

Chapter 7: OBVAT with Home Reinforcement

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Chapter 7: Office-based Vergence/Accommodative Therapy with Home Reinforcement (OBVAT)

7.1 General Principles and Guidelines for OBVAT

OBVAT requires a participant to undergo a specific therapy regimen with 16 weekly, 60-minute in-office treatment sessions. Vision Therapists (O.D., M.D., Orthoptists, or specially-trained technicians) administer the therapy in the office. OBVAT procedures are then supplemented with various home therapy procedures.

1. The OBVAT program has been divided into 4 phases. (See Appendix) Within each phase there are a number of categories such as gross convergence, vergence, and accommodation.
2. The therapy procedures in each category have been arranged sequentially from easiest to most difficult.
3. Each therapy procedure is described in this manual. The description includes the objectives, required equipment, procedure setup, procedure description, and the endpoint.
4. The endpoints are reasonable estimates of what we believe each participant should be able to achieve. These endpoints should be considered guidelines, rather than rigid criteria. Thus, if a participant appears to have attained the stated objectives of the therapy technique but is unable to achieve the precise endpoint, the investigator may move to the next procedure after a reasonable effort. The investigator should continue to work on prior techniques to achieve endpoints.
5. We anticipate that approximately 4 weeks will be required to complete each phase. This is only a guideline and in some cases a participant may complete the techniques in one phase sooner or later than this estimate. There is no minimum amount of time required for each phase. The investigator can move from one phase to another as quickly as the participant reaches the stated endpoints.
6. It is possible for a participant to complete the entire OBVAT sequence in less than 16 weeks. If this occurs, the participant will continue to come in for weekly visits and the therapy procedures used for these visits will be the final procedures (most difficult) in each category (gross convergence, vergence, and accommodation).
7. The principal investigator at each site will be responsible for monitoring the progress with therapy and recommending changes to the procedures performed at each visit as needed.
8. The vision therapy will always be performed on a one to one basis (one therapist per participant).

7.1.1 Therapist Instructions

It is important to understand that there are general principles and guidelines that apply to all binocular vision and accommodative techniques. Vision therapy is similar in many ways to other types of therapy that involve learning and education. If we look at other types of learning it becomes clear that there are specific guidelines to facilitate learning and success. Since vision therapy can be considered to be a form of learning and education, similar principles and guidelines are used to achieve success. Therapists should adhere to the following guidelines:

Determine a level at which the participant can perform easily

Working on this level makes it easier for the participant to become aware of the important feedback cues, strategies, and objectives involved in vision therapy. It also builds confidence and motivation.

Be aware of frustration level

Signs of frustration include: general nervous and muscular tension, hesitating performance, and possibly a desire to avoid the task.

Use positive reinforcement

The participant should be rewarded for attempting a task, even if it is not successfully completed. Reinforcements can be verbal praise, tokens that can be exchanged for prizes, or participating in a task that the participant enjoys.

Maintain an effective training level

Start at the initial level at which the task is easy and gradually increase the level of difficulty, being very careful to watch for signs of frustration. Vision therapy should be success-oriented, that is, build on what the participant can do successfully as opposed to giving tasks that are too difficult.

Emphasize to the participant that changes must occur within his or her/her own visual system

A key to success in vision therapy is teaching the participant to internalize changes in visual function, as opposed to just achieving certain criteria for specific techniques. Often, as participants go through a vision therapy program, they gain the impression that it is the instrumentation, lenses, or prisms that affect the change in their visual system. Unless told otherwise, a participant may believe that these external items are the keys to their success in vision therapy.

It is important to stress that the participant must be made aware that the changes actually occur internally, within the visual system, and not externally in the instruments and paraphernalia utilized in vision therapy. To accomplish this objective the language used in communication between the therapist and participant is critical.

Examples:

When performing a fusional vergence technique the therapist might say

"Try and keep the picture single."

The problem with this instructional set is that while the participant is asked to try, the instructions are given in terms of what happens to the targets rather than what changes the participant must make internally to achieve the desired result.

Try the following approach instead.

Explain to the participant that if the picture is double it is because he or she is looking too far or too close in space. In order to make it single he or she needs to look nearer or farther; he or she needs to make adjustments within him or herself, in where he or she is pointing his or her eyes in space, and then the picture will become single.

The underlying important concept is that it is not just the specific technique that leads to success in vision therapy. Rather, the key factor is to get the participant to take responsibility for creating internal change.

Make the participant aware of the goals of vision therapy

The participant must know why he or she is in vision therapy. He or she should be able to explain what his or her problem is, how it affects performance and the goals of vision therapy. Even with a young child, the therapist should try to establish some understanding on the part of the child about what is wrong with his or her eyes and why vision therapy is necessary. For each therapy technique the child should be able to explain what he or she needs to do to accomplish the desired task.

Set realistic therapy objectives and maintain flexibility with these objectives or endpoints

With all therapy techniques there are certain general objectives that we expect to achieve before we proceed to the next procedure. Each technique in this manual has specific "endpoints." It is important to understand that these endpoints are only guidelines and that flexibility and clinical judgment are important in deciding when to move on to another procedure. The objective of vision therapy is to achieve the objectives of the technique as quickly as possible. If a participant can only achieve 23 Base-out (endpoint 25 Base-out) with the Quoits/Clown Vectogram procedure in spite of sufficient effort then it makes sense to move on and try another technique.

Use vision therapy techniques that provide feedback to the participant

When performance feedback is available to the participant, therapy and teaching progresses more effectively. The various feedback mechanisms used in vision therapy include:

1. Diplopia
2. Blur
3. Suppression
4. Luster
5. Kinesthetic awareness
6. SILO (Small In, Large Out) (use of vergence as a cue for distance perception)
7. Float
8. Localization

Methods to Overcome Obstacles and to Facilitate Progress in OBVAT

If a participant is experiencing difficulty converging, diverging, relaxing, or stimulating accommodation, it is important to try and help the participant overcome this obstacle, rather than simply make the task easier. The following techniques should be used throughout the therapy program to accomplish this objective.

Participant is Experiencing Difficulty with Gross Convergence

1. Suggest that participant try and get the "feeling" of looking close and crossing his or her eyes.
2. Have the participant touch the object that he or she is trying to fuse. This kinesthetic feedback is sometimes enough to help the participant achieve single vision.
3. Use binocular minus lenses to stimulate accommodative convergence.

Participant is Experiencing Difficulty with Positive Fusional Vergence

1. Suggest that the participant get the feeling of looking close and crossing his or her eyes.
2. Use the following feedback technique of localization to show him how to regain fusion.

Localization refers to the ability of the participant to point to where the target appears to be when fusion occurs, and is based on the concept of physiological diplopia. During a convergence technique the visual axes cross before the target and the participant should perceive the target as smaller and

closer. The participant can now be asked to pick up a pointer and point to where he or she sees the target "floating." The objective is for the participant to point to the target and perceive one target and one pointer.

If the participant places the pointer in the general area of where his or her visual axes cross, he or she will perceive one target and one pointer. If he or she points closer or farther away than the intersection of his or her visual axes, he or she will report diplopia of either the target or the pointer. The importance of localization is that it allows the participant to develop an understanding of what changes must occur within his or her visual system to accomplish the therapy task. If he or she can localize the target, he or she will begin to understand that when the targets are separated to create a convergence demand, he or she must look closer and cross his or her eyes to maintain single vision and fusion. We cannot overemphasize the importance of the participant developing this understanding of what changes he/she must make to accomplish a particular task.

Often when a participant is first asked to try and localize during convergence therapy, he or she experiences difficulty. At first he or she may tend to point to the actual plane of the target, rather than the intersection of the visual axes. It is useful to state:

"We both know that the targets are back there, but what I want you to do is to try and get the feeling of where you are looking and where the target is floating."

If the participant continues to have problems localizing, the next step is to make him aware of the concept of physiological diplopia and to use this phenomenon to get the participant started. The explanation we use with participants is as follows:

"The way the visual system works is that whatever object we are directly viewing is seen as one, all other objects are seen as double." It is then useful to demonstrate this by having the participant look at a pointer while you hold another object in the background. Have the participant experiment with this concept for several minutes until he or she is comfortable with this idea and is satisfied that he or she can experience physiological diplopia. Demonstrate that when the more distant object (seen as two) is moved closer to the fixation object, it will also be seen singly when it is in approximately the same position in space. If the participant now understands the concept that we experience single vision when pointing to where the eyes are looking, the idea can be applied to vision therapy techniques. For example, we are working with a Quoits/Clown Vectogram and a convergence demand and the participant when asked to localize, points too far away and experiences diplopia. If the participant understands the concept of physiological diplopia we would say the following:

"This time I want you to hold the pointer at the slides and look directly at the pointer. Do not try to keep the two Quoits/Clowns single. If you look at the pointer while you do so you will see two Quoits/Clowns in the background. Now slowly move the pointer toward you, always looking directly at the pointer and being aware of the two Quoits/Clowns. As you do this you will notice that as you move the pointer toward you, the two Quoits/Clowns appear to move closer to one another. Continue moving the pointer toward you very slowly and you will notice that at some distance you will see one pointer and one Quoits/Clown. This is where you must look to accomplish this task. Do you feel yourself looking closer? Try and get the feeling of where you have to look. Can you now understand where you have to look to see one Quoits/Clown? Can you see that the Quoits/Clown is floating closer?"

Generally the participant continues to be unable to simply pick up the pointer and immediately localize correctly. However, with repetition most participants will soon understand what they must do visually during convergence therapy.

As a last resort you may decrease the demand of the task. Rather than simply moving the targets closer together, it is preferable to use lenses or prism to accomplish this goal.

- a. Minus lenses
- b. Base-in prism
- c. Increase the working distance

Participant is Experiencing Difficulty with Negative Fusional Vergence

1. Suggest that the participant get the feeling of looking farther away and relaxing his or her eyes.
2. Use the following feedback technique of localization to show him how to regain fusion.

The following divergence therapy procedure is a powerful training technique and in most instances will lead to excellent progress with divergence therapy. The participant is asked to stand several feet in front of a ball that has been suspended from the ceiling. The height of this ball should be adjustable to permit the therapist to change the height so that it is at eye level for any given participant. A Quoit Vectogram is placed in a clear holder and the participant is instructed to hold the target at arm's length so that he or she can see the ball in the background directly in the center of the Quoits. As the Quoits targets are slowly separated to create a divergence demand the participant is asked to maintain fusion and describe where the target is floating. At this point the therapist pushes the ball to create motion in an arc moving towards and away from the participant. The participant should perceive that the ball is moving in front and behind the Quoits, which itself appears to be floating behind the plane of the actual Vectogram targets. As the targets are separated, the participant will have to continue moving backwards to keep the Quoits floating out at the point at which the ball just swings in front of and behind the Quoits. Once appreciated, this is quite a startling experience for the participant and provides the feedback necessary for him to understand that when fusing during divergence therapy he or she has to relax his or her eyes as if something is moving farther away from him.

3. As a last resort you may decrease the demand of the task. Rather than simply moving the targets closer together it is preferable to use lenses or prism to accomplish this goal.
 - a. Plus lenses
 - b. Base-out prism
 - c. Increase the working distance

Participant is Experiencing Difficulty with Stimulation of Accommodation

If the participant is experiencing difficulty at any level:

1. Suggest that participant try and get the "feeling" of looking close and crossing his or her eyes.
2. Decrease the demand by moving card away until the print is clear and then moving back to 40 cm.
3. As a last resort decrease the demand by decreasing the power of the lenses.

Participant is Experiencing Difficulty with Relaxation of Accommodation

If the participant is experiencing difficulty at any level:

1. Suggest that participant try and get the "feeling" of looking farther away, relaxing or staring.
2. Decrease the demand by moving the card closer until the print clears and then move back to 40 cm.

3. As a last resort decrease the demand by decreasing the power of the lenses.

7.1.2 Participant Instructions

Participants will be given a written set of instructions which describe how to perform the home therapy procedures. The participant will be given, at each therapy visit, new home procedures to perform 15 minutes, five times per week. The therapist will review this instruction sheet in detail at the first treatment and at each weekly office visit to ensure that the participant has a complete understanding of the technique. Participants will be asked to demonstrate all home therapy techniques to the therapist before leaving. In addition, the participant will be given a home log form and instructions for proper completion.

7.1.3 Weekly Office Visits

The participants in this group will meet weekly with the therapist. During the 60-minute office visit, much of this time will be spent on in-office therapy procedures. However, time must also be allotted to review the home therapy procedures. The therapist will question the participant about his/her home therapy procedures during the previous week and check the participant's home therapy log and progress. This will be an opportunity for the therapist to correct any errors in technique, provide suggestions about how to overcome any perceived obstacles with the treatment, and to encourage and motivate the participant.

The therapist should make every attempt to emphasize compliance and question the participant about problems/issues with home or office therapy. However, the therapist should not initiate discussion about the participant's symptoms. If such issues arise, the participant can be directed to the principal investigator for further discussion. The therapist should not have access to the participant's binder specifically results from the masked examinations. During weekly meetings between the principal investigator and therapist to review participant progress, the discussion should be directed towards progress with therapy procedures and/or protocol issues.

7.1.4 Investigator Instructions

The therapist will use a standardized set of instructions to instruct the participant in each phase of OBVAT.

7.1.5 Treatment Compliance

Participants will be required to keep a daily home log of the time spent on each activity/ procedure and bring the form with them to the weekly appointments (CITT-ART Home Log Sheet).

