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Chapter 8: Office-based Vision Therapy (VT/Orthoptics)

8.1 General Principles and Guidelines for Office-based VT/Orthoptics

Office-based Vision Therapy/Orthoptics requires a subject to undergo a specific therapy regimen with 12 weekly, 60 minute in-office treatment sessions. Vision Therapists (O.D., M.D., Orthoptists, or specially-trained technicians) administer the therapy in the office. Office-based VT/Orthoptic procedures are then supplemented with various home therapy procedures.

1. The office-based vision therapy/orthoptics program has been divided into 3 phases. (See chart, page 8-10) Within each phase there are a number of categories such as gross convergence, vergence, and accommodation (See chart, page 8-11).
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 subject should be able to achieve. These endpoints should be considered guidelines, rather than rigid criteria. Thus, if a subject 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 of the 3 phases (12 weeks total). This is only a guideline and in some cases a subject 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 subject reaches the stated endpoints.
6. It is possible for a subject to complete the entire Office-based VT/Orthoptics therapy sequence in less than 12 weeks. If this occurs, the subject 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 in each site will be responsible for the selection of the vision therapy procedures performed at each visit.
8. The vision therapy will always be performed on a one to one basis (one therapist per subject).

8.1.1 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 subject can perform easily

Working on this level makes it easier for the subject 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 subject 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 subject 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 subject can do successfully as opposed to giving tasks that are too difficult.

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

A key to success in vision therapy is teaching the subject to internalize changes in visual function, as opposed to just achieving certain criteria for specific techniques. Often, as subjects 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 subject may believe that these external items are the keys to their success in vision therapy.

It is important to stress that the subject 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 subject 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 subject is asked to try, the instructions are given in terms of what happens to the targets rather than what changes the subject must make internally to achieve the desired result.

Try the following approach instead.

Explain to the subject 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 subject to take responsibility for creating internal change.

Make the subject aware of the goals of vision therapy

The subject 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 subject 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 subject

When performance feedback is available to the subject, 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 Vision Therapy

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

Subject is Experiencing Difficulty with Gross Convergence

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

Subject is Experiencing Difficulty with Positive Fusional Vergence

1. Suggest that the subject 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 subject 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 subject should perceive the target as smaller and closer. The subject 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 subject to point to the target and perceive one target and one pointer.

If the subject 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 subject 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 subject developing this understanding of what changes he/she must make to accomplish a particular task.

Often when a subject 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 subject 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 subject started. The explanation we use with subjects 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 subject look at a pointer while you hold another object in the background. Have the subject 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 subject 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 subject when asked to localize, points too far away and experiences diplopia. If the subject 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 subject continues to be unable to simply pick up the pointer and immediately localize correctly. However, with repetition most subjects will soon understand what they must do visually during convergence therapy.

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

Subject is Experiencing Difficulty with Negative Fusional Vergence

1. Suggest that the subject 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 subject 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 subject. A Quoits Vectogram is placed in a clear holder and the subject 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 subject 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 subject. The subject 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 subject 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 subject 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

Subject is Experiencing Difficulty with Stimulation of Accommodation

If the subject is experiencing difficulty at any level:

1. Suggest that subject 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.

Subject is Experiencing Difficulty with Relaxation of Accommodation

If the subject is experiencing difficulty at any level:

1. Suggest that subject 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.

8.1.2 Subject Instructions

Subjects will be given a written set of instructions which describe how to perform the home therapy procedures as outlined in sections 8.10 – 8.16. The subject 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 subject has a complete understanding of the technique. Subjects will be asked to demonstrate all home therapy techniques to the therapist before leaving. In addition, the subject will be given a CITT office-based therapy home log form and instructions for proper completion.

8.1.3 Weekly Office Visits

The subjects 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 subject about his/her home therapy procedures during the previous week and check the subject’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 subject.

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

8.1.4 Investigator Instructions

The therapist will use a standardized set of instructions to instruct the subject in each phase of Office-based VT/Orthoptics as outlined in sections 8.3 – 8.9.

8.1.5 Forms

Forms used for Office-based VT/Orthoptics therapy include the:

1. CITT Office-based VT/Orthoptics therapy investigator instructions
2. CITT Office-based VT/Orthoptics therapy subject instructions
3. CITT Office-based VT/Orthoptics therapy record form
4. CITT Office-based VT/Orthoptics therapy home log form

8.1.6 Treatment Compliance

Subjects will be required to keep a home log of the time for each activity/procedure they performed each day and bring the form with them to the weekly appointments.

