HOME VISION THERAPY:
History, Devices, Activities And Modifications

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Abstract

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The purpose of this study is to evaluate Home Vision Therapy Devices and Activities for new methods of use to increase interest by the patient and add variety to home training. Changes suggested follow the general philosophy of home therapy, the equipment should be inexpensive and the activities as uncomplicated as possible. Emphasis was placed on activities which are familiar and commonly used for home training. Equipment required is that which is commonly used for home based therapy, is commonly found in the home, or is inexpensive and easily obtained or constructed.

The origins of Vision Therapy and the equipment used in the evaluation of binocular vision skills and abilities are reviewed.

An overview of common binocular vision problems and a training outline for each are reviewed.

Introduction

Vision Therapy has evolved from its origins in Orthoptics[1 (pg2)]. Orthoptics, from the Latin is the straightening of the eyes or straightening of the visual axes. Through this evolutionary process new terms have been used to describe what was being done to the patient. Some of these include Vision Training, Vision Rehabilitation and Vision Enhancement Training[1, 3]. These changes in terms represent different approaches, changes in therapeutic regimens and therapeutic philosophies.

Orthoptics deals with the diagnosis and treatment of defective eye coordination, binocular vision, and functional amblyopia by non-medical and non-surgical methods[8]. Orthoptics uses devices such as glasses, prisms and exercises.

Orthoptics has its beginnings in the early 1850s with suggestions of a non-invasive approach to strabismus treatment by du Bois Reymond, 1852, and MacKenzie, 1854[1]. In the late 1800s Javal formulated the sequential steps and procedures involved in orthoptic therapy. Javal sought a non-invasive means to treat strabismus after he became dissatisfied with the outcome of strabismus surgery performed on his father and sister.

The methods developed by Javal were taken to England in 1896 by the British ophthalmologist Priestly Smith who visited Javal in France. Another prominent British ophthalmologist, Dr. Claud Worth, expanded on Javal's ideas. Dr. Worth invented the amblyoscope to assist in sensory fusion training procedures. In his writings Dr. Worth termed strabismus *squint* and wrote that in most cases orthoptics does not address muscle weakness, but boosts the signals (innervation) to the muscles.

In 1904 the holistic aspect of orthoptics was expressed by Dr. Valk, an ophthalmologic surgeon at the Manhattan Eye and Ear Hospital[1 (pg 2)], who suggested orthoptic treatment should be attempted before surgery. He wrote, " ... these beautiful anatomical structures of the eye are controlled and adjusted according to the laws of nature and also controlled by the human being behind it all that must influence them in many ways". This aspect of orthoptics was further expressed by Drs. Browne and Stevenson, two British ophthalmologists, who spoke about the importance of training perception as part of their treatment of strabismus[1].

In his 1912 comprehensive text on stereoscopic eye exercises Dr. David Wells[1], an ophthalmologist at Boston University Medical School, stressed that binocular vision was an intrinsic psychic faculty. "Its inefficiency could result in an inability to fix one's mind on studying and reading."

The American optometrist, A. M. Skeffington[1(pg 3)], introduced a broader concept of vision and ultimately of vision therapy in 1928 with the publication of "Procedure in Ocular Examination". That same year a landmark text was published by an optometrist, Dr. R. H. Peckham[1], which planted the seeds of optometric vision therapy. Dr. Skeffington[1, 8], a brilliant thinker and rhetorician, emerged in the late 1920s at the Congress of Optometry in Denver. Dr. Skeffington and his philosophies soon flourished. With optometrist E. B. Alexander, Dr. Skeffington spearheaded the Optometric Extension Program (OEP), which would become an "admixture of optometric art, science, philosophy and polemics". The importance of voluntary mental effort by the patient in orthoptics was recognized by the French ophthalmologist Cantonnet Filliozat[1]. However, the OEP formulated specific treatment regimens for visual

problems that did not respond to conventional lens prescriptions.

During this period of the 1920s and 1930s there was a wide collaborative effort among professionals interested in vision. The research at Dartmouth Eye Institute in New Hampshire provided key texts for understanding the influence of ophthalmic lenses on visual perception[1]. Dr. Skeffington collaborated with many professionals from other disciplines borrowing their terminology. Work done in the area of child development in the mid 1930s established the role of vision therapy in the developing visual system. The base of knowledge and the specific vision-training techniques were promulgated by the growing Optometric Extension Program as part of its postgraduate curricula[1, 8].

At this time there was a departure of two divisions of eye and vision care specialists[1 (pg 3)]. One spilt was due to the collaborative efforts of Dr. Skeffington, new concepts were introduced with new nomenclature. The new concepts and nomenclature required interpretation for the optometrist in the "trenches", the language and concepts of the OEP became an obstacle which is difficult to overcome. This polarized practitioners into different schools, or models, of vision. One, labeled Classical optometry, was the traditional approach which focused on a structural or a mechanistic philosophy of examination and treatment. Another school was the Functional model which concentrated on how the patient's environment affected vision. This is the approach derived from OEP style case analysis.

As visual training was clinically developing and optometry was becoming polarized, orthoptic organizations were developed in Europe and United States. With the founding of the British Orthoptic Society in 1937 and the American Orthoptic Council in 1938[1] formal education and certification was established in ophthalmic settings. Hospitals were the most common setting and inpatient care was the method used to ensure compliance. Tutorial services were provided for children so they would not fall behind in their school work. While this intensive program of vision exercises incorporated into and around activities of daily living was successful, it was too demanding on patients and families.

The early 1940s brought World War II and a group of young men trying to meet the unaided visual acuity requirements of the Armed Forces[1]. This large group of patients fueled a growth of activity with many realizing an improvement in their visual functioning. At this time an optometric giant, Fred Brock[1, 8], pioneered training strabismus in free space and natural environments. Training in free space, or out of instrument, enhanced the success rate of optometric vision therapy in strabismus and amblyopia treatment.

"Seminal works on the interrelationship of vision, spatiotemporal processing and motor function marked the close collaboration of scientists and optometrists, and the explosion of vision therapy applied to child development in the 1940s and 1950s"[1 (pg 4)]. An example of this cooperation is the operation of the Gesell Institute of Child Development which became a magnet for optometrists seeking refinement in the management of visual development.

The 1950s and 1960s brought a wealth of published works to swell the professional literature[1]. One of these was the first extensive vision-training instruction manual for professionals which was published by Heinsen and Schrock[1, 8]. Many of these published works were disseminated through, or as part of, the OEP curricula. During this time period an optometric leader, Flom[1, 8], worked to establish pretreatment predictions and posttreatment

criteria for the treatment of strabismus. These criteria would be used in later research which lead to the establishment of vision therapy as the treatment of choice for a variety of conditions.

