the string form an “X” at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Color Cubes- trains the visual skill of visualization.**

Materials: Color Cubes game

1. Choose card appropriate for patient.
2. Instruct patient to recreate the structure displayed on the card.

Modifications for cognitive activities:

Increase demand: Carry on a conversation with patient while performing the task, work in a busy environment, interrupt task and restart, or have the patient perform a task while standing or seated on Swiss ball as appropriate.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
2. Using the number worksheet, have the patient circle the number “1” as long as needed until they find number “2” then without picking up the pencil, circle number “2” and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number “30”.

3. The pencil should be moving at all times; do not lift the pencil up from the paper.

Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Flashlight Tag- trains the visual skill of fixation ability**

Materials: Two flashlights

1. In a darkened area, shine a flashlight around the room—on the floor, walls, and ceiling.
2. Include smooth movements as well as jumps in the pattern.
3. Have patient shine a second light directly on your beam.
4. Work on the patient's accuracy in following the lead beam. Go slowly at first and then increase speed

If patient has trouble doing this exercise with both eyes, have him/her cover one eye. Continue to work this activity with one eye at a time until performance improves; then work both eyes.

### **Infinity Pattern with Hand Movement- trains the visual skill of focusing and tracking**

Materials: No materials needed for this activity

1. Place patient in a seated or standing position.
2. Instruct patient to extend one arm forward with thumb up
3. Instruct patient to fix his/her eyes on the thumb and move extended arm in an Infinity pattern (horizontal figure 8).
4. The patient should follow the moving thumb with eyes only while holding the head stationary.
5. Repeat this exercise with the alternate arm extended and then with both arms extended, a hand clasped together and thumbs up.

### **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure "8".

3. Instruct patient to walk in a figure “8” pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure “8”. 3. Have patient catch a ball each time he/she crosses the “x” in the infinity pattern.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from  $-.50$  to  $-5.0$  are placed within reach of the patient.
5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.
7. Switch the patch and repeat the procedure on the opposite eye.

### **Lora’s Card- trains the visual skill of fixation ability**

Materials: Lora’s Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.



### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

**Increase Demand:** Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Motor Mimic- trains the visual skill of eye-hand/body/foot coordination**

Materials: Hart Charts (optional)

1. Have the patient stand directly next to you and be sure to point out where both the left and right hands are for the patient and the therapist
2. Start the activity by either stomping a foot or slapping a hand and instructing the patient to do what you had just done.
3. Increase the difficulty of the task by adding more slaps and stomps to the combination making sure not to add to the pattern until the previous pattern was successfully completed.
4. Once the patient has successfully completed a series of four slaps and stomps move 90- degrees so that you are perpendicular to the student and continue as you initially did.
5. The final progression of this task is to stand directly across from the patient when completing a combination.

Increase demand: Add math facts to the pattern by calling out a number as you are slapping or stomping. Have the patient answer a question before allowing them to repeat the pattern. Slap and stomp to a beat while counting. Add cross lateral movements. Add Hart Charts.

### **Parquetry Blocks- trains the visual skill of visualization**

Materials: Parquetry Blocks set

1. Choose pattern appropriate for patient ability.
2. Instruct patient to place block directly on the pattern.
3. Set the pattern on the table, instruct patient to replicate the pattern directly on the table.

Decrease demand: Use the simple black and white patterns, instruct patient to match the shape only.

Increase demand: Rotate the pattern left/right, flip pattern or recreate the pattern from memory.

## **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of “straight-ahead” and the objective direction of straight ahead. They may feel “out of synch” with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as “bases left or ‘bases right” can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopeters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

## **Projected Quoiets- trains the visual skill of accommodation and convergence**

Materials: Quoiets vectogram, overhead projector, screen

Convergence Therapy Set the Quoiets vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3Δ Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."
2. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.

3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.

4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.

5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.

6. After 6-8Δ Base-in, the target will be too far behind the targets for the patient to point.

7. The patient should be able see one set of Quoiets by looking beyond the Vectogram at the central letter chart on the wall.

8.If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoins at letter “L”. Endpoint 25Δ Base-out. and 12Δ Base-in.

### **Reach and Touch Targets- trains the visual skill of depth perception**

Materials: Assorted small to medium objects i.e. colorful pencils, pens, balls

- 1.Therapist sits or stands opposite from the patient.
- 2.Therapist holds a target for patient to reach out and touch then returns hand to start position.
- 3.Therapist moves and holds target at another distance, patient then reaches out and touches target.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

- 1.Choose a card appropriate for the patient.
- 2.Patient places game pieces on game board as shown on selected game card.
- 3.Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

- 1.Hold the sequential tracker at the patient’s reading distance. It may be supported by a book stand or taped to a window for rear illumination.
- 2.Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.
3. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long sweep back to the first target on the left.
- 4.Repeat the sequence five times, rest for half a minute, then repeat.  
Strive for both speed and accuracy, but of the two, accuracy is the most important.  
Eliminate any regressions (looking back at targets already passed over).  
Maintain a rhythmic shift from target to target. Rhythm is more important than speed.  
Begin with the metronome set at a slower speed to master control of the eye movements.  
Be sure you see each target clearly, and remember to be aware of as much as

possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the “thinking spot” and the starting position.
2. Instruct patient to “think about” number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to “look at” number. Watch the patient’s eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.
4. Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.
5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

1. The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.
2. The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

1. Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
2. Patient names the color of ink on printed words rather than reading the words.

3. Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

1. Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.

2. Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

### **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

### **Three D I Spy- trains the visual skill of visualization**

Materials: "Three-D I Spy" game

1. Choose a several clue cards and the coordinating cards.

2. Scatter the coordinating cards.
3. Give patient one clue card
4. Instruct patient to find the coordinating cards based on either the picture or verbal clues provided on the clue card.

Increase demand by eliminating the clue cards, with the therapist give the patient verbal clues only.

## **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quojis Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an "R" aligned over an "L". 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to  $3\Delta$  Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus

floating. Make sure the patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."

8. Once the patient can perform these steps, while the Vectograms slides are set at  $3\Delta$  Base out, have the patient slowly separate the targets to  $6\Delta$  Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **VOR- trains the visual skill of eye motility**

Materials: Pen or fixation target

1. Hold an object in front of the patient. Instruct patient to rotate head left/right smoothly while maintaining fixation on the object. Have the patient maintain fixation on the object while moving only his/her head.
2. Instruct patient to tilt chin up and down while maintaining fixation on the object.

Start with 5-7 repetitions as tolerated. Work up to 2 sets of 10 reps each without experiencing symptoms.

**SPORTS SPECIFIC**  
**HOCKEY**





## **SPORTS VISION - AND HOCKEY**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration under Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Time. (For more in-depth explanations, see the attached Visual Skills definition sheet.) These are all learned skills that can be improved with practice.

Hockey is a game that requires intense concentration and awareness of what is happening around the player. A slight deficiency or lapse in either of these areas can mean mental or physical error or much worse - injury!

As hockey is a sport of almost constant motion, for the players and the puck, well developed dynamic acuity is just as significant as good static acuity.

The following is an explanation of the most relative dynamic visual skills associated with each position.

### **ACCOMMODATION & CONVERGENCE**

The ability of the eyes to work in unison while tracking a moving object (the puck or puck carrier, etc.) and to change focus instantaneously- as the distance of that object changes in relationship to your own position. This can be particularly important for the victim or a two on one, or for the goalie when facing the long shot, or as it is often mistakenly refer to "the easy shot". Actually, it can be extremely difficult to handle for a goalie with accommodation problems, as the eyes must adjust so rapidly over such a great distance in order to keep the puck in clear focus all the way.

#### Accommodation activities:

- Brock String
- BIM/BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

#### Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-Vis-X-ball toss and catch
- Sequential Tracker

#### Divergence Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits

Vectograms  
Aperture Rule

### **ANTICIPATION TIMING**

Most miscues occur not because of the action taken, but rather when the action was taken. The player caught out of position usually reacted too soon or too late due to faulty visual information regarding when to perform. A goalie who is down on the ice when the puck goes in the top corner of the net has committed himself too soon. Offensively, anticipation timing helps decide where a teammate is going to be; where to pass the puck; when to make a move around his opponent; or when to break for holes in the defense.

#### Activities

- Ball batting with metronome
- Percon saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

### **CONCENTRATION**

The ability to concentrate on the task at hand despite harassment, crowd noise and numerous other distractions. It is important to maintain this concentration (focus) even when fatigued. A goalie must be able to keep his focus on the puck through a maze of players and must also be able to maintain high levels of concentration, to keep himself in the game, when the majority of action is at the other end of the ice.

#### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-vis-x
- Rush Hour
- Continuous Motion

## **DEPTH PERCEPTION**

Depth perception is a critical visual skill for a goalie. Excellent depth perception allows him to judge the distance, speed and direction of the puck as it approaches the net.

Players need to know where their teammates are in relation to the opposing players in order to make effective passes. In a one on one situation, good depth perception helps you judge when to make your move in relation to the defensive player between you and the net. You can also more accurately judge the movement of the puck as it related to the stationary lines and/or moving players to prevent off-sides.

### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances
- Brock String
- Projected Quoits

## **EYE FATIGUE AND PERFORMANCE LEVELS**

Hockey is a very fatiguing sport which requires excellent conditioning. Physical fatigue can greatly affect concentration, visual reaction time, and eye-hand coordination. Eye fatigue can also affect performance levels in much the same way. When the muscles in our eyes feel tired or strained, we feel the fatigue all over. Just like a weightlifting routine is used to increase physical endurance, visual exercises can be used to strengthen the eye muscles and thereby reduce fatigue.

### Activities

- Brock String
- Projected Quoits
- Missing Letter Charts
- Stroop Chart
- Vectograms
- Hart Charts, various
- Scanning Trails
- Marsden Ball

## **EYE-HAND COORDINATION**

The process of taking a pass and accurately shooting to the open part of the net is one of the prime examples of this skill. Eye-hand coordination plays an important part in deflecting shots and knocking down high passes in order to control the puck, or in helping a goalie to make a glove save.

### Activities

- Ball Tap
- Ball Batting
- Bean Bag Toss/Catch
- Space Fixator
- Ball toss/catch with X-Trainer chart
- Ball toss/catch in hallway while tapping peripheral targets
- Bal-a-Vis-X (rhythmic bounce to floor/catch 2 balls with partner)

## **PERIPHERAL VISION/AWARENESS**

The ability to focus on the appropriate key (i.e. puck carrier) and still maintain an awareness of overall play/action including the position of all other players on the ice. Peripheral awareness is essential in tracking both opponents and team players outside the major focal point in order to avoid a miscue or possible injury. Maintaining an awareness of all the options for play development will help to keep the player from being caught out of position. It also allows the players to use a "heads up" skating style and still be confident in his puck handling.

### Activities

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

## **SPEED AND SPAN OF RECOGNITION**

The speed of the game demands that players take in and absorb many different actions at one time. A player must keep his focus on his assigned task but must also absorb and interpret other actions developing on other parts of the ice. The faster the speed and the greater the span, the less likely a player will be caught out of position.

### Activities

- Near/far Memory Game
- Ace to King Card Game
- 2 ball (2 different colors) toss-patients catches color called out by trainer as balls are tossed.

## **VISUAL REACTION TIME**

The faster a player processes visual information, the faster he is able to initiate a physical response. By improving visual reaction time, players more consistently follow the flow of play and respond more

effectively as the play develops. Excellent visual reaction time can help a player create a turnover; control a rebound; help a goalie make the save; a center to win the draw; or be the difference between avoiding or taking a body check at the wrong time.

#### Activities

- Dash to cone and retrieve specified object from a bucket
- Peripheral scarf drop or ball drop

#### Dynamic Visual Skills for Hockey:

- **Recognition Skills; or your ability to see the big picture.** You can have a great understanding of the game, but if you're not seeing the whole play as it flows and develops around you, you may make mistakes because your own responses are based on only 'pieces of the play'. For example, those times that you allow yourself to get caught up with action that is secondary to the primary development of the play.
- **Speed of Decision Making; how fast you process what you see and make a decision.** The speed that you do this allows you to initiate the correct response, in a timely fashion. In other words, before the situation changes, and the opportunity is lost. You know those times when you are really 'in the zone' and it almost feels like things are moving in slow motion? Well, obviously the action isn't slower ... but because you are processing the visual feeds faster and making your own response decisions faster, it feels like you have more time. (Slows the game down).
- **The speed of your gross physical movements.** That's everything after the initial muscle twitch that gets you started. So, reading the play well and intuitively knowing what the perfect response should be is just the first half of the equation here, because if your physical movements are too slow, it will keep you from being consistently effective.
- **Eye-Hand Coordination.** You may have a great shot, but if it's poorly timed or it misses the target, you've lost that scoring opportunity. And that of course goes hand in hand, so to speak, with
- **Anticipation Timing.** Making sure that you don't over-anticipate, committing yourself to a response that is premature or simply inappropriate. For example, a goalie may have lightning reflexes, but if he over-anticipates and commits himself too soon, he'll be on the ice when the puck goes over his shoulder or challenging at the top of the crease when he is scored on from behind.
- **Peripheral Awareness and Concentration** also go hand in hand most of the time. Because as important as it is to maintain a high level of focus on your key target or objective, it's equally important that you don't allow yourself to become so focused that you start to tunnel, because when that happens you not only lose awareness of peripheral action, you can also become oblivious of verbal cues.
- **The effect that stress and fatigue have on your ability to perform.**

#### Hockey Specific:

Most reaction mistakes, athletic or otherwise, can be attributed to poor dynamic visual skills, errors caused by:

- **A Lack of Information or Improperly Read Visual Cues:** One of the biggest issues coaches deal with daily is player communication during the play. If the team is confident and sure of themselves, they communicate, shout cues, provide verbal support and act upon this language. If the team is not confident, none of this happens. Being able to process and make decisions is crucial. Being able to communicate the proper intentions only comes from the confidence that comes from

making the right choice. A team whose collective response time and communication is at its best, will be the best on most nights.

- **Poorly Developed Motor Skills, Especially Eye-Hand Coordination:** The battle at the net to deflect, screen and get to rebounds, can be won or lost depending on the forwards ability to read the situation, see the shot and position himself accordingly. Being alert and aware is critical to the forward who must show good timing, mental and physical toughness and good eye-hand coordination.
- **Poorly Timed Responses:** Creating or taking away 'time and space' is the essence of successful team play. The defenseman who is playing the delaying forward (ala Gretzky), must make a choice to pressure or contain. He needs to recognize his defensive support, the quality of possession by the attacker and the positioning of the offensive support. Enhancing the instinctive and spontaneous reads of the player may help him to close faster on the attacker, eliminating time and space, and ultimately options. Being slow to execute gives the time and space to the attacking team.

Anticipation timing is also about 'finding the open ice' and taking advantage of it. Mike Keenan described it this way: "There's a spot on the ice that's no-man's land, and all the good goal scorers find it. It's a piece of frozen real estate that's just in between the defense and the forward. For a defenseman, it's hell because he doesn't want to commit too far out and leave other people open. And yet, if he leaves you alone, you get a great shot."

- **Poor Peripheral Awareness:** Standard attack principles include the role of the first three attackers into the offensive zone. The puck carrier goes wide and hard with the puck; the second player should drive the middle going hard to the net, driving the defender back; and the third falls in behind the puck carrier to act as a trailer in forming the offensive triangle. The second and third attackers must show excellent peripheral awareness so as to avoid both players going hard to the net through the middle. Failing to do so would result in a lack of offensive balance in the attack and as important, leave no one high to defend a turnover.
- **Poor Concentration:** During an 82-game schedule, it's important to keep the senses as acute as possible so as to avoid the complacent approach. Players whose tendency it is to stand, as opposed to skating, whether on the offense or defending, are clearly lacking in concentration. It is essential to continue to stimulate the senses in a manner that gliding and standing still are not in the team's personality. Providing quick intelligent support to the puck carrier is essential and being a passing option more than once comes from good concentration as the player reads and then reacts to the needs of his teammate.

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).

2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the

opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick. Metronome (optional)

- 1.The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
- 2.The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
- 3.The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
- 4.The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

- 1.The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
- 2.The patient taps the ball with alternate hands, maintaining a steady rhythm
- 3.Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

- 1.Therapist stands opposite patient.
- 2.Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.



- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of Accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/-2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.

5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3<sup>Δ</sup> (6, F).
6. The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.
7. Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.

1. Use patient's existing glasses or a pair of dollar store readers with the lenses removed.
2. Add cloudy scotch tape to the edge of the iris.
3. Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
4. The width of the tape is based on what the patient indicates is most comfortable.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.

The goal is to see the string form an "X" at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Cone Dash and Retrieve- trains the visual skill of visual reaction time**

Materials: One or more cones or taped line, assorted balls or bean bags, basket or bucket

1. Set up starting line using cones or taped line.
2. Set bucket or basket of balls or bean bags 20 feet to 50 feet from the starting line (appropriate for patient).
3. Patient stands at starting line facing the bucket or basket.
4. Therapist gives patient cue to start towards the bucket.
5. As the patient is traveling to the basket the therapist will call out the color of the ball or bean bag to be retrieved by the patient.
6. The patient quickly identifies the bean bag or ball and returns to the starting point.  
Repeat as appropriate for the patient.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
  2. Using the number worksheet, have the patient circle the number "1" as long as needed until they find number "2" then without picking up the pencil, circle number "2" and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number "30".
  3. The pencil should be moving at all times; do not lift the pencil up from the paper.
- Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.
3. Read Hart Chart vertically, horizontally or first and last letter of each row or column.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.