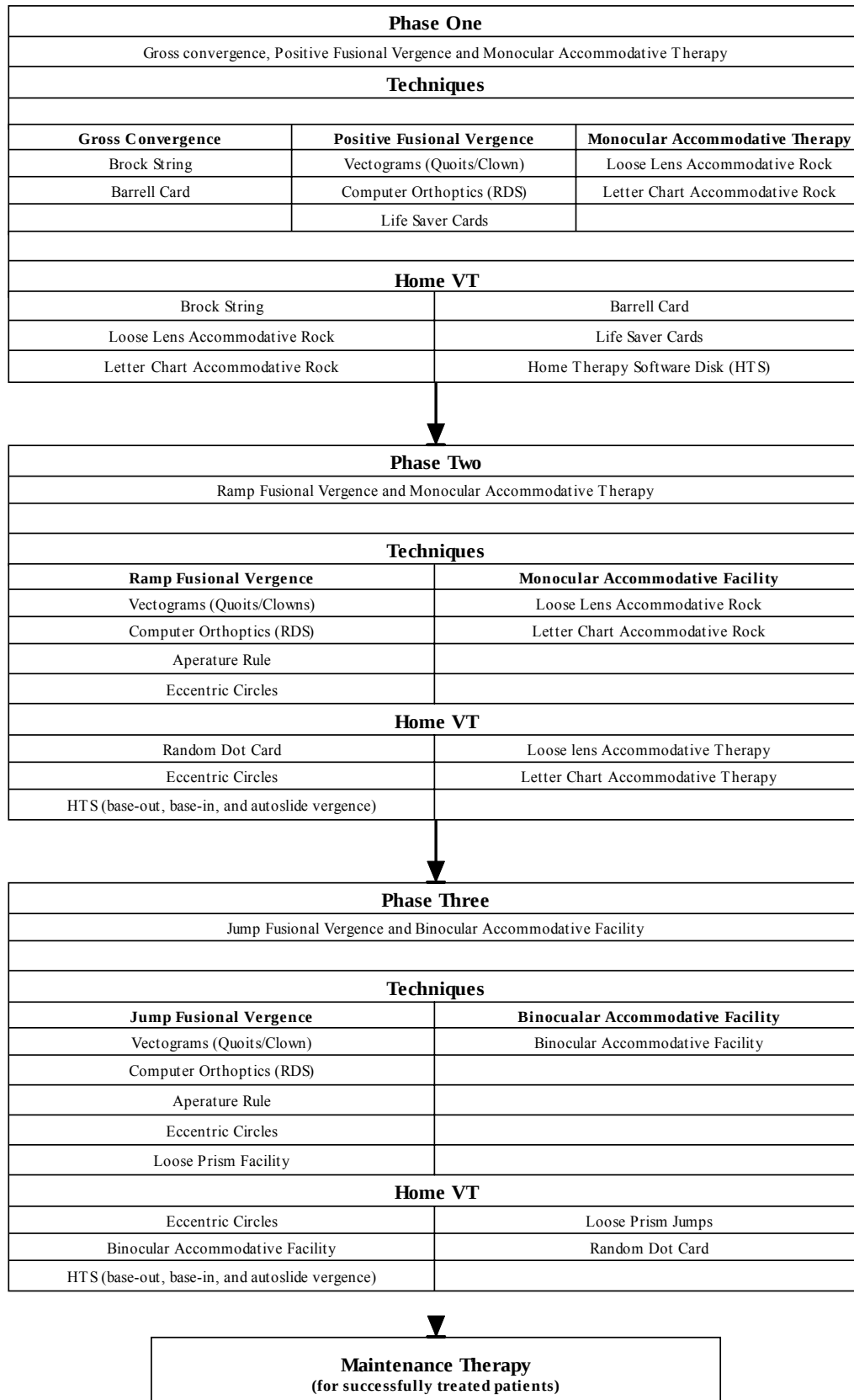
8.1.7 Maintenance Treatment

Maintenance therapy for successful Office-based VT/Orthoptics subjects 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 until the 6-month follow-up examination. The specific maintenance therapy assigned to subjects in this group should be recorded on the Vision Therapy Record form and transmitted to the DCC with other week-12 forms. From the 6-month to 12-month follow-up there will be no maintenance treatment.

8.2 Office-based VT/Orthoptics Vision Therapy Equipment Needed

Brock String
 Barrel Card
 Dual Polachrome Orthopter
 Two Quoits/Clown Vectograms
 Liquid Crystal Computer Orthopter
 Loose Lenses (+2.00 to -6.00 in ½ diopter increments)
 Accommodative Rock Cards
 Hart Chart
 Aperture Rule
 Random Dot Pads
 Clear Eccentric Circles
 Opaque Eccentric Circles
 Clear Life Saver Cards
 Opaque Life Saver Cards
 Lens Flippers (+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)
 Computer Orthoptics Random Dot Stereogram (RDS)
 Polaroid Flippers
 Polaroid Glasses
 Loose Prisms (6^Δ, 8^Δ, 10^Δ, 12^Δ, 15^Δ, 20^Δ, 25^Δ)

8.3 Office-based VT/Orthoptics Vision Therapy Protocol (Flow Sheet)



8.4 Office-based VT/Orthoptics Vision Therapy Endpoints (List)

Phase One	
Gross Convergence	Endpoint
A. Brock String (Level 1)	Converge to a bead 2.5 cm from nose
B. Brock String (Level 2)	Voluntarily converge to a bead 2.5cm from nose
C. Barrel Card	Fuse each of the three beads, hold fusion for 5 seconds, for 10 repetitions
Vergence	Endpoint
D. Vectograms (Quoits/Clown) Base-out	30 ^Δ Base-out
E. Computer Orthoptics (RDS) Base-out	45 ^Δ Base-out with large RDS targets
F. Lifesaver Cards	Able to clear all four levels of difficulty and hold fusion for at least 5 seconds
Accommodation	Endpoint
G. Loose Lens Accommodative Rock	Clear +1.50/-3.00, 10 cycles per minute
H. Letter Chart Accommodative Rock	Clear near chart at age-appropriate distance and be able to clear to distance chart
Phase Two	
Vergence	Endpoint
I. Vectograms (Quoits/Clown)	25 ^Δ Base-out, 12 ^Δ Base-in (Letter "L")
J. Computer Orthoptics (RDS)	45 ^Δ Base-out with large RDS targets 15 ^Δ Base-in with large RDS targets
K. Aperture Rule	30 ^Δ Base-out (card 12), 15 ^Δ Base-in (card 6)
L. Eccentric Circles	30 ^Δ Base-out/ 15 Base-in
Accommodation	Endpoint
M. Loose Lens Accommodative Rock	Clear +2.00/-6.00, 10 cycles per minute
N. Letter Chart Accommodative Rock	Clear near chart at age-appropriate distance, change fixation and clear far letter chart at 3 m for 10 cycles per minute
Phase Three	
Vergence	Endpoint
O. Vectograms (Quoits/Clown) Jump Vergence	Alternately fuse 25 ^Δ Base-out and 15 ^Δ Base-in for at least 10 cycles per minute
P. Computer Orthoptics (RDS) Jump Vergence	Alternately fuse 45 ^Δ Base-out and 15 ^Δ Base-in
Q. 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
R. Eccentric Circles Jump Vergence	Regain clear, chiasmatic fusion after fusion is disrupted with a card separation of 12cm (30 ^Δ Base-out) and clear, orthoptic fusion with a card separation of 6cm (15 ^Δ Base-in). Switch between chiasmatic and orthoptic fusion with the cards held 6 cm apart for 20 repetitions
S. Loose Prism Facility	For jump vergence, achieve single, clear, binocular vision while viewing a 20/30 target at 40 cm through 25 ^Δ Base-out and then without prism for at least 10 cycles per minute. For jump divergence, achieve single, clear, binocular vision while viewing a 20/30 target at 40cm through 12 ^Δ Base-in and then without prism for at least 10 cycles per minute.
Accommodation	Endpoint
T. Binocular Accommodative Facility	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.

8.5 Office-based VT/Orthoptics Vision Therapy Techniques (List)

Brock String (Level 1)
Brock String (Level 2)
Barrel Card
Vectograms (Quoits/Clown) Base-out
Computer Orthoptics (RDS) Base-out
Life Saver Cards
Loose Lens Accommodative Rock (Phase 1)
Letter Chart Accommodative Rock (Phase 1)
Vectograms (Quoits/Clown)
Computer Orthoptics (RDS)
Aperture Rule
Eccentric Circles
Loose Lens Accommodative Rock (Phase 2)
Letter Chart Accommodative Rock (Phase 2)
Vectograms (Quoits/Clown) Jump Vergence
Computer Orthoptics (RDS) Jump Vergence
Aperture Rule Jump Vergence
Eccentric Circles Jump Vergence
Loose Prism Facility
Binocular Accommodative Facility

8.6 Office-based VT/Orthoptics Treatment Sequence Phase 1

Phase One

Brock String (Level 1)
Brock String (Level 2)
Barrel Card
Vectograms (Quoits/Clown) Base-out
Computer Orthoptics (RDS) Base-out
Life Saver Cards
Loose Lens Accommodative Rock (Phase 1)
Letter Chart Accommodative Rock (Phase 1)

8.6.1 Phase 1: Gross Convergence Therapy

8.6.1.1 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. Flip lenses (-2.00 D)

Setup

1. Use two beads and about 1 m of string.
2. Instruct the subject 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 subject and the other about 30 cm away (green bead).