At this time two companies, the Keystone Company and the Bernell Corporation, were helping to expand vision therapy. The Keystone Company published many guides to their products that centered on the expansion of binocular fusion ranges in stereoscopic devices. These devices were important additions to clinical equipment. The Bernell Corporation concentrated on producing affordable equipment for home training to augment office based training. The included instruction sheets by company leader optometrist Benard Vodnoy were very instructional.

Vision therapy was taken to new areas by optometrists with a psychobehavioral view of vision. This model of vision brought optometrists and vision therapy into the care of children with learning related disorders in the middle to late 1960s[1, 3, 8].

Another important milestone of the 1960s was the search for a unitary model or hypothesis to guide child development[1]. The sensorimotor model of vision of the developmental optometrists predisposed them to perceptuomotor activities. The unitary model proved to be limiting and narrow. Packaged perceptuomotor activities such as the Frostig failed to deliver widespread changes in performance and grew into disfavor with educators. Any program which bore a resemblance to the Frostig program was rejected almost leading to the demise of optometric training.

The beginning of the 1970s brought the development of occupational therapy which had a model of intersensory integration, which helped bring vision therapy back into the mainstream[1]. This also brought a change of focus from vision training to vision therapy. The uniqueness of optometric use of lenses and prisms continue to make optometry a part of multi-discipline and interdisciplinary care of special populations[1, 8].

The OEP continued to be the major disseminator of original research and assistance to optometrists setting up vision therapy in their practices and training their staff. The early 1970s also brought two new organizations. First, in 1970, the College of Optometrists in Vision Development (COVD) sought to protect the public and profession by certifying its members in the expertise of vision therapy. Shortly thereafter the Section on Binocular Vision and Perception of the American Academy of Optometry initiated a diplomate program to certify the clinical skills and knowledge of its fellows. At this time residencies were set up at two of the colleges of optometry, Pennsylvania and State University of New York, to further teach new practitioners vision therapy. These were the first such residencies in optometry, their success lead the way for many other residency programs.

The 1970s brought a third company supplying equipment to the vision therapy market and a new patient population. Wayne Engineering developed dynamic training devices perfect for patients involved in sports or other dynamic events.

Computers have entered the scene over the last few years both as a treatment tool and as a source, or cause, of trouble for the patient. Computers are engaging for youth and adults alike, they can be programmed to perform a multitude of tasks from simple to complex. Computers increase the amount of time devoted to near-point tasks and limit physical mobility.

Historically the majority of ophthalmologists have been against vision therapy at least partly due to a lack of knowledge of the field[1]. At the national level pediatric and

ophthalmological groups have spoken in general against vision therapy. At the local level ophthalmologists and others exposed to successful patients have referred to optometrists who practice vision therapy[1]. Occupational therapists, neuropsychologist and other cognitive rehabilitation specialists increasingly interact with optometry[1, 8].

In the 1990s a shift in attitude occurred. In a study published in the *Binocular Vision and Eye Muscle Surgery Quarterly* journal, 64% of eye muscle surgeons recommend a nonsurgical approach to strabismus[1].

Vision Therapy has gone through an evolutionary change from orthoptics to vision training to where it is today. The adoption of the term therapy indicates the methods used, meaning the patient is worked with rather than something done to the patient or for the patient. Further the term therapy can mean anything that aids health or the healing process. "Vision therapy can be habilitative in a developmental framework, preventive as part of ongoing vision care, rehabilitative for visual dysfunction, or enhancing to meet specific, individual needs or goals for maximum visual efficiency"[1].

Vision is commonly used interchangeably with sight. Sight is defined as the ability or faculty of seeing[1, 3, 8]. Vision is defined as the act of seeing[1, 3, 8]. Further, vision is the ability of the eye to receive, resolve and transmit light images to the occipital lobe of the brain[1, 2, 8], where light sensation is interpreted. Sight equates to the resolving power or ability of the eye and is gauged by clarity and measured by acuity or contrast sensitivity. Vision is a more global sense, related not just to clarity of the image, but also to the acquisition of the image, processing of the image and comprehension of the image[1, 8]. The term visual skills refers to the visual processing which differentiates sight form vision. Visual skills refers to accuracy, efficiency and stamina of binocular vision accommodation and ocular motility[1, 3, 8]. This forms a triad of functions also know as the oculomotor complex. Visual skills are intimately related to perceptual skills[1, 8].

"The objective of vision therapy is to develop and maintain the individual's maximum efficiency of visual information processing by correcting and ameliorating the effects of eye movement disorders, non-strabismic binocular dysfunctions, focusing disorders, strabismus, amblyopia, nystagmus and visual perceptual disorders related to information processing"[1].

The Equipment of Orthoptics[2]

The instruments of vision therapy include all of those familiar to modern optometrist and uses some from orthoptics which may not be as familiar. Historically there are some instruments which are no longer in use and there are those which have evolved. An explanation of traditional orthoptics equipment will follow.

The Maddox rod consists of a series of parallel glass cylinders of high power that produce a linear image of a spotlight. When viewed through the rod the line image appears perpendicular to the axis of the cylinders. A maddox rod is used with prisms to measure heterophorias (phoria) or heterotopias (tropia).

The Maddox wing is used to measure a phoria at near. The instrument consists of a septum supported on a handle. At one end are the eye pieces with lens holders and at the other end is a metal plate bearing a horizontal scale of white numbers, a vertical scale of red numbers, a

red arrow, and a white arrow. The septum is arranged so that the right eye sees the arrows and the left eye the numbers.

The Synoptophore is a haploscopic device. It consists of two movable tubes mounted on a base. At the far end of each tube is a holder into which picture slides can be inserted. At the near ends are eyepieces. Each tube contains a lens system that refracts the light so the patient does not have to accommodate, other lenses can also be added to simulate any accommodative demand required. The tubes can be adjusted to the patient and can be moved to diverge, converge and moved vertically, the slide holders can be rotated to provide torsional input or compensation. The tubes are mounted on calibrated scales so their position can be measured and equated to the position of the eyes. The synoptophore can be used for both a variety of exam procedures and for treatment.