7.2 OBVAT Vision Therapy Equipment Needed

Brock String
 Barrel Card/3 dot card
 Dual Polachrome Orthopter/Illuminated Trainer
 Two Quoits/Clown Vectograms
 Loose Lenses (+2.00 D to -3.00 D in 0.50 D increments and -3 to -6 in 1.00 steps)
 Hopping cards
 Hart Chart (large and small letter chart cards)
 Aperture Rule and cards
 Random Dot Pads
 Clear Eccentric Circles
 Opaque Eccentric Circles
 Opaque Life Saver Cards
 Lens Flippers (+1.00/-1.00, +1.50/-1.50, +2.00/-2.00)
 Prism Flippers (8^{Δ} Base-out/ 4^{Δ} Base-in)
 Polaroid Bar Reader
 Home Therapy System computer software (HTS)
 VTS4 Computer Orthoptics Random Dot Stereogram (RDS) and Accommodative software
 Computer Orthopter Lens Flippers (1-6)
 Polaroid Flippers
 Polaroid Glasses
 Loose Prisms (6^{Δ} , 8^{Δ} , 10^{Δ} , 12^{Δ} , 15^{Δ} , 20^{Δ} , 25^{Δ})
 Eye patch
 Bulls Eye Rock Card
 Pencil
 Pointer
 Bernell-O-Scope

Home Therapy Equipment

Brock String
 3 Dot Card
 Letter Chart (large and small)
 Keystone Transparent Eccentric Circles
 Opaque Life Saver Cards
 Lens Flippers (+1.00/-1.00, +1.50/-1.50, +2.00/-2.00)
 Prism Flippers (8^{Δ} Base-out/ 4^{Δ} Base-in)
 Polaroid Bar Reader
 HTS disk
 HTS Flipper lenses 1-6
 Polaroid Glasses
 Eye patch
 Red and Blue glasses
 Pencil with sharpened point
 Computer
 Pointer

7.3 Phase 1 Office Therapy Procedures List

Gross Convergence Techniques

Brock String (Level 1)

Brock String (Level 2)

3 Dot Card

Positive Fusional Vergence Techniques

Vectograms (Quoits)

Computer Orthoptics (RDS)

Monocular Accommodation Techniques

Loose Lens Accommodative Rock

Letter Chart Accommodative Rock

Bulls Eye Rock

Lens Sorting

7.3.1 Brock String (Level 1)

Objective

The objectives of Brock String are to:

1. Develop the kinesthetic awareness of converging and diverging
2. Develop the ability to voluntarily converge
3. Normalize the near point of convergence

Equipment Needed

1. Brock String
2. Lens flippers (+/-2.00 D)

Setup

1. Use two beads and about 1 m of string.
2. Instruct the participant to hold the string taut and against the bridge of his or her nose.
3. Set one bead about 60 cm (red bead) from the participant and the other about 30 cm away (green bead).

Procedure

1. Ask the participant to look at the closer bead and describe what he or she sees. Because of physiological diplopia he or she should report that he or she sees one green bead and two red beads. In addition, he or she should perceive two strings crossing at the green bead with one string extending from his or her right eye and the other appearing to extend from his or her left eye.
2. Ask the participant to fixate the far bead (red) and he or she should now report one red bead with the strings crossing at the red bead. He or she will also see two green beads.
3. It is important to explain the meaning of these observations to the participant. Use the following explanation. "We are doing this exercise to teach you how to cross your eyes. The exercise lets you know what your eyes are doing at all times. The way vision works is that wherever your eyes are pointing you have single vision. Everything else in front or behind the object you are looking at will be seen as double. Look at the green bead and you will see one green bead, two red beads behind it and a string that crosses right at the green bead and forms the letter "X". The strings should look as if they are extensions of your right and left eyes. Where you perceive the two strings cross is actually where your eyes are aimed. Thus, if you are trying to look at the green bead but the strings appear to cross farther away than the bead, this is an indication that you are looking too far away. Use this information to try and correct your eye position and look closer."
4. If the participant experiences difficulty accomplishing any of the goals listed above there are several techniques the therapist can use to help him overcome this obstacle.
 - a. Suggest that participant try and get the "feeling" of looking close and crossing his or her eyes.
 - b. Have the participant touch the bead that he or she is trying to fuse. This kinesthetic feedback is sometimes enough to help the participant achieve single vision.
 - c. Use binocular minus lenses to stimulate accommodative convergence.
5. Once the participant is able to fuse the near and far beads instruct him to hold fixation at the near bead for 5 seconds and then switch fixation to the far bead and hold for 5 seconds.

6. Have him repeat this three times and then move the near bead 5 cm closer while always maintaining the far bead at 60 cm.
7. Have the participant repeat the step of alternately fixating the far and near beads for 5 seconds, 3 times.
8. Continue moving the near bead closer until he or she can successfully converge to a distance of 2.5 cm from his or her nose.

Endpoint

1. The participant can successfully converge to a bead placed 2.5 cm from his or her nose.
2. The participant should be able to appreciate the different feeling and effort associated with converging and diverging.

7.3.2 Brock String (Level 2)

Objective

The objectives of Brock String are to:

1. Develop the kinesthetic awareness of converging and diverging
2. Develop the ability to voluntarily converge
3. Normalize the near point of convergence

Equipment Needed

1. Brock String
2. Lens flippers (+/-2.00 D)

Setup

1. Use about 1 m of string, one bead at 2.5 cm and the other at 1 m.
2. Instruct the participant to hold the string taut and against the bridge of his/her nose.

Procedure

1. Instruct the participant to fixate the bead at the end of the string (1 m) to try and see that the two strings cross at the bead.
2. Now have the participant very slowly fixate closer and closer until he/she is fixating at the close bead at 2.5 cm in front of his/her nose. It is important to emphasize to him/her that the change in fixation from far to near should be very gradual.
3. After the participant can converge all the way to his/her nose, reverse the process and have him gradually diverge to the end of the string. Repeat this procedure for 20 repetitions.
4. Now have the participant remove all the beads from the string. Ask the participant to slowly converge from 1 m to 2.5 cm and always see the "X."
5. Now remove the string and have the participant try to voluntarily converge his/her eyes without the aid of a pointer, finger or any other object. To do so he/she should try and imagine an object slowly moving towards the eyes and try to get the feeling of crossing his/her eyes like when working with the Brock string.
6. Once the participant can converge to 2.5cm from the nose, have the participant try to gradually relax the eyes and look at a distance target. Repeat this procedure for 20 repetitions.

Endpoint

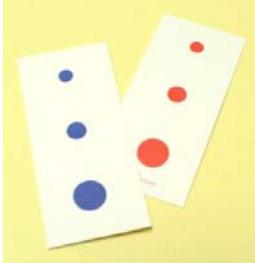
1. The participant can voluntarily converge to a distance 2.5 cm from his or her nose.
2. The participant should be able to appreciate the different feeling and effort associated with converging and diverging.

7.3.3 3 Dot Card

Objective

The objectives of the 3 Dot Card are to:

1. Develop the kinesthetic awareness of converging and diverging
2. Develop the ability to voluntarily converge
3. Normalize the near point of convergence



Equipment Needed

1. 3 Dot Card
2. Lens flippers (+/-2.00 D)

Setup

1. The card is held between index and thumb on lower edge of the card.
2. The card is held against the bridge of the nose with the chin slightly elevated so that the smallest dot is closest to the nose.

Procedure

1. While fixating on the dot farthest away he or she should be able to report one dot that is a mixture of the red and blue colors.
2. The other two dots should be seen as double.
3. The participant then fixates the middle dot, holds for 5 seconds and then the nearest dot and holds for 5 seconds. The other two dots should be seen as double.
4. Instruct the participant to alternate fixation from one dot to the other 10 times.
5. If the participant experiences difficulty there are several techniques the therapist can use to help him overcome this obstacle.
 - a. Suggest that participant try and get the “feeling” of looking close and crossing his or her eyes.
 - b. Move the card farther away from the participant.
 - c. Use binocular minus lenses to stimulate accommodative convergence.
 - d. Cut the card in half length-wise to decrease the septum effect.

Endpoint

1. Can fuse each of the three dots within 3 seconds and hold fusion for 5 seconds
2. Can repeat the sequence of fusing (for 5 seconds) the far, middle and near dots for 10 repetitions.
3. The participant should be able to appreciate the different feeling and effort associated with converging and diverging.

7.3.4 Vectograms (Quoits) Base-out

Objective

To increase positive fusional amplitudes

Equipment Needed

1. Quoits Vectogram
2. Dual Polachrome Illuminated Trainer
3. Polaroid Glasses

Setup

The participant wears Polaroid glasses and the Quoits Vectogram targets are set up in the Dual Polachrome Illuminated Trainer with the targets set at zero prismatic demand.

Procedure

Level 1: Establishing Basic Fusion Ability

1. Ask the participant to describe what he or she sees. The participant should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
2. The participant should also see the boxes with an “R” aligned over an “L”.
3. If the participant doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses proceed to step two.

Level 2: Establishing Presence of Feedback Cues

A. Blur

1. Determine if the participant is able to appreciate blur by slowly increasing the convergence demand until the participant loses clarity.
2. Decrease the convergence demand until the participant regains clear vision.

B. Diplopia

1. Determine if the participant is able to appreciate diplopia by slowly increasing the convergence demand until the participant loses fusion.
2. Decrease the convergence demand until the participant regains single, clear vision.

C. SILO (Small In Large Out)

1. Tell the participant to ignore “R” and “L” initially and to concentrate on the picture.
2. While slowly separating the two sheets to create a small amount of convergence demand, ask the participant to try and keep the picture clear and single and describe what he or she is seeing. The participant should notice that the target becomes smaller and moves closer.
3. While slowly separating the two sheets to create a small amount of divergence demand, ask the participant to try and keep the picture clear and single and describe what he or she is seeing. The participant should notice that the target becomes larger and moves farther away.
4. If the participant 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 participant 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. Float/Localization

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

Level 3: Convergence Therapy

Set the targets at zero prism demand and explain to the participant that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps.

1. **Step One:** Tell the participant to separate the sheets to 3^Δ Base-out and try to maintain clear, single vision (For convergence, separate the targets so that the numbers are shown).
2. **Step Two:** Instruct the participant to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the participant sees one pointer and one target. Stress to the participant the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."
3. Once the participant can perform these steps, while the Vectograms slides are set at 3^Δ Base-out, have the participant slowly separate the targets to 6^Δ Base-out and repeat steps 1-2. At some level the participant will be unable to successfully complete even step one, to see the circles clearly and singly.
4. If the participant is experiencing difficulty:
 - a. Suggest that the participant 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.
5. Once the participant can achieve clear, single vision with the Quoits Vectogram at 30 Base-out, repeat the same procedure with the Clown Vectogram.

Endpoint

30^Δ Base-out

7.3.5 VTS4: Computer Orthoptics Random Dot Stereogram (RDS) Base-out

Objective

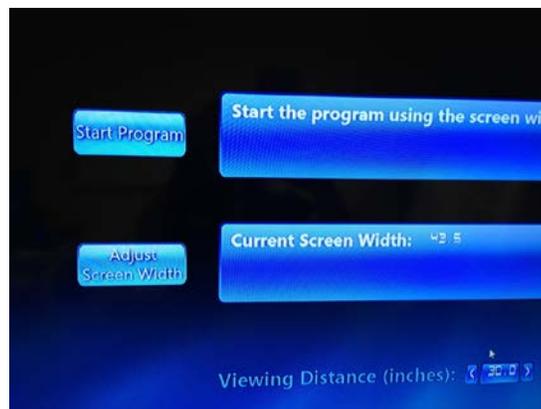
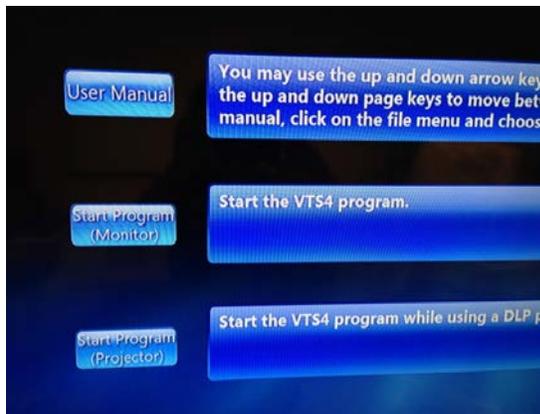
1. To increase positive fusional amplitudes

Equipment Needed

VTS4/Computer Orthopter

Setup

1. Turn on controller.
2. Turn on the liquid crystal glasses. The participant wears liquid crystal glasses. (Please note that these need to be charged.)
3. Turn on monitor and click on VTS4
4. Click on continue
5. Click on Start program monitor (see figure below)
6. Click Start Program and adjust the viewing distance if needed (typical distance is 30”).
7. Confirm that the LCD shutter glasses are working properly
8. Click on Main Menu
9. At the main Menu select **“Multiple Choice Vergence”**
10. On the left hand side under **“DIRECTION”** select **“horizontal”** and **“base out”**
11. On the right hand side of the screen select **“RDS”**
12. The others settings that you will see on the bottom of the screen do not require any adjustment.
13. Finally select the stimulus option with the **“blue box and the letter A”**.
14. The procedure will begin and last for 5 minutes



Procedure

1. Ask the participant if he or she is able to see the Letter “A” in the middle of the large square and another smaller square to be floating closer than the large square. This smaller square will either be above, below, to the right, or to the left of the letter “A”.
2. The participant should be able to move the game pad button in the direction he or she sees the floating square (right, left, up down).
3. The software program increases the prismatic demand of the task after two correct responses and decreases the prismatic demand after an incorrect response. The participant will receive auditory feedback for either a correct or an incorrect response.

Endpoint

45^Δ Base-out with large RDS targets

7.3.6 Loose Lens Accommodative Rock (Level 1)

Objective

1. Restore normal monocular accommodative amplitude.
2. Restore normal monocular accommodative facility.

Equipment Needed

1. Hopping Accommodative Facility VT Cards
2. Loose lenses from +1.50 D to -3.00 D in 0.50 D increments
3. Eye patch

Setup

1. Occlude the participant's left eye.
2. Hopping Card (20/30) is held at 40 cm.
3. The participant is asked to hold two lenses, one in the right hand and one in his or her left hand.
4. Start with +0.50 D and -0.50 D.

Procedure

1. The participant is asked to clear the print as he/she alternately holds the plus and then the minus lens in front of his/her right eye.
2. Give the participant as much time as necessary for him/her to clear and read the print.
3. The goal is to achieve clear vision, 10 times, without regard to the time factor.
4. Increase the power of the lenses in 0.50 D increments up to the endpoints (+1.50/-3.00).
5. If the participant is experiencing difficulty at any level:
 - a. Suggest that participant try and get the "feeling" of looking close and crossing his/ her eyes for the minus lenses or try and get the feeling of relaxing or staring for the plus lenses.
 - b. Decrease the demand by moving card away until the print is clear and then moving back to 40 cm for the minus lenses or move the card closer until the print clears and then move back to 40 cm for the plus lenses.
 - c. Decrease the demand by decreasing the power of the lenses for either plus or minus.
6. Repeat the procedure with the right eye occluded.
7. Once the participant can achieve clarity through +1.50/-3.00 lenses, begin to work on speed. The goal is to achieve 10 cpm with +1.50/-3.00.

Endpoint

1. Clear +1.50/-3.00, 10 cycles in one minute.
2. The participant should be able to appreciate the different feeling and effort associated with clearing the print through minus and plus lenses.

7.3.7 Letter Chart Accommodative Rock (Level 1)

Objective

1. Restore normal monocular accommodative amplitude.
2. Restore normal monocular accommodative facility.

Equipment Needed

1. Large Hart Chart suitable for distance viewing
2. Small Hart Chart suitable for near viewing
3. Eye patch

Setup

1. Occlude the participant's left eye.
2. Place the large letter chart at 3 m.
3. Have the participant hold the small letter chart at 40 cm.