Procedure

1. Ask the subject 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 subject 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 subject. 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 subject 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 subject try and get the "feeling" of looking close and crossing his or her eyes.
 - b. Have the subject touch the bead that he or she is trying to fuse. This kinesthetic feedback is sometimes enough to help the subject achieve single vision.
 - c. Use binocular minus lenses to stimulate accommodative convergence.
5. Once the subject 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 subject 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 subject can successfully converge to a bead placed 2.5 cm from his or her nose.
2. The subject should be able to appreciate the different feeling and effort associated with converging and diverging.

8.6.1.2 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. Flip Lenses (-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 subject to hold the string taut and against the bridge of his/her nose.

Procedure

1. Instruct the subject 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 subject 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 subject 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 patient remove all the beads from the string. Ask the patient to slowly converge from 1 m to 2.5 cm and to always see the "X."

Endpoint

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

8.6.1.3 Barrel Card

Objective

The objectives of the Barrel 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. Barrel Card
2. Flip lenses (-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 barrel is closest to the nose.

Procedure

1. While fixating on the barrel farthest away he or she should be able to report one barrel that is a mixture of the red and green colors.
2. The other two barrels should be seen as double.
3. The subject then fixates the middle barrel, holds for 5 seconds and then the nearest barrel and holds for 5 seconds. The other two barrels should be seen as double.
4. Instruct the subject to alternate fixation from one barrel to the other 10 times.
5. If the subject experiences difficulty there are several techniques the therapist can use to help him overcome this obstacle.
 - a. Suggest that subject try and get the “feeling” of looking close and crossing his or her eyes.
 - b. Move the card farther away from the subject.
 - 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 barrels within 3 seconds and hold fusion for 5 seconds
2. Can repeat the sequence of fusing (for 5 seconds) the far, middle and near barrels for 10 repetitions.
3. The subject should be able to appreciate the different feeling and effort associated with converging and diverging.

8.6.2 Phase 1: Fusional Vergence Therapy

8.6.2.1 Vectograms (Quoits/Clown) Base-out

Objective

To increase positive fusional amplitudes

Equipment Needed

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

Setup

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

Level 2: Establishing Presence of Feedback Cues

A. Blur

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

B. Diplopia

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

C. SILO (Small In Large Out)

1. Tell the subject 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 subject to try and keep the picture clear and single and describe what he or she is seeing. The subject 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 subject to try and keep the picture clear and single and describe what he or she is seeing. The subject should notice that the target becomes larger and moves farther away.
4. If the subject 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 subject 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 subject appreciates SILO, slowly increase the convergence demand and ask the subject to point to where the target appears to be floating in space. Ask the subject to point to different parts of the stimulus. Explain to the subject 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 subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps.

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

8.6.2.2 Computer Orthoptics Random Dot Stereogram (RDS) Base Out

Objective

1. To increase positive fusional amplitudes

Equipment Needed

Computer Orthopter

Setup

1. The subject wears liquid crystal glasses.
2. Select the following initial settings

MENU	MENU ITEM TO SELECT	ADDITIONAL NOTES
Main Menu	VTS3 LCD	After selecting VTS3 LCD, a dialog box will ask for the subject's name. It is not necessary to type in the name. Simply press the return key to continue.
VTS3 LCD Menu	Multiple Choice Vergence	
Multiple Choice Vergence Menu	1. Random Dot Stereogram 2. Large 3. Base-out mode 4. Duration: 5 minutes 5. Select either square, circle or triangle	1. Once you select square, circle or triangle the program begins, so it is important to select this parameter last.

Procedure

1. Ask the subject if he or she is able to see a figure/shape (triangle, square or circle depending on what target is selected by therapist) that appears to be floating closer than the large square. The subject should be able to name the shape (triangle, square or circle) and its location (right, left, up down).
2. Ask the subject to move the joystick in the direction he or she sees the floating shape (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 subject will receive auditory feedback for either a correct or an incorrect response.

Endpoint

45^Δ Base-out with large RDS targets

8.6.2.3 Life Saver Cards

Objective

The objective of Life Saver Cards is to increase your ability to converge without effort.

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 difficulty 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 difficulty doing the above there are several ways to overcome this problem.
 - 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.

Endpoint

1. You should be 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. You should be able to perform this task without the aid of the pencil.

8.6.3 Phase 1: Accommodative Therapy

8.6.3.1 Loose Lens Accommodative Rock

Objective

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

Equipment Needed

1. 20/30 Accommodative Rock Cards
2. Uncut plastic lens blanks from +1.50 D to -3.00 D in 0.50 D increments
3. Eye patch

Setup

1. Occlude the subject's left eye.
2. Accommodative Rock Card (20/30) is held at 40 cm.
3. The subject 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 subject 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 subject 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 subject is experiencing difficulty at any level:
 - a. Suggest that subject 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 patient 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 subject should be able to appreciate the different feeling and effort associated with clearing the print through minus and plus lenses.

8.6.3.2 Letter Chart Accommodative Rock

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

Procedure

1. Ask the subject 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 40 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 subject is experiencing difficulty at any level:
 - a. Suggest that subject try and get the "feeling" of looking close and crossing his or her eyes for the small chart or have the subject 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 equal to age-appropriate amplitude and is able to clear the distant chart.
2. The subject 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.

8.7 Office-based VT/Orthoptics Treatment Sequence Phase 2

Phase Two

Vectograms (Quoits/Clown) Base-out and Base-in
 Computer Orthoptics (RDS) Base-out and Base-in
 Aperture Rule
 Eccentric Circles
 Loose Lens Accommodative Rock (Phase 2)
 Letter Chart Accommodative Rock (Phase 2)

8.7.1 Phase 2: Fusional Vergence Therapy

8.7.1.1 Vectograms (Quoits/Clown)

Objective

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

Equipment Needed

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

Setup

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

Level 2: Establishing Presence of Feedback Cues

A. Blur

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

B. Diplopia

1. Determine if the subject is able to appreciate diplopia by slowly increasing the convergence demand until the subject loses fusion.

2. Decrease the convergence demand until the subject regains single, clear vision.

C. SILO (Small In Large Out)

1. Tell the subject 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 subject to try and keep the picture clear and single and describe what he or she is seeing. The subject 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 subject to try and keep the picture clear and single and describe what he or she is seeing. The subject should notice that the target becomes larger and moves farther away.
4. If the subject 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 subject 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 subject appreciates SILO, slowly increase the convergence demand and ask the subject to point to where the target appears to be floating in space. Ask the subject to point to different parts of the stimulus.

Explain to the subject 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 subject that you are going to demonstrate the procedure that he or she will practice. It involves 2 distinct steps.