2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

### **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

- 1.4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.
2. Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.
3. Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).
4. Have patient read first/last letters, all odd or all even letters, etc.
5. Walk Aways: Patient reads chart while walking to and away from the chart.
6. Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

### **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure "8".
3. Instruct patient to walk in a figure "8" pattern around the cones while maintaining fixation on the fixation target. If they are unable to maintain fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to

identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure “8”. 3. Have patient catch a ball each time he/she crosses the “x” in the infinity pattern.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.
5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.

Switch the patch and repeat the procedure on the opposite eye.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Missing Letter Charts- trains the visual skill of eye fatigue**

Materials: Chart with scattered letters

1. Patient reads chart vertically or horizontally

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
  2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.
  3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
  4. When shifting focus from near to far, ensure the letters are clear before moving on.
- Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

### **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
  2. Place three or four objects on the table in front of you (near to far).
  3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
  4. Block the patient's view of the objects with a folder.
  5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
  6. Ask the patient to identify the objects out of order until all of the objects are identified.
  7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
  8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.
- Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

### **Penny Drop- trains the visual skill of eye tracking**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
2. The therapist moves the container continuously in all directions within reach of the patient.

3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times. When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

### **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

1. Set metronome at appropriate pace for patient.
2. Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.
3. Work towards increasing the rhythm of the metronome.

### **Peripheral Scarf Drop- trains the visual skill of visual reaction time**

Materials: Various colors of scarves

1. The patient holds a scarf in each hand, instruct patient to slowly raise their arm and drop the scarf.
2. Without taking their eyes off you, have them catch the scarf from the top. Catching the bottom will encourage the tactile sense and not the peripheral awareness.
3. Repeat with the other hand, then alternate hands, then both hands simultaneously.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of “straight-ahead” and the objective direction of straight ahead. They may feel “out of synch” with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as “bases left or ‘bases right” can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopeters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

## **Projected Quoit- trains the visual skill of accommodation and convergence**

Materials: Quoit vectogram, overhead projector, screen

Convergence Therapy Set the Quoit vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3Δ Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."
2. Once the patient can perform these steps, while the Vectogram slides are set at 3Δ Base out, slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.
3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.

4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.

5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.
  6. After 6-8Δ Base-in, the target will be too far behind the targets for the patient to point.
  7. The patient should be able see one set of Quoit by looking beyond the Vectogram at the central letter chart on the wall.
  8. If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoit at letter "L".
- Endpoint 25Δ Base-out. and 12Δ Base-in.

## **Reach and Touch Targets- trains the visual skill of depth perception**

Materials: Assorted small to medium objects i.e. colorful pencils, pens, balls

1. Therapist sits or stands opposite from the patient.
2. Therapist holds a target for patient to reach out and touch then returns hand to start position.
3. Therapist moves and holds target at another distance, patient then reaches out and touches target.



### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

1. Choose a card appropriate for the patient.
2. Patient places game pieces on game board as shown on selected game card.
3. Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

1. Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
2. There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
3. Have the patient look at the letter "A" and, using only his/her eyes, follow the curved line from "A" to the correct number on the right side of the page, and call out the number.
4. Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
5. Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

1. Hold the sequential tracker at the patient's reading distance. It may be supported by a book stand or taped to a window for rear illumination.
2. Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.
3. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long sweep back to the first target on the left.
4. Repeat the sequence five times, rest for half a minute, then repeat.  
Strive for both speed and accuracy, but of the two, accuracy is the most important. Eliminate any regressions (looking back at targets already passed over). Maintain a rhythmic shift from target to target. Rhythm is more important than speed.

Begin with the metronome set at a slower speed to master control of the eye movements. Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the “thinking spot” and the starting position.
2. Instruct patient to “think about” number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to “look at” number 1. Watch the patient’s eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.
4. Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.
5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

1. The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.
2. The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

1. Patient stands or sits in front of large posted Stroop chart and reads chart as printed.

2. Patient names the color of ink on printed words rather than reading the words.
3. Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

1. Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
2. Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

### **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

### **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoit Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an "R" aligned over an "L". 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to  $3\Delta$  Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."
8. Once the patient can perform these steps, while the Vectogram slides are set at  $3\Delta$  Base out, have the patient slowly separate the targets to  $6\Delta$  Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

## **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.  
Continue until the patient has read the entire chart.

**ACTIVITY SPECIFIC**  
**LAW ENFORCEMENT**



**LAW ENFORCEMENT**

## **SPORTS VISION - AND LAW ENFORCEMENT**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration under Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Time. These are all learned skills that will improve with practice.

The law enforcement officer's career is one requiring an acute awareness and at times, perhaps unexpectedly, intense concentration. Any lack of, or deficiency in awareness, or a lapse in concentration could have grave implications as a result of an ill-timed or inappropriate response.

The following is a comprehensive breakdown of the dynamic visual skills and how they more specifically relate to the functions performed by a Law Enforcement Officer.

### **ACCOMMODATION AND CONVERGENCE**

Focusing flexibility and eye tracking are two separate skills but inseparable as they must work together to achieve good, clear vision. The task could be as mundane as watching a busy intersection while catching up on paperwork, or as dangerous as a high-speed pursuit, but the necessity of good focusing flexibility and eye-tracking skills is ever present.

#### Accommodation activities:

- Brock String
- BIM/BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

#### Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-Vis-X/ball toss and catch
- Sequential Tracker

#### Divergence Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule

## **ANTICIPATION TIMING**

Most efforts fail not because the physical movements were wrong, but because they were made at the wrong time. Determining the correct moment to act is certainly a prerequisite skill to efficient self-defense and may spell the difference between life and death in an armed confrontation.

### Activities

- Ball batting with metronome
- Person saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

## **CONCENTRATION**

This skill, as it pertains to vision, is certainly the determining and underlying factor in efficiency of performance. It's the ability to remain focused on a task, to give it your complete attention and not let yourself be distracted. Whether the task is report writing or conflict resolution, the final outcome, and the level of efficiency in arriving at it, is determined by one's ability to remain focused on the task.

### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

## **DEPTH PERCEPTION**

Acute depth perception is a necessary skill for efficient driving, shooting, self-defense and even simple observation (just to name a few). Both eyes must be working in unison to insure accurate judgements of the distance, the speed and the revolution of objects in space.

### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances
- Brock String
- Projected Quoits



## **EYE-HAND COORDINATION**

Because the visual system leads the motor system, our hands or feet or body respond to the information the eyes have sent to the brain. If this information is incorrect, even to the slightest degree, there will be error in the physical response. In the performance of their duty, peace officers are constantly required to use various pieces of equipment or execute movements in stressful situations or against resistance. He/she may be operating a vehicle, executing handcuff techniques, or utilizing a defensive baton.

### Activities

- Ball Tap
- Ball Batting
- Bean Bag Toss/Catch
- Space Fixator
- Ball toss/catch with X-Trainer chart
- Ball toss/catch in hallway while tapping peripheral targets
- Bal-a-Vis-X (rhythmic bounce to floor/catch 2 balls with partner)

## **PERIPHERAL VISION/AWARENESS**

The member involved in an arrest procedure, surveillance, or in a protective security function must be fully aware of everything going on around him/her while maintaining a level of concentration on a key figure.

### Activities:

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

## **SPEED AND SPAN OF RECOGNITION**

The officer who is able to absorb large amounts of information instantaneously is better equipped and more efficient in situations that require him/her to scan and search visually. An increase in the speed in recognizing a visual stimulus has a positive effect in terms of overall performance. It drives the physical impulses to a better reflex level. The reflex action becomes more automatic and less thought out, and as a result, the officer's intervention/response is much quicker, more accurate and more efficient.

### Activities

- Near/far Memory Game
- Ace to King Card Game
- 2 ball (2 different colors) toss-patients catches color called out by trainer as balls are tossed.

## **STRESS EFFECT**

This is a measurement of how stress and fatigue affect our ability to perform. Individuals are affected in different ways and to varying degrees. It can cause us to miss the 'big picture' (causing us to lose situational awareness); it can cause tunnel vision or target fixation (making us less aware of both peripheral action and verbal cues); it can create mental tunneling (making it harder for us to think outside the box and see the more obscure links); it can slow down the thought process and therefore the initiation of our responses (making it harder to 'think on the fly' and be consistently effective); it can cause us to over-anticipate and react too soon (making ill-timed or simply inappropriate responses).

### Activities

- Binasal occlusion
- Peripheral work with suspended ball
- Prisms

## **VISUAL MEMORY**

The ability to remember and record details of objects, events and persons is the essence of field investigation.

A detailed memory is not simply an asset, it is a necessity to the police function.

### Activities

- Parquetry
- Patient describes placement of items in a room in his/her home or lists events of his/her day in order of occurrence
- Ace to King Card Game
- Near/Far Memory Game

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).

2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick.

Metronome (optional)

1. The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
2. The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
3. The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
4. The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

1. The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
2. The patient taps the ball with alternate hands, maintaining a steady rhythm
3. Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

1. Therapist stands opposite patient.
2. Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an "A" pattern on floor with the top of the "A" closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of Accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/-2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.

5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3<sup>Δ</sup> (6, F).
6. The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.
7. Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

- Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.
1. Use patient's existing glasses or a pair of dollar store readers with the lenses removed.
  2. Add cloudy scotch tape to the edge of the iris.
  3. Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
  4. The width of the tape is based on what the patient indicates is most comfortable.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.
6. The goal is to see the string form an "X" at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
  2. Using the number worksheet, have the patient circle the number “1” as long as needed until they find number “2” then without picking up the pencil, circle number “2” and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number “30”.
  3. The pencil should be moving at all times; do not lift the pencil up from the paper.
- Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.
3. Read Hart Chart vertically, horizontally or first and last letter of each row or column.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

### **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

- 1.4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of

each section, progressing through each row of each section. Load by increasing separation of sections.

2.Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.

3.Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).

4.Have patient read first/last letters, all odd or all even letters, etc.

5.Walk Aways: Patient reads chart while walking to and away from the chart.

6.Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

### **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure “8”.
3. Instruct patient to walk in a figure “8” pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure “8”. 3. Have patient catch a ball each time he/she crosses the “x” in the infinity pattern.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.



3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.
5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.
7. Switch the patch and repeat the procedure on the opposite eye.

### **Lora's Card- trains the visual skill of fixation ability**

Materials: Lora's Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.

2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.
  3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
  4. When shifting focus from near to far, ensure the letters are clear before moving on.
- Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

### **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
  2. Place three or four objects on the table in front of you (near to far).
  3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
  4. Block the patient's view of the objects with a folder.
  5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
  6. Ask the patient to identify the objects out of order until all of the objects are identified.
  7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
  8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.
- Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

### **Parquetry Blocks- trains the visual skill of visualization**

Materials: Parquetry Blocks set

1. Choose pattern appropriate for patient ability.
  2. Instruct patient to place block directly on the pattern.
  3. Set the pattern on the table, instruct patient to replicate the pattern directly on the table.
- Decrease demand: Use the simple black and white patterns, instruct patient to match the shape only.

Increase demand: Rotate the pattern left/right, flip pattern or recreate the pattern from memory.

### **Penny Drop- trains the visual skill of eye tracking**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
2. The therapist moves the container continuously in all directions within reach of the patient.
3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times.

When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

### **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

1. Set metronome at appropriate pace for patient.
2. Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.
3. Work towards increasing the rhythm of the metronome.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of "straight-ahead" and the objective direction of straight ahead. They may feel "out of synch" with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as "bases left or 'bases right"

can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

### **Projected Quoit- trains the visual skill of accommodation and convergence**

Materials: Quoit vectogram, overhead projector, screen

Convergence Therapy Set the Quoit vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3Δ Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."

2. Once the patient can perform these steps, while the Vectogram slides are set at 3Δ Base out, slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.

3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.

4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.

5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.

6. After 6-8Δ Base-in, the target will be too far behind the targets for the patient to point.

7. The patient should be able to see one set of Quoit by looking beyond the Vectogram at the central letter chart on the wall.

8. If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoit at letter "L". Endpoint 25Δ Base-out. and 12Δ Base-in.

### **Reach and Touch Targets- trains the visual skill of depth perception**

Materials: Assorted small to medium objects i.e. colorful pencils, pens, balls

1. Therapist sits or stands opposite from the patient.
2. Therapist holds a target for patient to reach out and touch then returns hand to start position.
3. Therapist moves and holds target at another distance, patient then reaches out and touches target.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

1. Choose a card appropriate for the patient.
2. Patient places game pieces on game board as shown on selected game card.
3. Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

1. Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
2. There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
3. Have the patient look at the letter "A" and, using only his/her eyes, follow the curved line from "A" to the correct number on the right side of the page, and call out the number.
4. Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
5. Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

1. Hold the sequential tracker at the patient's reading distance. It may be supported by a book stand or taped to a window for rear illumination.
2. Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.
3. Move your eyes from one target to the next along the top line. A pointer may be used

initially for feedback. When you have reached the last target on the right, make the long sweep back to the first target on the left.

4. Repeat the sequence five times, rest for half a minute, then repeat.

Strive for both speed and accuracy, but of the two, accuracy is the most important.

Eliminate any regressions (looking back at targets already passed over).

Maintain a rhythmic shift from target to target. Rhythm is more important than speed.

Begin with the metronome set at a slower speed to master control of the eye movements.

Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the “thinking spot” and the starting position.

2. Instruct patient to “think about” number 1 and visualize where it is while maintaining fixation on the center dot.

3. Instruct the patient to “look at” number 1. Watch the patient’s eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.

4. Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.

5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

1. The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.

2. The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

1. Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
2. Patient names the color of ink on printed words rather than reading the words.
3. Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

1. Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
2. Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

### **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

## **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoiets Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an “R” aligned over an “L”. 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to  $3\Delta$  Base-out and try to maintain clear, single vision (For convergence, separate the targets so



that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes." Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, have the patient slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **Visual Memory of Objects in Room- trains the visual skill of visual memory**

Materials: Paper, markers, crayons, pen or pencil

1. Instruct patient to recall placement of furniture in the therapy room or in a room of the patient's home.
2. Instruct patient to visualize and draw from memory, the furniture placement in a specified room.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.
4. Continue until the patient has read the entire chart.

ACTIVITY SPECIFIC  
MILITARY SPECIAL FORCES



## **SPORTS VISION - AND MILITARY SPECIAL FORCES**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration under Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Time. These are all learned skills that will improve with practice.

Military Special Forces is a career requiring an acute awareness and at times, perhaps unexpectedly, intense concentration. Any lack of, or deficiency in awareness, or a lapse in concentration could have grave implications as a result of an ill-timed or inappropriate response.

The following is a comprehensive breakdown of the dynamic visual skills and how they more specifically relate to the functions performed by Military Special Forces.

### **ANTICIPATION TIMING**

Making sure you don't over-anticipate, committing yourself too soon. The guy who initiates a movement (especially out of panic) before he has been able to sort out the visual clues and consciously make a decision, is the one we can vote 'most likely to shoot the hostage'.

#### Activities

- Ball batting with metronome
- Person saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

### **CONCENTRATION**

The ability to maintain a high level of focus on a key target or objective in high stress situations. It's important to attend to a wide range of external cues; it's also important to organize and integrate a wide range of internal thoughts and ideas, but it's crucial that you are not distracted by getting 'caught up in your head' when external vigilance is important.

#### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

## **EYE-HAND COORDINATION**

This is the speed, the accuracy and the quality of the gross physical movement or response. Let's face it. It doesn't matter how fast the movement is, if you miss your target, you lose!

### Activities

- Ball Tap
- Ball Batting
- Bean Bag Toss/Catch
- Space Fixator
- Ball toss/catch with X-Trainer chart
- Ball toss/catch in hallway while tapping peripheral targets
- Bal-a-Vis-X (rhythmic bounce to floor/catch 2 balls with partner)

## **INITIATION SPEED**

How long it takes you to process what you see, make a decision and get started. For example: an assaulter, making a room entry, has only a fraction of a second to assess the situation, make a decision and initiate a response. Keep in mind, the perp doesn't have a decision to make. Everything coming into his playground dies. You're the only one that has to be discriminating.

### Activities

- Bal-a-Vis X- One or two bean bag toss/catch
- Ball toss/catch from various distances, heights and angles
- Ball Batting
- Ball Tap

## **PERIPHERAL AWARENESS**

The quantity and the quality of the information that is absorbed away from your central field of view and the speed of your response to that stimulus. For example: 'Tunnel vision' is a very common stress effect. When making a room entry, your first point of focus may not be the primary threat. Therefore, you need to be aware of the entire picture so that you can react instantly to a threat that is initiated away from the central field of view.

### Activities:

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

## **SPEED AND SPAN OF RECOGNITION**

This is a measure of their ability to see and attend to a wide variety of external cues as well as their ability to accurately recall detail from short-term memory.

Not being aware of the entire picture causes a lack of situational awareness and may cause the operator to make reaction decisions based on pieces of the action. For example: His first point of focus may not be the primary threat and if he becomes fixated with that secondary one or even irrelevant action, he will not be effective.

The ability to accurately recall detail from short-term memory can be a crucial part of the after-action report on a mission. For example: Assaulters, making a deliberate entry, are at phase line green. Someone on the team hears or sees something that leads you to believe you have been compromised. You call an "I.A.". As a result of that decision, the entire plan has changed ... and hostages are killed. You need to justify that decision, which ultimately cancelled the plan that was originally made to get everyone out alive.

Sequence is crucial... hence, the quality and the quantity of your short-term memory recall. Another example: A sniper must be able to remember details of how it was, so subtle changes are noticed. For instance, if a perp appears in a different window, it indicates that he has control over more than one floor. Or an open door, previously closed, lets you know there is a guaranteed entry point (in other words, it's not barricaded).

### Activities

Near/far Memory Game

Ace to King Card Game

2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.

## **STRESS**

How stress affects your ability to function. It really doesn't matter much how fast and accurate, or appropriate your responses are when stress isn't a factor. The key in this job is what happens to all that when stress is a factor.