Procedure

1. Ask the participant to hold the small chart at 40 cm and call off the letters on the top line as he or she slowly moves the chart closer.
2. When he or she can no longer keep it clear have him move the chart 2.5 cm further away and then shift to the second line of the larger chart placed at about 3 m. Repeat the far to near change for each letter on the second line.
3. After completing line two, move the small chart to 33 cm and call off the letters on the third line as he or she slowly moves the chart closer. Then repeat step 2.
4. Repeat until all 10 lines are complete.
5. If the participant is experiencing difficulty at any level:
 - a. Suggest that participant try and get the "feeling" of looking close and crossing his or her eyes for the small chart or have the participant try and get the feeling of relaxing or starring for the large chart.
6. Repeat the procedure with the patch moved to the right eye.

Endpoint

1. Successfully clear the near chart held at a distance of 33 cm and be able to clear the distant chart.
2. The participant should be able to appreciate the different feeling and effort associated with clearing the print while viewing the far chart compared with clearing the print while viewing the near chart.

7.3.8 Bulls Eye Rock (Level 1)

Objective

1. Restore normal monocular accommodative amplitude.
2. Restore normal monocular accommodative facility.

Equipment Needed

1. Bulls Eye Rock card
2. Eye patch

Setup

1. Occlude the participant's left eye.
2. Place a large Letter Chart on the wall at eye level 10 feet away from the participant
2. Have the participant hold the Bulls Eye Rock card at 40 cm.

Procedure

1. Ask the participant to hold the Bulls Eye Rock card at 40 cm. Look through the transparent card and call off the letters on the top line of the distance Letter Chart.
2. The participant should then change fixation to the Bulls Eye Rock card at 40 cm and try to keep the card clear for 5 seconds. Repeat the far to near change for each line on the Letter Chart.
3. After completing the far to near change for each line on the Letter Chart, occlude the right eye and repeat steps 1-2 with the left eye.
4. After the participant can complete steps 1-2 with each eye, bring the Bulls Eye Rock card to 33 cm and repeat steps 1-2.
5. If the participant is experiencing difficulty at any level:
 - b. Suggest that participant try and get the "feeling" of looking close and crossing his or her eyes for the Bulls Eye Rock card or have the participant try and get the feeling of relaxing or starring for the large chart.

Endpoint

1. Successfully clear the Bulls Eye Rock card held at a distance of 33 cm and be able to clear the distant chart.
2. The participant should be able to appreciate the different feeling and effort associated with clearing the print while viewing the far chart compared with clearing the Bulls Eye Rock card at near.

7.3.9 Lens Sorting (Level 1)

Objective

1. To develop an awareness of the ability to relax and stimulate accommodation.
2. To teach the participant to voluntarily accommodate or relax accommodation

Equipment Needed

1. Hopping Accommodative Facility VT cards
2. Loose lenses from +1.50 D to -3.00 D in 0.50 D increments, and -4.00 to -6.00D in 1 D increments
3. Eye patch

Setup

1. Occlude the participant's left eye.
2. Place the Hopping Accommodative Facility VT card at 40 cm.

Procedure

1. Select a +1.00 D lens and a minus lens that is less than one half of the participant's amplitude of accommodation.
2. Instruct the participant to view the Hopping Accommodative Facility VT cards at 40 cm and to try and get the letters clear. The minus lens is removed and is replaced by the +1.00 lens. The participant is again asked to clear the print through the plus lens. After repeating this several times, the participant is asked to describe the differences he or she experiences through the minus and plus lenses. The questions should be open-ended at first. If the participant is unable to describe any differences, ask the following questions:
 - With which lens is the print larger or smaller?
 - With which lens do you feel more strain or effort?
 - Does this lens make you look close or far?
3. The objective is for the participant to realize that he or she can either stimulate or relax the accommodative system and learn to voluntarily do so. Any other questions that will lead the participant to this objective would be appropriate.
4. Once the participant can consistently describe that the print becomes smaller with the minus lenses and appears either closer or farther away, the second objective is to help the participant develop a kinesthetic awareness of accommodation. We want the participant to be able to appreciate the difference in feeling between relaxing and stimulating accommodation.
5. It may be necessary to ask specific questions and spend some time explaining what the participant is experiencing. The following is an example of such an explanation.

Does it feel like you are working harder or straining your eyes now? That is the feeling of focusing. If you cannot see clearly through this lens, try to get the feeling of straining, looking close, or focusing your eyes. (Conversely, with plus lenses you would ask the participant to get the feeling of looking far away, relaxing the eyes, or the sensation of drifting off to sleep.)
6. Once the participant can appreciate the differences between looking through a plus and minus lens, he or she is ready to begin the actual procedure of lens sorting.
7. The therapist now places six to eight unmarked uncut lenses (1 D increments) on the table in front of the participant. The participant is asked to sort the lenses from strongest to weakest—the strongest being the lens that makes him focus the most, the weakest being the lens that causes the greatest relaxation.

Endpoint

1. Successfully sort lenses in 1D increments
2. The participant should be able to appreciate the different feeling and effort associated with clearing the print through plus and minus lenses.

7.4 Phase 2 Office Therapy Procedures List

Positive Fusional Vergence Techniques

Vectograms (Quoits/Clowns)

Computer Orthoptics (RDS)

Life Saver Cards

Monocular Accommodation Techniques

Loose Lens Accommodative Rock (Level 2)

Letter Chart Accommodative Rock (Level 2)

Bulls Eye Rock

Lens Sorting

7.4.1 Vectograms (Quoits/Clown)

Objective

1. To increase positive fusional amplitudes.
2. To increase negative fusional amplitudes.

Equipment Needed

1. Clown Vectogram
2. Dual Polachrome Illuminated Trainer
3. Polaroid Glasses

Setup

The participant wears Polaroid glasses and the Clown Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.

Procedure

Level 1: Establishing Basic Fusion Ability

1. Ask the participant to describe what he or she sees. The participant should be able to describe the picture and indicate that parts of the picture appear to be floating closer than other parts.
2. The participant should also see the boxes with an “R” aligned over an “L”.
3. If the participant doesn't voluntarily respond with these answers, ask leading questions to elicit this information. Once you are able to elicit these responses, proceed to step two.

Level 2: Establishing Presence of Feedback Cues

A. Blur

1. Determine if the participant is able to appreciate blur by slowly increasing the convergence demand until the participant loses clarity.
2. Decrease the convergence demand until the participant regains clear vision.

B. Diplopia

1. Determine if the participant is able to appreciate diplopia by slowly increasing the convergence demand until the participant loses fusion.
2. Decrease the convergence demand until the participant regains single, clear vision.

C. SILO (Small In Large Out)

1. Tell the participant to ignore “R” and “L” initially and to concentrate on the picture.
2. While slowly separating the two sheets to create a small amount of convergence demand, ask the participant to try and keep the picture clear and single and describe what he or she is seeing. The participant should notice that the target becomes smaller and moves closer.
3. While slowly separating the two sheets to create a small amount of divergence demand, ask the participant to try and keep the picture clear and single and describe what he or she is seeing. The participant should notice that the target becomes larger and moves farther away.
4. If the participant 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 participant 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. Float/Localization

1. After establishing that the participant appreciates SILO, slowly increase the convergence demand and ask the participant to point to where the target appears to be floating in space. Ask the participant to point to different parts of the stimulus.

Explain to the participant that these are all feedback cues (blur, diplopia, SILO, float/localization) and will be used throughout therapy to help monitor his or her responses.

Level 3: Convergence Therapy

Set the targets at zero prism demand and explain to the participant that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps.

1. **Step One:** Tell the participant 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).
2. **Step Two:** Instruct the participant to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the participant sees one pointer and one target. Stress to the participant the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."
3. Once the participant can perform these steps, while the Vectograms slides are set at 3Δ Base-out, have the participant slowly separate the targets to 6Δ Base-out and repeat steps 1-2. At some level the participant will be unable to successfully complete even step one, to see the circles clearly and singly.
4. If the participant is experiencing difficulty:
 - a. Suggest that the participant 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.

Level 4: Divergence Therapy

1. For divergence, separate the targets so that the letters are shown.
2. The same steps are followed for divergence therapy except that the participant will eventually be unable to physically point to the location at which he or she perceives the target as the Vectograms are separated.
3. After $6-8\Delta$ Base-in, the target will be too far behind the targets for the participant to point.
4. Because it is difficult for some participants to visualize looking behind an opaque object, use a clear hand-held Vectogram holder to help a participant struggling with divergence therapy.
5. Tape a red pointer on the wall and have the participant stand about 3-4 feet away from the pointer.
6. Have the participant hold the Quoits Vectogram in the clear holder about 40cm away from his or her eyes.

7. Instruct him to look at the pointer on the wall and while doing so to be aware of the Quoits. He should be able see one set of Quoits by looking beyond the Vectograms at the pointer on the wall.
8. If he cannot, have him walk 6 inches closer or farther away until he does experience fusion.
9. Continue separating the targets by 3 letters at a time until the participant is able to fusion the Quoits at letter “L”.

Endpoint

1. 25^Δ Base-out.
2. 12^Δ Base-in (Letter L).

7.4.2 VTS4/Computer Orthoptics Random Dot Stereogram (RDS)

Objective

To increase positive and negative fusional amplitudes.

Equipment Needed

VTS4/Computer Orthopter

Setup

1. See 7.3.5. The participant wears liquid crystal glasses.
2. At the main Menu select “**Multiple Choice Vergence**”
3. On the left hand side under “DIRECTION select “**horizontal**” and “**base out**”
4. On the right hand side of the screen select “**RDS**”
5. The others settings that you will see on the bottom of the screen do not require any adjustment.
6. Finally select the stimulus option with the “**blue box and the letter A**”.
7. Press the down arrow key until the large square measures approximately 8 inches
8. The procedure will last for 5 minutes

Procedure: Convergence Therapy

1. Ask the participant if he or she is able to see the Letter “A” in the middle of the large square and another smaller square to be floating closer than the large square. This smaller square will either be above, below, to the right, or to the left of the letter “A”.
2. The participant should be able to move the game pad button in the direction he or she sees the floating square (right, left, up down).
3. The software program increases the prismatic demand of the task after two correct responses and decreases the prismatic demand after an incorrect response. The participant will receive auditory feedback for either a correct or an incorrect response

Procedure: Divergence Therapy

1. Select Base-in vergence and repeat the procedure described above for use for Base-out vergence.

Endpoint

1. 45^Δ Base-out/15^Δ Base-in with medium (8 inch) RDS targets

7.4.3 Life Saver Cards

Objective

To increase the ability to converge without effort.

Equipment Needed

1. Opaque Life Saver Card
2. Pencil with sharpened point

Procedure

1. Have the participant hold the opaque Life Saver card about 16 inches (40 cm) from his/her nose.
2. Have the participant to place the pencil tip slightly below and between the two Lifesavers or circles (red and green) that are closest together and then to stare at the pencil tip.
3. Have the participant slowly move the pencil tip away from the paper and closer to him/her while looking at the pencil tip the whole time.
4. Instruct the participant that as he/she pulls the pencil tip closer, he/she should NOTICE that the two colored circles on either side of the pencil are getting blurry and may start to split apart. Remind the participant to keep his/her eyes on the pencil tip as he/she pulls it closer.
5. Instruct the participant that as he/she continues, he/she should notice that one of the green circles and one of the red circles may merge and create a third circle located directly under the pencil tip.
6. As the participant to try to clear that third circle by slowly moving the pencil slightly forwards and backwards until he/she can get it clear. Instruct the participant to ignore all the other circles.
7. Tell the participant that the circle will appear to float directly under where the pencil tip is.
8. As the participant to hold the clear reddish and greenish circle for at least ten seconds. Then ask the participant to take the pencil away and try to keep that third circle clear and single for another 10 seconds.
9. Have the participant relax his/her eyes and then try again without the use of the pencil. Allow the participant to continue to use the pencil if he/she has difficulty.
10. Have the participant move up to the next set of circles and repeat the procedure until he/she reaches the top of the card.
11. If the participant has difficulty doing the above there are several ways to overcome this problem.
 - a. Have the participant try and get the “feeling” of looking close, crossing his/her eyes, or working harder
 - b. Have the participant move the card slightly forward or backwards until you get the circle to be single and clear while keeping the pencil stationary.

Endpoint

1. Able to fixate on floating third circle and keep it clear for at least 5 seconds for each of the four levels of the card.
2. Perform this task without the aid of the pencil.

7.4.4 Loose Lens Accommodative Rock (Level 2)

Objective

1. Restore normal monocular accommodative amplitude.
2. Restore normal monocular accommodative facility.

Equipment Needed

1. Hopping Accommodative Facility VT cards
2. Loose lenses from +2.00 D to -6.00 D in 0.50 D increments
3. Eye patch

Setup

1. Occlude the participant's left eye.
2. Hopping Accommodative Facility VT card is held at 40 cm.
3. The participant is asked to hold two lenses, one in the right hand and one in his or her left hand.
4. Start with +0.50 D and -0.50 D.

Procedure

1. The participant is asked to clear the print as he or she alternately holds the plus and then the minus lens in front of his or her right eye.
2. Give the participant as much time as necessary for him to clear and read the print.
3. The goal is to achieve clear vision, 10 times, without regard to the time factor.
4. Increase the power of the lenses in 0.50 D increments up to the endpoints (+2.00/-6.00).
5. If the participant is experiencing difficulty at any level:
 - a. Suggest that participant try and get the "feeling" of looking close and crossing his or her eyes for the minus lenses or have the participant try and get the feeling of relaxing or starring for the plus lenses.
 - b. Decrease the demand by moving card away until the print is clear and then moving back to 40 cm for the minus lenses or move the card closer until the print clears and then move back to 40 cm for the plus lenses.
 - c. Decrease the demand by decreasing the power of the lenses for either plus or minus.
6. Repeat the procedure with the right eye occluded.
7. Once the participant can achieve clarity through +2.00/-6.00 lenses, begin to work on speed. The goal is to achieve 10 cpm with +2.00/-6.00.

Endpoint

1. Clear +2.00/-6.00, 10 cycles in one minute.
2. The participant should be able to appreciate the different feeling and effort associated with clearing the print through minus and plus lenses.

7.4.5 Letter Chart Accommodative Rock (Level 2)

Objective

1. Restore normal monocular accommodative amplitude
2. Restore normal monocular accommodative facility

Equipment Needed

1. Large Hart Chart suitable for distance viewing
2. Small Hart Chart suitable for near viewing
3. Eye patch

Setup

1. Occlude the participant's left eye
2. Place the large letter chart at 3 m
3. Have the participant hold the small letter chart at 40 cm

Procedure

1. Ask the participant to hold the small chart at 40 cm and call off the letters on the top line as he or she slowly moves the chart closer.
2. When he/she can no longer keep it clear have the participant move the chart 2.5 cm further away and then shift to the second line of the larger chart placed at about 3 m. Repeat the far to near change for each letter on the second line.
3. After completing line two, move the small chart to 40 cm and call off letters on the third line as he/she slowly moves the chart closer. Then repeat step 2.
4. Repeat until all 10 lines are complete.
5. If the participant is experiencing difficulty at any level:
 - a. Suggest that participant try and get the "feeling" of looking close and crossing his/her eyes for the small chart or have the participant try and get the feeling of relaxing or staring for the large chart.
6. Repeat the procedure with the patch moved to the right eye.