1. **Step One:** Tell the subject 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 subject to take a pointer and point to the location at which he or she sees the stimulus floating. Make sure the subject sees one pointer and one target. Stress to the subject the importance of the kinesthetic awareness or feeling of "looking close" and "crossing his or her eyes."
3. Once the subject can perform these steps, while the Vectograms slides are set at 3 Δ Base-out, have the subject slowly separate the targets to 6 Δ Base-out and repeat steps 1-2. At some level the subject will be unable to successfully complete even step one, to see the circles clearly and singly.
4. If the subject is experiencing difficulty:
 - a. Suggest that the subject 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 subject 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^Δ Base-in, the target will be too far behind the targets for the subject to point.
4. Because it is difficult for some patients to visualize looking behind an opaque object, use a clear hand-held Vectogram holder to help a patient struggling with divergence therapy.
5. Tape a red pointer on the wall and have the patient stand about 3-4 feet away from the pointer.
6. Have the patient 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 to 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 patient is able to fuse the Quoits at letter "L".

Endpoint

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

8.7.1.2 Computer Orthoptics Random Dot Stereogram (RDS)

Objective

To increase positive and negative fusional amplitudes.

Equipment Needed

Computer Orthopter

Setup

1. The subject wears liquid crystal glasses.
2. Select the following initial settings.

MENU	MENU ITEM TO SELECT	ADDITIONAL NOTES
Main Menu	VTS3 LCD	After selecting VTS3 LCD, a dialog box will ask for the subject's name. It is not necessary to type in the name. Simply press the return key to continue.
VTS3 LCD Menu	Multiple Choice Vergence	
Multiple Choice Vergence Menu	1. Random Dot Stereogram 2. Large 3. Base-out mode 4. Duration: 5 minutes 5. Select either square, circle or triangle	1. Once you select square, circle or triangle the program begins, so it is important to select this parameter last. 2. After working for 5 minutes with Base-out, select Base-in mode and repeat.

Procedure

Convergence Therapy

1. Ask the subject if he or she is able to see a figure/shape (triangle, square or circle depending on what target is selected by therapist) that appears to be floating closer than the large square. The subject should be able to name the shape (triangle, square or circle) and its location (right, left, up, down).
2. Ask the subject to move the joystick in the direction he or she sees the floating shape (right, left, up or 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 subject will receive auditory feedback for either a correct or an incorrect response.

Divergence Therapy

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

Endpoint

1. 15^Δ Base-in with large RDS targets

8.7.1.3 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 subject 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 subject'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 subject 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 subject 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 subject realizes where he or she must look, try removing the pointer. With some practice the subject will soon be able to fuse without the additional support of the pointer.
8. Once fusion is reported, question the subject regarding the clarity of the target, the suppression cues, and whether he or she appreciates the depth in the circles.
9. Ask the subject 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)

8.7.1.4 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 subject 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 subject.
3. Begin with the two cards together with the "A"s touching.

Procedure

Convergence Therapy

1. The subject should see two cards at this point.
2. Ask the subject 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 subject 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 subject to relax their focus a little or maintain fusion for 5 seconds and see if the letters clear. It is important to make the subject 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 subject 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.

Divergence Therapy

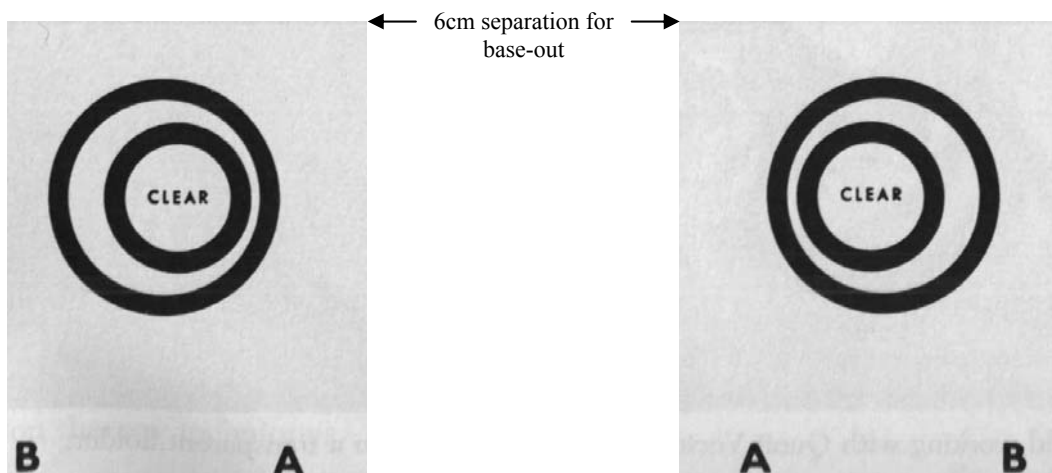
1. The same general procedures are performed for divergence therapy except that the subject must now diverge behind the plane of the cards.
2. Because it is difficult for some subjects to visualize looking behind an opaque object, translucent Eccentric Circle cards are available for divergence therapy.
3. Subjects 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 subject's eye level. Have the subject 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 subject 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 subject walk closer or farther away until he/she does appreciate three circles. Tell the subject to concentrate on the middle set and ignore the side images. Once he/she can achieve this have the subject 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.
6. The final task is to instruct the subject to achieve clear, chiasmatic fusion hold it for 5 seconds and then switch to clear, orthoptic fusion and hold for 5 seconds.
7. Instruct the subject to continue alternating back and forth for several minutes.

Endpoint

1. 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).



8.7.2 Phase 2: Accommodative Therapy

8.7.2.1 Loose Lens Accommodative Rock

Objective

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

Equipment Needed

1. 20/30 Accommodative Rock Cards
2. Uncut plastic lens blanks from +2.00 D to -6.00 D in 0.50 D increments
3. Eye patch

Setup

1. Occlude the subject's left eye.
2. Accommodative Rock Card (20/30) is held at 40 cm.
3. The subject 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 subject 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 subject 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 subject is experiencing difficulty at any level:
 - a. Suggest that subject try and get the "feeling" of looking close and crossing his or her eyes for the minus lenses or have the subject 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 patient 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 +2.00/-6.00, 10 cycles in one minute.
2. The subject should be able to appreciate the different feeling and effort associated with clearing the print through minus and plus lenses.

8.7.2.2 Letter Chart Accommodative Rock

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

Procedure

1. Ask the subject 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 subject 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 subject is experiencing difficulty at any level:
 - a. Suggest that subject try and get the "feeling" of looking close and crossing his/her eyes for the small chart or have the subject 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.
2. The subject 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.