Individuals are affected in different ways and to varying degrees. It can cause us to miss the 'big picture' (causing us to lose situational awareness); it can cause tunnel vision or target fixation (making us less aware of both peripheral action and verbal cues); it can create mental tunneling (making it harder for us to think outside the box and see the more obscure links); it can slow down the thought process and therefore the initiation of our responses (making it harder to 'think on the fly' and be consistently effective); it can cause us to over-anticipate and react too soon (making ill-timed or simply inappropriate responses).

### Activities

Binasal occlusion

Peripheral work with suspended ball

Prisms

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).

2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick.

Metronome (optional)

1. The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.

- 2.The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
  - 3.The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
  - 4.The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.
- Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

- 1.The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
- 2.The patient taps the ball with alternate hands, maintaining a steady rhythm
- 3.Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

- 1.Therapist stands opposite patient.
- 2.Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

- 1.Patient and therapist stand facing each other.

2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.

1. Use patient’s existing glasses or a pair of dollar store readers with the lenses removed.
2. Add cloudy scotch tape to the edge of the iris.
3. Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).

The width of the tape is based on what the patient indicates is most comfortable.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.



6. The goal is to see the string form an “X” at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
2. Using the number worksheet, have the patient circle the number “1” as long as needed until they find number “2” then without picking up the pencil, circle number “2” and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number “30”.
3. The pencil should be moving at all times; do not lift the pencil up from the paper.  
Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

### **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

- 1.4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of

each section, progressing through each row of each section. Load by increasing separation of sections.

2.Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.

3.Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).

4.Have patient read first/last letters, all odd or all even letters, etc.

5.Walk Aways: Patient reads chart while walking to and away from the chart.

6.Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

### **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure “8”.
3. Instruct patient to walk in a figure “8” pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure “8”. 3. Have patient catch a ball each time he/she crosses the “x” in the infinity pattern.

### **Lora’s Card- trains the visual skill of fixation ability**

Materials: Lora’s Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.

3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
  2. Place three or four objects on the table in front of you (near to far).
  3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
  4. Block the patient's view of the objects with a folder.
  5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
  6. Ask the patient to identify the objects out of order until all of the objects are identified.
  7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
  8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.
- Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

### **Penny Drop- trains the visual skill of eye tracking activities**

Materials: One penny, one cup, and a clicker or bell.

- 1.The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
- 2.The therapist moves the container continuously in all directions within reach of the patient.
- 3.The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times.

When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

### **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

- 1.Set metronome at appropriate pace for patient.
- 2.Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.

Work towards increasing the rhythm of the metronome.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of "straight-ahead" and the objective direction of straight ahead. They may feel "out of synch" with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as "bases left or 'bases right" can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

- 1.Start with a low diopter prism such as a 2 or 3 diopter.
- 2.Trial various diopters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

1. Choose a card appropriate for the patient.
2. Patient places game pieces on game board as shown on selected game card.
3. Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the “thinking spot” and the starting position.
2. Instruct patient to “think about” number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to “look at” number. Watch the patient’s eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.
4. Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.
5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

1. Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
2. Patient names the color of ink on printed words rather than reading the words.
3. Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

## **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

1. Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
2. Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

## **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

**SPORT SPECIFIC**  
**MOTOR SPORT RACING**



## SPORTS VISION - AND MOTOR SPORT RACING

There are a number of visual skills that are necessary for a driver to interact competitively in a race environment. These skills can be assessed and with training, improvement can be observed and translated to more confident and effective race performance. Some of these dynamic visual and mental skills are defined for your information.

### ACCOMMODATION AND CONVERGENCE

*Accommodation* is the ability to change focus immediately as objects, cars, etc. move closer to, or farther away from you or when you switch from distant to near focus such as from the circuit to the instrument panel of the car. *Convergence* is the ability to keep both eyes working in unison as they track other cars that are moving rapidly in your environment. These are two separate skills that must work together to achieve good, clear vision.

Accommodation activities:

- Brock string
- BIM/BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-Vis-X-ball toss and catch
- Sequential Tracker

Divergence Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule

### ANTICIPATION TIMING

The visual system provides you with the information needed to act, as well as the information needed to judge when to act. In fact, 85% of the information during any athletic competition is received via the visual channel. Timing, however, is the key to effective performance. Many efforts fail not because the physical movements were wrong, but because they were made at the wrong time. The activities, and even superior speed, size and reflexes cannot compensate for the faulty processing of visual information regarding when to perform.



#### Activities

- Ball batting with metronome
- Percon saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

#### **Errors in racing can be classified into the following categories:**

**Errors of Omission:** Situations in which you did not or forgot to form an intention and therefore did not do what should have been done before a race or in a race.

**Errors of Commission:** These include actions you carried out that were wrong in one of two ways:  
Forming an intention. A situation in which you decided to do something, and it was done correctly and with good timing, but it was the wrong thing to do under the circumstances.  
Performing an intention: A situation in which you made a correct decision, but it was done at the wrong time.

#### **CONCENTRATION**

This is defined as the ability to maintain a high level of focus while driving competitively at the limits of your ability, in spite of distractions, and while maintaining total awareness of what is happening all around you. This is not to be confused with staring, which is just another form of distraction. Staring means the eyes are not focused but are in fact disassociated from the race and represents total loss of concentration with little or no sharp awareness of what is going on around you. This phenomenon may show up in the form of Brain Fade. The noticeably higher levels of performance evident during your "better" races can frequently be attributed to that "will to win" ... or determination that accompanies an intense concentration on the race. It shows up in an unwavering focus on every relevant bit of information and action around your car, the discipline not to be distracted and the energy to sustain total concentration for the duration of the race.

#### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

#### **DEPTH PERCEPTION**

We are able to perceive depth in space because we are endowed with stereopsis or binocular vision, whereby each eye records a separate, two-dimensional image on the retina. If both eyes are working in unison, the brain perceives the object as a single three-dimensional object. This allows us to judge the distance, speed and the dynamics of objects, cars, etc. in our environment.

#### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances
- Brock String
- Projected Quoits

### **DYNAMIC VISUAL ACUITY**

This may be defined as "vision in motion", or the ability to see, interpret and react immediately to a rapidly moving object while you are also in motion. This, obviously, is what is happening during the course of a race.

#### Activities

- Hart Charts, various
- Penny Drop
- Stroop Chart
- Rope Pull with letter/number chart
- Hart Chart with Infinity Walk
- 4 corners chart with toe tap to dyna disc
- Head turn left/right to targets with tandem walk
- Small Stroop chart on stationary bike

### **EYE-HAND COORDINATION**

The "eyes lead the body follows", not the other way around. Drivers who refer to "hand-eye" coordination have missed the significance of this relationship.

#### Activities

- Ball Tap
- Ball Batting
- Bean Bag Toss/Catch
- Space Fixator
- Ball toss/catch with X-Trainer chart
- Ball toss/catch in hallway while tapping peripheral targets
- Bal-a-Vis-X (rhythmic bounce to floor/catch 2 balls with partner)

### **THE VISUAL SYSTEM LEADS THE MOTOR SYSTEM**

Our hands, feet or body respond to the information the eyes have sent to the brain. If this information is incorrect, even to the slightest degree, there is a good chance of error in our physical response. Many driver errors, or poorly executed maneuvers, can be attributed to faulty visual judgement, and it is visual judgement alone that determines eye-hand coordination.

## **PERIPHERAL AWARENESS**

This is not to be confused with peripheral vision which is relatively unchangeable. The visual field is strictly dictated by the skeletal structure and the shape of the retina. You can, however, enhance peripheral awareness, or your ability to maintain an awareness of what is happening around you during a race while keeping your concentration on the relevant field and race in front of the car. A well-developed peripheral field will help you to see everything at once, to maintain the whole pattern, to sense the flow of the race as it constantly changes.

### Activities:

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

## **SPEED AND SPAN OF RECOGNITION**

This refers to how much information you can take in and process. Any increase you can achieve in recognizing a visual stimulus has a very special effect in terms of your overall competitive performance. It drives the physical impulses to a better reflex level. The reflex action becomes more automatic and requires less processing time. As a result, your physical response becomes much quicker, more accurate and more efficient.

### Activities

- Near/far Memory Game
- Ace to King Card Game
- 2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).
2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick. Metronome (optional)

- 1.The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
- 2.The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
- 3.The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
- 4.The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

- 1.The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
- 2.The patient taps the ball with alternate hands, maintaining a steady rhythm
- 3.Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

- 1.Therapist stands opposite patient.
- 2.Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of Accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/-2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.
5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3<sup>Δ</sup> (6, F).
6. The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.

7. Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.

1. Use patient's existing glasses or a pair of dollar store readers with the lenses removed.
2. Add cloudy scotch tape to the edge of the iris.
3. Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
4. The width of the tape is based on what the patient indicates is most comfortable.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.
6. The goal is to see the string form an "X" at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
2. Using the number worksheet, have the patient circle the number "1" as long as needed until they find number "2" then without picking up the pencil, circle number "2" and continue

circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number “30”.

3. The pencil should be moving at all times; do not lift the pencil up from the paper.

Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.
3. Read Hart Chart vertically, horizontally or first and last letter of each row or column.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

### **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

- 1.4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.
2. Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.
3. Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).
4. Have patient read first/last letters, all odd or all even letters, etc.
5. Walk Aways: Patient reads chart while walking to and away from the chart.



6. Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

### **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure "8".
3. Instruct patient to walk in a figure "8" pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixate without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure "8". 3. Have patient catch a ball each time he/she crosses the "x" in the infinity pattern.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.
5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.

Switch the patch and repeat the procedure on the opposite eye.

### **Lora's Card- trains the visual skill of fixation ability**

Materials: Lora's Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.
3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
4. When shifting focus from near to far, ensure the letters are clear before moving on.

Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

## **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
2. Place three or four objects on the table in front of you (near to far).
3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
4. Block the patient's view of the objects with a folder.
5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
6. Ask the patient to identify the objects out of order until all of the objects are identified.
7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.  
Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

## **Penny Drop- trains the visual skill of eye tracking**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
2. The therapist moves the container continuously in all directions within reach of the patient.
3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times. When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

## **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

1. Set metronome at appropriate pace for patient.
2. Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.
3. Work towards increasing the rhythm of the metronome.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of “straight-ahead” and the objective direction of straight ahead. They may feel “out of synch” with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as “bases left or ‘bases right” can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

### **Projected Quoiets- trains the visual skill of accommodation and convergence**

Materials: Quoiets vectogram, overhead projector, screen

Convergence Therapy Set the Quoiets vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3Δ Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."
2. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.
3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.
4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.

5.The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.

6.After 6-8Δ Base-in, the target will be too far behind the targets for the patient to point.

7.The patient should be able see one set of Quoits by looking beyond the Vectogram at the central letter chart on the wall.

8.If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoits at letter “L”. Endpoint 25Δ Base-out. and 12Δ Base-in.

### **Rope Pull With Chart- trains the visual skill of dynamic visual acuity**

Materials: Heavy Rope, letter and number chart or shapes chart

1. Post chart at eye level for patient
2. Patient pulls rope hand over hand while reading chart.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

- 1.Choose a card appropriate for the patient.
- 2.Patient places game pieces on game board as shown on selected game card.
- 3.Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

- 1.Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
- 2.There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
- 3.Have the patient look at the letter “A” and, using only his/her eyes, follow the curved line from “A” to the correct number on the right side of the page, and call out the number.
- 4.Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.

5. Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

1. Hold the sequential tracker at the patient's reading distance. It may be supported by a book stand or taped to a window for rear illumination.
2. Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.
3. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long sweep back to the first target on the left.
4. Repeat the sequence five times, rest for half a minute, then repeat.  
Strive for both speed and accuracy, but of the two, accuracy is the most important. Eliminate any regressions (looking back at targets already passed over). Maintain a rhythmic shift from target to target. Rhythm is more important than speed. Begin with the metronome set at a slower speed to master control of the eye movements. Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the "thinking spot" and the starting position.
2. Instruct patient to "think about" number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to "look at" number. Watch the patient's eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.
4. Instruct the patient to "touch" number 1 then return to eyes and finger to start position of the center dot.
5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

- 1.The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.
- 2.The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

- 1.Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
- 2.Patient names the color of ink on printed words rather than reading the words.
- 3.Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

- 1.Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
- 2.Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

### **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

### **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoits Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an "R" aligned over an "L". 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.



7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to 3Δ Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."

Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, have the patient slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.
4. Continue until the patient has read the entire chart.

**ACTIVITY SPECIFIC**  
**ON-ICE OFFICIAL**



## **SPORTS VISION – AND ON-ICE OFFICIALS**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration under Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Speed. These are all learned skills that can be improved with practice.

Hockey is a sport of almost constant motion, so well-developed dynamic acuity is just as significant as good static acuity. To be effective, a referee/or linesman requires intense concentration and awareness of what is happening at all times. A slight lapse in either of these areas could result in a missed call or a questionable decision that could ultimately affect the outcome of the game.

The following is a comprehensive breakdown of the dynamic skills and how they more specifically relate to the function performed by on-ice officials.

### **ACCOMMODATION AND CONVERGENCE**

Accommodation is the ability to change focus instantaneously as the play moves closer to, or farther away from you. Convergence is the ability to keep both eyes working in unison so as to achieve good, clear vision, as they track players or a fast-moving puck.

#### Accommodation activities:

- Brock String
- BIM/BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

#### Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-Vis-X-ball toss and catch
- Sequential Tracker

#### Divergence Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule

## **ANTICIPATION TIMING**

The visual system provides you with the information needed in order to act, as well as the information needed to judge when to act. Timing is the key to effective performance.

Most efforts fail not because the physical movements were wrong, but because they were made at the wrong time. The ability to anticipate is a major factor in high level performance, and even superior speed, size and reflexes cannot compensate for the insufficient processing of visual information regarding when to perform.

### Activities

- Ball batting with metronome
- Percon saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

## **CONCENTRATION**

This is defined as the ability to maintain a high level of focus in spite of distractions and/or fatigue and while maintaining total awareness of what is happening all around you. This is not to be confused with staring, which is just another form of distraction. Staring means the eyes are not focused but are in fact disassociated from the action and represents total loss of concentration with little or no sharp awareness of what is going on around you. This phenomenon may show up in the form of Brain Fade. To perform effectively it is necessary to maintain an unwavering focus on every relevant bit of information, i.e. your position in relation to the action, as well as the discipline not to be distracted and the energy to sustain that total concentration for the duration of the contest.

### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

## **DEPTH PERCEPTION**

The ability to accurately judge the movement of the puck as it related to a stationary line and/or moving players is critical in determining goals and off sides.

### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances

Brock String  
Projected Quoits

### **EYE-HAND COORDINATION**

Physical fatigue can greatly affect concentration, visual reaction time and eye-hand coordination. Eye fatigue can also affect performance levels in much the same way. When the muscles in our eyes feel tired or strained, we feel the fatigue all over. Just like a weightlifting routine is used to increase physical endurance, visual exercises can be used to strengthen the eye muscles, and thereby reduce fatigue.

#### Activities

- Ball Tap
- Ball Batting
- Bean Bag Toss/Catch
- Space Fixator
- Ball toss/catch with X-Trainer chart
- Ball toss/catch in hallway while tapping peripheral targets
- Bal-a-Vis-X (rhythmic bounce to floor/catch 2 balls with partner)

### **PERIPHERAL VISION/AWARENESS**

Enhanced peripheral awareness allows the official to concentrate on a key target, and still be aware of the entire play/action as it develops around them. This in turn, could help to avoid personal injury from unexpected sources, as well as helping them to be aware of interactions that happen away from the puck (i.e.: too many men on the ice, etc.)

#### Activities:

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

### **SPEED AND SPAN OF RECOGNITION**

Since the official must be able to read the entire play at all times, it is essential to take in and interpret many different visual activities at one time. Visual memory is also very important in order to recall action or events in their continuity when assessing penalties or awarding goals and assists.

#### Activities

- Near/far Memory Game
- Ace to King Card Game
- 2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.

## **VISUAL REACTION TIME/SPEED**

How rapidly the official processes the visual information or game action and initiates a physical response; be it blowing the whistle or waving off a call. An immediate response can often keep a situation from getting out of hand.

### Activities

- Bal-a-Vis X- One or two bean bag toss/catch
- Ball toss/catch from various distances, heights and angles
- Ball Batting
- Ball Tap

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).

2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick.

Metronome (optional)

1. The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
2. The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
3. The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
4. The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

1. The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
2. The patient taps the ball with alternate hands, maintaining a steady rhythm
3. Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

1. Therapist stands opposite patient.
2. Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.



### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of Accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/-2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.
5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3<sup>^</sup> (6, F).

6.The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.

7.Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.

- 1.Use patient's existing glasses or a pair of dollar store readers with the lenses removed.
- 2.Add cloudy scotch tape to the edge of the iris.
- 3.Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
- 4.The width of the tape is based on what the patient indicates is most comfortable.

### **Brock String- trains the visual skill of accommodation**

Materials; Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.
6. The goal is to see the string form an "X" at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance

2. Using the number worksheet, have the patient circle the number “1” as long as needed until they find number “2” then without picking up the pencil, circle number “2” and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number “30”.
  3. The pencil should be moving at all times; do not lift the pencil up from the paper.
- Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.
3. Read Hart Chart vertically, horizontally or first and last letter of each row or column.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

### **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

- 1.4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.

2. Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.
  3. Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).
  4. Have patient read first/last letters, all odd or all even letters, etc.
  5. Walk Aways: Patient reads chart while walking to and away from the chart.
  6. Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.
- Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

### **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure "8".
3. Instruct patient to walk in a figure "8" pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure "8". 3. Have patient catch a ball each time he/she crosses the "x" in the infinity pattern.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.

5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.

Switch the patch and repeat the procedure on the opposite eye.

### **Lora's Card- trains the visual skill of fixation ability**

Materials: Lora's Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.