Endpoint

1. Successfully clear the near chart held at a distance equal to age-appropriate amplitude and is able to do 10 cycles per minute of far to near fixations. The distance for age-appropriate amplitude should be calculated using the formula $18.5 - 0.3 \times \text{age}$.
2. The participant should be able to appreciate the different feeling and effort associated with clearing the print while viewing the far chart compared with clearing the print while viewing the near chart.

7.4.6 Bulls Eye Rock (Level 2)

Objective

1. Restore normal monocular accommodative amplitude.
2. Restore normal monocular accommodative facility.

Equipment Needed

1. Bulls Eye Rock card
2. Eye patch

Setup

1. Occlude the participant's left eye.
2. Place a large Letter Chart on the wall at eye level 10 feet away from the participant
2. Have the participant hold the Bulls Eye Rock card at 40 cm.

Procedure

1. Ask the participant to hold the Bulls Eye Rock card at 40 cm. Look through the transparent card and call off the letters on the top line of the distance Letter Chart.
2. The participant should then change fixation to the Bulls Eye Rock card at 40 cm and try to keep the card clear for 5 seconds. Repeat the far to near change for each line on the Letter Chart.
3. After completing the far to near change for each line on the Letter Chart, occlude the right eye and repeat steps 1-2 with the left eye.
4. After the participant can complete steps 1-2 with each eye, bring the Bulls Eye Rock card 5 cm closer, repeat steps 1-2 and continue moving the Bulls Eye Rock card until the participant can achieve clarity while the Bulls Eye Rock card is held at a distance equal to age-appropriate amplitude.
5. If the participant is experiencing difficulty at any level:
 - c. Suggest that participant try and get the "feeling" of looking close and crossing his or her eyes for the Bulls Eye Rock card or have the participant try and get the feeling of relaxing or starring for the large chart.

Endpoint

1. Successfully clear the Bulls Eye Rock card held at a distance equal to age-appropriate amplitude and is able to clear the distant chart. The age-appropriate distance should be calculated using the formula $18.5 - 0.3 \times \text{age}$.
2. The participant should be able to appreciate the different feeling and effort associated with clearing the print while viewing the far chart compared with clearing the print while viewing the near chart.

7.4.7 Lens Sorting (Level 2)

Objective

1. To develop an awareness of the ability to relax and stimulate accommodation.
2. To teach the participant to voluntarily accommodate or relax accommodation

Equipment Needed

1. Hopping Accommodative Facility VT cards
2. Loose lenses from +1.50 D to -3.00 D in 0.50 D increments, and -4.00 to -6.00D in 1 D increments
3. Eye patch

Setup

1. Occlude the participant's left eye.
2. Place the Hopping Accommodative Facility VT cards at 40 cm.

Procedure

1. Select a +1.00 D lens and a minus lens that is less than one half of the participant's amplitude of accommodation.
2. Instruct the participant to view the Hopping Accommodative Facility VT cards at 40 cm and to try and get the letters clear. The minus lens is removed and is replaced by the +1.00 lens. The participant is again asked to clear the print through the plus lens. After repeating this several times, the participant is asked to describe the differences he or she experiences through the minus and plus lenses. The questions should be open-ended at first. If the participant is unable to describe any differences, ask the following questions:
 - With which lens is the print larger or smaller?
 - With which lens do you feel more strain or effort?
 - Does this lens make you look close or far?
3. The objective is for the participant to realize that he or she can either stimulate or relax the accommodative system and learn to voluntarily do so. Any other questions that will lead the participant to this objective would be appropriate.
4. Once the participant can consistently describe that the print becomes smaller with the minus lenses and appears either closer or farther away, the second objective is to help the participant develop a kinesthetic awareness of accommodation. We want the participant to be able to appreciate the difference in feeling between relaxing and stimulating accommodation.
5. It may be necessary to ask specific questions and spend some time explaining what the participant is experiencing. The following is an example of such an explanation.

Does it feel like you are working harder or straining your eyes now? That is the feeling of focusing. If you cannot see clearly through this lens, try to get the feeling of straining, looking close, or focusing your eyes. (Conversely, with plus lenses you would ask the participant to get the feeling of looking far away, relaxing the eyes, or the sensation of drifting off to sleep.)
6. Once the participant can appreciate the differences between looking through a plus and minus lens, he or she is ready to begin the actual procedure of lens sorting.
7. The therapist now places six to eight unmarked uncut lenses (1/2 D increments) on the table in front of the participant. The participant is asked to sort the lenses from strongest to weakest—the strongest being the lens that makes him focus the most, the weakest being the lens that causes the greatest relaxation.

Endpoint

1. Successfully sort lenses in 1/2D increments
2. The participant should be able to appreciate the different feeling and effort associated with clearing the print through plus and minus lenses.

7.5 Phase 3 Office Therapy Procedures List

Fusional Vergence

Vectograms (Quoits/Clowns) Jump Vergence

Computer Orthoptics (RDS) Jump Vergence

Aperture Rule

Eccentric Circles

Bi-ocular Accommodation

Stereoscope Bi-ocular Rock

Prism Dissociation Bi-ocular Rock

Computer Orthoptics Bi-ocular Rock

7.5.1 Vectograms (Quoits/Clown) Jump Vergence

Objective

1. To increase the speed and decrease the latency of the positive fusional vergence response
2. To increase the speed and decrease the latency of the negative fusional vergence response

Equipment Needed

1. Quoits/Clown Vectogram
2. Dual Polachrome Illuminated Trainer
3. Polaroid Glasses
4. Loose prism (6^{Δ} , 10^{Δ} , 12^{Δ} , 15^{Δ} , 20^{Δ} , 25^{Δ})
5. Polaroid Flippers

Setup

1. The participant wears Polaroid glasses.
2. The Quoits Vectogram targets are set up in the Dual Polachrome Illuminated Trainer and are set at zero prismatic demand.

Procedure

The jump vergence procedure involves several steps in addition to those listed earlier under ramp therapy.

Previous Procedures:

1. **Step One:** Tell the participant to separate the sheets to number 3^Δ Base-out and try to keep the Quoits single and clear.
2. **Step Two:** Instruct the participant to take the pointer and point to the location at which he or she sees various parts of the picture floating. Make sure the participant sees one pointer and one Quoits. Stress to the participant the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."

Jump Vergence Procedures

Use the following procedures:

1. Have the participant separate the Vectograms to number 3 and regain clear, single vision. Once the participant achieves clear, single, binocular vision instruct the participant to change fixation from the target to another point in space. Ask the participant to fuse the Vectogram, then look away for several seconds and look back and regain fusion. Continue this process until the participant can look away and look back, regain single, clear vision for at least 10 cycles per minute while the Vectograms are set at 25 Base-out.
2. Have the participant separate the Vectograms to number 3 and regain clear, single vision. Once the participant achieves clear, single, binocular vision additional prism (6^{Δ} , 10^{Δ} , 12^{Δ} , 15^{Δ} , 20^{Δ} , and 25^{Δ}) is placed in front of the participant's eyes (binocularly) to create a large change in vergence demand. Instruct the participant to try and regain single, clear, vision as quickly as possible through the prism. Once the participant can do this for at least 10 cpm with 6^{Δ} have them switch to the 10^{Δ} prism.
3. Two different Vectograms are set up in a Dual Polachrome Illuminated Trainer. The one on top should be set at 6 Base-out and the one on the bottom should be set at 2 Base-in. Ask the

participant to fuse the top target, hold it for 3 seconds and then change fixation to the bottom target and hold fixation 3 seconds. Once the participant can complete 10 cpm at the initial settings, increase the Base-out demand by 2 Base-out and the Base-in demand by 1 Base-in. Continue until the participant can complete at least 10 cpm with the top Vectogram set at 25 Base-out and the bottom Vectogram set at 12 Base-in.

4. Polaroid flippers are used to change the demand from Base-in to Base-out each time they are flipped. With the participant looking through one side of the Polaroid flippers, have the participant separate the Vectograms to number 3 and regain clear, single vision. Once the participant achieves clear, single, binocular vision instruct the participant to flip the Polaroid flipper to the second side and again regain single, clear vision as quickly as possible. Once the participant can perform this task at least 10 cpm, increase the Vectogram separation by 3 and repeat. Continue until the participant can complete at least 10 cpm while the Vectograms are set at 12 Base-out.

Endpoint

1. When using two Vectograms, can alternately fuse 25^Δ Base-out and 12^Δ Base-in for at least 10 cycles per minute.
2. When using Polaroid flippers, can alternately fuse 12^Δ Base-out and 12^Δ Base-in for at least 10 cycles per minute.

7.5.2 VTS4/Computer Orthoptics Random Dot Stereogram (RDS) (Phase 3)

Objective

1. To increase the speed and decrease the latency of the positive fusional vergence response.
2. To increase the speed and decrease the latency of the negative fusional vergence response.

Objective

To increase positive and negative fusional amplitudes.

Equipment Needed

VTS4/Computer Orthopter

Setup

1. See 7.3.5. The participant wears liquid crystal glasses.
2. At the main Menu select **“JUMP DUCTION”**
3. On the left hand side under **“DIRECTION** select **“horizontal”** and **“BO + BI”**
4. Select **“STEP”**
5. On the right hand side of the screen select **“RDS”**
6. The other settings that you will see on the bottom of the screen do not require any adjustment.
7. Finally select the stimulus option with the **“blue box and the letter A”**.
8. Press the down arrow key until the large square measures approximately 8 inches (medium targets).
9. The procedure will last for 5 minutes

Procedure:

1. Ask the participant if he or she is able to see the Letter “A” in the middle of the large square and another smaller square to be floating closer than the large square. This smaller square will either be above, below, to the right, or to the left of the letter “A”.
2. The participant should be able to move the game pad button in the direction he or she sees the floating square (right, left, up down).
3. The software program changes the demand from base-in to base-out after each response and increases the prismatic demand of the task after two correct responses and decreases the prismatic demand after an incorrect response. The participant will receive auditory feedback for either a correct or an incorrect response.
4. When participant can fuse 45^Δ Base-out to 15^Δ Base-in repeat above with red box with the letter “A” selected and press the down arrow key until the large square measures approximately 6 inches (small targets).

Endpoint

Participant can fuse 45^Δ Base-out to 15^Δ Base-in using small (6 inch) targets in step jump duction mode.

7.5.3 Aperture Rule

Objective

To increase positive and negative fusional amplitudes

Equipment Needed

1. Bernell Aperture Rule Trainer and Cards
2. Pointer

Setup

1. Place the single aperture at the number one mark on the Aperture Rule and the cards at the setting marked "place aperture cards here".
2. The participant should place the end of the Aperture Rule against the bridge of his or her nose.

Procedure

Convergence Therapy

1. Turn to card number one.
2. Alternately cover the participant's right and left eyes and demonstrate that he or she will see one target with the right eye and one with the left eye.
3. Remove the cover paddle and ask the participant what he or she sees with both eyes open.
4. He or she will report double vision, suppression or will be able to fuse the two targets and report that he or she sees one target.
5. Explain that the objective is to achieve clear, single vision.
6. If he or she is unable to fuse you can use the same techniques that were suggested for the previous binocular vision therapy procedures. These include kinesthetic awareness of looking close or localization suggested in the Quoits Vectogram procedure.
7. To use the localization technique with the Aperture Rule have the participant hold the pointer directly behind the single aperture. Instruct him to look directly at the pointer. If he or she does this, he or she will report one pointer and one target. Once the participant realizes where he or she must look, try removing the pointer. With some practice the participant will soon be able to fuse without the additional support of the pointer.
8. Once fusion is reported, question the participant regarding the clarity of the target, the suppression cues, and whether he or she appreciates the depth in the circles.
9. Ask the participant to hold fusion for a count of five, look away momentarily and then try and regain fusion as quickly as possible.
10. This procedure should be repeated five times and the next card is then exposed, the single aperture is moved to its appropriate position and the entire procedure (steps 3-9) is repeated. Goal is card #12.

Divergence Therapy

The same general procedures are performed for divergence therapy, except that the double aperture slide is substituted for the single aperture slide and when attempting localization, the pointer needs to be behind the card.

Endpoint

Successfully achieve clear, single binocular vision with a prismatic demand of 30^Δ Base-out (Card 12) and 15^Δ Base-in (card 6)

7.5.4 Eccentric Circles

Objective

1. To increase positive fusional amplitudes
2. To increase negative fusional amplitudes

Equipment Needed

1. Keystone Opaque Eccentric Circles
2. Keystone Transparent Eccentric Circles
3. Pointer

Setup

1. Either have the participant hold the cards or place them in the Polachrome Illuminated Trainer, the horizontal holder or any other suitable device.
2. The cards should be held about 40 cm from the participant.
3. Begin with the two cards together with the "A"s touching.

Procedure

Convergence Therapy

1. The participant should see two cards at this point.
2. Ask the participant to try and cross his/her eyes and get the feeling of looking closer.
3. If he/she cannot do this voluntarily, use localization with a pointer to demonstrate the point to which he/she must converge to achieve fusion.
4. Tell the participant that when he/she achieves fusion he/she will see "three sets of circles."
5. Explain that he/she is to concentrate only on the middle set and is to ignore the two side images.
6. Ask him/her about the middle set of cards. He/she should be able to spontaneously indicate that he/she sees two circles, one larger than the other and that the larger one appears to be floating closer to him/her. In addition, he/she should see the word "clear", in focus. If he/she does not spontaneously respond with this information, ask the participant to relax their focus a little or maintain fusion for 5 seconds and see if the letters clear. It is important to make the participant aware that this perception of depth is a feedback cue about his/her performance.
7. Once he/she can achieve fusion ask him/her to hold the position for 5 seconds, look away momentarily, and look back at the cards and regain fusion. Instruct the participant to repeat these 10 times and then separate the cards about 1 centimeter and repeat the entire procedure again. Continue until he/she is able to achieve fusion, look away and back with the cards separated about 12 cm (measure from the left side of the outer ring on the left card to the left side of the outer ring on the right card).