Worth's Four Dot Test consists of four lighted dots, one red, two green, and one white arranged in a diamond shape. The patient wears a red filter in front of one eye and a green filter in front of the other. Through the red filter two lights are seen, the red light and the white light which appears red, the green lights are blocked. Through the green filter three lights are seen, the two green lights and the white light which appears green, the red light is blocked. The test is used to diagnose the presence of any simultaneous binocular vision, normal or abnormal, and to detect suppression. If the two eyes are being used together the patient fuses the white light and sees four lights, one red, two green, and the white as some mixture of red and green (yellow).

The Diploscope makes use of physiologic diplopia to exercise relative convergence. The instrument consists of a metal rod supported by a handle. The near end of the rod is held against the bridge of the nose. When in position, a card is mounted on the far end 33.3 cm from the eyes. Between the eyes and the card at a distance of 25 cm is a collapsible septum with two holes side by side through which letters on the card can be seen. The central letter is a fusion lock and is the letter "O". When the eyes are fixating both eyes see the letter "O". To the left of the "O" is the letter "D", which is only seen by the left eye; to the right of the "O" is the letter "G", which is only seen by the right eye. With bifoveal fixation the word DOG is seen.

The Rémy separator is used to exercise negative relative convergence (relative divergence). The instrument consists of a septum supported on a handle that separates the fields of the two eyes. At one end is a nosepiece and at the other end is a slide carrier. When the instrument is held in position, the slides are 33.3 cm from the patient's eyes. The picture slides, which are made of transparent plastic, are paired, one for each side of the septum. The two pictures may be similar or dissimilar. When the patient looks through the slides at a distant fixation object, the pictures will be imaged one on each fovea and will be seen fused or superimposed.

The Stereoscope is used to exercise positive and negative relative convergence. There are many varieties of stereoscopes, but basically the instrument consists of two eyepieces, a septum that separates the fields of the two eyes, and a separate picture for each eye. The eyepieces usually contain convex lenses so the patient does not have to accommodate to see the pictures clearly. The lenses are decentered to produce a base-out prismatic effect. By either changing the position of the pictures or by introducing additional prismatic effects, relative convergence can be exercised.

The Bar Reader is used in conjunction with near reading material. It is held between the patient's eyes and the print, thereby creating a minor obstacle to binocular vision. Simultaneously it provides an excellent means for subjectively controlling the maintenance of binocular vision. The most common type of bar reader is the thumb bar which, when in position, is 8 cm from the page. As the patient reads the print binocularly, the bar is perceived in crossed diplopia, each image of the bar hiding a portion of the print from one eye, but not the other, so the print can be read normally. Maintaining the correct position of the eyes despite this obstacle will strengthen binocular vision. When binocularity is lost a single bar is seen, hiding some of the print, making reading impossible.

Hess's Screen is a tangent screen with a series of horizontal and vertical lines. The distance between each line subtends a visual angle of 5°. Fixation points are indicated at the center of the screen and at the intersections of the 15° and 30° lines. The original Hess screen employs complementary colors for dissociation of the eyes. The patient wears tranaglyph goggles with a different color filter for each eye. Through these, only one eye sees the fixation points, whereas the other eye sees only an indicator. The patient superimposes the indicator successively on each of the fixation points, and the relative position of the eye is plotted for each direction of gaze. One modification is the use of two screens at right angles with a plane mirror bisection of the angle and dissociating the fields of the eyes.

The Visuscope is a modified direct ophthalmoscope used to determine the point on the retina which the patient uses during monocular fixation. A black star is introduced into the light beam such that it is projected onto the retina. With one eye occluded the patient is asked to fixate the star and the examiner uses the foveal light reflex to determine the point of fixation. A bull's-eye target consisting of concentric rings can also be projected onto the retina by the ophthalmoscope. If the fovea is observed at some eccentric point from fixation the distance can be measured by observing the rings of the bull's-eye which are spaced ½° apart.

The Pleoptophore, used for the treatment of eccentric fixation, contains a telescope-like optical system that allows the examiner to observe the patient's fundus through the dilated pupil. By moving a fixation target in front of the other eye, the amblyopic eye can be so positioned that its fovea lies in the optical axis of the instrument. Light of high intensity is used to dazzle the retina, except for the central fovea, which is shielded from exposure by a small opaque disk placed in the light beam. The disk can be removed to allow light stimulation of the fovea following the exposure.

The Euthyscope, an instrument used in pleoptics, is a special ophthalmoscope with opaque disks that can be moved into the light pathway. These serve to shield the fovea during the exposure of the surrounding retina. Since the light intensity used is moderate, the peripheral retina is not dazzled but only stimulated enough to produce an afterimage.

The Projectoscope is used for the same purposes as the Pleoptophore and the Euthyscope. It is a special ophthalmoscope in which opaque disks can be moved into the pathway of the illuminating system to shield the fovea from stimulation while the peripheral retinal is dazzled. It has an automatic flashing device for subsequent light stimulation of the fovea. This instrument may also be used, as is the Euthyscope, to produce afterimages rather than to dazzle.

The Coordinator is used to determine the type of fixation present and to teach the patient to obtain and maintain central fixation. The instrument consists of a rotating blue polarizing plastic disk illuminated from behind. Viewing the polarized light, the entoptic phenomenon of Haidinger's brushes can be observed. These consist of a pair of dark brushlike shapes that radiate from the fixation point in opposite directions. During rotation of the polarizing filter, brushes appear to rotate at the same speed and in the same direction around the fixation point. A table model of the instrument is for use during near vision, while a space coordinator is available for distance vision.

Vision Therapy Programs

The Optometrist develops an individualized program for each patient based on their abilities, needs and goals. This individualized program or curriculum can be thought of as the blueprint to guide the patient to their goals. A vision therapy program follows the natural developmental path of vision by starting with monocular skills. As the monocular skills are equalized the binocular skills can begin to be developed. With increasing efficiency and equality of these monocular skills the binocular vision is integrated efficiently into dynamic performance by combining it with visual, motor, auditory and/or cognitive demands to acquire and process visual information.

To successfully accomplish this training plan the optometrist needs to be knowledgeable in the area of visual science. Visual science includes the areas of neurology and physiology of the visual system, perception, optics and human anatomy. A sound foundation in learning theories, child development, human behavior and behavior modification is also required. These skills and knowledge are used to rule out pathology, establish a diagnosis for the patient's condition and assess the patient's visual abilities, determine appropriate lens and therapy conditions for each VT activity and to develop a VT program for each patient using educational principles. Once therapy is begun periodic reassessments and follow-up care are used to monitor progress and maintain progress made.