3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
  4. When shifting focus from near to far, ensure the letters are clear before moving on.
- Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

### **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
2. Place three or four objects on the table in front of you (near to far).
3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
4. Block the patient's view of the objects with a folder.
5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
6. Ask the patient to identify the objects out of order until all of the objects are identified.
7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.  
Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

### **Penny Drop- trains the visual skill of eye tracking activities**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
2. The therapist moves the container continuously in all directions within reach of the patient.

3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times.

When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

### **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

1. Set metronome at appropriate pace for patient.
2. Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.
3. Work towards increasing the rhythm of the metronome.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of “straight-ahead” and the objective direction of straight ahead. They may feel “out of synch” with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as “bases left or ‘bases right” can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

### **Projected Quoits- trains the visual skill of accommodation and convergence**

Materials: Quoits vectogram, overhead projector, screen

Convergence Therapy Set the Quoits vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3Δ Base-out and patient try to

maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."

2. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.

3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.

4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.

5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.

6. After 6-8Δ Base-in, the target will be too far behind the targets for the patient to point.

7. The patient should be able to see one set of Quojis by looking beyond the Vectogram at the central letter chart on the wall.

8. If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quojis at letter "L". Endpoint 25Δ Base-out. and 12Δ Base-in.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

1. Choose a card appropriate for the patient.

2. Patient places game pieces on game board as shown on selected game card.

3. Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

1. Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.



2. There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
3. Have the patient look at the letter "A" and, using only his/her eyes, follow the curved line from "A" to the correct number on the right side of the page, and call out the number.
4. Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
5. Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

1. Hold the sequential tracker at the patient's reading distance. It may be supported by a book stand or taped to a window for rear illumination.
2. Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.
3. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long sweep back to the first target on the left.
4. Repeat the sequence five times, rest for half a minute, then repeat.  
Strive for both speed and accuracy, but of the two, accuracy is the most important. Eliminate any regressions (looking back at targets already passed over). Maintain a rhythmic shift from target to target. Rhythm is more important than speed. Begin with the metronome set at a slower speed to master control of the eye movements. Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the "thinking spot" and the starting position.
2. Instruct patient to "think about" number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to "look at" number. Watch the patient's eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.

4. Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.

5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

1. The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.

2. The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

1. Patient stands or sits in front of large posted Stroop chart and reads chart as printed.

2. Patient names the color of ink on printed words rather than reading the words.

3. Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

1. Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or

increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.

2. Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

### **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

### **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quioits Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an "R" aligned over an "L". 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what

- he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away?
5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
  6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
  7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to 3Δ Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."
  8. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, have the patient slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty:
    - a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.
4. Continue until the patient has read the entire chart.

ACTIVITY SPECIFIC  
PILOTS



## **SPORTS VISION - AND PILOTS**

### **ACCOMMODATION AND CONVERGENCE**

Scanning or cross-checking the various flight instruments on the instrument panel requires that the pilot's eyes move in unison, that they stop and zoom-in to define clearly, the pertinent information to be gathering such as airspeed, altitude, course information and rate of climb or descent.

#### Accommodation activities:

- Brock String
- BIM/BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

#### Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-Vis-X-ball toss and catch
- Sequential Tracker

#### Divergence Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule

### **ANTICIPATION TIMING**

When aircraft speed is required to extend the flaps and landing gear, an exact speed schedule must be maintained. For the actual landing, the aircraft is proceeding at an average speed of 145 mph (Boeing 737) and a sink rate of approximately 700 feet per minute. The pilot must determine by visual cues (outside) when the aircraft is at the exact spot to pull the nose up, (to stop the rate of descent) and reduce thrust (to allow the aircraft to settle on the runway) from a point just a few inches off the runway. If the rate of descent is stopped too early, the airplane will drop onto the runway (bad landing) and if it is stopped too late, the aircraft will hit the runway at an excessive rate of descent (bad landing). This is further complicated by crosswinds. In a crosswind, the aircraft will be maintaining a "crab" angle (to compensate for wind drift) until just prior to touchdown.

At the same time, the nose of the aircraft is raised, (to check the rate of descent), the proper amount of rudder pedal input must be applied to align the aircraft with the runway centerline, the wings-maintained level and the thrust reduced.

#### Activities

- Ball batting with metronome
- Percon saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

### **CONCENTRATION UNDER STRESS**

The pilot's ability to maintain concentration on the task at hand, (as in the supervision of flight instruments) and the allocation of his attention to these successive tasks is especially crucial under intense situations. Instrument flying and landings can be further complicated by aircraft failures (i.e. one engine rendered inoperative) or wind shears, which cause the instrument scan to include more details. Situations like these require instantaneous, calm, controlled responses, and make well developed eye-hand coordination (to respond faster to the newly picked up cues)-an even more essential skill.

#### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

### **DEPTH PERCEPTION**

Judging the actual position of the aircraft, based on the information obtained from the flight instruments, is a prerequisite to accurate, rapid and smooth execution of the maneuvers, especially during the landing of the airplane. The aircraft may be flown on instruments to an altitude of 200 feet above the ground and forward visibility of 2600 feet (depending on actual weather and the approach facilities available). At this point, the pilot makes the transition to the use of visual cues obtained from outside of the aircraft (using depth perception and peripheral vision) as to the rate of sink of the aircraft and the amount of drift (caused by crosswinds) from the center line of the runway - backed up by quick instrument scans (which draw on speed and span of recognition skills and quick visual reaction).

#### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances
- Brock String
- Projected Quoits

## **EYE-HAND COORDINATION**

Fine motor coordination is required for the precise adjustments involved in the flight maneuvers. The pilot must make accurate, smooth contact with the proper controls. This is exemplified in all phases of flight.

### Activities

- Ball Tap
- Ball Batting
- Bean Bag Toss/Catch
- Space Fixator
- Ball toss/catch with X-Trainer chart
- Ball toss/catch in hallway while tapping peripheral targets
- Bal-a-Vis-X (rhythmic bounce to floor/catch 2 balls with partner)

## **PERIPHERAL VISION AND AWARENESS**

The pilot uses peripheral vision to maintain a constant awareness of the data being presented to him by way of his flight instruments and to pick-up cues in the panoramic horizon. Upon landing, when the aircraft crosses the threshold of the runway (at an altitude of approximately 50 feet), the pilot no longer cross-checks his instruments, but depends only on visual cues outside of the aircraft to complete the landing.

### Activities:

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

## **SPEED AND SPAN OF RECOGNITION**

Using the various instruments, the pilot must be able to locate and extract all pertinent information which indicates even slight variations in the aircraft's flight pattern. A constant cross-check is required to insure that the R.M.I. (Radio Magnetic Indicators) correspond with the course bar in the horizontal situation indicator, and that the proper altitudes are achieved in relation to the position of the aircraft (as indicated by the altimeter), and that the speed is correct (airspeed indicator). Air speed is constantly changing due to the fact that the air the aircraft is travelling through is a constantly changing mass.

### Activities

- Near/far Memory Game
- Ace to King Card Game
- 2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.



## **VISUAL REACTION TIME/SPEED**

The pilot's ability to rapidly process and interpret the visual information and to initiate a response based on the cues, determines his/her effectiveness during delicate maneuvers and/or emergency situations.

### Activities

- Bal-a-Vis X- One or two bean bag toss/catch
- Ball toss/catch from various distances, heights and angles
- Ball Batting
- Ball Tap

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).

2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick.

Metronome (optional)

- 1.The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
- 2.The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
- 3.The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
- 4.The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

- 1.The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
- 2.The patient taps the ball with alternate hands, maintaining a steady rhythm
- 3.Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

- 1.Therapist stands opposite patient.
- 2.Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of Accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/-2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.
5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3<sup>^</sup> (6, F).

6. The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.
7. Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

- Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.
1. Use patient's existing glasses or a pair of dollar store readers with the lenses removed.
  2. Add cloudy scotch tape to the edge of the iris.
  3. Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
  4. The width of the tape is based on what the patient indicates is most comfortable.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.
6. The goal is to see the string form an "X" at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance

2. Using the number worksheet, have the patient circle the number “1” as long as needed until they find number “2” then without picking up the pencil, circle number “2” and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number “30”.
  3. The pencil should be moving at all times; do not lift the pencil up from the paper.
- Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.
3. Read Hart Chart vertically, horizontally or first and last letter of each row or column.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

### **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

- 1.4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.

2. Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.
  3. Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).
  4. Have patient read first/last letters, all odd or all even letters, etc.
  5. Walk Aways: Patient reads chart while walking to and away from the chart.
  6. Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.
- Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

### **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure "8".
3. Instruct patient to walk in a figure "8" pattern around the cones while maintaining fixation on the fixation target. If they are unable to maintain fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure "8". 3. Have patient catch a ball each time he/she crosses the "x" in the infinity pattern.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.

5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.
7. Switch the patch and repeat the procedure on the opposite eye.

### **Lora's Card- trains the visual skill of fixation ability**

Materials: Lora's Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.



3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
  4. When shifting focus from near to far, ensure the letters are clear before moving on.
- Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

### **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
2. Place three or four objects on the table in front of you (near to far).
3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
4. Block the patient's view of the objects with a folder.
5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
6. Ask the patient to identify the objects out of order until all of the objects are identified.
7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.  
Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

### **Penny Drop- trains the visual skill of eye tracking activities**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
2. The therapist moves the container continuously in all directions within reach of the patient.

3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times.

When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

### **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

1. Set metronome at appropriate pace for patient.
2. Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.
3. Work towards increasing the rhythm of the metronome.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of “straight-ahead” and the objective direction of straight ahead. They may feel “out of synch” with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as “bases left or ‘bases right” can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopeters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

### **Projected Quoits- trains the visual skill of accommodation and convergence**

Materials: Quoits vectogram, overhead projector, screen

Convergence Therapy Set the Quoits vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3Δ Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."
2. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.
3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.
4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.
5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.
6. After 6-8Δ Base-in, the target will be too far behind the targets for the patient to point.
7. The patient should be able to see one set of Quoit by looking beyond the Vectogram at the central letter chart on the wall.
8. If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoit at letter "L". Endpoint 25Δ Base-out. and 12Δ Base-in.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

1. Choose a card appropriate for the patient.
2. Patient places game pieces on game board as shown on selected game card.
3. Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

1. Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
2. There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.

3. Have the patient look at the letter "A" and, using only his/her eyes, follow the curved line from "A" to the correct number on the right side of the page, and call out the number.
4. Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
5. Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

1. Hold the sequential tracker at the patient's reading distance. It may be supported by a book stand or taped to a window for rear illumination.
2. Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.
3. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long sweep back to the first target on the left.
4. Repeat the sequence five times, rest for half a minute, then repeat.  
Strive for both speed and accuracy, but of the two, accuracy is the most important. Eliminate any regressions (looking back at targets already passed over). Maintain a rhythmic shift from target to target. Rhythm is more important than speed. Begin with the metronome set at a slower speed to master control of the eye movements. Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the "thinking spot" and the starting position.
2. Instruct patient to "think about" number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to "look at" number. Watch the patient's eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.
4. Instruct the patient to "touch" number 1 then return to eyes and finger to start position of the center dot.
5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

- 1.The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.
- 2.The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

- 1.Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
- 2.Patient names the color of ink on printed words rather than reading the words.
- 3.Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

- 1.Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
- 2.Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

## **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

## **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoits Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an "R" aligned over an "L". 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with

- convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
  7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to  $3\Delta$  Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."
  8. Once the patient can perform these steps, while the Vectograms slides are set at  $3\Delta$  Base out, have the patient slowly separate the targets to  $6\Delta$  Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty:
    - a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.
4. Continue until the patient has read the entire chart.

**SPORT SPECIFIC**  
**SKIING**





## **SPORTS VISION – AND SKIING**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Time. (For more in-depth explanations, see the attached Visual Skills definition sheet.) These are all learned skills that can be improved with practice.

The following is an explanation of the most relative dynamic visual skills associated with skiing.

### **ACCOMMODATION AND CONVERGENCE**

The skier must be able to focus rapidly on parts of his run and allow his eyes to track the obstacles in his path to determine and affect the proper maneuvers. For the alpine skier, moguls offer a challenging situation. His/her eyes must track the ideal path to engage in and must accommodate rapidly to the hillocks that seem to pop up on the slope. As for the slalom skier, he experiences a combination of focusing flexibility and peripheral awareness as he projects his sight to the forward gate and tightly squeezes by the immediate one.

#### Accommodation activities:

- Brock String
- BIM/ BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

#### Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-Vis-X-ball toss and catch
- Sequential Tracker

#### Divergence Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule

### **ANTICIPATION TIMING**

Perhaps more than others, this skill is most important and evident in freestyle events. Judging when to act, as dictated by the visual system, is the key to effective performance. Most efforts fail not because the physical movements were wrong, but because they were made at the wrong time. Whether the ski jumper is performing aerials off the 'kicker' or travelling at speeds of around 60mph, down specially prepared ramps (in runs) before taking off to perform flight jumps (which can reach over 400 ft. in some cases), the ability to

anticipate and react at the precise moment is a major factor to effective execution.

Activities

- Ball batting with metronome
- Percon saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

## **CONCENTRATION**

Unwavering focus on every bit of pertinent action, near and far, and the discipline not to be distracted constitutes the concentration that the downhill skier must maintain. Straight running (schuss) or mogul runs are two events for which the highest levels of concentration are mandatory in negotiating the descents. These events are unforgiving, and injury may await the out-of-control skier (schussboomer).

Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis X
- Rush Hour
- Continuous Motion

## **DEPTH PERCEPTION**

The skier's ability to instantly and accurately judge distance and speed is crucial to the timely execution of maneuvers. Executing somersaults and negotiating moguls are especially challenging to the skier who must rapidly adjust physical responses in accordance to his/her position on or to the slope. When the skier's eyes are working in unison, they have a clear, three-dimensional image of the surroundings on which to base physical adjustments and positioning.

Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances
- Brock String
- Projected Quoits

## **EYE-HAND/FOOT/BODY COORDINATION**

Planting the poles in the snow, as an aid to turning control when parallel skiing, requires good eye-hand coordination, as it is necessary to plant the pole precisely between the boot and ski tip while executing the turn around the pole. Since our hands or feet or body respond to the information the eye has sent to the brain, there is a good chance that we will end in our physical response if this information is incorrect, even to the slightest degree. For the slalom skier, precise maneuvering around the gates can make the difference between immediate disqualification and completion of the run.

### Activities

- Step ups/side lunges with ball toss/catch
- Infinity walk with ball toss/catch
- Infinity Walk with Hart Chart
- Tandem Walk with Peripheral Touch
- Bola Ball
- Motor Mimic with Hart Charts

## **PERIPHERAL AWARENESS**

Most skiers have experienced particular weekends when the slopes are inordinately crowded, and under these conditions, it is imperative that one be aware of the traffic on the slope. At the same time that the skiers are concentrating on their fall line, they must be peripherally aware in order to avoid immobilized or out-of-control skiers traversing the fall lines.

### Activities:

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

## **SPEED AND SPAN OF RECOGNITION**

The amount of information and the speed at which it is absorbed and processed enhances the skier's ability to be in continuous control while negotiating the piste (ski run). This skill is most valuable for those skiers who enjoy the back-country slopes through forested and rough terrain. The skier's speed in recognizing off-piste obstacles will have a great effect in terms of his/her ability to remain in control. Instantaneous recognition drives the physical impulses to a better reflex level as the reflex action becomes more automatic and less thought out. An increase in the amount of information one is able to take in at once and rapidly digest or interpret also quickens the skier's physical responses and makes them more accurate and efficient.

### Activities

- Near/far Memory Game
- Ace to King Card Game
- 2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.

## **VISUAL REACTION SPEED/TIME**

It is imperative for the competitive alpine skier to possess quick visual reaction. The amount of time available to process visual information and initiate a physical response is extremely limited because of the high speeds involved in these events. The downhill skier must rapidly choose the best fall line and initiate the transition almost instantaneously.

### Activities

- Bal-a-Vis X- One or two bean bag toss/catch
- Ball toss/catch from various distances, heights and angles
- Ball Batting
- Ball Tap

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).

2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick.

Metronome (optional)

1. The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
2. The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
3. The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
4. The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

1. The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
2. The patient taps the ball with alternate hands, maintaining a steady rhythm
3. Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

1. Therapist stands opposite patient.
2. Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of Accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/-2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.

5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3° (6, F).
6. The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.
7. Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

- Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.
1. Use patient's existing glasses or a pair of dollar store readers with the lenses removed.
  2. Add cloudy scotch tape to the edge of the iris.
  3. Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
  4. The width of the tape is based on what the patient indicates is most comfortable.

### **Bola Ball- trains the visual skill of eye/hand/body/foot coordination**

Materials: Bola Ball

1. Instruct patient to toss Bola Ball vertically in air, as the Bola Ball flips end over end the patient is to catch the Bola Ball in midair.  
Alternate method: Patient and therapist stand facing each other, therapist tosses Bola Ball vertically in direction of patient, patient then catches Bola Ball.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.



5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.

6. The goal is to see the string form an "X" at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
2. Using the number worksheet, have the patient circle the number "1" as long as needed until they find number "2" then without picking up the pencil, circle number "2" and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number "30".
3. The pencil should be moving at all times; do not lift the pencil up from the paper.

Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.
3. Read Hart Chart vertically, horizontally or first and last letter of each row or column.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.

2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

## **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

1.4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.

2.Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.

3.Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).

4.Have patient read first/last letters, all odd or all even letters, etc.

5.Walk Aways: Patient reads chart while walking to and away from the chart.

6.Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

## **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure "8".
3. Instruct patient to walk in a figure "8" pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient

to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure “8”. 3. Have patient catch a ball each time he/she crosses the “x” in the infinity pattern.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.
5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.
7. Switch the patch and repeat the procedure on the opposite eye.