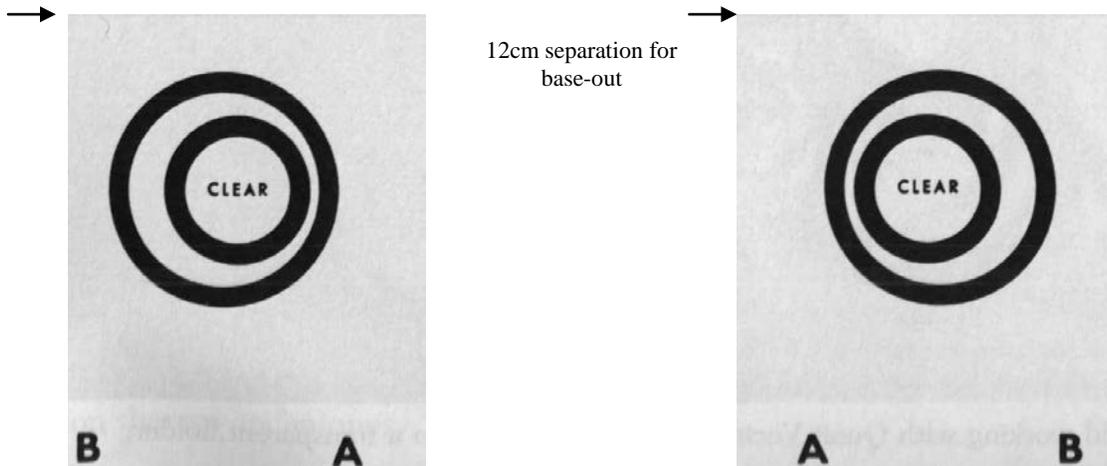
Divergence Therapy

1. The same general procedures are performed for divergence therapy except that the participant must now diverge behind the plane of the cards.
2. Because it is difficult for some participants to visualize looking behind an opaque object, translucent Eccentric Circle cards are available for divergence therapy.
3. Participants often experience some difficulty initially with this procedure. It is helpful to show them where they must look to achieve orthoptic fusion. To accomplish this tape a pointer to the

- wall at the participant's eye level. Have the participant stand about 3-4 feet away from the wall and hold the transparent Eccentric Circle Cards about 25 cm away from his/her eyes.
4. Instruct the participant to look at the pointer on the wall and while doing so to be aware of the circles. He/she should be able to see three sets of circles. If he/she cannot, have the participant walk closer or farther away until he/she does appreciate three circles. Tell the participant to concentrate on the middle set and ignore the side images. Once he/she can achieve this have the participant repeat the same procedures described for convergence therapy.
 5. The only difference is that because of the lower physiological limit for divergence the final separation will be smaller. Fusion with a 6 cm separation is considered adequate (measure from the left side of the outer ring on the left card to the left side of the outer ring on the right card).

Endpoint

At a working distance of 40 cm, achieve clear, chiasmatic fusion with a card separation of 12 cm (30^Δ Base-out) and clear, orthoptic fusion with a card separation of 6 cm (15^Δ Base-in). Measure separation from the left side of the outer ring on the left card to the left side of the outer ring on the right card.



7.5.5 Stereoscope Bi-Ocular Rock

Objective

1. Restore normal monocular accommodative amplitude.
2. Restore normal monocular accommodative facility.

Equipment Needed

1. 2 small Letter Chart Cards
2. Bernell-O-Scope
3. Loose lenses from +2.00 D to -6.00 D in 0.50 D increments

Setup

1. Place the 2 Small Letter Charts on each side of the slide holder.
2. Move the slide holder to number 10 on the stereoscope arm (2.50D accommodative demand).
3. Place a +1.00 D lens in the lens cell of the right eye and a -1.00 D lens in the lens cell of the left eye

Procedure

1. The participant is asked flip the occluder down before the left eye and clear the print with the right eye and read the top line.
2. Then have the participant open remove the occluder before the left eye and place in before the right and clear the print with the left eye and read the second line.
3. Continue until all the participant clears and reads all ten lines.
4. Increase the power of the lenses in 0.50 D increments up to the endpoints (+2.00/-6.00).
5. If the participant is experiencing difficulty at any level:
 - a. Suggest that participant try and get the “feeling” of looking close and crossing his or her eyes for the minus lenses or have the participant try and get the feeling of relaxing or starring for the plus lenses.
 - b. Decrease the demand by decreasing the power of the lenses for either plus or minus.
6. Next visits repeat the procedure with the plus and minus lenses switched (i.e., minus before right eye, plus before left eye).

Endpoint

1. Clear +2.00/-6.00, 10 cycles in one minute.
2. The participant should be able to appreciate the different feeling and effort associated with clearing the print through minus and plus lenses.

7.5.6 Prism Dissociation Bi-Ocular Rock

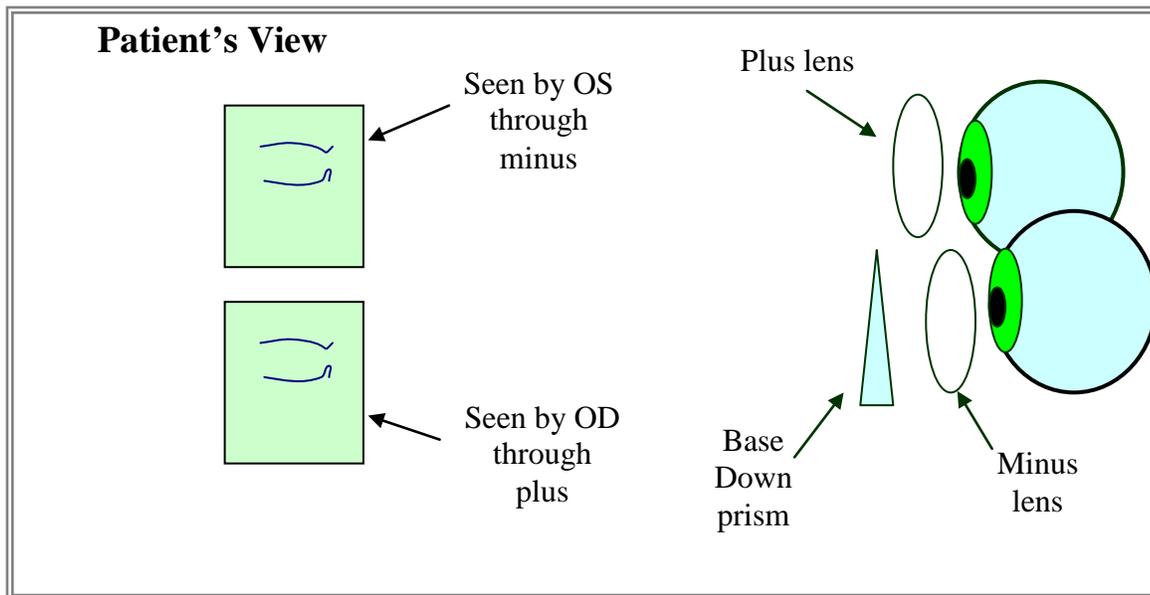
Objective

1. Restore normal monocular accommodative amplitude.
2. Restore normal monocular accommodative facility.

Equipment Needed

1. Small Letter Chart
2. Loose prisms (10-12 prism diopters)
3. Loose lenses (+1.00 to +2.50 and -1.00 to -6.00)

Setup



Procedure:

1. The participant places the small Letter Chart or other small print at reading distance (30-40 cm) on a table or a reading board.
2. The participant or therapist/doctor holds the dissociating prism base down in front of the left eye. This displaces the left eye's image above the right eye's image. Make sure that the images do not overlap. This may require a stronger prism (greater dissociation) or a shorter reading target.
3. A minus lens is held before the left eye and a plus lens is held before the right eye. The initial powers should be small (+/- 1.00).
4. The participant is instructed to read a few letters from the target on top (the eye looking through minus) and then switch fixation to read a few letters from the bottom target (the eye looking through plus).
5. The participant should practice until she is able to easily and quickly clear both targets alternately. The powers are increased in increments until she reaches +2.00/-6.00.
6. After a few minutes, the lenses should be swapped. The participant should spend 4-5 minutes reading before the lenses are swapped (8-10 minutes total time).

Endpoint

1. Clear +2.00/-6.00, 10 cycles in one minute.

2. The participant should be able to appreciate the different feeling and effort associated with clearing the print through minus and plus lenses.

7.5.7 Computer Orthopter Bi-Ocular Rock (Accommodative Rock)

Objective

1. Restore normal monocular accommodative amplitude.
2. Restore normal monocular accommodative facility.

Equipment Needed

1. Computer Orthopter: Accommodative Software Program
2. Loose lenses or trial lenses (+1.00 to +2.00 and -1.00 to -6.00)
3. Liquid Crystal Glasses

Setup

1. The participant wears the liquid crystal glasses.
2. Select Accommodative Rock; Select 1 or 4 Targets (C's)
3. A minus lens is held before the left eye and a plus lens is held before the right eye while viewing the computer screen. The initial powers should be small (+/- 1.00).

Procedure

1. The computer program presents 1 or 4 C's. Only the right eye first views the stimulus. The C may be oriented with the opening up, down, left, or right. The participant is instructed to move the game pad-switch in the direction of the opening of each C. (If 4 targets are selected, the openings should be identified starting from left to right).
2. Correct responses result in a "beep" tone and incorrect responses with a "boop" tone
3. After the participant responds to the target set (one or 4 C's) seen by the right eye, a second set appears, and this is seen by only the left eye.
4. The participant should practice until she is able to easily and quickly clear both targets alternately. The powers are increased in increments until he/she reaches +2.00/-6.00.
5. After a few minutes, the lenses should be swapped.
6. If the participant is experiencing difficulty at any level:
 - a. Suggest that participant try and get the "feeling" of looking close and crossing his or her eyes for the minus lenses or have the participant try and get the feeling of relaxing or staring for the plus lenses.
 - b. Decrease the demand by decreasing the power of the lenses for either plus or minus.
 - c. Increase the size of the target slightly by pressing the up arrow one to several times

Endpoint

1. Clear +2.00/-6.00, 10 cycles in one minute.
2. The participant should be able to appreciate the different feeling and effort associated with clearing the print through minus and plus lenses.

7.6 Phase 4 Office Therapy Procedures List

Fusional Vergence

Computer Orthoptics (RDS) Jump Vergence

Aperture Rule Jump Vergence

Eccentric Circles Jump Vergence

Binocular Accommodation

Polaroid Bar Reader/Flippers

Aperture Rule/Flippers

7.6.1 Computer Orthoptics (RDS) Jump Vergence (Phase 4)

VTS4/Computer Orthoptics Random Dot Stereogram (RDS) (Phase 4)

Objective

1. To increase the speed and decrease the latency of the positive fusional vergence response.
2. To increase the speed and decrease the latency of the negative fusional vergence response.

Objective

To increase positive and negative fusional amplitudes.

Equipment Needed

VTS4/Computer Orthopter

Setup

1. See 7.3.5. The participant wears liquid crystal glasses.
2. At the main Menu select **“JUMP DUCTION”**
3. On the left hand side under **“DIRECTION** select **“horizontal”** and **“BO + BI”**
4. Select **“RANDOM”**
5. On the right hand side of the screen select **“RDS”**
6. Limits should be set at 45^Δ Base-out and 15^Δ Base-in. (Vergence demand should be 1.)
7. Finally select the stimulus option with the **“blue box and the letter A”**.
8. Press the down arrow key until the large square measures approximately 8 inches (medium targets).
9. The procedure will last for 5 minutes

Procedure:

1. Ask the participant if he or she is able to see the Letter “A” in the middle of the large square and another smaller square to be floating closer than the large square. This smaller square will either be above, below, to the right, or to the left of the letter “A”.
2. The participant should be able to move the game pad button in the direction he or she sees the floating square (right, left, up down).
3. The software program changes the demand from base-in to base-out after each response and increases the prismatic demand of the task after two correct responses and decreases the prismatic demand after an incorrect response. The participant will receive auditory feedback for either a correct or an incorrect response
4. When participant can fuse 45^Δ Base-out to 15^Δ Base-in for at least 15 repetitions in one minute repeat above with red box with the letter “A” selected and press the down arrow key until the large square measures approximately 6 inches (small targets).

Endpoint

Participant can fuse 45^Δ Base-out to 15^Δ Base-in for at least 15 repetitions in one minute using small (6 inch) targets in Random jump duction mode.

7.6.2 Aperture Rule Jump Vergence

Objective

1. To increase the speed and decrease the latency of the positive fusional vergence response.
2. To increase the speed and decrease the latency of the negative fusional vergence response.

Equipment Needed

1. Bernell Aperture Rule Trainer and Cards
2. Flip Prism (8 Δ Base-out/4 Δ Base-in)
3. Pointer

Setup

1. Place the single aperture at the number one mark on the Aperture Rule and the cards at the setting marked "place aperture cards here."
2. The participant should place the end of the Aperture Rule against the bridge of his or her nose.

Procedure

1. Turn to card number one.
2. Ask the participant to fuse the two targets. Once fusion is reported, question the participant regarding the clarity of the target, the suppression cues, and whether he or she appreciates the depth in the circles.

Jump Convergence Procedures

1. Change fixation from the target to another point in space. Ask the participant to fuse the Aperture Rule Card, then look away for several seconds and look back and regain fusion.
2. After the participant has fused the Aperture Rule Card, then cover one eye for 5 seconds to break fusion. He or she then uncovers his or her eye and has to regain fusion.
3. Flip prism with prism flippers, the participant should be able to regain fusion within 3 seconds and repeat this for up to 15 repetitions.
 - a. While the participant is fusing the Aperture Rule Card at a particular convergence or divergence demand, additional prism can be placed in front of the participant's eyes to create a large change in vergence demand.
 - b. Lens flippers can also be used to create a step vergence change in vergence demand.
4. Continue until participant can achieve clear, single binocular vision using card # 8 and the flip prism.

Jump Divergence Procedures

1. Same as above but the double aperture is used to create a divergence demand.
2. Continue until participant can achieve clear, single binocular vision using care #4 and the flip prism.

Endpoint

Using 8 Δ Base-out and 4 Δ Base-in prism flippers, achieve clear, single binocular vision with card 8 for convergence and card 4 for divergence for 10 cycles per minute.

7.6.3 Eccentric Circles Jump Vergence

Objective

To increase the speed and decrease the latency of the positive and negative fusional response.

Equipment Needed

1. Keystone Opaque Eccentric Circle Cards
2. Keystone Transparent Eccentric Circle Cards
3. Flip Prism (8^{Δ} Base-out/ 4^{Δ} Base-in)
4. Pointer

Setup

1. Either have the participant hold the cards or place them in the Polachrome Illuminated Trainer, the horizontal holder or any other suitable device.
2. The cards should be held about 40 cm from the participant.
3. Begin with the two cards together with the "A"s touching.

Jump Convergence Procedures

1. Ask the participant to fuse the Eccentric Circle Cards using chiasmatic fusion, then look away for several seconds and look back and regain fusion.
2. After the participant has fused the Eccentric Circle Cards, then cover one eye for 5 seconds to break fusion. He or she then uncovers his or her eye and has to regain fusion.
3. While the participant is fusing the Eccentric Circle Cards at a particular convergence or divergence demand, flip prism is used to create a change in vergence demand.