Vision Therapy is used for a wide variety of dysfunctions which arise from two distinct causes. One source of dysfunction is developmental from inadequate development of required visual abilities. Another source is acquired visual dysfunctions from the breakdown or deterioration of previously developed visual abilities. Efficient and sustained acquisition and processing of visual information comes from developing preprogrammed, task-specific automatic processes. In sensorimotor terms these processes are called schemata[1]. Even when these sensorimotor skills or schemata are properly developed they can break down under conditions of fatigue, stress and sustained near-point tasks. Conditions for which VT is effective include amblyopia, strabismus, accommodative and vergence disorders, ocular motility dysfunctions developmental and acquired visual information processing disorders, sports vision and myopia control.

Vision Therapy is developed, managed and performed using educational principles. VT is something the patient does compared to something that is done to, or done for, the patient. The patient must be actively involved and participating. Parents and family need to understand the goals, methods and plans of the program. The active support of parents and family is important

and should be guided by communication with the patient and optometrist. The program should work from the patient's strengths to build confidence and ensure a firm foundation to build on. By progressing in small steps and setting attainable goals the tasks can be made harder by increasing the demands placed on the patient as the simpler tasks are performed. As confidence and skills are developed the program can begin to develop the patient's weaknesses, always building on previous successes. Reinforcement of success is very important to let the patient know their efforts are noticed and recorded. Recognition of success can take many forms from tangible, such as stickers, prizes or treats; to less tangible, such as smiles and positive comments. Training tasks need to be meaningful for the patient, the skills being developed should be explained to the patient, in terms the patient can relate to. The way training tasks will help in the areas the patient has difficulty may not be readily apparent to the patient, these should be explained. Success can be built by helping the patient appreciate their perception of visual phenomena and control of visual functions such as blur and diplopia. As patients move from step to step or phase to phase of training the way their new skills will be used in the next step should be explained.

An important aspect of learning is remembering. Remembering is enhanced by overlearning which is achieved by repetitive practice or drill. Overlearning is accomplished by regular practice and reinforcement of learned skills. Learning happens best when the patient discovers relationships and generalizations for themselves. As patients make their own relationships the new skills are transferred to new situations in an improved way.

Vision Training for Various Conditions[1, 8]

Each patient requires a custom training plan based on their current skills and abilities which they start with and the goals they wish to obtain. Even though each program is customized there are some basic frameworks, or logical sequences, around which these programs can be constructed. Below are some starting points for programs for various conditions.

Ocular Motility and Oculomotor Dysfunction
Sequence
- Monocular skills
- Biocular skills
- Binocular skills

Techniques
- Pursuits
- Saccades
- Motility with hand-eye coordination
- Intersensory integration

Accommodative Insufficiency
Sequence
Phase I
- Monocular rock

Phase II
    Biocular rock
Phase III
    Binocular rock
Phase IV
    Accommodative-Convergence flexibility

Accommodative Excess/Spasm
Phase I
    Monocular minus accommodative rock in space
Phase II
    Alternate rock
Phase III
    Binocular phase at near

Convergence Insufficiency
Phase I
    Accommodative and peripheral stereo enhancement
Phase II
    Central stereo and biocular skills enhancement
Phase III
    Flat fusion and antisuppression
Phase IV
    Accommodative-convergence flexibility

Convergence Excess
Phase I
    Accommodative and peripheral stereo enhancement
Phase II
    Central stereo and biocular skills enhancement
Phase III
    Flat fusion and antisuppression
Phase IV
    Accommodative-convergence flexibility

Antisuppression Therapy
Phase I
    Stimulation of poorer eye
Phase II
    Rapid alternation of targets resulting in alternate stimulation to both eyes
Phase IV
    Peripheral fusion

Phase V
    Fovea to fovea

General Skills Training (Fusional Vergence Dysfunction)
Phase I
    Monocular skills enhancement
        Monocular motility
        Monocular accommodative rock
Phase II
    Antisuppression, biocular motility and biocular accommodation
        Antisuppression
        Biocular motility
        Biocular accommodation
Phase III
    Fusional range enhancement and binocular motility and accommodation
        Increasing fusional ranges-work through plus, emphasize recovery
        Binocular motility with +0.50 spheres over distance prescription
        Binocular accommodative rock with suppression control
Phase IV
    Accommodative-convergence flexibility
Phase V
    Visualization and tachistoscope work
Vectogram Sequence

Divergence Excess
Phase I
    Motility and monocular accommodative rock
Phase II
    Biocular motility and accommodation
Phase III
    Build fusional ranges at nearpoint with stereo targets and working through plus
Phase IV
    Build flat fusional ranges at nearpoint
Phase V
    Build fusional ranges at intermediate distances and work toward distance
Phase VI
    Accommodative-convergence flexibility

Home VT Activities

Out of the various possibilities of training environments for the practice of VT from complete in patient training, to office based training, to home based training the most common is a combination of in office and home based training sessions. The time spent in the office provides the needed professional supervision and "coaching" time. The time spent at home can reduce expenses for the patient, increase convenience for the patient and provide an opportunity for involvement of the family in a shared activity. The combination of in office training and home based training puts an increased burden of responsibility for compliance on the patient. Not only must the patient make their weekly appointments, they must also complete each days assigned activities.

Because VT programs are based on the premiss that the patient is worked with rather than something being done to the patient or for the patient, VT is most successful when the patient is motivated and enthusiastic. Home based programs provide an excellent opportunity for family involvement and encouragement. When the VT program is made a part of the family's routine then shared experiences can improve understanding and communication. Involvement of more than one individual adds the element of competition. Competition can be a very powerful motivating force. Some possible ways which others can be involved in the program is by simply doing the activities with, or after, the patient. Some examples would be to put on the eye patch and do the Arrow Orientation game after the patient, allowing the patient to be the time keeper. Another possibility is continuing where the patient left off on the Precision Teaching form, again allowing the patient to be the time keeper. When patient success is measured by the amount of improvement from session to session and week to week and month to month then scores are easily compared between individuals of varying capabilities. The base line score, or score from the first time an activity is performed, is subtracted from the current score. The result is the amount of improvement made by the individual over the specified period of time. When needed the base line can be reset to maintain competitiveness. When the amount of improvement scores are compared the competition becomes to better the personal performance.

Home Based VT Activities[4, 7]

Tracing/Circle Game

Develops smooth, controlled and efficient pursuit and saccadic eye movement skills.

Materials needed are appropriate sized print material such as newspapers or magazines, brightly lit desk or table, writing instrument such as crayon, marker, pen or pencil, and near spectacle prescription.