### **Lora’s Card- trains the visual skill of fixation ability**

Materials: Lora’s Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Motor Mimic- trains the visual skill of eye-hand/body/foot coordination**

Materials: Hart Charts (optional)

1. Have the patient stand directly next to you and be sure to point out where both the left and right hands are for the patient and the therapist
2. Start the activity by either stomping a foot or slapping a hand and instructing the patient to do what you had just done.
3. Increase the difficulty of the task by adding more slaps and stomps to the combination making sure not to add to the pattern until the previous pattern was successfully completed.
4. Once the patient has successfully completed a series of four slaps and stomps move 90-degrees so that you are perpendicular to the student and continue as you initially did.
5. The final progression of this task is to stand directly across from the patient when completing a combination.

Increase demand: Add math facts to the pattern by calling out a number as you are slapping or stomping. Have the patient answer a question before allowing them to repeat the pattern. Slap and stomp to a beat while counting. Add cross lateral movements. Add Hart Charts.

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.
3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
4. When shifting focus from near to far, ensure the letters are clear before moving on.

Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

## **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
2. Place three or four objects on the table in front of you (near to far).
3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
4. Block the patient's view of the objects with a folder.
5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
6. Ask the patient to identify the objects out of order until all of the objects are identified.
7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.

Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

## **Penny Drop- trains the visual skill of eye tracking activities**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
2. The therapist moves the container continuously in all directions within reach of the patient.
3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times.

When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

## **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

1. Set metronome at appropriate pace for patient.
2. Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.
3. Work towards increasing the rhythm of the metronome.

## **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of "straight-ahead" and the objective direction of straight ahead. They may feel "out of synch" with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as "bases left or 'bases right" can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

## **Projected Quoits- trains the visual skill of accommodation and convergence**

Materials: Quoits vectogram, overhead projector, screen

Convergence Therapy Set the Quoits vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3Δ Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."
2. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, slowly separate the targets to 6Δ Base-out and repeat steps one and two. At

some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.

3.If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.

4.Divergence Therapy: For divergence, separate the targets so that the letters are shown.

5.The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.

6.After 6-8Δ Base-in, the target will be too far behind the targets for the patient to point.

7.The patient should be able see one set of Quoits by looking beyond the Vectogram at the central letter chart on the wall.

8.If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoits at letter “L”. Endpoint 25Δ Base-out. and 12Δ Base-in.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

1.Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.

2.There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.

3.Have the patient look at the letter “A” and, using only his/her eyes, follow the curved line from “A” to the correct number on the right side of the page, and call out the number.

4.Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.

5.Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

1.Hold the sequential tracker at the patient’s reading distance. It may be supported by a book stand or taped to a window for rear illumination.

2.Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.

3. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long

sweep back to the first target on the left.

4. Repeat the sequence five times, rest for half a minute, then repeat.

Strive for both speed and accuracy, but of the two, accuracy is the most important.

Eliminate any regressions (looking back at targets already passed over).

Maintain a rhythmic shift from target to target. Rhythm is more important than speed.

Begin with the metronome set at a slower speed to master control of the eye movements.

Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the “thinking spot” and the starting position.

2. Instruct patient to “think about” number 1 and visualize where it is while maintaining fixation on the center dot.

3. Instruct the patient to “look at” number 1. Watch the patient’s eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.

4. Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.

5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

1. The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.

2. The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.



### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

1. Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
2. Patient names the color of ink on printed words rather than reading the words.
3. Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

1. Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
2. Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

### **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

### **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoit Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an "R" aligned over an "L". 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to  $3\Delta$  Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the

- patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."
8. Once the patient can perform these steps, while the Vectograms slides are set at  $3\Delta$  Base out, have the patient slowly separate the targets to  $6\Delta$  Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty:
    - a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.
4. Continue until the patient has read the entire chart.

**SPORT SPECIFIC**  
**SOCCER**



## **SPORTS VISION - AND SOCCER**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration under Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Speed. (For more in-depth explanation, see the attached Visual Skills definition sheet.) These are all learned skills that can be improved with practice.

As soccer is a sport of almost constant motion, for the players and the ball, well developed dynamic acuity is just as significant as good static acuity.

The following is a comprehensive breakdown of the dynamic visual skills and how they more specifically relate to the game of soccer.

### **ACCOMMODATION AND CONVERGENCE**

Eye tracking ability is important in soccer. Quick, accurate saccades (or eye movements) are needed to rapidly survey the changing locations and movements of the other 21 players, and the ball on the pitch. The player must also use saccades to monitor the location of the various boundary lines and goals. Studies have shown that if the athlete's head has to move to aid in eye tracking, his performance is not only less efficient, but balance is thrown off too.

Focusing flexibility is also important because the ball and other players move so quickly. The player has to be able to shift focus from near to far, or to intermediate targets rapidly throughout the game, while general body stamina is running down due to heavy exertion.

#### Accommodation activities:

- Brock String
- BIM/BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

#### Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-Vis-X-ball toss and catch
- Sequential Tracker

#### Divergence Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule

## **CONCENTRATION**

Playing one and a half hours of soccer can be very fatiguing, so maintaining a high level of focus throughout the game is close to impossible. However, if all players can develop the skill to keep concentration throughout the game and still be able to exploit an opponent's errors on the field, they might find that this is the skill that determines the winning or losing of a championship.

### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

## **DEPTH PERCEPTION**

Timing, for receiving passes and jumping up to head the ball at just the right moment, are skills related to good depth perception. The player must be able to judge the speed and spin on the ball, as well as how quickly other players are moving toward or away from him. Also, knowing where you are, relative to other objects, is very important in soccer because traffic patterns on the field can become very congested. No one stays in the same place very long. The ball and the players are all in constant, relative motion. The goals are stationary, but most shots are taken at the goal as the player is moving laterally, vertically, transversely or "all of the above".

### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances
- Brock String
- Projected Quoit

## **EYE FATIGUE**

Soccer is a very fatiguing sport which requires excellent conditioning. Physical fatigue can greatly affect concentration, visual reaction time, and eye-hand coordination. Eye fatigue can also affect performance levels in much the same way. When the muscles in our eyes feel tired or strained, we feel the fatigue all over. Just like a weightlifting routine is used to increase physical endurance, visual exercises can be used to strengthen the eye muscles and thereby reduce fatigue.

#### Activities

- Brock String
- Projected Quoits
- Missing Letter Charts
- Stroop Chart
- Vectograms
- Hart Charts, various
- Scanning Trails
- Marsden Ball

### **EYE-HAND/BODY/FOOT COORDINATION**

Most soccer players depend more on eye-foot and eye-body coordination, than on eye-hand; except the goaltenders, who are permitted to use their hands to catch, throw and block shots taken on their goal. The eyes lead the body follows, so the visual system guides the motor system. For the players, exact eye-foot coordination is essential to hit a solid volley or half-volley and to ensure that the ball goes in the right direction and is perfectly on target.

#### Activities

- Step ups/side lunges with ball toss/catch
- Infinity walk with ball toss/catch
- Infinity Walk with Hart Chart
- Tandem Walk with Peripheral Touch
- Bola Ball
- Motor Mimic with Hart Charts

### **FIXATION ABILITY**

Fixations in soccer are seldom in one place very long. They are actually tied in with saccadic eye movement ability. The player's eyes are in constant motion, with quick fixation shifts from the ball, to the other players (his team and opponents), to the goal, to the touchline (sideline) boundaries, etc. During a free kick, corner kick, penalty kick, etc. the player has the time and space to fixate on a precise portion of the soccer ball (e.g. one of the dark or light hexagonal panels) for more accurate kicking. Perhaps even some quick visualization can be done in these situations. Fixation would then be shifting from the target on the ball panel, to where the player wants that kick to land on the pitch.

NOTE: Staring at the target too long before kicking the ball can lead to more misses. The ability to fine focus (center) on a target diminishes with time. Therefore, soccer players should be advised to avoid staring. When balanced and ready, he/she should just center on the target's finest detail (first the ball, and then the spot on the field where they want the shot to land) and smoothly execute the free kick.

#### Activities

- Lora's Card
- Space Fixator
- Flashlight Tag
- Brock String
- VOR activities
- AIT

## **PERIPHERAL VISION/AWARENESS**

When dribbling the ball, the player must be aware of where he's going; where the defensive tacklers are coming from; and also, be peripherally aware of the soccer ball his foot is controlling.

Defensively, he/she must stay between the opponent and the goal. Therefore, he must be centrally aware of the offensive player with the ball, if it's his responsibility to mark (guard) him.

Peripherally, he must be aware of the goal and potential passing lanes the offense might use. Also, if he is marking a player away from the ball, he must be peripherally aware of the ball and the goal.

This is not only a very essential skill for superior performance in a game like soccer, but it also helps avoid collision and injury. Each player must be aware of (1) the location of the ball, (2) where he should be in relation to the action going on at any given time, (3) where his opponents and his teammates are if he is in control of the ball and (4) where he is on the pitch (playing field) in relationship to the numerous boundaries.

### Activities:

Brock string

Marsden Ball

Lora's Card

Bean Bag toss to peripheral targets on floor

Tandem walk in hall with hand tap to targets on wall

Circular toss/catch with suspended ball

Prism work

## **SPEED AND SPAN OF RECOGNITION**

Opportunities to make a proper pass, nutmeg a player (kick the ball between his legs), or tackle an opponent and steal the ball without fouling, only present themselves for fractions of seconds. Also, the soccer ball itself can move at high rates of speed. Once the ball starts ricocheting off players who are fighting for its control, reaction speed can be the difference between a winner and a loser. The player must be able to absorb a great deal of information, with just a quick scan of the field in order to make his decision for play development - i.e. - whether to pass the ball, and where and how to make his next move.

### Activities

Near/far Memory Game

Ace to King Card Game

2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.



## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **AIT- trains visual skill of fixation ability**

Materials: After Image Trainer, patch, solid colored target such as a suspended ball, smiley face posted on the wall

1. Patch one eye
2. Flash the After Image Trainer on the eye.
3. Instruct patient to blink rapidly 3 times.
4. Instruct patient to place the after image on the target. If the target is a smiley face ask patient to place the after image on the smile or eye of the smiley face.
5. Remove patch from eye and repeat steps 1-4 with the alternate eye.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).

2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

1. Therapist stands opposite patient.

2. Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.

b. Incorporate step ups (using a stable wooden box or step-up platform).

c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.

2. Toss and catch the ball while therapist gradually steps forward or backward.

3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of Accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/-2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.
5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3<sup>Δ</sup> (6, F).
6. The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.
7. Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

- Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.
1. Use patient’s existing glasses or a pair of dollar store readers with the lenses removed.
  2. Add cloudy scotch tape to the edge of the iris.
  3. Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
  4. The width of the tape is based on what the patient indicates is most comfortable.

### **Bola Ball- trains the visual skill of eye/hand/body/foot coordination**

Materials: Bola Ball

1. Instruct patient to toss Bola Ball vertically in air, as the Bola Ball flips end over end the patient is to catch the Bola Ball in midair.

Alternate method: Patient and therapist stand facing each other, therapist tosses Bola Ball vertically in direction of patient, patient then catches Bola Ball.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.

2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.

3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.

4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.

5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.

6. The goal is to see the string form an "X" at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance

2. Using the number worksheet, have the patient circle the number "1" as long as needed until they find number "2" then without picking up the pencil, circle number "2" and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number "30".

3. The pencil should be moving at all times; do not lift the pencil up from the paper.

Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.
3. Read Hart Chart vertically, horizontally or first and last letter of each row or column.

### **Flashlight Tag- trains the visual skill of fixation ability**

Materials: Two flashlights

1. In a darkened area, shine a flashlight around the room—on the floor, walls, and ceiling.
2. Include smooth movements as well as jumps in the pattern.
3. Have patient shine a second light directly on your beam.
4. Work on the patient's accuracy in following the lead beam. Go slowly at first and then increase speed

If patient has trouble doing this exercise with both eyes, have him/her cover one eye. Continue to work this activity with one eye at a time until performance improves; then work both eyes.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

## **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

1.4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.

2.Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.

3.Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).

4.Have patient read first/last letters, all odd or all even letters, etc.

5.Walk Aways: Patient reads chart while walking to and away from the chart.

6.Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

## **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure “8”.
3. Instruct patient to walk in a figure “8” pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure “8”. 3. Have patient catch a ball each time he/she crosses the “x” in the infinity pattern.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.
5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.
7. Switch the patch and repeat the procedure on the opposite eye.

### **Lora's Card- trains the visual skill of fixation ability**

Materials: Lora's Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Missing Letter Charts- trains the visual skill of eye fatigue**

Materials: Chart with scattered letters

1. Patient reads chart vertically or horizontally

### **Motor Mimic- trains the visual skill of eye-hand/body/foot coordination**

Materials: Hart Charts (optional)

1. Have the patient stand directly next to you and be sure to point out where both the left and right hands are for the patient and the therapist
2. Start the activity by either stomping a foot or slapping a hand and instructing the patient to do what you had just done.
3. Increase the difficulty of the task by adding more slaps and stomps to the combination making sure not to add to the pattern until the previous pattern was successfully completed.
4. Once the patient has successfully completed a series of four slaps and stomps move 90-degrees so that you are perpendicular to the student and continue as you initially did.
5. The final progression of this task is to stand directly across from the patient when completing a combination.

Increase demand: Add math facts to the pattern by calling out a number as you are slapping or stomping. Have the patient answer a question before allowing them to repeat the pattern. Slap and stomp to a beat while counting. Add cross lateral movements. Add Hart Charts.

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.
3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
4. When shifting focus from near to far, ensure the letters are clear before moving on.



Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

### **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
2. Place three or four objects on the table in front of you (near to far).
3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
4. Block the patient's view of the objects with a folder.
5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
6. Ask the patient to identify the objects out of order until all of the objects are identified.
7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.  
Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

### **Penny Drop- trains the visual skill of eye tracking**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
2. The therapist moves the container continuously in all directions within reach of the patient.
3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times.

When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

## **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of “straight-ahead” and the objective direction of straight ahead. They may feel “out of synch” with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as “bases left or ‘bases right” can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

## **Projected Quois- trains the visual skill of accommodation and convergence**

Materials: Quois vectogram, overhead projector, screen

Convergence Therapy Set the Quois vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3Δ Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."

2. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.

3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.

4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.

5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.

6. After 6-8Δ Base-in, the target will be too far behind the targets for the patient to point.

7.The patient should be able see one set of Quoits by looking beyond the Vectogram at the central letter chart on the wall.

8.If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoits at letter “L”. Endpoint 25Δ Base-out. and 12Δ Base-in.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

- 1.Choose a card appropriate for the patient.
- 2.Patient places game pieces on game board as shown on selected game card.
- 3.Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

- 1.Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
- 2.There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
- 3.Have the patient look at the letter “A” and, using only his/her eyes, follow the curved line from “A” to the correct number on the right side of the page, and call out the number.
- 4.Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
- 5.Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

- 1.Hold the sequential tracker at the patient’s reading distance. It may be supported by a book stand or taped to a window for rear illumination.
- 2.Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.

3. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long sweep back to the first target on the left.
4. Repeat the sequence five times, rest for half a minute, then repeat.  
Strive for both speed and accuracy, but of the two, accuracy is the most important. Eliminate any regressions (looking back at targets already passed over). Maintain a rhythmic shift from target to target. Rhythm is more important than speed. Begin with the metronome set at a slower speed to master control of the eye movements. Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of speed and span of recognition**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the “thinking spot” and the starting position.
2. Instruct patient to “think about” number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to “look at” number 1. Watch the patient’s eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.
4. Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.
5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

1. The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.
2. The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

1. Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
2. Patient names the color of ink on printed words rather than reading the words.
3. Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

1. Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
2. Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

### **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

### **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoit Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an "R" aligned over an "L". 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to 3Δ Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one

target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."

8. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, have the patient slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **VOR- trains the visual skill of eye motility**

Materials: Pen or fixation target

1. Hold an object in front of the patient. Instruct patient to rotate head left/right smoothly while maintaining fixation on the object. Have the patient maintain fixation on the object while moving only his/her head.

2. Instruct patient to tilt chin up and down while maintaining fixation on the object.

Start with 5-7 repetitions as tolerated. Work up to 2 sets of 10 reps each without experiencing symptoms.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.

Continue until the patient has read the entire chart.

**SPORT SPECIFIC**  
**TABLE TENNIS**





## **SPORTS VISION - AND TABLE TENNIS**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration under Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Time. These are all learned skills that can be improved with practice.

Table tennis is an extremely fast game which requires exceptional skill and competence to play at a competitive level. In the last forty years, the innovative style of many top ranked players in the world has introduced a number of new spins and serve and given a new meaning to the word "speed". Reactions must be automatic, (not thought out), so players need to analyze the speed and recognize the kind of spin on the ball instantaneously.

Their concentration must also remain consistently high in order to minimize errors and the unnecessary loss of a point.

The following is an explanation of the most relative dynamic visual skills associated with table tennis.

### **ACCOMMODATION AND CONVERGENCE**

As the ball is being played rapidly back and forth, the athlete's eyes have to keep it in constant, clear focus. In the same way, both eyes need to be working in unison in order to track the rapidly moving ball, especially if it takes a funny bounce when hitting the net or the edge of the table.

#### Accommodation activities:

- Brock String
- BIM/BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

#### Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-Vis-X-ball toss and catch
- Sequential Tracker

#### Divergence Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule

## ANTICIPATION TIMING

The key to effective performance is knowing the exact moment to act. If the player doesn't anticipate properly their opponents could pick up on their miscues and hit a winner.

### Activities

- Ball batting with metronome
- Person saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

## CONCENTRATION

In such a fast-moving sport, there is little room for error. Players have to be involved and focused on every swing and stroke that they make, constantly keeping their eyes on the ball. When in pressure situations, any form of distraction (i.e. crowd noises or camera flashes) must be eliminated, and only the task at hand can be important. Concentration is a skill that can make even an average player perform much better because it promotes more consistent play and less unforced errors.

### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

## **DEPTH PERCEPTION**

Depth perception is necessary for accurate shot placement, especially on smaller playing surfaces such as the table tennis table. Players must accurately judge the speed and revolution of the ball so that they can position themselves correctly for each shot. This is especially useful when they are defending against smashes which can often move them ten feet back of the table.

### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances
- Brock String
- Projected Quoits

## **EYE FATIGUE**

Table tennis can be a very tiring sport which requires good conditioning. Physical fatigue can greatly affect concentration, visual reaction time and eye-hand coordination. Eye fatigue can also affect performance levels in much the same way. When the muscles in our eyes feel tired or strained, we feel the fatigue all over. Just like a weightlifting routine is used to increase physical endurance, visual exercises can be used to strengthen the eye muscles and thereby, reduce eye fatigue.

### Activities

- Brock String
- Projected Quoits
- Missing Letter Charts
- Stroop Chart
- Vectograms
- Hart Charts, various
- Scanning Trails
- Marsden Ball

## **EYE-HAND COORDINATION**

This skill is vital in any racquet sport since the process of hitting a moving object with a racquet or bat primarily requires eye-hand coordination. Our hands, feet and body respond to the information the eyes have sent to the brain. If this information is incorrect, even to the slightest degree, there is a good chance that we will err in our physical response. Almost every sport error, or poorly executed play, can be attributed to faulty visual judgement and it is visual judgement alone that determines eye-hand coordination.

#### Activities

- Ball Tap
- Ball Batting
- Bean Bag Toss/Catch
- Space Fixator
- Ball toss/catch with X-Trainer chart
- Ball toss/catch in hallway while tapping peripheral targets
- Bal-a-Vis X (rhythmic bounce to floor/catch 2 balls with partner)

### **PERIPHERAL VISION/AWARENESS**

More essential in doubles play, so that the players can concentrate on the ball and still be aware of where their partner is standing.

#### Activities:

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

### **SPEED AND SPAN OF RECOGNITION**

Players only have a split second or so to determine the speed and recognize what kind of spin was put on the shot they are about to return. Due to the nature of the game, it is essential for players to quickly recognize when the ball has hit the net or the edge of the table in order to be ready to respond effectively.

#### Activities

- Near/far Memory Game
- Ace to King Card Game
- 2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.

### **VISUAL REACTION TIME/SPEED**

The more rapidly the players can process visual information and initiate their own physical response, the more automatic their reaction will be, and hence, the more effective their game will be. In table tennis, this is one of the most crucial skills to develop and keep sharp.

#### Activities

- Bal a Vis X- One or two bean bag toss/catch
- Ball toss/catch from various distances, heights and angles
- Ball Batting
- Ball Tap

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).
2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick. Metronome (optional)

- 1.The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
- 2.The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
- 3.The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
- 4.The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

- 1.The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
- 2.The patient taps the ball with alternate hands, maintaining a steady rhythm
- 3.Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

- 1.Therapist stands opposite patient.
- 2.Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of Accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/- 2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.
5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3<sup>^</sup> (6, F).
6. The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.
7. Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.

1. Use patient's existing glasses or a pair of dollar store readers with the lenses removed.
2. Add cloudy scotch tape to the edge of the iris.
3. Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
4. The width of the tape is based on what the patient indicates is most comfortable.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.
6. The goal is to see the string form an "X" at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
2. Using the number worksheet, have the patient circle the number "1" as long as needed until they find number "2" then without picking up the pencil, circle number "2" and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number "30".
3. The pencil should be moving at all times; do not lift the pencil up from the paper.

Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.



## **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.
3. Read Hart Chart vertically, horizontally or first and last letter of each row or column.

## **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

## **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

- 1.4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.
2. Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.
3. Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).
4. Have patient read first/last letters, all odd or all even letters, etc.
5. Walk Aways: Patient reads chart while walking to and away from the chart.
6. Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

## **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure "8".
3. Instruct patient to walk in a figure "8" pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure "8". 3. Have patient catch a ball each time he/she crosses the "x" in the infinity pattern.

## **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from  $-.50$  to  $-5.0$  are placed within reach of the patient.
5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.

Switch the patch and repeat the procedure on the opposite eye.

## **Lora's Card- trains the visual skill of fixation ability**

Materials: Lora's Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.

4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Missing Letter Charts- trains the visual skill of eye fatigue**

Materials: Chart with scattered letters

1. Patient reads chart vertically or horizontally

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.
3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
4. When shifting focus from near to far, ensure the letters are clear before moving on.

Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

## **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
2. Place three or four objects on the table in front of you (near to far).
3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
4. Block the patient's view of the objects with a folder.
5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
6. Ask the patient to identify the objects out of order until all of the objects are identified.
7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.  
Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

## **Penny Drop- trains the visual skill of eye tracking**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
  2. The therapist moves the container continuously in all directions within reach of the patient.
  3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times.
- When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

## **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

1. Set metronome at appropriate pace for patient.

2. Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.

Work towards increasing the rhythm of the metronome.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of "straight-ahead" and the objective direction of straight ahead. They may feel "out of synch" with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as "bases left or 'bases right" can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

### **Projected Quoiets- trains the visual skill of accommodation and convergence**

Materials: Quoiets vectogram, overhead projector, screen

Convergence Therapy Set the Quoiets vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3Δ Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."

2. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.

3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.

4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.

5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.

6. After 6-8Δ Base-in, the target will be too far behind the targets for the patient to point.

7.The patient should be able see one set of Quoits by looking beyond the Vectogram at the central letter chart on the wall.

8.If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoits at letter “L”. Endpoint 25Δ Base-out. and 12Δ Base-in.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

- 1.Choose a card appropriate for the patient.
- 2.Patient places game pieces on game board as shown on selected game card.
- 3.Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

- 1.Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
- 2.There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
- 3.Have the patient look at the letter “A” and, using only his/her eyes, follow the curved line from “A” to the correct number on the right side of the page, and call out the number.
- 4.Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
- 5.Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

- 1.Hold the sequential tracker at the patient’s reading distance. It may be supported by a book stand or taped to a window for rear illumination.
- 2.Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.
3. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long

- sweep back to the first target on the left.
4. Repeat the sequence five times, rest for half a minute, then repeat.  
Strive for both speed and accuracy, but of the two, accuracy is the most important.  
Eliminate any regressions (looking back at targets already passed over).  
Maintain a rhythmic shift from target to target. Rhythm is more important than speed.  
Begin with the metronome set at a slower speed to master control of the eye movements.  
Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the “thinking spot” and the starting position.
2. Instruct patient to “think about” number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to “look at” number. Watch the patient’s eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.
4. Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.
5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

1. The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.
2. The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

## **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

1. Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
2. Patient names the color of ink on printed words rather than reading the words.
3. Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

## **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

1. Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
2. Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

## **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.



## **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoits Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an "R" aligned over an "L". 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to 3Δ Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."
8. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, have the patient slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty: a. Suggest that the patient

get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.
4. Continue until the patient has read the entire chart.

**SPORT SPECIFIC**  
**TENNIS**



## **SPORTS VISION - AND TENNIS**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration under Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Time. These are all learned skills that can be improved with practice.

The following is a comprehensive breakdown of the dynamic visual skills associated with tennis.

### **ACCOMMODATION AND CONVERGENCE**

Well-developed accommodative skills are important in tennis because both the ball and the opponent are in constant, rapid movement and the player must be able to shift focus from the near to far or to intermediate targets instantaneously throughout the contest.

Eye tracking ability is also important. Quick, accurate saccades (or eye movements) are needed to rapidly survey the changing locations and movements of the opponent and the ball in relationship to the net, boundary lines, etc. Studies have shown that if the head has to move to aid in eye tracking, the performance is not only less efficient, but balance is thrown off too. The ultimate goal, regarding this visual skill and tennis, is to track the ball until contact can be made, not flinching on impact.

#### Accommodation activities:

- Brock String
- BIM/BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

#### Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Suspended ball
- Bal-a-Vis-X-ball toss and catch
- Sequential Tracker

#### Divergence Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule

## **ANTICIPATION TIMING**

The visual system provides an individual with the information needed in order to appropriately act as well as the information needed to decide exactly when to act. For example, when receiving a serve, you have mere 100th's of a second to read and react. You have to properly recognize the type of serve your opponent has chosen, as well as choose and prepare for your response. You can't swing too soon or too late or you will miss the opportunity to make your shot. Timing must be perfect! The ability to anticipate is a major factor in high level competitive activities and even superior speed, size and reflexes cannot compensate for the insufficient processing of the visual information regarding when to perform.

### Activities

- Ball batting with metronome
- Percon saccades
- Penny Drop
- Suspended Ball
- Ball toss/catch
- Bal-A-Vis-X
- Hart Chart with metronome

## **CONCENTRATION**

Maintaining a high level of concentration/focus in a fast-moving sport like tennis is essential, especially when receiving a serve or playing at the net. Even a slight lapse in concentration may mean losing a point in a game in which every point is important.

### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

## **DEPTH PERCEPTION**

Depth perception is necessary for accurate shot placement, evaluating the defensive positions of the opponent and judgement of whether a ball hit to you will land in or out of bounds, thus, helping you decide whether or not to play the ball. It also assists in judgement of the speed of the opponent's shot.

### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances
- Brock String
- Projected Quoits

## **EYE FATIGUE**

Tennis is a very fatiguing sport which requires excellent conditioning. Physical fatigue can greatly affect concentration, visual reaction time and eye-hand coordination. Eye fatigue can also affect performance levels in much the same way. When the muscles in our eyes feel tired or strained, we feel the fatigue all over. Just like a weightlifting routine is used to increase physical endurance, visual exercises can be used to strengthen the eye muscles and thereby, reduce eye fatigue.

### Activities

- Brock String
- Projected Quoits
- Missing Letter Charts
- Stroop Chart
- Vectograms
- Hart Charts, various
- Scanning Trails
- Marsden Ball

## **EYE-HAND COORDINATION**

This skill is vital in any racquet sport since the process of hitting a moving object with a racquet primarily requires eye-hand coordination. Our hands, feet and body respond to the information the eyes have sent to the brain. If this information is incorrect, even to the slightest degree, there is a good chance that we will err in our physical response. Almost every sport error, or poorly executed play, can be attributed to faulty visual judgement, and it is visual judgement alone that determines eye-hand coordination.

### Activities

- Ball Tap
- Ball Batting
- Bean Bag Toss/Catch
- Space Fixator
- Ball toss/catch with X-Trainer chart

Ball toss/catch in hallway while tapping peripheral targets  
Bal-a-Vis-X (rhythmic bounce to floor/catch 2 balls with partner)

### **PERIPHERAL VISION/AWARENESS**

This is an essential skill for a tennis player whether on defense or on the attack. The attacking player has to be distinctly aware of the speed and position of the oncoming ball in order to secure correct contact as well as remaining peripherally aware of the opponent's position and the location of the court boundaries.

The defensive player must concentrate centrally on the attacking player's court position and the likely direction the ball will come off his opponent's racket. Meanwhile, he must be peripherally aware of the net and boundary lines of the court, etc. These factors all hold true for doubles too. However, in doubles, the players have the additional complication of being peripherally aware of where their partner's body and racket are.

#### Activities:

Brock String  
Marsden Ball  
Lora's Card

Bean Bag toss to peripheral targets on floor  
Tandem walk in hall with hand tap to targets on wall  
Circular toss/catch with suspended ball  
Prism work

### **SPEED AND SPAN OF RECOGNITION**

Boris Becker's serve has been clocked at 145 mph. This doesn't allow much time to react. Even the speed of a normal rally shot requires a player to detect the speed and spin on the ball as quickly as possible in order to make the proper return. This means he/she must pick up the ball visually as it comes off the opponent's racket. Opportunities to make that proper return shot only present themselves for fractions of seconds, and in order to be effective (i.e. quick, accurate and efficient), the reflex action of response must be automatic, not thought out.

#### Activities

Near/far Memory Game  
Ace to King Card Game  
2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.

### **VISUALIZATION**

This could be very useful for a tennis player, particularly when serving the ball. A tennis player has a 30-second time limit between the end of one point and the service for the next. This is enough time for

some quick visualization. The rest of the game is so fast moving, the player doesn't have time to think and visualize using the five-step technique. He or she must simply react. Sub-vocalization, thought by some to be a form of visualization, actually distracts from it! Not only does it take longer, it is not as efficient. Therefore, don't give yourself a "pep talk" while playing tennis... visualize instead.

Activities

- Rush Hour
- Color Cubes
- Three-D I Spy (finding cards based on written definition)
- Parquetry
- Ace to King
- Parquetry with rotation and flips
- Rush Hour

**VISUAL REACTION SPEED**

The more rapidly a tennis player processes visual information, the faster he/she can position their body to hit the ball effectively with power. Excellent visual reaction time helps a player return a serve, a smash, play effectively at the net or simply return the ball into the opponent's court.

Activities

- Bal-a-Vis X- One or two bean bag toss/catch
- Ball toss/catch from various distances, heights and angles
- Ball Batting
- Ball Tap



## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).

2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick.

Metronome (optional)

1. The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
2. The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
3. The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
4. The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

1. The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
2. The patient taps the ball with alternate hands, maintaining a steady rhythm
3. Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

1. Therapist stands opposite patient.
2. Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an "A" pattern on floor with the top of the "A" closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of Accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/-2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.
5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3<sup>^</sup> (6, F).

6.The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.

7.Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.

- 1.Use patient's existing glasses or a pair of dollar store readers with the lenses removed.
- 2.Add cloudy scotch tape to the edge of the iris.
- 3.Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
- 4.The width of the tape is based on what the patient indicates is most comfortable.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.
6. The goal is to see the string form an "X" at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Color Cubes- trains the visual skill of visualization.**

Materials: Color Cubes game

- 1.Choose card appropriate for patient.
- 2.Instruct patient to recreate the structure displayed on the card.

Modifications for cognitive activities:

Increase demand: Carry on a conversation with patient while performing the task, work in a busy environment, interrupt task and restart, or have the patient perform a task while standing or seated on Swiss ball as appropriate.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
2. Using the number worksheet, have the patient circle the number "1" as long as needed until they find number "2" then without picking up the pencil, circle number "2" and continue circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number "30".
3. The pencil should be moving at all times; do not lift the pencil up from the paper.

Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.
3. Read Hart Chart vertically, horizontally or first and last letter of each row or column.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

## **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

1.4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.

2.Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.

3.Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).

4.Have patient read first/last letters, all odd or all even letters, etc.

5.Walk Aways: Patient reads chart while walking to and away from the chart.

6.Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

## **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure "8".
3. Instruct patient to walk in a figure "8" pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixation without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient

to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure “8”. 3. Have patient catch a ball each time he/she crosses the “x” in the infinity pattern.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.
5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.
7. Switch the patch and repeat the procedure on the opposite eye.

### **Lora’s Card- trains the visual skill of fixation ability**

Materials: Lora’s Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Missing Letter Charts- trains the visual skill of eye fatigue**

Materials: Chart with scattered letters

1. Patient reads chart vertically or horizontally

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.
3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.
4. When shifting focus from near to far, ensure the letters are clear before moving on.

Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

### **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
2. Place three or four objects on the table in front of you (near to far).
3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
4. Block the patient's view of the objects with a folder.
5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
6. Ask the patient to identify the objects out of order until all of the objects are identified.
7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.



8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.  
Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of “loading” time.

### **Parquetry Blocks- trains the visual skill of visualization**

Materials: Parquetry Blocks set

1. Choose pattern appropriate for patient ability.
2. Instruct patient to place block directly on the pattern.
3. Set the pattern on the table, instruct patient to replicate the pattern directly on the table.

Decrease demand: Use the simple black and white patterns, instruct patient to match the shape only.

Increase demand: Rotate the pattern left/right, flip pattern or recreate the pattern from memory.

### **Penny Drop- trains the visual skill of eye tracking**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient’s sights.
2. The therapist moves the container continuously in all directions within reach of the patient.
3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times.

When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

### **Percon Saccades- trains the visual skill of anticipation timing**

Materials: Percon Saccades Charts, metronome, pen or marker

1. Set metronome at appropriate pace for patient.
2. Instruct patient to touch each dot on the chart with the pen or marker, in rhythm to the metronome.
3. Work towards increasing the rhythm of the metronome.

### **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of “straight-ahead” and the objective direction of straight ahead. They may feel “out of synch” with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as “bases left or ‘bases right” can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopeters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

### **Projected Quoits- trains the visual skill of accommodation and convergence**

Materials: Quoits vectogram, overhead projector, screen

Convergence Therapy Set the Quoits vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3Δ Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."
2. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.
3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.

4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.
5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.
6. After 6-8Δ Base-in, the target will be too far behind the targets for the patient to point.
7. The patient should be able to see one set of Quojis by looking beyond the Vectogram at the central letter chart on the wall.
8. If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quojis at letter "L". Endpoint 25Δ Base-out. and 12Δ Base-in.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

1. Choose a card appropriate for the patient.
2. Patient places game pieces on game board as shown on selected game card.
3. Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

1. Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
2. There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
3. Have the patient look at the letter "A" and, using only his/her eyes, follow the curved line from "A" to the correct number on the right side of the page, and call out the number.
4. Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
5. Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

1. Hold the sequential tracker at the patient's reading distance. It may be supported

- by a book stand or taped to a window for rear illumination.
2. Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.
  3. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long sweep back to the first target on the left.
  4. Repeat the sequence five times, rest for half a minute, then repeat.
- Strive for both speed and accuracy, but of the two, accuracy is the most important. Eliminate any regressions (looking back at targets already passed over). Maintain a rhythmic shift from target to target. Rhythm is more important than speed. Begin with the metronome set at a slower speed to master control of the eye movements. Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1. Instruct patient to look at the center dot which is the “thinking spot” and the starting position.
2. Instruct patient to “think about” number 1 and visualize where it is while maintaining fixation on the center dot.
3. Instruct the patient to “look at” number 1. Watch the patient’s eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.
4. Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.
5. Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

- 1.The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.
- 2.The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

### **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

- 1.Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
- 2.Patient names the color of ink on printed words rather than reading the words.
- 3.Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

### **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

- 1.Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
- 2.Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

### **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

- 1.Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
- 2.Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.