Jump Divergence Procedures

1. Ask the participant to fuse the Eccentric Circle Cards using orthoptic fusion, then look away for several seconds and look back and regain fusion.
2. After the participant has fused the Eccentric Circle Cards, then cover one eye for 5 seconds to break fusion. He or she then uncovers his or her eye and has to regain fusion.
3. While the participant is fusing the Eccentric Circle Cards at a particular convergence or divergence demand, flip prism is used to create a change in vergence demand.

Convergence to Divergence Procedure

1. With the cards held together, ask the participant to switch from chiasmatic to orthoptic fusion. He or she should hold fusion for about 5 seconds chiasmatically and then switch to orthoptic fusion and hold for 5 seconds.
2. This should be repeated 20 times
3. Separate the cards 1 cm and repeat steps 1-3
4. Continue until a separation of 6 cm can be achieved

Endpoint

1. Regain clear, chiasmatic fusion after fusion is disrupted with a card separation of 12 cm (30^{Δ} Base-out) and clear, orthoptic fusion with a card separation of 6 cm (15^{Δ} Base-in).
2. Switch between chiasmatic and orthoptic fusion with the cards held 6 cm apart for 20 repetitions

7.6.4 Polaroid Bar Reader/Flippers

Objective

To decrease the latency and increase the speed of the accommodative response under binocular conditions

Equipment Needed

1. Lens flippers in various powers: +/-1.00, +/-1.50, +/-2.00.
2. The Hopping Accommodative Facility VT cards or other age appropriate reading material in various print sizes from 20/80 to 20/30.
3. Polaroid bar reader
4. Polaroid glasses

Setup

1. A Polaroid bar reader is placed on age appropriate reading material (20/30 print size @ 40 cm).
2. The participant wears Polaroid glasses.

Procedures

1. Lens flippers (+1.50/-1.50) are held before the participant's eyes and the participant is instructed to clear the print. If the participant has trouble clearing the print, use +1.00/-1.00 lenses. The participant reads one letter line and the lens flippers are flipped to the other side presenting a new accommodative stimulus. The participant is asked to clear and read the next letter.
2. The therapist emphasizes that the reading material should always be visible through the 4 stripes of the Polaroid material.
3. After repeating this several times the participant is asked to describe the differences he or she experiences through the minus and plus lenses. The questions should be open ended at first. If the participant is unable to describe any differences ask the following questions:

With which lens is the print larger or smaller?

With which lens do you feel more strain or effort?

Does this lens make you look close or far?

With which lens is it easiest to see all four lines?

4. The objective is for the participant to realize that he or she can either stimulate or relax the accommodative system and to learn to voluntarily do this. Any other questions that will lead the participant to this objective would be appropriate.
5. Have the participant continue reading one letter and flipping the lenses for 3 minutes.

Endpoint

Able to achieve single, clear, vision while viewing 20/30 print through +2.00 and -2.00 for at least 13 cycles per minute without suppression

7.6.5 Aperture Rule/Flippers

Objective

To decrease the latency and increase the speed of the accommodative response under binocular conditions

Equipment Needed

1. Lens flippers in various powers: +/-1.00, +/-1.50, +/-2.00.
2. Aperture Rule with single aperture

Setup

1. The Aperture Rule is set at card 2 with the single aperture in place
2. The participant holds the +1/-1 flipper in front of his/her eyes.

Procedures

1. Lens flippers (+1.00/-1.00) are held before the participant's eyes with the "minus" lenses as a starting point.
2. Explain that the objective is to achieve clear, single vision.
3. If he or she is unable to fuse you can use the same techniques that were suggested for the previous binocular vision therapy procedures. These include kinesthetic awareness of looking close or localization suggested in the Quoits Vectogram procedure.
4. Once fusion is reported, question the participant regarding the clarity of the target, the suppression cues, and whether he or she appreciates the depth in the circles.
5. Ask the participant to hold fusion for a count of five, and then flip the flipper to the other side (plus lens) and then try and regain fusion as quickly as possible.
6. This procedure should be repeated five times and the next card is then exposed, the single aperture is moved to its appropriate position and the entire procedure (steps 3-9) is repeated. Goal is card #12.

Endpoint

Able to achieve single, clear, vision while viewing Aperture Rule Card 12 through +2.00 and -2.00 lenses for at least 13 cycles per minute without suppression

7.7 Home Therapy Equipment and Sequence

Equipment

Brock String

3 Dot Card

Letter Chart (large and small)

Keystone Transparent Eccentric Circles

Opaque Life Saver Cards

Lens Flippers (+1.00/-1.00, +1.50/-1.50, +2.00/-2.00)

Prism Flippers (8^Δ Base-out/4^Δ Base-in)

Polaroid Bar Reader

HTS disk

HTS Flipper lenses 1-6

Polaroid Glasses

Eye patch

Red and Blue glasses

Pencil with sharpened point

Computer

Pointer

Home Therapy Sequence for Patients Using HTS***Phase One*****Weeks 0-1 (Visits 1-2)**

Procedure	Minutes assigned
Brock String (Level 1)	8
Letter Chart Accommodative Rock (Level 1)	7

Weeks 2-3 (Visits 3-4)

Procedure	Minutes assigned
Brock String (Level 2)	4
HTS (Level 1)	11 (BO 5 mins; BI 3 mins; ACC 3 mins)

Phase Two**Weeks 4-5 (Visits 5-6)**

Procedure	Minutes assigned
3 Dot Card	2
Life Saver Cards	3
HTS (Level 2)	10 (Auto slide 7 mins; ACC 3 mins)

Weeks 6-7 (Visits 7-8)

Procedure	Minutes assigned
Voluntary Convergence	1
Life Saver Cards	4
HTS (Level 2)	10 (Auto slide 7 mins; ACC 3 mins)

Phase Three**Weeks 8-11 (Visits 9-12)**

Procedure	Minutes assigned
Eccentric Circles	5
HTS (Level 3)	10 (JD 7 mins; ACC 3 mins)

Phase Four**Weeks 12-15 (Visits 13-16)**

Procedure	Minutes assigned
Polaroid Bar Reader/Flippers	2
Eccentric Circle Jump Vergence	3
HTS (Level 3)	10 (JD 7 mins; ACC 3 mins)

Home Therapy Sequence for Patients WITHOUT Access to a Computer***Phase One*****Weeks 0-1 (Visits 1-2)**

Procedure	Minutes assigned
Brock String (Level 1)	8
Letter Chart Accommodative Rock (Level 1)	7

Weeks 2-3 (Visits 3-4)

Procedure	Minutes assigned
Brock String (Level 2)	4
Monoc Hopping card with +2 to -6D (loose lenses 1 D steps)	3 (1.5 min ea eye)
Variable Tranaglyph Level 1 (Sports, Bunny, Clown or Random Dot)	(BI 3min, BO 5 min)

Phase Two**Weeks 4-5 (Visits 5-6)**

Procedure	Minutes assigned
3 Dot Card	2
Life Saver Cards	3
Monoc Hopping card with +2 to -6D (loose lenses 1 D steps)	3 (1.5min ea eye)
Variable Tranaglyph Level 2	7

Weeks 6-7 (Visits 7-8)

Procedure	Minutes assigned
Voluntary Convergence	1
Life Saver Cards	4
Monoc Hopping card with +2 to -6D (loose lenses 1 D steps)	3 (1.5min ea eye)
Variable Tranaglyph Level 3 (split prism)	7

Phase Three**Weeks 8-11 (Visits 9-12)**

Procedure	Minutes assigned
Polaroid Bar Reader/Flippers	3
Eccentric Circles	5
Variable Tranaglyph Level 3 (split prism)	7

Phase Four**Weeks 12-15 (Visits 13-16)**

Procedure	Minutes assigned
Polaroid Bar Reader/Flippers	5
Eccentric Circle Jump Vergence	3
Variable Tranaglyph Level 4 (R/G flipper)	7

7.7.1 Brock String (Level 1)

Objective

To develop your awareness of crossing your eyes.

Equipment Needed

1. Brock String
2. Lens flippers (+/-2.00 D)

Procedure

1. Use two beads and about 1m of string.
2. Attach one end of the string on a chair or doorknob and hold the other end of the string taut and against the bridge of your nose.
3. Set the red bead at 2 ft (60 cm) from your nose and the green bead at about 1 ft (30 cm).
4. Look at the closer bead (green bead) and observe what you see and appreciate how your eyes feel. You should see one green bead and two red beads. In addition, you should notice two strings crossing at the green bead (looking like the letter X) with one string coming from your right eye and the other coming from your left eye. You should appreciate that your eyes are crossing or working harder.
5. Now look at the far bead (red bead) and you should now see one red bead with the strings crossing (looking like the letter X) at the red bead. You will also notice two green beads. You should appreciate that now your eyes are more relaxed than when looking at the green bead.
6. Remember the strings should look as if they are extensions of your right and left eyes. Where you perceive the two strings crossing is actually where your eyes are aimed. Thus, if you are trying to look at the green bead but the strings appear to cross farther away than the bead, this is an indication that you are looking too far away. Use this information to try and correct your eye position and look closer.
7. If you have trouble:
 - a. Try and get the “feeling” of looking close, crossing your eyes, or working harder.
 - b. Touch the bead that you are trying to make single.
 - c. Use the minus lens flippers to help cross your eyes.
8. Once you are able to fuse the near and far beads, try to keep the near bead single for 5 seconds and then switch to the far bead and hold for 5 seconds. Repeat this 10 times
9. Then move the near bead 2 inches (5 cm) closer while always maintaining the far bead at 2 feet (60 cm) and repeat step 5.
10. Continue moving the near bead closer until you reach your therapy goal.

Your Therapy Goal!

1. Move the near bead closer until you can successfully cross your eyes at a distance of 2 inches (5 cm) from your nose. You should be able to quickly move back and forth from the near bead to the far bead.
2. You should also be able to appreciate the different “feeling” and effort associated with crossing and relaxing your eyes.

7.7.2 Brock String (Level 2)

Objective

To improve the control of your ability to cross and relax your eyes

Equipment Needed

1. Brock String
2. Lens flippers (+/-2.00 D)

Procedure

1. Use about 1 m of string and place one bead at 2.5 cm and the other at 1 m.
2. Attach one end of the string on a chair or doorknob and hold the other end of the string taut and against the bridge of your nose.
3. Look at the bead at 1 m away and try and see that the two strings meet at that bead.
4. Now very slowly look closer and closer (as if a bug is walking on the string towards you) until you are looking at the bead 2.5 cm in front of your nose. Repeat this 10 times.
5. If you have trouble:
 - a. Try and get the “feeling” of looking close, crossing your eyes, or working harder.
 - b. Touch the point on the string that you are trying to look at with your finger or pencil tip and move it along the string towards your nose. As it gets easier remove your finger or the pencil.
6. After you can converge all the way to within 5 cm of your nose, slowly look along the string from that point to the end of the string. Repeat going towards and away from your nose 20 times.
7. Finally remove all beads from the string and slowly cross and relax your eyes, making sure you see the “X” at all times.

Your Therapy Goal!

1. You should be able to cross your eyes to within 2.5 cm of your nose and relax your eye to 1 m.
2. You should be able to slowly look along the string from near your nose to the end of the string and back again.
3. You should also be able to appreciate the different “feeling” and effort associated with crossing and relaxing your eyes.

7.7.3 3 Dot Card

Objective

To develop a strong awareness of crossing your eyes.

Equipment Needed

1. 3 Dot Card
2. Lens flippers (+/-2.00 D)

Procedure

1. The card is held between your index and thumb on lower edge of the card.
2. The card is held against the end of your nose with your chin slightly elevated so that the smallest dot is closest to your nose.
3. While looking at the dot farthest away you should see one dot that is a mixture of the red and blue colors. You should notice the middle and nearest dots are double.
4. Now look at the middle dot, holding it single for 5 seconds. You should notice the farthest and nearest dots are double.
5. Now look at the nearest dot, holding it single for 5 seconds. You should notice the farthest and middle dot as double.
6. You should alternate looking from the farthest, to the middle, to the nearest dot 20 times.
7. If you have trouble:
 - a. Try and get the “feeling” of looking close, crossing your eyes, or working harder.
 - b. Move the card farther away (1 to 2 inches) from your nose.
 - c. Use the minus lens flippers to help cross your eyes.

Your Therapy Goal!

1. You should be able to make each of the three dots single as quickly as possible, holding each single for at least 5 seconds, and be able to repeat this 10 times.
2. You should be able to appreciate the “feeling” and effort associated with crossing your eyes.

7.7.4 Voluntary Convergence

Objective

Develop the ability of your eyes to voluntarily converge

Equipment Needed

1. None

Setup

No setup required

Procedure

1. You should be able to voluntarily cross your eyes without the aid of a pointer, finger or any other object. To do so you should try and imagine an object slowly moving towards your eyes and try to get the feeling of crossing your eyes like when you worked with the Brock string.
2. Once you can cross your eyes so that you are looking as close as 1-2 inches from your nose, reverse the process and gradually relax your eyes and look at a distance target. Repeat this procedure for 20 repetitions.

Endpoint

1. You should be able to voluntarily cross your eyes to a distance 2.5 cm (1 inch) from your nose.
2. You should be able to appreciate the different feeling and effort associated with crossing and relaxing your eyes.

7.7.5 Home Therapy System (HTS) (Level 1)

Objective

To improve your ability to comfortably focus, cross and relax your eyes.

Equipment Needed

1. Computer
2. HTS program disk
3. Red and Blue glasses
4. HTS Flippers

Procedure

1. The instructions for installation of the HTS are included with the software.
2. To launch the HTS program double click on the HTS icon that has been added to your Desktop screen.
3. The first time you use the HTS program you will be prompted to enter your name. Once your name has been entered it cannot be changed.
4. Follow the prompts on the screen that will lead you step by step through the setup (measure screen size, indicate whether you have internet access). It is important to carefully measure the screen size. It is also important to indicate if you have internet access.
5. Once the setup is complete, the program will run on AUTO mode. As you complete each of the assigned procedures, the computer program will automatically move to the next procedure. You simply need to follow the instructions at each session.
6. Place the red and blue glasses over your eyes and click on the “**Run Program**” button and the therapy program will begin. You should always wear the red and blue glasses each time you do this computerized therapy.
7. The first therapy procedure you will perform during the first phase of HTS therapy is Vergence Base-in. For **Base In** Vergence, try to get the “feeling” of relaxing your eyes, or looking far away. During Base In therapy, you should notice a large square with a smaller square inside that is “popping out” towards you. Press the up, down, right or left arrow key to show where the small square appears (e.g., push left arrow if the small square is on the left side of the larger square).
 - a. If you answer correctly, the computer will “beep” and automatically increase the difficulty. If you are incorrect, the computer will “boop” and decrease the difficulty.
 - b. When you reach the point where the large box separates into 2, do not randomly push the arrow keys.
 - c. Try to get the “feeling” of looking far away until the boxes come back together into one.
 - d. If you see two boxes, try to remember how your eyes felt before the boxes split into two and try to get them back into one as soon as possible.
 - e. There are 3 different modes you may use to respond: classic, clicker, or spaceship.
 - i. In *classic* mode, you will use the arrow keys to answer and you will look to see whether you think the small square ‘popping out’ is to the top, bottom, left or right of the larger square. Try to keep the letter clear.
 - ii. In the *clicker* mode you will use the mouse to move the ‘swatter’ over the small square that you see popping out and then click when it is over the small square.
 - iii. In the *spaceship* mode, you will see a small square popping out in the upper half of the large square. The small square will start dropping towards the bottom of

the large square and you need to try to “hit” it before it reaches the bottom of the large square.