8.8 Office-based VT/Orthoptics Treatment Sequence Phase 3

Phase Three

Vectograms (Quoits/Clown) Jump Vergence
 Computer Orthoptics (RDS) Jump Vergence
 Aperture Rule Jump Vergence
 Eccentric Circles Jump Vergence
 Loose Prism Facility
 Binocular Accommodative Facility

8.8.1 Phase 3: Fusional Vergence Therapy

8.8.1.1 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})

Setup

1. The subject 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 subject to separate the sheets to number 3^{Δ} Base-out and try to keep the Quoits single and clear.
2. **Step Two:** Instruct the subject to take the pointer and point to the location at which he or she sees various parts of the picture floating. Make sure the subject sees one pointer and one Quoits. Stress to the subject 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 subject separate the Vectograms to number 3 and regain clear, single vision. Once the subject achieves clear, single, binocular vision instruct the subject to change fixation from the target to another point in space. Ask the subject to fuse the Vectogram, then look away for several seconds and look back and regain fusion. Continue this

- process until the subject 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 subject separate the Vectograms to number 3 and regain clear, single vision. Once the subject 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 subject's eyes (binocularly) to create a large change in vergence demand. Instruct the subject to try and regain single, clear, vision as quickly as possible through the prism. Once the subject 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 subject to fuse the top target, hold it for 5 seconds and then change fixation to the bottom target and hold fixation 5 seconds. Once the subject can complete at least 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 subject 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 subject looking through one side of the Polaroid flippers, have the subject separate the Vectograms to number 3 and regain clear, single vision. Once the subject achieves clear, single, binocular vision instruct the subject to flip the Polaroid flipper to the second side and again regain single, clear vision as quickly as possible. Once the subject can perform this task at least 10 cpm, increase the Vectogram separation by 3 and repeat. Continue until the subject 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 Base-out and 12 Base-in for at least 10 cycles per minute.
2. When using Polaroid flippers, can alternately fuse 15 Base-out and 12 Base-in for at least 10 cycles per minute.

8.8.1.2 Computer Orthoptics (RDS) 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

Computer Orthopter

Setup

1. The subject wears liquid crystal glasses and the random dot stereopsis program is selected.

MENU	MENU ITEM TO SELECT	ADDITIONAL NOTES
Main Menu	VTS3 LCD	After selecting VTS3 LCD, a dialog box will ask for the subject's name. It is not necessary to type in the name. Simply press the return key to continue.
VTS3 LCD Menu	Jump Duction	
Jump Duction Menu	1. Random Dot Stereogram 2. Mode: Step 3. Large 4. Duration: 5 minutes 5. Select either square, circle or triangle	1. Once you select square, circle or triangle the program begins, so it is important to select this parameter last. 2. After the subject can complete 40 Base-out to 15 Base-in with the large target change the mode to "RANDOM" and continue as above.

Procedure

1. Ask the subject if he or she is able to see a figure/shape (triangle, square or circle depending on what target is selected by therapist) that appears to be floating closer than the large square. The subject should be able to name the shape (triangle, square or circle) and its location (right, left, up, down).
2. Instruct the subject to move the joy stick in the direction he or she sees the floating shape (right, left, up, down)
3. When the subject can achieve the endpoint for Step vergence move to Random vergence.

Endpoint

Subject can alternately fuse 40^Δ Base-out and 15^Δ Base-in for at least 15 repetitions in one minute.

8.8.1.3 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 subject 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 subject to fuse the two targets. Once fusion is reported, question the subject 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 subject to fuse the Aperture Rule Card, then look away for several seconds and look back and regain fusion.
2. After the subject 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 subject should be able to regain fusion within 3 seconds and repeat this for up to 15 repetitions.
 - a. While the subject is fusing the Aperture Rule Card at a particular convergence or divergence demand, additional prism can be placed in front of the subject's eyes to create a large change in vergence demand.
 - b. Flip lenses can also be used to create a step vergence change in vergence demand.
4. Continue until subject 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 subject can achieve clear, single binocular vision using card #4 and the flip prism.

Endpoint

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

8.8.1.4 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 subject 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 subject.
3. Begin with the two cards together with the "A"s touching.

Jump Convergence Procedures

1. Ask the subject to fuse the Eccentric Circle Cards using chiasmatic fusion, then look away for several seconds and look back and regain fusion.
2. After the subject 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 subject 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 subject to fuse the Eccentric Circle Cards using orthoptic fusion, then look away for several seconds and look back and regain fusion.
2. After the subject 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 subject 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 subject 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

8.8.1.5 Loose Prism Facility

Objective

To improve ability to make rapid, jump vergence eye movements

Equipment Needed

1. Loose prism (6^{Δ} , 10^{Δ} , 12^{Δ} , 15^{Δ} , 20^{Δ} , 25^{Δ})
2. 20/30 vertical column of letters

Setup

A 20/30 target is placed at a distance of 40 cm.

Procedures

1. The subject looks at the target with both eyes open.
2. The 6^{Δ} prism is brought from the side of the subject's head (Base-out) and placed directly in front of the right eye (The base of the prism should not be tilted but held with the edge of the base exactly vertical).
3. The target should appear to double with the introduction of the prism. If this happens, the subject is to concentrate and make the target into one as quickly as possible.
4. Once the target is seen as one, the subject is to report if the letters on the target are clear. If the letters are blurred, the subject is to blink and concentrate on clearing the letters while maintaining single vision.
5. As soon as single vision and clarity of the target is achieved, the prism is removed and the subject is to regain fusion and clear the target as quickly as possible.
6. The procedure is repeated with the subject clearing the target and maintaining singleness of the target as the prism is repeatedly introduced and taken away.
7. As the subject progresses, successively introduce higher magnitude prism (6^{Δ} , 10^{Δ} , 15^{Δ} , 20^{Δ} , 25^{Δ}).
8. Steps 2-7 should be repeated with Base-in prism (6^{Δ} , 10^{Δ} , 12^{Δ})

Endpoint

1. For jump convergence, achieve single, clear, binocular vision while viewing a 20/30 target at 40 cm through 25^{Δ} Base-out and then without prism for at least 10 cycles in one minute.
2. For jump divergence, achieve single, clear, binocular vision while viewing a 20/30 target at 40 cm through 12^{Δ} Base-in and then without prism for at least 10 cycles in one minute.

8.8.2 Phase 3: Accommodative Therapy

8.8.2.1 Binocular Accommodative Facility

Objective

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

Equipment Needed

1. Flip lenses in various powers: ± 1.00 , ± 1.50 , ± 2.00 .
2. The Accommodative Rock 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 subject wears Polaroid glasses.