3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.

4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.

### **Three D I Spy- trains the visual skill of visualization**

Materials: “Three-D I Spy” game

1. Choose a several clue cards and the coordinating cards.

2. Scatter the coordinating cards.

3. Give patient one clue card

4. Instruct patient to find the coordinating cards based on either the picture or verbal clues provided on the clue card.

Increase demand by eliminating the clue cards, with the therapist give the patient verbal clues only.

### **Vectograms- trains visual skill of accommodation**

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoits Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.

2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.

3. The patient should also see the boxes with an “R” aligned over an “L”. 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.

4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.

5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what

- he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away?
5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
  6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
  7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to 3Δ Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."
  8. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, have the patient slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the patient is experiencing difficulty:
    - a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.
4. Continue until the patient has read the entire chart.

**SPORT SPECIFIC**  
**VOLLEYBALL**





## **SPORTS VISION - AND VOLLEYBALL**

Sports Vision Training consists of the learning and training of Dynamic Visual Skills. These skills include Accommodation and Convergence, Anticipation Timing, Concentration under Stress, Depth Perception, Eye-Hand Coordination, Peripheral Awareness, Speed and Span of Recognition and Visual Reaction Time. (For more in-depth explanations, see the attached Visual Skills definition sheet.) These are all learned skills that can be improved with practice.

The following is an explanation of the most relevant dynamic visual skills associated with volleyball.

### **ACCOMMODATION AND CONVERGENCE**

Eye tracking ability is important since quick, accurate saccades (or eye movements), are needed to rapidly survey the locations and movements of the other eleven players and the ball, in relationship to the net, boundary lines, etc.

Since the ball and other players move quickly, it is necessary to shift focus from near to far or intermediate targets rapidly throughout the contest.

#### Accommodation activities:

- Brock string
- BIM/BOP
- Near/far Hart Charts
- Window Rock
- Vectograms

#### Eye Tracking Activities:

- Marsden Ball
- Scanning Trails
- Penny Drop
- Bal-a-Vis X-ball toss and catch
- Sequential Tracker

#### Divergence Activities

- Binasal occlusion
- Brock String
- Far Hart Charts
- Projected Quoits
- Vectograms
- Aperture Rule

## **CONCENTRATION**

In this fast-moving sport, where so many play developments and tactics are used, it is very important for all players to keep constant focus on the ball throughout each volley.

### Activities

- Space Fixator
- Stroop Chart
- Tandem walk
- Infinity walk while reading Hart Chart
- Bal-a-Vis-X
- Rush Hour
- Continuous Motion

## **DEPTH PERCEPTION**

Necessary for accurate serving, setting and boundary line play or no play determination.

### Activities

- Vectograms
- Space Matching
- Lens Sorting
- Suspended ball
- Patient reach out and touch various targets held by therapist at various distances
- Ball toss/catch with various size balls at various distances Brock String
  
- Projected Quoits

## **EYE FATIGUE**

Volleyball is a very fatiguing sport which requires excellent conditioning. Physical fatigue can greatly affect concentration, visual reaction time and eye-hand coordination. Eye fatigue can also affect performance levels in much the same way. When the muscles in our eyes feel tired or strained, we feel the fatigue all over. Just like a weightlifting routine is used to increase physical endurance, visual exercises can be used to strengthen the eye muscles and thereby, reduce eye fatigue.

### Activities

- Brock String
- Projected Quoits
- Missing Letter Charts
- Stroop Chart
- Vectograms
- Hart Charts, various
- Scanning Trails

## Marsden Ball

### **EYE-HAND COORDINATION**

The visual system leads the motor system. Our hands or feet or body respond to the information the eyes have sent to the brain. If the information is incorrect, even to the slightest degree, there is a good chance that we will err in our physical response. In volleyball, this skill becomes one of the most important, when serving, passing, setting, bumping, blocking, diving or spiking.

#### Activities

Ball Tap

Ball Batting

Bean Bag Toss/Catch

Space Fixator

Ball toss/catch with X-Trainer chart

Ball toss/catch in hallway while tapping peripheral targets

Bal-a-Vis-X (rhythmic bounce to floor/catch 2 balls with partner)

## **PERIPHERAL AWARENESS**

Peripheral acuity is very important for a volleyball player on either defense or offense as the player must always focus on the ball while also maintaining an awareness of where his fellow teammates are in relation to the offensive or defensive alignments of the opponents.

### Activities:

- Brock String
- Marsden Ball
- Lora's Card
- Bean Bag toss to peripheral targets on floor
- Tandem walk in hall with hand tap to targets on wall
- Circular toss/catch with suspended ball
- Prism work

## **SPEED AND SPAN OF RECOGNITION**

The amount of time it takes a player to recognize a play and react to it, by adjusting his/her body position, can be crucial. Opportunities to return a spiked ball, which can be travelling at over 70mph, only present themselves for a fraction of a second. Absorbing as much information as possible will enable players to anticipate all possible play developments and therefore foil any surprising tactic or play.

### Activities

- Near/far Memory Game
- Ace to King Card Game
- 2 ball (2 different colors) toss-patient catches color called out by trainer as balls are tossed.

## ACTIVITIES

### **Ace to King- trains visual skill speed and span of recognition**

Materials: One deck of playing cards

1. The patient sits comfortably with good posture at a desk or table.
2. The therapist sorts the deck of cards by suit; use a set of 13 cards of the same suit, from ace to king.
3. The therapist shuffles the 13 cards and places them face down in a row in front of the patient.
4. The patient turns each card over one at a time to see which card it is and then turns it back face down.

### **Aperture Rule- trains visual skill of divergence**

Materials: Aperture Rule and Aperture Rule cards

1. Follow the directions as indicated on the aperture rule cards.
2. Use the double aperture to work divergence, setting the aperture to the setting indicated on the chosen card.
3. Use the single aperture to work convergence, setting the aperture to the setting as indicated on the chosen card.

### **Bal-A-Vis-X- trains visual skill of anticipation timing**

Materials: Two bean bags (weighted if possible), 2 balls

1. Begin in seated position, therapist sits opposite patient. Patient tosses bean bag from their left hand to therapist's right hand, therapist flips bean bag from his/her right hand to left hand then tosses bean bag to patient's left hand, continue in circular pattern. When working peripheral: goal for patient is to maintain awareness of bean bag movement through his/her peripheral field. Load activity by changing direction. Progress to adding second bean bag (patient and therapist will each toss a bean bag to the others opposite hand and flip the bean bag at the same time).
2. Address pursuits by having patient follow bean bag with eyes (using one bean bag).

Increase demand: 1. Patient and therapist stand opposite of each other, each holding a ball in one hand. 2. Patient and therapist simultaneously bounce their ball to the floor towards the opposite person. 3. Patient and therapist simultaneously catch the ball tossed by the other person and repeat.

### **Ball Batting- trains visual skill of anticipation timing**

Materials: Ball on a string, Visual Motor Stick or a stick 2 feet in length which is marked at 2", 3", and 4" intervals. Write a number or letter in each interval on the stick. Metronome (optional)

- 1.The patient holds the visual motor stick horizontally with one hand on each end so that the numbers are facing them.
- 2.The therapist holds the string with the suspended ball approximately three feet away from the patient so it is at their chest level. As the therapist calls out the number, the patient hits the ball with the corresponding part of the visual motor stick.
- 3.The patient continues hitting the ball, maintaining a steady rhythm, until a new number is called. The patient then switches to the new number called and continues.
- 4.The patient should hold their head still and locate the proper point on the visual motor stick by moving their eyes only.

Patient bats the ball in time to a metronome.

### **Ball Tap- trains visual skill of eye hand coordination**

Materials: Ball attached to the end of a string approximately 4 feet in length

- 1.The therapist holds the string so that the suspended ball is located one to two feet away from the patient at eye level. The patient begins by tapping the ball lightly in a regular rhythm with their dominant hand.
- 2.The patient taps the ball with alternate hands, maintaining a steady rhythm
- 3.Next, the patient taps the ball with just one finger, again beginning with the dominant hand and then alternating left and right.

Decrease demand: use a larger ball progressing to smaller ball

### **Ball Toss/Catch- trains visual skill of anticipation timing**

Materials: Ball of appropriate size for patient age and skill level.

- 1.Therapist stands opposite patient.
- 2.Toss and catch the ball at the appropriate challenge for the patient.

Increase demand:

- a. Tape targets to both walls of a hallway. Patient walks in the hallway and taps the targets on the wall while tossing and catching the ball.
- b. Incorporate step ups (using a stable wooden box or step-up platform).
- c. Patient performs side lunges while tossing and catching ball.

### **Ball Toss/Catch with Various Size Balls at Various Distances- trains visual skill of anticipation timing**

Materials: Various size balls, i.e. beach ball, tennis ball, web ball

1. Patient and therapist stand facing each other.
2. Toss and catch the ball while therapist gradually steps forward or backward.
3. Perform this exercise with different size balls.

### **Bean Bag Toss to Peripheral Targets on Floor- trains visual skill of peripheral vision/awareness**

Materials: Assorted bean bags, shallow buckets, rings or hoops or assorted colored construction paper for use as targets

1. Targets arranged in an “A” pattern on floor with the top of the “A” closest to the patient.
2. Have patient fix eyes on distant target.
3. Have patient toss bean bags to targets using peripheral vision.
4. Load task by changing arrangement and/or size of targets, add balance activity.
5. Work pursuits by having patient follow bean bag with eyes when tossing to target.

### **BIM/BOP- trains the visual skill of Accommodation**

Materials: Two vectograms, one vectogram stand, +/- 2.00 flippers

1. Place one vectogram in the top position of the vectogram stand set at convergence demand (3). Place the different vectogram in the bottom position of the vectogram stand set at divergence (C).
2. The patient is seated in front of the vectogram stand and is provided with polarized glasses and +/- 2.00 flippers.
3. The patient is instructed to hold the (+) side of the flipper over their eyes and look at the top vectogram, making it clear. Once they can keep the image single and clear, they then rotate the flipper so the (-) lens is over their eyes and shift their focus to the bottom vectogram and make it clear.
4. The patient continues to look between the 2 vectograms for 5 cycles of the flippers.
5. Once the patient can master this phase, the therapist will increase the convergence/divergence demand by sliding the vectogram by 3<sup>Δ</sup> (6, F).
6. The patient is to look between the top vectogram and the bottom vectogram keeping the images single and clear for 5 cycles.

7. Once the patient can accomplish this, the therapist continues to change the convergence/divergence demands as the patient is able to keep the images single and clear.

### **Binasal Occlusion- trains the visual skill of divergence**

Materials: Cloudy scotch tape and a pair of dollar store readers with lenses removed (optional)

Binasal occlusion helps with orientation, reduces visual noise/stimuli and strain on the binocular system and increase peripheral awareness.

1. Use patient's existing glasses or a pair of dollar store readers with the lenses removed.
2. Add cloudy scotch tape to the edge of the iris.
3. Apply the tape vertically or at an angle (narrowing towards the bottom edge of the frame, wider at the top edge of the frame).
4. The width of the tape is based on what the patient indicates is most comfortable.

### **Brock String- trains the visual skill of accommodation**

Materials: Brock String

1. The patient should be seated or standing in a relaxed, balanced posture.
2. Attach one end of the string to a stationary object at a height slightly below eye level or have therapist hold the string.
3. Place 3 beads on the string at various distances, each bead should have a small letter or number placed just above the opening of the bead.
4. The patient holds the other end of the string between the thumb and forefinger just below the nose, exactly on the mid-line.
5. The patient shifts his focus from one bead to another in random order while calling out the letter or number on the bead.
6. The goal is to see the string form an "X" at each bead, the bead of focus remains single while the remaining 2 beads appear double.

### **Continuous Motion- trains the visual skill of concentration**

Materials: Continuous Motion Chart (a chart with numbers 1-30 scattered on the page)

1. Have patient be seated in a relaxed comfortable position with the number chart placed in front of them at a good working distance
2. Using the number worksheet, have the patient circle the number "1" as long as needed until they find number "2" then without picking up the pencil, circle number "2" and continue



circling until they find the next corresponding number. Continue to circle numbers in numerical order until reaching number “30”.

3. The pencil should be moving at all times; do not lift the pencil up from the paper.

Increase Demand: Instruct the patient they are only allowed to circle each number 3 xs. Circle odd numbers clockwise and even numbers counterclockwise. Circle numbers in reverse sequence, starting at 30.

### **Far Hart Chart- trains the visual skill of divergence**

Materials: Hart Chart

1. Hang Hart Chart on wall
2. Have patient step back from the chart until it becomes blurry, next step 2 steps forward.
3. Read Hart Chart vertically, horizontally or first and last letter of each row or column.

### **Hart Chart- trains the visual skill of anticipation timing**

Materials: One or two Hart Charts, metronome (optional)

1. Patient seated, Hart Chart held at arms distance, gradually increase distance of chart from patient. Add anticipatory task by incorporating a metronome. Add dynamic activity by having patient perform rope pull while reading Hart Chart.
2. Patient is seated, instruct patient to read alternate lines from 2 Hart Charts placed vertically, horizontally or diagonally from each other.

### **Hart Chart Variations- trains the visual skill of eye fatigue and performance levels**

Materials: Hart Chart cut into four sections, Hart Chart cut into strips, color dot charts, animal charts, and shapes charts

1. 4 Corners Hart Chart: Hart Chart cut into 4 sections, tape sections to wall spaced several inches apart forming a square. Patient reads left to right, starting with the letter in the upper left corner of each section, then proceeds to the second letter in the first row of each section, progressing through each row of each section. Load by increasing separation of sections.
2. Saccadic strips: Cut Hart Chart into columns, tape 1 column on each side of a doorway.
3. Hart Chart with pictures of cartoon characters, animal, or color dots. (For the younger population).
4. Have patient read first/last letters, all odd or all even letters, etc.
5. Walk Aways: Patient reads chart while walking to and away from the chart.

6. Incorporate a metronome with patient reading letters of chart in time to the rhythm of the metronome.

Increase Demand: Incorporate toe tap to Dyna Disc, or balance activity.

### **Infinity Walk- trains the visual skill of dynamic visual acuity, eye/hand/body/foot coordination, concentration**

Materials: Two cones or two chairs, various charts and/or ball

1. Place 2 items (cones, chairs, etc.) on the floor approximately 6 feet apart. This will form the openings of the figure 8 to guide the patient.
2. Place a chart or fixation target at a 90-degree angle from the center of the figure "8".
3. Instruct patient to walk in a figure "8" pattern around the cones while maintaining fixation on the fixation target. If they are unable to fixate without changing the direction of their head, they are walking the wrong direction, have them change direction.

Decrease demand: Instruct patient to walk the pattern in segments, i.e. walk the diagonal, stop and rest, proceed to walk around the cone, stop and rest, and then walk the diagonal back to the starting point.

Increase demand: 1. Require the patient to read a Hart Chart, X-Trainer Chart, shapes chart, etc. placed at the center of the figure 8, at a 90-degree angle. 2. Require the patient to identify items on a flashcard or even to toss a ball back and forth as they cross the center of the figure "8". 3. Have patient catch a ball each time he/she crosses the "x" in the infinity pattern.

### **Lens Sorting- trains the visual skill of depth perception**

Materials: Assorted plus and minus lenses, interesting target or a chart posted on a wall

1. Patient stands in a relaxed balanced posture.
2. A patch is placed over one eye.
3. The patient is instructed to look at a target in the distance.
4. Minus lens ranging from -.50 to -5.0 are placed within reach of the patient.
5. The patient is instructed to look through the various lens at the target in the distance, noticing the spatial difference within each lens.
6. Next, have the patient to arrange the lens in order based on the strength and the spatial difference from closer to farther.
7. Switch the patch and repeat the procedure on the opposite eye.

### **Lora's Card- trains the visual skill of fixation ability**

Materials: Lora's Card

1. Place the card at reading distance (elbow to knuckle).
2. Keep eyes focused at the central fixation dot.
3. Peripherally locate each letter in alphabetical order.
4. Touch each letter as it is located, and check for accuracy (look at it).
5. Refixate the central target before peripherally locating the next letter in order.
6. Load task by locating every other letter, reverse sequence, spell words or add a
7. Balance demand.

### **Marsden Ball- trains the visual skill of eye fatigue**

Materials: Suspended Marsden Ball

1. Patient and therapist stand opposite of each other.
2. Instruct patient to call out letters on the ball as it is being swung between the patient and therapist.
3. Swing the ball left and right while having the patient following the swinging ball with eyes only and calling out letters.

Increase Demand: Incorporate balance activity such as standing on balance board, sitting on Swiss ball, or marching in place.

### **Missing Letter Charts- trains the visual skill of eye fatigue**

Materials: Chart with scattered letters

1. Patient reads chart vertically or horizontally

### **Near Far Hart Chart- trains the visual skill of accommodation**

Materials: Near Hart Chart and Far Hart Chart

1. Patient is seated or standing 6-8 feet from the wall, with large chart taped to the wall at eye level.
2. Patient holds the small chart in his/her hand at eye level so the top line of the distant chart is just visible over the top of the near card.
3. Patient then shifts focus from near to far, reading alternate lines or letters from each chart.

4. When shifting focus from near to far, ensure the letters are clear before moving on. Progress to increasing the distance from the far chart and decreasing the distance between the near chart and the patient's eyes. Work toward increasing the speed of shifting between distances.