- f. Press Next Procedure
8. Next you will perform **Base Out** therapy during the first phase of HTS therapy. During Base Out therapy, you should notice a large square with a smaller square inside that is “popping out” towards you. Press the up, down, right or left arrow key to show where the small square appears (e.g., push left arrow if the small square is on the left side of the larger square).
 - a. If you answer correctly, the computer will “beep” and automatically increase the difficulty. If you are incorrect, the computer will “boop” and decrease the difficulty.
 - b. When you reach the point where the large box separates into 2, do not randomly push the arrow keys.
 - c. Try to get the “feeling” of pulling your eyes together, crossing your eyes, or working harder until the boxes come back together into one.
 - d. If you see two boxes, try to remember how your eyes felt (pulling your eyes together, crossing your eyes, or working harder) before the boxes split into two and try to get them back into one as soon as possible.
 - e. There are 3 different modes you may use to respond: classic, clicker, or spaceship.
 - f. Select Next Procedure
9. The last procedure you will perform each session is **accommodative rock**. You will need to use the flipper lenses provided. Hold the flipper of the appropriate level in your left hand with the appropriate level number facing you. You will begin with level 1 accommodative therapy and you will hold the level # 1 & 2 flipper in your left hand with the number ‘1’ facing you and look through the bottom set of lenses. Push the arrow key to indicate whether you see the opening of the C facing up, down, right or left. There are 6 levels of accommodative therapy and the program will show you which level to use.

Your Therapy Goal!

Your therapy goal is to complete each assigned activity in the HTS program.

7.7.6 Letter Chart Accommodative Rock (Level 1)

Objective

To improve your eye focusing power and flexibility.

Equipment Needed

1. Large letter chart
2. Small letter chart
3. Eye patch

Procedure

1. Cover your left eye with the patch.
2. Place the large letter chart at 9 feet (3 m) away.
3. Hold the small letter chart at 16 inches (40 cm).
4. Hold the small chart at 16 inches (40 cm) and call off the letters on the top line while moving the chart closer.
5. When you can no longer keep it clear, move the chart 1 inch (2.5 cm) further away and then shift to the second line of the larger chart. Repeat the far to near change for each letter on the second line.
6. After completing line two, move the small chart to 16 inches (40 cm) and call off letters on the third line while moving the chart closer. Then repeat step 2, shifting to the fourth line of the larger chart.
7. Repeat until all 10 lines are complete.
8. If you have trouble, try and get the “feeling” of looking close or crossing your eyes for the small chart or try and get the feeling of relaxing or looking far away for the large chart.
9. Repeat the procedure with the patch moved to your right eye.

Your therapy goal!

1. You should be able to clear letters on the near chart at about 4 inches (10 cm) while being able to shift your focus and clear the letters on the far chart.
2. You should be able to appreciate the different “feeling” and effort associated with clearing the print while viewing the far chart compared with clearing the print while viewing the near chart.

7.7.7 Life Saver Cards

Objective

To improve your ability to comfortably cross and relax your eyes

Equipment Needed

1. Opaque Life Saver Card
2. Pencil with sharpened point

Procedure

Convergence Therapy

1. Hold the opaque Life Saver card about 16 inches (40 cm) from your nose.
2. Place the pencil tip slightly below and between the two Lifesavers or circles (red and green) that are closest together.
3. Stare at the pencil tip.
4. Slowly move the pencil tip away from the paper and closer to you while looking at the pencil tip the whole time.
5. As you pull the pencil tip closer, you should NOTICE that the two colored circles on either side of the pencil are getting blurry and may start to split apart. Remember to keep your eyes on the pencil tip as you pull it closer to you.
6. As you continue, you should notice that one of the green circles and one of the red circles may merge and create a third circle located directly under your pencil tip.
7. Try to clear that third circle by slowly moving the pencil slightly forwards and backwards until you get it clear. Ignore all the other circles.
8. The circle will appear to float directly under where the pencil tip is.
9. Hold the clear reddish and greenish circle for at least ten seconds.
10. Take the pencil away and try to keep that third circle clear and single.
11. Hold for another ten seconds.
12. You may relax your eyes now.
13. Try this again without the use of the pencil. If you have difficulties continue to use the pencil.
14. Move up to the next set of circles and repeat the procedure until you reach the top of the card.
15. If you have trouble:
 - a. Try and get the “feeling” of looking close, crossing your eyes, or working harder.
 - b. Move the card slightly forward or backwards until you get the circle to be single and clear while keeping the pencil stationary.

Your Therapy Goal!

1. You should be hold the floating third circle and keep it clear for at least 5 seconds for each of the four levels of the card.
2. You should be able to perform this task without the aid of the pencil.

7.7.8 Home Therapy System (HTS) (Level 2)

Objective

To improve your ability to comfortably cross and relax your eyes

Equipment Needed

1. Computer
2. HTS program disk
3. Red and Blue glasses

Procedure

1. To launch the HTS program double click on the HTS icon that has been added to your Desktop screen.
2. Place red and blue glasses over your eyes and click on the **“Run Program”** button and the therapy program will begin. At this stage in the treatment you will be working on “Autoslide Vergence.”
3. The task is similar to the procedure you completed earlier with Base-out and Base-in Vergence.
4. Continue the procedure for the allotted practice time.

Your Therapy Goal!

Your therapy goal is to complete each assigned activity in the HTS program.

7.7.9 Home Therapy System (HTS) (Level 3)

Objective

To improve your ability to cross and relax your eyes quickly and efficiently.

Equipment Needed

1. Computer
2. HTS program disk
3. Red and Blue glasses

Procedure

1. To launch the HTS program double click on the HTS icon that has been added to your Desktop screen.
2. Place red and blue glasses over your eyes and click on the “**Run Program**” button and the therapy program will begin.
3. At this stage in the treatment you will be working on “Jump Ductions.” The task is similar to the procedure you completed earlier with Base-out and Base-in Vergence.
4. You should notice a large red square with a smaller square inside that is “popping out” towards you.
5. Press the arrow key to the side of where the small square appears (i.e., push left arrow key if the small square is on the left side of the larger square).
6. If you correctly match the location of the smaller square the computer will “beep” at you. If you are incorrect the computer will “boop”.
7. Your eyes relax and cross with each successive square.
8. When you reach the point where the large box separates into two boxes, try to get the “feeling” of using your eyes to determine if you have to relax or cross your eyes to get the big square to become single again.
9. Again, press the arrow key to where you see the smaller square “popping out” towards you.

Your Therapy Goal!

1. You should complete each assigned activity in the HTS program.
2. You should be able to cross or relax your eyes quickly and easily.

7.7.10 Eccentric Circle

Objective

To improve your ability to cross your eyes quickly and efficiently.

Equipment Needed

1. Transparent Eccentric Circle Cards
2. Pointer

Convergence Procedures

1. Hold the cards about 16 inches (40 cm) from your nose.
2. Begin with the two cards together with the "A"s touching.
3. Start by getting the three circles as you learned in the office.
4. Once you are able to hold the three circles for 5 seconds, look away and look back, trying to get the three circles back as soon as possible.
5. If you are having trouble try the following:
 - a. Place a pencil tip slightly below and between the two cards.
 - b. Stare at the pencil tip.
 - c. Slowly move the pencil tip away from the cards and closer to you while looking at the pencil tip the whole time.
 - d. As you pull the pencil tip closer, you should NOTICE that the two cards on either side of the pencil are getting blurry and may start to split apart. Remember to keep your eyes on the pencil tip as you pull it closer to you.
 - e. Keep moving the pencil tip toward you until you notice the inside pair of cards merge and create a third card with two circles directly under your pencil tip.
 - f. Try to clear that third card by slowly moving the pencil slightly forwards and backwards until you get it clear. Ignore all the other two cards on the sides.
 - g. The outer circle will appear to float closer to you than the inner circle.
 - h. Once you are able to hold the three circles for 5 seconds, look away and look back, trying to get the three circles back as soon as possible.
 - i. Take the pencil away and try to keep that card clear and single.
 - j. Hold for another ten seconds.
 - k. You may relax your eyes now.
 - l. Try this again without the use of the pencil. If you have difficulties continue to use the pencil.
6. Once you can do this with the cards together begin to increase the separation $\frac{1}{4}$ inch at a time and repeat the process.
7. Continue until you can do the above with a 5 inch separation of the cards.

Your Therapy Goal!

You should be able to see three cards, the word "CLEAR" in the middle card should be clear, the outer circle in the middle card should float closer to you than the inner circle. You should be able to do this with the cards separated by 5 inches.

Divergence Procedures

1. Hold the CLEAR Eccentric Circle cards about 16 inches (40 cm) from your nose.
2. Begin with the two cards together with the "A"s touching.
3. Start by getting the three circles as you learned in the office. Remember that for divergence you must relax your eyes and look through the clear cards at a distance.
4. Once you are able to hold the three circles for 5 seconds, look away and look back, trying to get the three circles back as soon as possible.
5. If you are having trouble try the following:
 - a. Try to stare out at a distance object.
 - b. It is helpful to tape a pencil or pick-up stick on the wall and sit about 10 feet away. Look through the Eccentric Circle cards at the stick on the wall.
 - c. Once you are able to hold the three circles for 5 seconds, look away and look back, trying to get the three circles back as soon as possible.
6. Once you can do this with the cards together begin to increase the separation $\frac{1}{4}$ inch at a time and repeat the process.
7. Continue until you can do the above with a 2.5 inch separation of the cards.

Your Therapy Goal!

You should be able to see three cards, the word "CLEAR" in the middle card should be clear, the inner circle in the middle card should float closer to you than the outer circle. You should be able to do this with the cards separated by 2.5 inches.

7.7.11 Eccentric Circle Jump Vergence

Objective

To improve your ability to cross and relax your eyes quickly and efficiently.

Equipment Needed

1. Transparent Eccentric Circle Cards
2. Flip Prism (8^Δ Base-out/4^Δ Base-in)
3. Pointer

Procedures

1. Hold the cards about 16 inches (40 cm) from your nose.
2. Begin with the two cards together with the "A"s touching.
3. Start by getting the three circles you learned from before.
4. Once you are able to hold the three circles for 5 seconds, look away and look back, trying to get the three circles back as soon as possible.
5. Now that you are able to get the three circles, place the prism in front of your right eye with the thickest part pointing away from your nose.
6. If the third circle disappears, cross your eyes to get the circle back.
7. Flip the prism down to the prism with the thickest part pointing toward from your nose.
8. If the third circle disappears, relax your eyes to get the circle back.
9. Continue switching between the two prisms until it takes very little effort to get the third circle.

Your Therapy Goal!

You should be able to, getting the third circle as quickly as possible, switch between the two parts of the prism 20 times in 1 minute.

7.7.12 Polaroid Bar Reader/Flippers

Objective

To improve your ability to focus your eyes quickly and efficiently

Equipment Needed

1. Lens flippers in various powers: +/-1.00, +/-1.50, +/-2.00.
2. Reading materials of differing sizes (given to you).
3. Vertical striped "bar reader"
4. Polaroid glasses

Procedures

1. Put the "bar reader" over your reading material with the strips vertical (up and down).
2. Put the Polaroid glasses over your eyes.
3. Put the lens flippers (+1.00/-1.00) in front of your eyes. Read one line at a time. Once you get to the end, flip the lens to the other side and read the next line of letters.
4. If you have trouble clearing the print:
 - a. Try relaxing your eyes as you read through the "plus" side of the lens.
 - b. Try crossing your eyes as you read through the "minus" side of the lens.
5. If you are having trouble because one of the stripes go black:
 - a. Blink very quickly until the letters reappear under the stripe
 - b. Wave your hand in front of your eyes very quickly until the letters return
6. Continue flipping the lenses and reading for 3 minutes.
7. Move to the next set of lenses after reading for a week with the previous set of lenses.
8. Once you can get clear vision with +2.00/-2.00 try to focus your eyes quickly.
9. The goal is to be able to get clear vision through the +2.00 and then the -2.00 lenses as fast as possible and to be able to flip the plus and minus lens 20 times in 1 minute.

Your Therapy Goal!

1. You should be able to read the letters with the +2.00/-2.00 flipper without the "bar reader" over the letters ever going black.
2. You should be able to flip the plus and minus lens 20 times in 1 minute.

Alternate Home Therapy Procedures for Patients WITHOUT Access to a Computer

7.7.13 Hopping Card Focusing Procedure

Objective

1. To improve your eye focusing power and flexibility

Equipment Needed

1. Hopping Focusing Cards
2. Eye patch
3. Hand held lenses in 1 unit steps (+2, +1, -1, -2, -3, -4, -5, -6)
Lenses to send home for use this week _____

Set up

1. Position yourself so that you are about 16 inches from the Hopping Card.
2. Patch your left eye.
3. Hold one lens in your right hand and one lens in your left hand (Use the lenses prescribed by your therapist)
4. Make sure you have good lighting when performing this task.

Procedure

1. The left-hand column of each line has directions telling you what you need to do. Follow these directions. For example, if the directions on the first line state, "Find words starting with the N". You should read the words from left to right and after EACH word, switch and look through the lens in the other hand. After each lens change you will need to re-focus as quickly as you can to make the words clear and continue to find words that begin with "N".
2. Continue reading each line, alternately changing the lens you are looking through after each word.
3. Repeat with your left eye (right eye should be patched)

Endpoint

You should be able to alternately clear the lenses 25 times a minute.