Procedures

1. Flip lenses ($+1.50/-1.50$) are held before the subject's eyes and the subject is instructed to clear the print. If the subject has trouble clearing the print, use $+1.00/-1.00$ lenses. The subject reads one letter line and the flip lenses are flipped to the other side presenting a new accommodative stimulus. The subject 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 subject 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 subject 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 subject 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 subject to this objective would be appropriate.
5. Have the subject 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

8.9 Office-based VT/Orthoptics Home Vision Therapy Techniques (List)

Brock String (Level 1) - gross convergence
 Brock String (Level 2) - voluntary gross convergence
 Barrel Card - gross convergence
 Life Saver Cards - convergence and divergence
 HTS (Level 1) - computer convergence
 Loose Lens Accommodative Rock (Level 1) – accom. ampl/fac to +1.50/-3.00
 Letter Chart Accommodative Rock (Level 1) - clear near/far print without time constraints
 Eccentric Circles - convergence and divergence
 HTS (Level 2) - computer convergence and divergence
 Random Dot Pads with loose prism (Level 1) - stereoscopic convergence and divergence
 Letter Chart Accommodative Rock (Level 2) – accom. ampl/fac to +2.00/-6.00
 Loose Lens Accommodative Rock (Level 2) - clear near/far with time factor
 HTS (Level 3) - computer jump vergence
 Random Dot Pads with loose prism (Level 2) - stereoscopic jump vergence
 Eccentric Circle jump vergence - jump vergence
 Binocular Accommodative Facility

8.10 Office-based VT/Orthoptics Home Vision Therapy Equipment (List)

Brock String
 Barrel Card
 Loose Lenses (+2.00 to -6.00 in 0.50 D diopter increments)
 Accommodative Rock Cards
 Letter Chart (large and small)
 Clear Eccentric Circles
 Opaque Eccentric Circles
 Clear Life Saver Cards
 Opaque Life Saver Cards
 Lens Flippers (+1.50/-1.50, +2.00/-2.00)
 Prism Flippers (8^Δ Base-out/4^Δ Base-in)
 Polaroid Bar Reader
 Random Dot Pads
 HTS disk
 Polaroid Flippers
 Polaroid Glasses
 Loose Prisms (6^Δ, 10^Δ, 12^Δ, 15^Δ, 20^Δ, 25^Δ)
 Eye patch

8.11 Office-based VT/Orthoptics Home Vision Therapy Sequence

Phase One

Weeks 1-2

Brock String (Level 1)
Brock String (Level 2)
Letter Chart Accommodative Rock (Level 1)

Weeks 3-4

Barrel Card
Life Saver Cards
HTS (Level 1)
Loose Lens Accommodative Rock (Level 1)

Phase Two

Weeks 5-6

Eccentric Circles
HTS (Level 2)
Letter Chart Accommodative Rock (Level 2)

Weeks 7-8

HTS (Level 2) or Random Dot Pads with loose prism
Loose Lens Accommodative Rock (Level 2)

Phase Three

Weeks 9-10

HTS (Level 3) or Random Dot Pads with loose prism
Eccentric Circle jump vergence
Binocular Accommodative Facility

Weeks 11-12

HTS (Level 3) or Random Dot Pads with loose prism
Eccentric Circle jump vergence
Binocular Accommodative Facility

8.12 Office-based VT/Orthoptics Home Vision Therapy Sequence Phase 1

8.12.1 Phase 1: Gross Convergence Therapy

8.12.1.1 Brock String (Level 1)

Objective

To develop your awareness of crossing your eyes.

Equipment Needed

1. Brock String
2. Flip lenses (-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 flip lenses 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.

8.12.1.2 Brock String (Level 2)

Objective

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

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.

8.12.1.3 Barrel Card

Objective

To develop a strong awareness of crossing your eyes.

Equipment Needed

1. Barrel Card
2. Flip lenses (-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 barrel is closest to your nose.
3. While looking at the barrel farthest away you should see one barrel that is a mixture of the red and green colors. You should notice the middle and nearest barrels are double.
4. Now look at the middle barrel, holding it single for 5 seconds. You should notice the farthest and nearest barrels are double.
5. Now look at the nearest barrel, holding it single for 5 seconds. You should notice the farthest and middle barrel as double.
6. You should alternate looking from the farthest, to the middle, to the nearest barrel 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 flip lenses to help cross your eyes.

Your Therapy Goal!

1. You should be able to make each of the three barrels 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.

8.12.2 Phase 1: Fusional Vergence

8.12.2.1 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.

8.12.2.2 HTS (Level 1)

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. The instructions for installation of the HTS are in the manual that is 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. After entering your name you will be instructed to insert the **KEY DISK**. Your doctor will have already personalized your “KEY DISK” for your use. You only need to do this once.
5. Once the **KEY DISK** has been successfully loaded you will see the “Main Menu” screen.
6. Place red and blue glasses over your eyes and click on the “**Run Program**” button and the therapy program will begin.
7. You should notice a large red square with a smaller square inside that is “popping out” towards you.
8. Move the arrow key to the side where the small square appears (i.e., push left arrow if the small square is on the left side of the larger square).
9. If you correctly match the location of the smaller square the computer will “beep” at you and increase the difficulty. If you are incorrect the computer will “boop” and decrease the difficulty.
10. When you reach the point where the large box separates, do not arbitrarily push the joystick in various directions.
11. Try to get the “feeling” of pulling your eyes together, crossing your eyes, or working harder until the boxes fuse together.
12. Repeat the procedure for the allotted practice time.
13. As you complete each one of the assigned procedures, the computer program will automatically move to the next procedure. For example, after completing the Vergence Base-out for the allotted time, Vergence Base-in will begin. For Base-in Vergence, try to get the “feeling” of relaxing your eyes together, staring in the distance, looking far away.

Your Therapy Goal!

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

8.12.3 Phase 1: Accommodation

8.13.3.1 Loose Lens Accommodative Rock (Level 1)

Objective

To improve your eye focusing power and flexibility.

Equipment Needed

1. Letter card
2. Lenses marked from +1.50 to -3.00 D
3. Eye patch

Procedure

1. Cover your left eye with the eye patch.
2. Hold the letter card at 16 inches (40 cm).
3. Start with holding two lenses, +0.50 D in the right hand and -0.50 D in the left hand.
4. Clear the print as you alternately hold the plus and then the minus lens in front of your right eye. When you look through the plus lens you have to relax your focus; through the minus you have to focus harder.
5. Take as much time as you need to clear and read the print.
6. Repeat this 10 times with each lens, taking as long as you need to get the print clear.
7. Once you can clear the +0.50 and -0.50 lens, increase to the next power lenses on the following list:
 - a. +1.00/-1.00 D
 - b. +1.50/-1.50 D
 - c. +1.50/-2.00 D
 - d. +1.50/-2.50 D
 - e. +1.50/-3.00 D
8. If you have trouble:
 - a. Try and get the “feeling” of looking close and crossing your eyes for the minus lens or try and get the feeling of relaxing or staring far away for the plus lens.
 - b. Move the card away until the print is clear and then move it back to 40cm for the minus lens or move the card closer until the print clears and then move back to 40cm for the
 - c. Decrease the power of the lens for either plus or minus by one increment.
9. Repeat the procedure with the right eye covered.
10. Once you can get clear vision with +1.50/-3.00 try to focus your eyes quickly.
11. The goal is to be able to get clear vision through the +1.50 and then the -3.00 lenses as fast as possible and to be able to go back and forth from one lens to the other 10 times in a minute.

Your Therapy goal!

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

8.12.3.2 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:
 - a. 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 staring 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.