Begin training by underlining sentences and circling specific assigned items such as a's, t's, e's, the patient's initials, etc. Begin slowly, accurately and neatly. Increase speed but maintain accuracy and neatness. Increase difficulty by circling sight words when appropriate.

Score by counting items circled in specified amount of time and counting errors.

Other Modifications

Code words, use circles and squares to mark the letters in a magazine so a message is reveled when the circled letters and squared letters are read.

Pre-mark an identical passage with a red or green marker then use red/green glasses and marker to copy the markings on the pre-marked passage. Pre-marked passage may be placed under a red or green overlay.

Arrow Orientation Game

Develops smooth, efficient and well controlled eye movement skills along with automaticity of left/right and up/down laterality skills.

Materials needed are the random arrow VT or VT-2 page, bright lighting, near spectacle prescription and a blank wall or refrigerator to mount the arrow page to at the patient's eye level while standing.

Training begins with the patient using their whole arm to point in the direction of each arrow, moving from arrow to arrow across the page. Begin slowly and accurately. As skill increases increase speed.

With continued improvement the patient can begin calling out the arrow directions verbally. Difficulty can be further added by having the patient balance on one foot while calling out the directions. Automaticity and rhythmicity can be improved by performing to a patterned beat from a metronome or clapped beat.

Other modifications

The randomness of the arrow sheet can be maintained by periodically rotating the sheet making the top the bottom or by mounting it sideways.

While saying right or left direction point with correct hand; designate a hand for up and one for down, i.e. right hand points up and left points down.

Turn the head in the appropriate direction, either a small amount maintaining fixation on the arrow page or by a larger amount, breaking fixation and regaining fixation on the page.

Use red/green overlays and glasses or Polaroid overlays and glasses.

Flashlight Game

Develops smooth, controlled and efficient pursuit and saccadic eye movement skills.

Materials needed are two flashlights, a blank wall, dim lighting and proper spectacle prescription.

Begin training with the following game or flashlight tag. The parent and patient stand between six to eight feet from the wall. The parent moves their flash light beam across the wall and the patient follows with their flashlight beam. Begin slowly, working on accuracy. Start out by moving the flashlight beam from side to side, progress to up and down, then diagonal and circular movements. The patient should limit head and body movements and follow the beam movements with their eyes. The patient should smoothly follow the same path and arrive at the same point with their light beam as the parent with a minimum of head and body movements. As the activity becomes easier speed should be increased as well as distance from the wall. Shapes,

letters and numbers can be traced out on the wall for the patient to identify as they follow with their light beam.

As the patient progresses the activity can be modified to the Shifting Point to Point game. In this game the parent quickly moves their flashlight beam from one point to another, again beginning with side to side movements and progressing through up and down to diagonal to circular movements. The patient should think about the direction of movement and then quickly and accurately move their flashlight beam to the same location by the same path. Begin four to six feet from the wall and continue to move back to twenty feet as the patient progresses.

Other modifications

Flashlight Geoboard game can be played by hanging paper spots on the wall in the shape of a geoboard. Alternately a sheet can be hung on the wall which has spots colored on or paper spots pinned on. The parent traces geoboard patterns with their flashlight beam and the child either follows or reproduces the pattern with their flashlight beam.

The game can be made more difficult by making the dots from Red / Green material and the patient wearing Red / Green glasses.

Marsden Ball Games

Develops smooth, controlled and efficient pursuit and saccadic eye movement skills while emphasizing eye-hand coordination and balance.

Materials needed are a rubber softball, heavy string or similar material to suspended the ball and adjust to the eye level of the patient while standing, a heavy dowel rod, bright lighting and proper spectacle prescription. The ball should be prepared by marking with three circles one to two inches in diameter. One circle should be red, one yellow and one blue; the circles can be marked with the corresponding letter if appropriate. The dowel is prepared in a similar fashion to the ball, one third is painted or covered with red tape, the middle third yellow and one third with blue.

Begin training by the parent slowly swinging the ball from side to side while the patient follows the slowly swinging ball with their eyes, keeping head and body movements to a minimum. The parent should monitor the patient's eye movements for accuracy during all activities with the Marsden Ball. When the patient develops accurate eye tracking movements then the dowel can be used to gently tap the ball with one end when the ball is directly in front of the patient, always maintaining good eye contact with the ball. As the patient improves their abilities they can begin to tap the ball with the color on the dowel which matches the color on the ball when it passes in front of them. As the patient's skills improve the parent can randomly call out the color for the patient to tap the ball with as it crosses the midline. To add greater difficulty the patient can begin standing on one foot, spelling, counting, reciting or other similar activities while working with the Marsden Ball.

Other Modifications

The ball can be marked with a letter for the color, i.e. B for blue, instead of the color. The letter can be colored blue. Alternately the letters can all be made one color such as black.

Another variation involving letters on the ball would be to color the "B" green, the "R" yellow and the "Y" blue. The dowel could also be marked in similar ways.

The dowel can be used to follow the ball. The dowel can be marked with a letter for the color, or by a spot, then the ball could be followed with the appropriate letter or spot.

Hart Chart

Develops the accommodative system and improves the efficiency of the saccadic system.

Materials needed are two Hart charts, one large and the other small. The large chart is mounted at distance, up to twenty feet, and the small chart is used at near. Bright lighting and proper spectacle prescription for nearpoint are used with an occluder. The patient should be able to clearly see the letters on the large chart.

Begin training by patching one of the patient's eyes. The patient reads the first letter on the top line of the large chart. After the letter is seen clearly the patient shifts to the second letter on the top line of the small chart. After this letter is seen clearly the patient shifts to the third letter on the large chart and back to the small chart for the fourth letter. The patient continues this same pattern of shifting from the large chart to the small chart until all of the letters on the first line have been read. The patient continues on to the second line in a similar fashion until all ten rows have been read. Each letter should be seen clearly before shifting to the next letter. After completing the activity with the first eye repeat with the other eye. Begin slowly and accurately. Add speed as the patient's skills develop, always maintain accuracy of accommodation.

Other Modifications

Use charts with Landolt Cs, use charts with mixed letters and numbers. Use arrows instead of letters or numbers, each line would have left and right arrows or up and down arrows. The arrow points can be made by changing the line width, i.e. a line of 20/30 width would taper to a 20/25 or 20/20 width for the point.

Brock String Game

Develops convergence and divergence skills

Materials needed are a three bead Brock String, bright lighting and proper spectacle prescription. The Brock String is attached by one end to a door knob or similar anchoring point and the other end is held to the nose.