7.7.14 Home Vergence Therapy Tranaglyph Procedure

Objective

To improve your ability to comfortably cross and relax your eyes

Equipment Needed

4. Red /Green Tranaglyph in holder
5. Red and Green filter glasses (red filter should be in front of right eye)
6. 12/3 or 8/4 Split Prism
7. Red/Green Flipper
8. ± 2.00 Flipper lenses

Procedure

Level 1:

Convergence

1. Hold the Tranaglyph about 16" in front of you
2. Put on the Red Green filter glasses (with the red filter in front of your right eye) and look at the tranaglyph (arrows pointing to 0).
3. You should see the 'R's on top of the 'L's. (Please let your therapist know if the R's are not lined up over the L's.)
Separate the sheets so that you are slowly pulling the sheet with the RED pictures on it to the RIGHT (This is the sheet with the 'L' on it.) and try to keep the pictures clear and single. You should see the pictures appear to be floating. Point to where you see the pictures floating. Make sure that the pictures stay single (one) and try to keep the pictures clear. **The arrows should still appear to be pointing to the zeros in the center and the 'R's should stay lined up over the 'L's.**
4. Think about how your eyes feel. You should feel like you are looking close or crossing your eyes. Pay attention to whether the picture is changing in size.
5. Look at the pairs of circles. Notice which circle looks closer to you (inside circle or outside circle). You should see an 'X' in each pair of circles with a square lined up over the 'X' and a circle lined up below the 'X'.
6. If the pictures start to look flat or if you are unable to keep the pictures single (one), bring the sheets *slightly* closer together. Try to get the pictures back into one by looking close.
7. Repeat trying to separate the sheets as far as you can. Your goal is to have the sheets separated by 5 inches or more. (When you look without the glasses you should see that the green 'R' is 5 inches or more to the left of the red 'L'. You will also see the bottom green arrow pointing to the number 30 or farther on the bottom scale.)
8. If you are having difficulty
 - a. Try thinking about looking close
 - b. Place the white sheet behind the red and green sheets
 - c. Blink your eyes if needed to see the pictures clearly.
 - d. Look through the -2.00 side of the flipper lens. Make the pictures clear and single. Try to keep the pictures clear and single as you remove the lens. Your goal is to keep the pictures clear and single even when not looking through the lenses.

Home Vergence Therapy Tranaglyph Procedure

Divergence (Level 1)

1. Hold the Tranaglyph about 16" in front of you.
2. Put on the Red Green filter glasses (red filter in front of your right eye) and look at the Tranaglyph (arrows pointing to 0).
3. You should see the 'R's lined up over the 'L's.
4. Separate the sheets so that you are slowly pulling the sheet with the GREEN pictures on it to the RIGHT and try to keep the pictures clear and single. (This is the sheet with the 'R' on it.)
5. The pictures should appear to be floating. Point to where you see the pictures floating. Make sure that the pictures stay single (one) and try to keep the pictures clear. The arrows should still appear to be pointing to the zeros in the center and the 'R's should stay lined up over the 'L's.
6. Think about how your eyes feel. You should feel like you are looking far away or relaxing your eyes. Pay attention to whether the picture is changing in size.
7. Look at the pairs of circles. Notice which circle looks closer to you (inside circle or outside circle). You should see an 'X' in each pair of circles with a square lined up over the 'X' and a circle lined up below the 'X'.
8. When you are unable to keep the pictures single (one) and clear, bring the sheets a little bit closer together. Try to get the pictures back into one by looking far.
9. Repeat trying to separate the sheets as far as you can. Your goal is to have the sheets separated by 2.5 inches or more. (When you look without the glasses you will see that the green 'R' is 2.5 inches or more to the right of the red 'L'. You will also see the top green arrow pointing to the number 15 or higher on the top scale.)
10. If you are having difficulty
 - a. Try thinking about looking far or relaxing your eyes
 - b. Remove the white background behind the red and green sheets and try to look through the sheets to make the pictures one.
 - c. Blink your eyes if needed to see the pictures clearly.

Endpoint

1. Convergence: When pulling the RED sheet to the RIGHT, you can separate the sheets by 5 inches or more (bottom green arrow pointing to number 30 (or farther) on the bottom scale).
2. Divergence: When pulling the GREEN sheet to the RIGHT, you can separate the sheets by 2.5 inches or more (top green arrow pointing to number 15 or higher on the top scale).

Home Vergence Therapy Tranaglyph Procedure

Level 2:

1. Once you are able to meet the goals for Level 1, pull the RED sheet to the RIGHT about 1/2 inch at a time. Try to keep the pictures clear and single. If the pictures start to look flat or if you are unable to keep the pictures single (one), bring the sheets *slightly* closer together. Try to get the get the pictures back into one by looking close.
 - a. Repeat trying to separate the sheets as far as you can. Your goal is to have the sheets separated by 5 inches or more. (When you look without the glasses you should see that the green 'R' is 5 inches or more to the left of the red 'L'. You will also see the bottom green arrow pointing to the number 30 or more on the bottom scale.)
 - b. If you are having difficulty
 - i. Try thinking about looking close or crossing your eyes more
 - ii. Place the white background behind the red and green sheets
 - iii. Blink your eyes if needed to see the pictures clearly.
 - iv. Look through the -2.00 side of the flipper lenses. Make the pictures clear and single. Try to keep the pictures clear and single as you remove the lens and keep them clear and single.
2. Pull the GREEN sheet to the RIGHT about 1/2 inch at a time. Try to keep the pictures clear and single. If the pictures start to look flat or if you are unable to keep the pictures single (one), bring the sheets *slightly* closer together. Try to get the get the pictures back into one by looking far away or relaxing your eyes.
 - a. Repeat trying to separate the sheets as far as you can. Your goal is to have the sheets separated by 2.5 inches or more. (When you look without the glasses you will see that the green 'R' is 2.5 inches or more to the right of the red 'L'. You will also see the top green arrow pointing to the number 15 or higher on the top scale.)
 - b. If you are having difficulty
 - i. Try thinking about looking far or relaxing your eyes
 - ii. Remove the white background behind the red and green sheets and try to look through the sheets to make the pictures one.
 - iii. Blink your eyes if needed to see the pictures clearly.
3. Repeat the steps above pulling the RED sheet to the RIGHT and then pulling the GREEN sheet to the RIGHT about 1inch at a time.

Endpoint

You should be able to keep the pictures clear and single when pulling the RED sheet to the RIGHT (5 inches or more) and when pulling the GREEN sheet to the RIGHT (2.5 inches or more).

Home Vergence Therapy Tranaglyph Procedure**Level 3:**

1. Hold the Tranaglyph about 16" in front of you
2. Put on the Red Green filter glasses (red lens over your right eye) and look at the Tranaglyph (arrows pointing to 0).
3. Separate the sheets so that you are pulling the RED sheet to the RIGHT slightly.
4. Hold the prism (marked 12 or 8) in front of one eye so that the thick part of the prism is facing outwards towards your ear. You may see the picture split into two and you should try to make it clear and single (one) again as quickly as possible. Think about looking close or crossing your eyes more. Try to keep it one for a count of 5 seconds.
5. Next, look through the other half of the prism (3 or 4). You may see the picture split into two and you should try to make it one. Try to keep it one for a count of 5 seconds.
6. Alternate looking through the thick part and the thin part of the prism 20 times and making the picture clear and single again each time. Repeat, separating the sheets slightly further each time.
7. Repeat, separating the sheets so that you are pulling the GREEN sheet to the RIGHT.

Endpoint

You should be able to keep the pictures clear and single when looking through each half of the prism and when pulling the RED sheet to the RIGHT (5 inches or more, bottom arrow pointing to number 30 on the bottom scale) and when pulling the GREEN sheet to the RIGHT (2 inches or more, top green arrow pointing to number 12 or higher on the top scale).

Home Vergence Therapy Tranaglyph Procedure**Level 4:**

1. Hold the Tranaglyph sheets about 16" in front of you.
2. Put on the Red Green filter glasses (red lens in front of your right eye) and look at the Tranaglyph (arrows pointing to 0).
3. Separate the two sheets so that you are pulling the RED sheet to the RIGHT slightly.
4. Keep the pictures clear and single for 5 seconds, then look away for several seconds and look back and regain fusion (single picture); keep the pictures single for another 5 seconds.
5. Repeat, separating the sheets slightly further each time.
6. Set the sheets so that the green arrow at the bottom is pointing to the 25 (or higher) on the bottom scale (Sheet with Red 'L' should be to the right of the sheet with the Green 'R'). Make the pictures clear and single, look away and look back, regain single, clear vision. Your goal is to be able to do this 10 times a minute.
7. Repeat steps 1-3, separating the separating the sheets so that you are pulling the GREEN Tranaglyph sheet to the RIGHT.
8. Set the sheets so that the green arrow at the top is pointing to the 15 on the top. (Sheet with Green 'R' should be on the right of the sheet with the Red 'L'.) Make the pictures clear and single, look away and look back, regain single, clear vision. Your goal is to be able to do this 10 times a minute.
9. Remove the Red Green filter glasses, pull the RED Tranaglyph sheet to the RIGHT slightly and look through the **Red Green flippers** (red lens should be over your right eye). The Red Green flipper lenses are used to change the demand between convergence (looking close and crossing your eyes) and divergence (looking far and relaxing your eyes) each time they are flipped.
10. Alternately flip the red/green flippers making the pictures clear and single after each flip.
11. Continue to separate the sheets slightly further.
12. Continue until you can look through each side of the flipper and make the picture clear and single while the sheets are set with the bottom green arrow pointing to number 15 or higher on the bottom scale.
13. Set the sheets so that the green arrow at the bottom is pointing to the 15 or higher on the bottom scale. Alternately flip the Red Green flippers and make the pictures single and clear as quickly as you can each time. Your goal is to be able to flip the lenses 20 times in a minute (making the pictures clear and single each time).

Endpoint

1. You are able to set the sheets so that the green arrow at the bottom is pointing to the 30 on the bottom scale (Sheet with Red 'L' should be to the right of the sheet with the Green 'R'). Make the pictures clear and single, look away and look back, regain single, clear vision. Your goal is to be able to do this 10 times a minute.
2. You are able to set the sheets so that the green arrow at the top is pointing to the 15 on the top scale. (Sheet with Green 'R' should be on the right of the sheet with the Red 'L'.) Make the pictures clear and single, look away and look back, regain single, clear vision. Your goal is to be able to do this 10 times a minute.
3. When using Red Green flippers, you can alternately make the picture clear and single with the Tranaglyph set on 15 for at least 20 flips per minute.

7.8 Maintenance Therapy

Maintenance therapy for OBVAT participants with an average CISS score is less than 16, will consist of one gross convergence technique (Brock String or Barrel Card) and one fusional vergence technique (Eccentric Circles or Lifesaver Cards). Subjects will be instructed to perform these techniques for a total of 15 minutes, once per week from the primary outcome examination for 3 months after which maintenance therapy will be discontinued.

Appendix

Convergence Insufficiency Treatment Trial – Attention and Reading Study
VISION TREATMENT PROTOCOL SUMMARY FORM

Instructions: At each therapy session select at least one therapy procedure from each category. During a typical vision therapy session the participant will be ask to work on 4 to 5 different procedures.

PHASE ONE		
Gross Convergence	Endpoint	Date & Initials
Brock String (Level 1)	Converge to a bead placed 2.5cm from nose	
Brock String (Level 2)	Voluntarily converge to 2.5cm from nose	
3 Dot Card	Converge to closest Dot on card	
Accommodation	Endpoint	Date & Initials
Loose Lens Accom Rock (Level 1)	Clear +1.50/-3.00, 10 cycles per minute	
Letter Chart Accom Rock (Level 1)	Clear near chart at 33 cm and be able to clear to distance chart	
Bulls Eye Rock (Level 1)	Clear near chart at 33 cm and be able to clear to distance chart	
Lens Sorting (Level 1)	Ability to sort lenses with 1D increments	
Vergence	Endpoint	Date & Initials
Vectograms (Quoits) Base-out	30 ^Δ Base-out	
Computer Orthoptics (RDS) Base-out	45 ^Δ Base-out with large RDS targets	
PHASE TWO		
Accommodation	Endpoint	Date & Initials
Loose Lens Accom Rock (Level 2)	Clear +2.00/-6.00, 10 cycles per minute	
Letter Chart Accom Rock (Level 2)	Clear near chart at age-appropriate distance and be able to clear to distance chart 10cpm	
Bulls Eye Rock (Level 2)	Clear near chart at chart at age-appropriate distance and be able to clear to distance chart	
Lens Sorting (Level 2)	Ability to sort lenses with ½ D increments	
Vergence	Endpoint	Date & Initials
Vectograms (Quoits/Clowns)	25 ^Δ Base-out /12 base-in	
Computer Orthoptics (RDS)	45 ^Δ Base-out with Medium RDS targets/15 Base-in with Medium RDS targets	
Life Saver Cards	Able to clear all four levels of difficulty and hold fusion for at least 5 Seconds	
PHASE THREE		
Accommodation	Endpoint	Date & Initials
Stereoscope Bi-ocular Rock	Clear +2.00/-6.00, 10 cycles per minute	
Prism dissociation Bi-ocular Rock	Clear +2.00/-6.00, 10 cycles per minute	
Computer Orthoptics Bi-ocular Rock	Clear +2.00/-6.00, 10 cycles per minute	
Vergence	Endpoint	Date & Initials
Vectograms (Quoits/Clown) Jump Vergence	25 ^Δ Base-out, 12 ^Δ Base-in (Letter "L"), 10cpm 12 ^Δ Base-out, 12 ^Δ Base-in with Polaroid flippers, 10cpm	
Computer Orthoptics (RDS) Jump Vergence	Fuse 45 ^Δ Base-out to 15 ^Δ Base-in using small targets in Step jump duction mode.	
Aperture Rule	30 ^Δ Base-out (Card 12), 15 ^Δ Base-in (Card 6)	
Eccentric Circles	30 ^Δ Base-out, 15 ^Δ Base-in	
PHASE FOUR		
Accommodation	Endpoint	Date & Initials
Polaroid Bar Reader/Flippers	Single, clear vision while viewing 20/30 point at 40cm through +2.00 and alternately -2.00 for at least 13 cycles per minute without suppression.	
Aperture Rule/Flippers	Single, clear vision while viewing Card 12 through +2.00 and alternately -2.00 for at least 13 cycles per minute without suppression.	
Vergence	Endpoint	Date & Initials
Computer Orthoptics (RDS) Jump Vergence	Fuse 45 ^Δ Base-out to 15 ^Δ Base-in for at least 15 repetitions in 1 minute using small targets in Random jump duction mode.	
Aperture Rule Jump Vergence	Using 8 ^Δ Base-out/4 ^Δ Base-in prism flippers, achieve clear, single binocular vision with card 8 for convergence (28 ^Δ Base- out to 16 ^Δ Base-out) and Card 4 for divergence (2 ^Δ Base-in to 14 ^Δ Base-in) for 10 cycles per minute	
Eccentric Circles Jump Vergence	Regain clear, chiasmotic fusion after fusion is disrupted with a card separation of 12cm (30 ^Δ Base-out) and clear, orthopic fusion with a card separation of 6cm (15 ^Δ Base-in). Switch between chiasmotic and orthoptic fusion with the cards held 6 cm apart for 20 repetitions	

By initialing a specific procedure, you are certifying that the participant has achieved the desired endpoint for that procedure.

Overview of the sequencing of OBVAT