### **Near Far Memory Game- trains the visual skill of speed and span of recognition**

Materials: Collection of small objects: blocks, toy's, coins, etc., metronome

1. Ask the patient to sit across from you.
2. Place three or four objects on the table in front of you (near to far).
3. Ask the patient to "load" the objects into their visual memory. They should count aloud while "loading"
4. Block the patient's view of the objects with a folder.
5. Ask the patient to label the objects #1, #2, #3, etc. starting with the near object and working to the farthest object.
6. Ask the patient to identify the objects out of order until all of the objects are identified.
7. Next, ask the patient to imagine that the 1st object is being moved to the end position at distance. Continue to move different objects to different positions until 4 moves have been made. Remember, the objects have not been viewed by the original "loading". They must continue to imagine the positional changes in their minds eye.
8. Once 4 moves have been accomplished, begin to switch 2 objects (as in trading places) i.e.: the 1st and the last, trade with the 2nd and the 3rd positions, etc.  
Increase Demand: 1. Increase the number of objects. 2. Decrease the amount of "loading" time.

### **Penny Drop- trains the visual skill of eye tracking**

Materials: One penny, one cup, and a clicker or bell.

1. The patient holds the penny lightly between their thumb and forefinger of their dominant hand. The therapist stands facing the patient, holding a small container with one hand. With the other hand, the therapist holds a clicker or bell out of the patient's sights.
2. The therapist moves the container continuously in all directions within reach of the patient.
3. The patient keeps the penny directly above the container as it moves around. The patient tracks the container visually and with their own hand while keeping his head still at all times.

When the therapist clicks the clicker or gives a verbal cue, the patient must release the penny immediately. If the patient has been accurately tracking the moving container, the penny falls directly into the container

## **Prisms- trains the visual skill of stress effect**

Materials: Various prisms

A patient may experience a mismatch between his/her sense of "straight-ahead" and the objective direction of straight ahead. They may feel "out of synch" with their environment, experience mislocalization of objects and difficulty with ambulation. Yoked prisms with their bases in the same direction such as "bases left or 'bases right" can reduce this perceptual mismatch and improve spatial abilities. Prisms with both bases in, or both bases out can reduce visual clutter/stress and increase peripheral awareness.

1. Start with a low diopter prism such as a 2 or 3 diopter.
2. Trial various diopters of prisms in various positions looking for the position and diopter which elicits the most positive response from the patient.

## **Projected Quoiets- trains the visual skill of accommodation and convergence**

Materials: Quoiets vectogram, overhead projector, screen

Convergence Therapy Set the Quoiets vectogram at zero prism demand and explain to the subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. Step One: separate the sheets to 3Δ Base-out and patient try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two:

1. Instruct the patient to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the patient the importance of the awareness or feeling of "looking close" and "crossing his or her eyes."

2. Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly.

3. If the patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. b. Use the feedback technique of localization to show him how to regain fusion.

4. Divergence Therapy: For divergence, separate the targets so that the letters are shown.

5. The same steps are followed for divergence therapy except that the patient will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.

6. After 6-8Δ Base-in, the target will be too far behind the targets for the patient to point.

7. The patient should be able see one set of Quoiets by looking beyond the Vectogram at the central letter chart on the wall.

8.If patient cannot, slightly wiggle the center letter chart or the slides. Continue separating the targets by 3 letters at a time until the patient is able to fuse the Quoits at letter “L”. Endpoint 25Δ Base-out. and 12Δ Base-in.

### **Rush Hour- trains the visual skill of concentration**

Materials: Single player Rush Hour game

- 1.Choose a card appropriate for the patient.
- 2.Patient places game pieces on game board as shown on selected game card.
- 3.Patient moves game pieces in such a way that allows the specified game piece to exit the game board.

### **Scanning Trails chart- trains the visual skill of accommodation and convergence**

Materials: Scanning Trails charts

- 1.Note the letters are arranged in a column on the left side of the page and the numbers are arranged in a column on the right side of the page.
- 2.There is a curved line connecting each letter on the left side of the page to one of the numbers on the right side of the page.
- 3.Have the patient look at the letter “A” and, using only his/her eyes, follow the curved line from “A” to the correct number on the right side of the page, and call out the number.
- 4.Encourage the patient to keep his/her head still and not to use his/her finger to follow the curved line from letter to number.
- 5.Continue until each letter has been matched to the appropriate number.

### **Sequential Tracker- trains the visual skill of eye tracking**

Materials: Sequential Tracker sheet, metronome

- 1.Hold the sequential tracker at the patient’s reading distance. It may be supported by a book stand or taped to a window for rear illumination.
- 2.Look at the first target in the upper left corner. Be aware of as much of the surrounding field of view as possible.
3. Move your eyes from one target to the next along the top line. A pointer may be used initially for feedback. When you have reached the last target on the right, make the long sweep back to the first target on the left.

4.Repeat the sequence five times, rest for half a minute, then repeat.

Strive for both speed and accuracy, but of the two, accuracy is the most important.

Eliminate any regressions (looking back at targets already passed over).

Maintain a rhythmic shift from target to target. Rhythm is more important than speed.

Begin with the metronome set at a slower speed to master control of the eye movements.

Be sure you see each target clearly, and remember to be aware of as much as possible in your side vision. When you look at one target, are you aware of the next target? Strive to make each eye movement accurate, speedy, and direct

### **Space Fixator/Clock- trains the visual skill of concentration**

Materials: Space Fixator

Inform the patient that the dots are arranged like the face of a clock, each dot represents a number on the clock.

1.Instruct patient to look at the center dot which is the “thinking spot” and the starting position.

2.Instruct patient to “think about” number 1 and visualize where it is while maintaining fixation on the center dot.

3.Instruct the patient to “look at” number. Watch the patient’s eyes to see if they go directly to the number 1 or if they use a searching pattern to locate it.

4.Instruct the patient to “touch” number 1 then return to eyes and finger to start position of the center dot.

5.Patient continues to call out numbers in order from 1-12, pay attention to eye movement and ability of the patient to look directly at desired number.

Peripheral training with Space Fixator: instruct the patient to maintain fixation on the central dot while calling out each number on the clock, using peripheral vision only, observe if the patient is able to locate the number called out.

### **Space Matching/Estimation- trains the visual skill of depth perception**

Materials: Various objects such as cones, bean bags, taped lines, etc.

1.The patient estimates the number of steps it will take to walk to various objects across the room and then paces out the steps. The patient then estimates how many steps it will take the therapist to walk to the same objects and pace them out.

2.The patient estimates the length of various tape lines visually and places them in order from shortest to longest. The patient then measures the lines with a ruler or yard stick.

## **Stroop Chart- trains the visual skill of concentration**

Materials: Small and Large Stroop Chart

1. Patient stands or sits in front of large posted Stroop chart and reads chart as printed.
2. Patient names the color of ink on printed words rather than reading the words.
3. Patient alternately reads the word with naming the color of the ink.

Dynamic Activity task: Read small Stroop Chart while riding stationary bike or working on stationary rower.

## **Suspended Ball working peripheral or pursuits- trains the visual skill of depth perception, eye tracking, peripheral awareness, anticipation timing**

Materials: Suspended ball, Hart Chart (optional)

1. Patient is seated in chair with eye fixed on horizon. As the ball is gently pushed in a circular movement, instruct the patient to notice the movement of the ball peripherally and catch the ball as it approaches. Load this task by incorporating a Hart Chart and/or increasing the size of the circular movement of the ball. Balance may be added with a balance board, bosu ball or swiss ball.
2. Work pursuits by having the patient follow the moving ball with eyes. Load this task by increasing the circular movement of the ball; incorporate a balance task such as balance board, bosu ball or swiss ball.

## **Tandem Walk- trains the visual skill of concentration**

Materials: Hallway, small pictures, shapes, etc. posted on each wall of hallway

1. Instruct patient to walk heel to toe forward and backward along a wall or in a long hallway.
2. Post various targets, i.e. shapes, small pictures, words, numbers, etc. on the walls of the hall.
3. Instruct the patient to keep his/her eyes focused on the horizon, use peripheral vision to note and then reach to touch targets while performing the tandem walk.
4. Change demand by having patient rotate head left and right to find targets.

Decrease demand: Have patient perform tandem walk in wheelchair or wheeled chair (safety first with wheeled chair). Patient performs tandem walk only.

Increase demand: Instruct the patient turn head to left/right to note and touch targets posted on the wall.



## Vectograms- trains visual skill of accommodation

Materials: Assorted vectograms, polaroid glasses, vectogram holder

1. The patient wears Polaroid glasses and the Quoits Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.
2. Ask the patient to describe what he or she sees. The patient should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
3. The patient should also see the boxes with an "R" aligned over an "L". 3. If the subject doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to the next step.
4. Determine if the patient is able to appreciate blur by slowly increasing the convergence demand until the patient loses clarity. Ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes smaller and moves closer.
5. While slowly separating the two sheets to create a small amount of divergence demand, ask the patient to try and keep the picture clear and single and describe what he or she is seeing. The patient should notice that the target becomes larger and moves farther away. If the patient is unable to spontaneously describe this, it is important to ask leading questions to obtain these responses. Sample questions are: Is the picture becoming larger or smaller? Is the picture coming closer or moving farther away? 5. Establish whether the patient is experiencing SILO [small and in (SI) with convergence and large and out with divergence (LO)] or SOLI [small and out (SO) with convergence and large and in with divergence (LI)] D.
6. After establishing that the patient appreciates SILO, slowly increase the convergence demand and ask the patient to point to where the target appears to be floating in space. Ask the patient to point to different parts of the stimulus. Explain to the patient that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.
7. Convergence Therapy: Set the targets at zero prism demand and explain to the patient that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps. tip One: Tell the patient to separate the sheets to 3Δ Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown). Step Two: Instruct the subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the patient sees one pointer and one target. Stress to the patient the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."

Once the patient can perform these steps, while the Vectograms slides are set at 3Δ Base out, have the patient slowly separate the targets to 6Δ Base-out and repeat steps one and two. At some level the patient will be unable to successfully complete even step one, to see the circles clearly and singly. If the

patient is experiencing difficulty: a. Suggest that the patient get the feeling of looking close and crossing his or her eyes. Use the feedback technique of localization to show him how to regain fusion.

### **Window Rock- trains visual skill of accommodation**

Materials: Near Hart Chart, +2.00 readers, -4.00 lens

1. The patient stands in front of a window facing out into the distance fixating on a target.
2. The patient puts on and wears +2.00 readers to look out a window and find a fixation point in the distance. It will be blurry. Try to clear it.
3. Next, the patient looks at a near Hart Chart using -4.00 lens placed over the readers. Try to clear. Switch back and forth having patient clear distant target then read Hart chart.
4. Continue until the patient has read the entire chart.

## Vision Skills and Activities Organized by Skill

### **Accommodation activities**

Athletic activities requiring these skills: Badminton, Baseball/softball, basketball, football, hockey, motor sport racing, pilots, skiing

Brock string  
BIM/BOP  
Near/Far Hart Charts  
Window Rock  
Vectograms

### **Anticipation Timing Activities**

Athletic activities requiring these skills: Badminton, Baseball/softball, Boxing, Football, Hockey, Law Enforcement Basketball, Military, Motor Sports, On Ice Official, Pilots, Skiing, Table Tennis, Tennis

Ball batting with Metronome  
Percon Saccades  
Penny Drop  
Suspended Ball  
Ball toss/catch  
Bal-A-Vis-X  
Hart Chart with Metronome

### **Concentration**

Athletic activities requiring these skills: Badminton, Basketball, Boxing, Football, Golf, Hockey, Law Enforcement, Military, Motor Sports, Pilots, Skiing Soccer, Table Tennis, Volleyball

Rush Hour  
Space Fixator  
Continuous Motion  
Stroop Chart  
Tandem Walk  
Infinity Walk while reading Hart Chart  
Bal-A-Vis-X

### **Depth Perception**

Athletic activities requiring these skills: Badminton, Basketball, Boxing, Football, golf, Hockey, Law Enforcement, Motor Sport, On Ice Official, Pilots, Skiing, Soccer, Table Tennis, Volleyball

Vectograms

Space Matching

Lens Sorting

Suspended ball

Patient reaches out and touch various target held by therapist at various distances

Ball toss/catch with various size balls at various distances

Brock String

Projected Quoits

### **Divergence**

Athletic activities requiring these skills: Basketball, Football, Hockey, Law Enforcement, Motor Sports, On Ice Official, Pilots, Skiing , Soccer, Table Tennis, Volleyball

Bi-nasal occlusion

Brock String

Far Hart Charts

Projected Quoits

Vectograms

Aperture Rule

### **Dynamic Visual Acuity**

Athletic activities requiring these skills: Baseball/Softball, Basketball, Motor Sports

Hart Charts, various

Penny Drop

Stroop Chart

Rope Pull with letter/number chart

Hart Chart with Infinity Walk

4 corners chart with toe tap to dyna disc

Head turn left/right to targets with tandem walk

Small Stroop chart on stationary bike

### **Eye Alignment**

Athletic activities requiring these skills: Baseball/Softball, Basketball, Motor Sports

Brock string

Lifesaver Cards

JND

Space Fixator  
Eye stretches with clothespins and rings  
Eye pointing in front of mirror  
Prisms  
VOR

### **Eye Fatigue**

Athletic activities requiring these skills: Badminton, Basketball, Boxing, Football, Hockey, Soccer, Table Tennis, Tennis, Volleyball

Brocks String  
Projected Quoits  
Missing Letter Charts  
Stroop Chart  
Vectograms  
Hart Charts, various  
Scanning Trails  
Marsden Ball

### **Eye Hand Coordination**

Athletic activities requiring these skills: Badminton, Baseball/Softball, Basketball, Football, Hockey, Law Enforcement, Military, Motor Sports

Ball Tap  
Ball Batting  
Bean Bag Toss/Catch  
Space Fixator  
Ball toss/catch with X-Trainer chart  
Ball toss/catch in hallway while tapping peripheral targets  
Bal-a-vis-x (rhythmic bounce to floor/catch 2 balls with partner)

### **Eye Hand/Body/Foot Coordination**

Athletic activities requiring these skills: Boxing, Golf, ON Ice Official, Pilots, Skiing, soccer, Table Tennis, Tennis, Volleyball

Step ups/side lunges with ball toss/catch  
Infinity walk with ball toss/catch  
Infinity Walk with Hart Chart  
Tandem Walk with Peripheral Touch  
Bola Ball  
Motor Mimic with Hart Charts

## **Eye Motility**

Athletic activities requiring these skills: Boxing

Eye Stretches

Vertical/Horizontal, Diagonal Saccades

Alternating Hart Charts, 4 corners charts

X-Trainer chart with Infinity Walk

Fitz's Fixator

Space Fixator

VOR

## **Eye Tracking Activities**

Athletic activities requiring these skills: Baseball/Softball, Basketball, Football, Hockey, Law Enforcement, Motor Sport, On Ice Official, Pilots, Skiing, Soccer, Table Tennis, Tennis, Volleyball

Marsden Ball

Scanning Trails

Penny Drop

Suspended ball

Bal-a-vis-x/ball tosses and catches

Sequential Tracker

Scanning Trails chart

## **Fixation**

Athletic activities requiring these skills: Basketball, Golf, Soccer

Lora's Card

Space Fixator

Flashlight Tag

Brocks String

VOR

AIT

### **Focusing and Tracking**

Athletic activities requiring these skills: Golf

Make infinity pattern in air with right hand then left hand then both hands together, eyes remain on thumb of hand making infinity pattern.

Letter find on swinging Marsden ball

Trail Making Charts

Sequential Tracker

Continuous Motion

### **Initiation/Visual reaction Speed**

Athletic activities requiring these skills: Badminton, Military

Bal-a-Vis X- One or two bean bag toss/catch

Ball toss/catch from various distances, heights and angles

Ball Batting

Ball Tap

### **Peripheral Awareness**

Athletic activities requiring these skills: Badminton, Basketball, boxing, Football, golf, Hockey, Law Enforcement, Military, Motor Sports, On Ice Official, Pilots, Skiing, Table tennis, Tennis, Volleyball

Brock String

Marsden Ball

Lora's Card

Bean Bag toss to peripheral targets on floor

Tandem walk in hall with hand tap to targets on wall

Circular toss/catch with suspended ball

Prism work

### **Speed and Span of Recognition**

Athletic activities requiring these skills: Baseball/Softball, Basketball, boxing, Football, Hockey, Law Enforcement, Military, Motor Sports, On Ice Official, Pilots, Skiing, Soccer, Table Tennis, Tennis, Volleyball

Near/far Memory Game

Ace to King Card Game

2 ball (2 different colors) toss-pt catches particular color called out by trainer as balls are tossed.

**Stress Effect**

Athletic activities requiring these skills: Law Enforcement, Military

Bi-nasal occlusion

Peripheral work with suspended ball

Prisms

**Visual Memory**

Athletic activities requiring these skills: Law Enforcement

Parquetry

Pt describes placement of items in a room in his/her home or lists events of his/her day in order of occurrence

Ace to King Card Game

Near/Far Memory Game

**Visual Reaction Speed**

Athletic activities requiring these skills: Basketball, Tennis

Bal a Vis X- One or two bean bag toss/catch

Ball toss/catch from various distances, heights and angles

Ball Batting

Ball Tap

**Visualization**

Athletic activities requiring these skills: Boxing, Golf, Tennis

Rush Hour

Color Cubes

3D I Spy

Parquetry

Ace to King

Parquetry with rotation and flips

**Visual Reaction Time/Initiation Speed**

Athletic activities requiring these skills:

Near/far Memory Game

Ace to King Card Game



2 ball (2 different colors) toss-pt catches particular color called out by trainer as balls are tossed.