For convergence training begin by positioning the closest bead about one foot from the nose, the next bead at about two feet from the nose and the third bead at about three feet. Fixate the far end of the string, the string should be observed to form a V pattern from the end of the attachment point. Fixation should then be shifted to the most distant bead, the string should then be observed to form an X pattern with the crossing at the bead. Fixation is then shifted to the next bead with the string forming an X at that bead. Finally fixation is shifted to the closest bead forming an X at the bead. The beads should be positioned so each can be fixated in turn to form a X at the bead. When the closest bead has been fixated the cycle should be repeated with the gazed shifted back to the attachment point to form the V pattern with the string. Each bead is

then fixated in turn with the string forming an X at each bead. Repeat the cycle for the prescribed number of times. As the activity becomes easier move each bead about 3 inches closer. The goal is to bring the closest bead in to 3 to 4 inches from the nose, the middle bead at 15 inches and the far bead at 27 inches or less.

For divergence training position the farthest bead at the attachment point, the middle bead one foot closer and the third bead one foot closer from the middle bead. Repeat the above procedures, fixating each bead in turn forming an X or a V pattern as appropriate. Position the beads so the cycle can be completed.

If the one or both of the strings flashes on and off take a break by looking away at a distant object for convergence training or at a near object for divergence training.

Other Modifications

Use a multicolored jump rope or multicolored yarn, fixate on the boundaries between the different colors. Have someone call out boundaries or colors to fixate in a random pattern. Use a colored dowel such as one used with a Marsden Ball, use the color boundaries as fixation spots. Use a yard stick and use the numbers as fixation points to form the V or X pattern. Hold the yard stick or string over a table with objects placed on the table to act as fixation points. Use a folded card with printed words on it or pens or pencils with words as fixation targets on the table, read the words while maintaining the X or V pattern.

Hart Accommodative Rock

Develops enhanced range and speed of the accommodation system.

Materials needed are two Hart charts, one large and the other small. The large chart is mounted at distance, up to twenty feet, and the small chart is used at near. Bright lighting and proper spectacle prescription for nearpoint are used with an occluder. The patient should be able to clearly see the letters on the large chart.

Begin training by patching one of the patient's eyes. The patient reads half the letters on the top line of the large chart. The letters should be seen clearly. The patient then shifts to the near card and reads the second half of the letters on the top line of the small chart. The letters should be seen clearly. The patient continues on to the second line in a similar fashion for the prescribed amount of time. After completing the activity with the first eye repeat the process with the other eye. Each letter should be seen clearly before shifting to the next letter. Begin slowly and accurately. Add speed as the patient's skills develop, always maintain accuracy of accommodation.

Other Modifications

Use a septum or a high and low occluder so one eye sees the distant, or large chart, and the other eye sees the near, or small chart. Use charts with two to four nonsense words per line, read half the words on the large chart then the other half on the small chart. Use a Red overlay with the small chart and a Green overlay with the large chart and Red / Green glasses to view the charts.

Use charts with Landolt Cs, use charts with mixed letters and numbers. Use arrows instead of letters or numbers, each line would have left and right arrows or up and down arrows. The arrow points can be made by changing the line width, i.e. a line of 20/30 width would taper to a 20/25 or 20/20 width for the point.

Lens Rock

Develops increased efficiency of the accommodative system.

Materials needed are an occluder, nearpoint targets, $^{+}/_{-}$ lens flippers, bright lighting, proper near spectacle prescription. Other materials include prisms and Red / Green anaglyphs.

Begin training with the occluder over one eye , a large near target and with the appropriate power lens flipper, such as $^{+}/_{-}1.00$ used to cover the other eye. Look through the first lens and clear the target, hold for 10 seconds with the target clear then flip the lens. Again clear the target and hold for 10 seconds. Repeat for the prescribed number of cycles and for the prescribed number of sessions per day. When the accommodative skills improve shift to a small near target. Increase the lens flipper power in 0.50D steps as the accommodative skills improve.

Other modifications

Use a flipper with lenses only on one side, maintain fixation with eye behind the flipper lens while maintaining awareness of the other eye. Use flippers with only two lenses as above, however mount them diagonally, shifting fixation from the right eye to the left eye as the lenses are flipped from the right eye to the left eye. Always fixate with the eye behind the lens.

Fill in the O's Game

Develops improved visual acuity, eye tracking skills and fixation accuracy in an amblyopic eye.

Materials needed are a pen, pencil, marker or crayon, page from a newspaper or magazine, a patch or occluder, bright lighting and proper near spectacle prescription.

Begin training by occluding or patching, the weaker, or amblyopic eye. While sitting comfortably, begin reading the article from the newspaper or magazine or following along the lines of letters. Each time a letter with an opening in it is encountered, stop and fill in the hole with the pen or pencil. Pay close attention to the O, P, D, R, B, Q, o, p, q, d, g, etc. Continue through the article for the prescribed amount of time. After completing the activity with the first eye repeat it with the amblyopic eye. After filling in a letter remove the pen or pencil from the paper; only use the eyes to follow along the lines of text not the pen, pencil or finger. Record the accuracy for each eye and difference between each eye.

Other Modifications

Use a fine point pen or pencil and make smilely faces in the letter openings. Use a different colored pen or pencil, three or more colors, to fill in each letter, putting each pen or pencil down after using it and picking up the next in order.

Use a septum to separate the page in half or to separate two pages. Alternate between eyes, filling in the letters of one line or half line with one eye and then use the other eye to fill in

the letters for it's line or half line. Note differences between the eyes. The pages may also be separated by Red / Green filters held above the page(s) and Red / Green glasses.

Toothpicks in a Drinking Straw Game

Develops improved vision in an amblyopic eye.

Materials needed are a glass, straw, toothpicks, patch or occluder, bright lighting and proper near spectacle prescription.

Begin training by patching or occluding the weaker, or amblyopic eye. Hold a toothpick about 5 to 7 inches above the straw, while sighting down from above quickly drop as many toothpicks through the straw into the glass during the prescribed time. Repeat the activity for the other, amblyopic eye. Compare the score between the eyes and from day to day.

Other Modifications

Use colored toothpicks, drop them in a predetermined order into the glass, use several glasses to sort the toothpicks.

Drop candy beads into a curly straw. Use a straight straw and several glasses to sort the candy beads by size or color.

Tape a paper shield to the straw to block errant candy beads or toothpicks from getting into the glass.

Clothes Pin Drop Game

Develops improved vision in a weaker, or amblyopic eye.

Materials needed are clothes pins, coffee can, patch or occluder, bright lighting and proper spectacle correction.