8.13 Office-based VT/Orthoptics Home Vision Therapy Sequence Phase 2

Phase Two

Eccentric Circles

HTS (Level 2)

Random Dot Pads with Loose Prism I (subjects without computer)

Loose Lens Accommodative Rock (Level 2)

Letter Chart Accommodative Rock (Level 2)

8.13.1 Phase 2: Vergence

8.13.1.1 Eccentric Circles (Level 2)

Objective

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

Equipment Needed

1. Clear Eccentric Circles
2. Pencil

Procedure

Convergence Therapy

1. Hold the cards (one labeled A/B, the other B/A) about 16 inches (40 cm) from your nose.
2. Begin with the two cards together with the "A"s touching.
3. You should see two cards at this point.
4. Place the pencil tip slightly below and between the two cards.
5. Stare at the pencil tip.
6. Slowly move the pencil tip away from the cards and closer to you while looking at the pencil tip the whole time.
7. As you pull the pencil tip closer, you should NOTICE that the two sets of 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.
8. As you continue, you should notice that a third set of circles will appear, located directly under your pencil tip.
9. 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.
10. The circle should be floating directly under the pencil tip.
11. Hold and keep clear the middle set of circles for at least ten seconds.
12. You should see two circles, a smaller one inside a larger circle, with the larger one appearing to float closer to you.
13. You should see the word "CLEAR", in focus.
14. Take the pencil away and try to keep that third circle clear and single.
15. Hold for another ten seconds.
16. You may relax your eyes now.
17. Try this again without the use of the pencil.
18. When you are able to hold and keep clear the middle set of circles for at least 5 seconds, look away then look back and see if you can get three sets again.

19. Repeat this 10 times.
20. If this becomes easy, start to pull the cards apart by half an inch (1cm).
21. Continue separating the cards until you reach your therapy goal.

Your Therapy Goal!

You should see a clear and single set of third circles when you have the circles about 5 inches apart.

Divergence Therapy

1. Hold the cards (one labeled A/B, the other B/A) about 16 inches (40 cm) from your nose.
2. Begin with the two cards together with the "B"s overlapping.
3. Place the pencil tip slightly below and between the two cards.
4. Stare at the pencil tip.
5. Slowly move the pencil tip away from the cards, and away from you, while looking at the pencil tip the whole time.
6. As you push the pencil farther, you should NOTICE that the two sets of 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 push it away from you.
7. As you continue, you should notice that a third set of circles may appear, located directly over your pencil tip.
8. 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.
9. The circle should be floating directly over the pencil tip.
10. Hold and keep clear the middle set of circles for at least 5 seconds.
11. You should see two concentric circles, one larger than the other with the larger one appearing to float closer to you.
12. You should see the word "CLEAR", in focus.
13. Take the pencil away and try to keep that third circle clear and single.
14. Hold for another ten seconds.
15. You may stop now.
16. Try this again without the use of the pencil.
17. When you are able to hold and keep clear the middle set of circles for at least 5 seconds, look away then look back and see if you can get the middle set of circles again.
18. Repeat this 10 times.
19. Pull the cards away from each other by half an inch (1 cm).
20. Continue separating the cards until you reach your therapy goal.
21. If you have trouble:
 - a. Tape a 3x5 card with an "X" at your eye level to the wall opposite where you will be doing this exercise.
 - b. Stand about 3-4 feet away from the wall and hold the eccentric circles up again.
 - c. You should be able to see the "X" through the clear plastic.
 - d. Look at the "X" on the wall. You should be able to start seeing the third set of circles in the middle of the other two. IGNORE the other two and concentrate on the middle set. Get it to clear.

Your Therapy Goal!

You should see a clear and single set of third circles when you have the circles about 5 inches (12 cm) apart.

8.13.1.2 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.

8.13.1.3 Random Dot Pads with Loose Prism I (for subjects without computer)

Objective

To improve your ability to comfortably cross and relax your eyes

Equipment Needed

1. Loose prism (6^{Δ} , 8^{Δ} , 10^{Δ} , 12^{Δ} , 15^{Δ} , 20^{Δ} , 25^{Δ})
2. Random dot pad

Procedures

1. Hold the Random Dot Pad at a distance of 15 inches (about 40 cm).
2. Look at the picture with both eyes open and try to perceive the 3D picture by staring through the picture. It may help for you to try and look at the two fusion dots at the top of each page. You must make these two dots into three for the pictures below to appear in 3D. This can be done by either crossing or relaxing your eyes (do whichever is easier for you), letting the two dots first become 4 dots and then bringing the two center dots into one.
3. Once you can see the 3D picture, hold the 6^{Δ} prism in your right hand (with the thickest side away from your nose) from your right side to directly in front of your right eye.
4. The picture may double or you may lose the 3D effect. If this happens, concentrate and make the target into one and try as quickly as you can.
5. Once it is single, try to regain the 3D effect.
6. Once you get the 3D effect, take the prism away and try to get the picture single and clear and regain the 3D effect as quickly as possible.
7. Do this 10 times.
8. Then turn to the next page and repeat steps 2-7.
9. Continue until you can complete this exercise with all of the 36 pages.
10. After completing all 36 pages get the next higher power prism and try this again. Stop at 25^{Δ} .
11. Now start again with 6^{Δ} with the thickest part pointing towards the nose as you bring it to the front of your right eye from your right side and repeat steps 2 to 9.
12. Go to the next highest power prism but stop at 12^{Δ} this time.

Your Therapy Goal!

1. You should be able to easily get the letters single and clear with and without the 25^{Δ} Base-out.
2. You should be able to easily get the letters single and clear with and without the 12^{Δ} Base-in.

8.13.2 Phase 2: Accommodation

8.13.2.1 Loose Lens Accommodative Rock (Level 2)

Objective

To continue to improve your eye focusing power and flexibility

Equipment Needed

1. Letter cards
2. Lenses marked from +2.00 D to -6.00 D
3. Eye patch

Procedure

1. Cover your left eye with the eye patch.
2. Hold the letter card at 16 inches (40 cm).
3. Start by holding two lenses, +2.00 D in the right hand and -3.00 D in the left hand.
4. Clear the print as you alternately hold the plus and then the minus lens in front of your right eye. When you look through the plus lens you have to relax your focus; through the minus you have to focus harder.
5. Try to clear the letters as quickly as possible.
6. Repeat this 10 times with each lens.
7. Once you can quickly clear the +2.00 D and -3.00 D lens, increase to the next power lenses on the following list:
 - a. +2.00 D/ -3.50 D
 - b. +2.00 D/ -4.00 D
 - c. +2.00 D/ -4.50 D
 - d. +2.00 D/ -5.00 D
 - e. +2.00 D/ -5.50 D
 - f. +2.00 D/ -6.00 D
8. If you have trouble:
 - a. Try and get the “feeling” of looking close and crossing your eyes for the minus lens or try and get the feeling of relaxing or staring far away for the plus lens.
 - b. Move the card away until the print is clear and then move it back to 40 cm for the minus lens or move the card closer until the print clears and then move back to 40 cm for the plus lenses.
 - c. Decrease the power of the lens for either plus or minus by one increment.
9. Repeat the procedure with the right eye covered.