Begin training with the patch or occluder over the weaker, or amblyopic eye. Place the coffee can on the floor about one foot in front of the patient. The patient sights over the can and, one at a time, drops the clothes pins into the can from eye level. Count how many clothes pins are dropped into the can during the prescribed time period. Repeat for the other eye. When the skill improves with the weaker, or amblyopic eye use a smaller can or a bottle. Spread the clothes pins out to increase difficulty.

Other Modifications

Use modeling clay or Play-Doh to make a flat target, bomb target with clay or Play-Doh balls. Each hit scores, target may get bounced around or move. Use flat clay or Play-Doh pancakes to drop on each other, attempt to make a stack, or pile. The pancakes bounce so drop each one so it will stay on top of another. Score by counting only those which are stacked or piled on another. Alternately, drop pancakes into a can, only score those that are flat at the end of the time period.

Other flat objects, such as empty VCR tape boxes can be dropped to form a stack, or pile. Either drop onto the floor, aiming for the previous one, or into a box or container with a score counting for those which are flat at the end of the time period.

Felt Pen and Poster Board Game

Develops improved vision in a weaker, or amblyopic eye.

Materials needed are a felt pen marker, poster board with various size holes cut out, white-out correction fluid, patch or occluder, bright lighting and proper spectacle correction. Mount the poster board at eye level for the patient and about one foot from a wall.

Begin training by patching the weaker, or amblyopic eye. Hold the marker in the dominant hand and, while sighting over the marker, extend the arm and hold the marker tip in the center of the largest hole without touching the poster board. When this can be maintained for 30 seconds without touching the poster board move to a smaller hole. Continue for 3 to 5 minutes, taking short breaks to rest the arm if needed. Take a short break and repeat the activity with the same eye. Repeat the process with the weaker, or amblyopic eye. The white-out can be used to restore the holes of the poster board if they become marked up.

Other Modifications

Use finger dipped in finger paint to hold in the poster board hole.

Use a six volt battery, wire, a light bulb and some aluminum foil to line the poster board holes. Connect one side of the battery to the foil with a piece of wire and alligator clips or paper clamps. Connect the other side of the battery to one side of a light holder. A wire from the other side of the light holder is used to hold in the hole, the insulation should be removed from the last 2 to 3 inches of the wire. If the bare wire touches the aluminum foil the light will light. Alternately a buzzer could be substituted for the light for an audible feedback.

Various sized targets can be made from foil and attached to the poster board. The wire pointer can then be held on the target to keep the light lit for 30 seconds or to operate a buzzer, radio, or similar battery operated device.

Tweezers and Rice Game

Develops improved vision in a weaker, or amblyopic eye.

Materials needed are tweezers, rice (about 30 to 50 grains), a narrow mouth bottle, patch or occluder, bright lighting and proper spectacle prescription.

Begin training by patching or occluding the weaker, or amblyopic eye. Spread rice out on a table or tray and pick up rice with the tweezers one grain at a time and place in the bottle. Score by counting how many grains are placed in the bottle in the prescribed time. Switch to the other eye and repeat.

For added difficulty use the right hand with the right eye for one minute, the left hand with the left eye for one minute, the left hand with the right eye for one minute and the right hand with the left eye for one minute. Record the score at the end of each one minute period.

Other Modifications

Use contact lens solution bottles by removing the dropper spout, i.e. the red dropper spout from a Boston cleaner bottle. Various sizes are available, cleaner, conditioner, rewetting drops.

Use modeling clay or Play-Doh to make small balls. Use tweezers to pick up and drop balls in appropriate sized bottles. Use clay or Play-Doh to make larger balls to make the game easier if needed. Play-Doh left out will dry out making permanent hard balls.

Substitute candy beads or sprinkles for rice or clay balls. Use various colors to sort clay balls or candy beads into several small containers. Assign specific numbers of each color to pick up, based on patients skill level.

Use a box with Red and Green windows and Red / Green glasses. Place rice on one side of the box so it is under one of the windows and the bottle on the other so it is below the opposite color. Pick up rice on one side and place in bottle on the other side.

TV Filters

Develops the inhibition of suppression while building peripheral awareness and peripheral fusion skills.

Materials needed are a TV, black and white is best but a color set works too, Red / Green filters for the TV, Red / Green glasses and proper spectacle prescription. Set up the training by taping filters over the TV screen, start with the red filter over one half and the green filter over the other half. When the Red / Green glasses are worn the red side of the TV is dark when the red side of the glasses are covered and the green side is dark when the green side of the glasses are covered.

Begin training by sitting close to the TV, two to three feet, and the room lighting dimmed. Simply watch TV. Maintaining awareness of both the left and the right, or red and green sides of the screen by keeping both sides "on", also maintain awareness of the non-filtered edges of the visual field. If needed, blink one eye and then the other or further dim the room lights to keep both sides "on". Mark the distance from the TV and score by comparing the distance from day to day. Try to move back a small amount each day. The filters can be rearranged from side to side or to up and down or diagonal, uncovered parts of the TV screen are OK. As the patient improves the room illumination can be increased in addition to moving back from the TV.

Other Modifications

Place strips of paper, or yard sticks, on the TV, radiating out from the TV on the sides, top and bottom. Label the strips with numbers or letters and note how far out the paper strips or yard sticks can be read while keeping both sides of the TV "on". Record how far out the numbers or letters can be seen and record each day, i.e. Rt - 3, Lt - 4, Top - 5 and Bt. - 2.

Red / Green Bar Reading

Develops inhibition of suppression, anti-suppression abilities, peripheral awareness and peripheral fusion skills.

Materials needed are appropriate sized reading material, best if black text on a white background, Red / Green bar reader and Red / Green glasses, bright room illumination and proper spectacle prescription.

Begin training by placing the Red / Green bar reader over the reading material with the bars horizontal. Observe that when the "red"eye is closed the text behind the red filter disappears

and when the "green" eye is closed the text behind the green filter disappears. Place the reading material at a normal reading distance, about 16 inches. Keep both sides "on" while reading, maintaining awareness of the red letters when reading the green and the green letters while reading the red letters. Close one eye and then the other if needed to keep both sides "on", the room lighting may need to be increased to help keep both sides "on".

When reading can be comfortably accomplished for 30 minutes the bars can be turned so they are vertical and repeat. Polaroid glasses and a Polaroid bar reader can be substituted for the Red / Green glasses and reader.

Other Modifications

Use the Red / Green bars to split the lines of text, use two filters so a red bar is adjacent to a green bar. Keep both sides "on" to read the top and bottom halves of the words.

Red / Green Diplopia Awareness

Develops awareness of diplopia and inhibition of suppression while building peripheral awareness skills.

Materials needed are Red / Green glasses, loose prisms, penlight and proper spectacle prescription.

Begin training with dim room illumination. While wearing the Red / Green glasses the parent shines the penlight towards the patient from 1 to 2 feet away. The patient covers their red filter and notices the light is green, then covers their green filter and notices the light is red. A prism is held over the red filter with the base (wide part) held up or down. The patient should then see two lights, one above the other (if the prism base is down the red light will be above the green light). The patient should concentrate on the top light while constantly noticing the bottom light with their side vision for ten seconds. Fixation should then be shifted to the bottom light while constantly noticing the top light with their side vision. To keep both lights "on" a bigger or brighter light may need to be used, the room lights dimmed, the penlight flashed or the eyes blinked to maintain both lights "on", or to maintain diplopia awareness.

As the activity becomes easier the penlight can be moved; side to side at first, then up and down and finally in geometric, letter or number patterns. The room illumination can be increased or the brightness of the penlight reduced over time as the patient progresses.

Other Modifications

Use a finger to point to the light and follow the light when it is moved. The dominant hand can be used and alternated with the non-dominate hand. A light which projects a pattern can be used to increase interest.

Red / Green Connect the Dots Game

Develops the inhibition of suppression and the development of antisuppression abilities, peripheral awareness and peripheral fusion skills.

Materials needed are an appropriate sized connect the dots book, Red / Green glasses, special red and green pens, bright room illumination and proper spectacle prescription. The patient should use good posture while sitting at a table.

Begin training by using the green pen to connect three to five of the dots, then change pens and connect the next three to five of the dots maintaining constant awareness of the green line completed. Continue switching pens every three to five dots until the picture is completed, always maintaining awareness of the other lines drawn. It may be necessary to blink one or the other eye to keep both the red and green lines "on", clear and sharp. Begin slowly, and maintain accuracy as speed is increased. Do for the specified time and for the number of times per week. When the activity becomes easier begin using the non-dominate hand.

Other Modifications

Use Red / Green pens to copy the dot to dot pattern, use a red pen to copy three to five dots and the green pen to copy the next three to five dots, continue with the same pattern to finish copying the dot to dot. Use the opposite color pen to connect the dots.

Red / Green Playing Cards

Develops inhibition of suppression while building eye teaming/fusion skills for maximum efficiency and minimum effort.

Materials needed are Sherman VT Playing cards from Keystone View, Red / Green glasses, work surface, bright lighting and proper spectacle prescription.

Begin training by noticing the cards with the white background are seen through the green lens and the red background cards are seen through the red lens. After becoming familiar with the cards shuffle them and begin with simple activities such as sorting the cards by color into two piles. Sort the cards by suit into two piles. Sort the cards by numbers. The goal is to keep all of the cards "on" all of the time. If the cards flash "on" and "off", or part of a card flashes, close one eye and then the other or move the cards to a different location until they are back "on".

When the sorting activities become easier use the cards to play card games. Some games which demand eye teaming skills and maintain interest are: Casino, Concentration, Go Fish, Old Maid, Rummy, Slap Jacks, Solitaire, and War.

Play for prescribed time per day and number of times per week.

Other Modifications

Build card houses. Combine with prism or lenses to change the demand. Use Red / Green overlays and play cards on a computer.

Window Filter Games

Develops inhibition of suppression while building peripheral awareness and peripheral fusion skills.

Materials needed are house windows, best if large and at, or near, ground level, Red / Green filters and glasses, and proper spectacle prescription. The filters are mounted on a window so objects outside can be observed through the filters. When using the Red / Green glasses notice

the red filter is dark when the red lens is covered and the green filter is dark when the green lens is covered. Best results are achieved during bright daylight.

Begin training close to the window, insure objects are viewed through both the red and the green filter. Talk about objects seen through the filters. The parent can point out various objects for the patient to observe. Ensure both the red image and the green image stays "on" at all times, close one eye and then the other or dim the room illumination to keep both sides "on".

The filters can be changed from side by side to up and down or diagonally. Try to move back from the window 6 to 12 inches each day. Change windows periodically to maintain interest.

Other Modifications

Play window games such as I Spy, Counting Objects, finding objects which start with each letter of the alphabet.

Play memory games such as looking out the window for ten seconds, closing the eyes then answering questions about what was seen, i.e. how many cars, etc.

Barrel Card

Develops convergence skills. This task is at a very close distance and is not appropriate for severe Convergence Insufficiency.

Materials needed are a Bernell red-green barrel convergence training card, bright room illumination and proper spectacle prescription.

Begin training by holding the Barrel Card to the nose with the large barrels away from the face and the small barrels closest to the nose. Fixate the large barrels which are the farthest away, cross the eyes pulling the red and green barrels together. When the barrels are fused the barrels should appear sharp and simultaneously half red and half green. Change focus, or fixation, to the middle barrel, make it sharply focused and fused so it is simultaneously red and green. Change fixation to the closest, or small barrel, and repeat. Change focus to a distant object across the room to complete one cycle. Repeat for the prescribed number of cycles and the prescribed number of times per day. The goal is to complete twenty cycles maintaining clear and single targets with a minimum eyestrain.

Other Modifications

Combine with a large Hart chart, Arrow chart, etc. as the distance object.

Combine with a variety of distance targets. The parent directs which is the next target to fixate, i.e. the 3rd arrow on the top row. The patient calls out clear when each barrel is fixated and the distance object fixated: Large barrel, middle barrel, smallest barrel, up arrow. As the patient goes through each cycle the parent calls out the next distance target.

Chiatopic "Thumbs"

Maintains convergence skill. Used as a maintenance activity following a complete vision therapy program.

Materials needed are a right thumb and a left thumb, bright lighting and proper spectacle prescription.

The activity is performed by holding the thumbs at arms length about two inches apart. The eyes are slowly crossed until each thumb doubles, four thumbs are noticed. Superimpose the two inner thumbs so a total of three are seen. When three clear thumbs are seen hold for 10 seconds, then jump to a distant target. Complete 10 cycles then try to move the thumbs farther apart and complete 10 more cycles. Move the thumbs closer together then slowly separate the hands while maintaining a clear middle thumb until four thumbs are seen. As the activity becomes easier move the thumbs in closer than arms length.

Other Modifications

Jump to a distant object designated by an assistant.

While maintaining three thumbs identify other objects held up by an assistant or in the line of sight designated by an assistant.

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