Your Therapy Goal!

1. You should be able to clear the +2.00/ -6.00 cycle 10 times in one minute.
2. You should be able to appreciate the different feeling and effort associated with clearing the print through minus and plus lenses.

8.13.2.2 Letter Chart Accommodative Rock (Level 2)

Objective

To continue 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 10 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 small 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 repeat the far to near change for each letter on the third line.
7. Continue until all 10 lines are completed.
8. Start reading the letters faster and faster as you switch between the near and far charts
9. If you have trouble:
 - a. 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 staring for the large chart.
10. Repeat the procedure with the patch moved to your right eye.

Your Therapy Goal!

1. You should be able to finish all ten lines in 3 minutes.
2. You should be able to feel the different effort with clearing the print while looking at the far chart compared to looking at the near chart.

8.14 Office-based VT/Orthoptics Home Vision Therapy Sequence Phase 3

Phase Three

HTS (Level 3)

Random Dot Pads with Loose Prism II (Subjects without computer)

Eccentric Circle Jump Vergence

Binocular Accommodative Facility

8.14.1 Phase 3: Vergence

HTS (Level 3)

Random Dot Pads with Loose Prism

Eccentric Circle Jump Vergence

8.14.1.1 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.
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.
8. 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.

8.14.1.2 Random Dot Pads with Loose Prism II (for subjects without computer)**Objective**

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

Equipment Needed

1. Loose prism (6^{Δ} , 8^{Δ} , 10^{Δ} , 12^{Δ})
2. Random Dot pad

Procedures

1. Hold the Random Dot Pad at a distance of 15 inches (about 40 cm).
2. Look at the picture with both eyes open and try to perceive the 3D picture by starring through the picture. It may help for you to try and look at the two fusion dots at the top of each page. You must make these two dots into three for the pictures below to appear in 3D. This can be done by either crossing or relaxing your eyes (do whichever is easier for you), letting the two dots first become 4 dots and then bringing the two center dots into one.
3. Once you can see the 3D picture, hold the 6^{Δ} prism in your right hand (with the thickest side away from your nose) from your right side to directly in front of your right eye.
4. The picture may double or you may lose the 3D effect. If this happens, concentrate and make the target into one and try as quickly as you can.
5. Once you get the 3D effect and can hold it for 5 seconds, turn the prism so the thickest part is facing your nose. The picture may double or you may lose the 3D effect. If this happens, concentrate and make the target into one and try as quickly as you can.
6. Once it is single, try to regain the 3D effect and hold it for 5 seconds.
7. Then flip back to the other side with the thickest part facing away from your nose.
8. Get and hold the letters single and clear for 5 seconds.
9. Repeat this process of flipping the prism from in towards the nose to away from the nose for 10 times.
10. Then turn to the next page and repeat steps 2-9
11. Continue until you can complete this exercise with all of the 36 pages.
12. After completing all 36 pages get the next higher power prism and try this again. Stop at 12^{Δ} .

Your Therapy Goal!

You want to get the letters clear and single as quickly as possible, being able to switch between the two “sides” for 10 times in a minute for each of the prism powers.

8.14.1.3 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.

8.14.2 Phase 3: Accommodation

8.14.2.1 Binocular Accommodative Facility

Objective

To improve your ability to focus your eyes quickly and efficiently

Equipment Needed

1. Flip lenses 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 flip lenses ($+1.00/-1.00$) 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.

Chapter 8 Appendix

Convergence Insufficiency Treatment Trial VISION TREATMENT PROTOCOL SUMMARY FORM

SUBJECT ID

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

PHASE ONE		
Gross Convergence	Endpoint	Date & Initial
Brock String Level One	Converge to a bead placed 2.5 cm from nose	
Brock String Level Two	Voluntarily converge to 2.5 cm from nose	
Barrel Card	Fuse each of the three barrels within three seconds, and hold fusion for 5 seconds, for 10 repetitions	
Vergence	Endpoint	Date & Initial
Vectograms (Quoits/Clown) Base-out	30 ^Δ Base-out	
Computer Orthoptics (RDS) Base-out	45 ^Δ Base-out with large RDS targets	
Life Saver Card	Able to clear all four levels of difficulty and hold fusion for at least 5 Seconds	
Accommodation	Endpoint	Date & Initial
Loose Lens Accommodative Therapy	Clear +1.50/-3.00, 10 cycles in one minute	
Letter Chart Accommodative Therapy	Clear near chart at age-appropriate distance and be able to clear the distant chart.	
PHASE TWO		
Vergence	Endpoint	Date & Initial
Vectograms (Quoits/Clown)	25 ^Δ Base-out, 12 ^Δ Base-in (Letter "L")	
Computer Orthoptics (RDS)	45 ^Δ Base-out with large RDS targets 15 ^Δ Base-in with large RDS targets	
Aperture Rule	30 ^Δ Base-out (Card 12), 15 ^Δ Base-in (Card 6)	
Eccentric Circles	30 ^Δ Base-out, 15 ^Δ Base-in	
Accommodation	Endpoint	Date & Initial
Loose Lens Accommodative Therapy	Clear +2.00/-6.00, 10 cycles in one minute	
Letter Chart Accommodative Therapy	Clear near chart at age-appropriate distance, change fixation and clear far Letter Chart at 3m for 10 cycles per minute.	
PHASE THREE		
Vergence	Endpoint	Date & Initial
Vectograms (Quoits/Clown) <i>Flip prism</i> <i>Look away/Look Back</i> <i>2 targets at different settings</i> <i>Polaroid flippers</i>	Alternately fuse 25 ^Δ Base-out and 15 ^Δ Base-in for at least 10 cycles in one minute	
Computer Orthoptics (RDS)	Alternately fuse 40 Base-out and 15 Base-in	
Aperture Rule <i>Flip prism</i> <i>Look away/Look Back</i>	Using 8 Base-out/4 Base-in prism flippers, achieve clear, single binocular vision with card 8 for convergence (28 Base-out to 16 Base-out) and card 4 for divergence (2 Base -in to 14 Base-in) for 10 cycles in one minute	
Eccentric Circles <i>Flip prism</i> <i>Look away/Look Back</i> <i>2 targets at different settings</i>	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 orthopic fusion with the cards held 6cm apart for 20 repetitions.	
Loose Prism Facility	For jump convergence, achieve single, clear, binocular vision while viewing a 20/30 target at 40cm through 25 ^Δ Base-out and then without prism for at least 10 cycles in one minute. For jump divergence, achieve single, clear, binocular vision while viewing a 20/30 target at 40cm through 12 ^Δ Base-in and then without prism for at least 10 cycles in one minute.	
Accommodation	Endpoint	Date Initial
Binocular Accommodative Facility	Single, clear, vision while viewing 20/30 print at 40cm through +2.00 and -2.00 for at least 13 cycles per minute without suppression	