Neuro-Visual Postural Rehabilitation (NVPT)

William V. Padula, OD FNAP FNORA, FAAO
Raquel Munitz, MS, COVT

NVPT On-Line Seminar
Introduction

- Creating a model of vision for neuro-rehabilitation
- Paradigm shift
- Prisms
- Need for understanding development related to posture and vision
- Need to observe and assess posture
Goals of NVPT Workshop
Level I

• To create a more in-depth understanding between the bi-modal visual process and the motor-sensory system
• To be able to assess posture as a relationship to visual dysfunction
• To understand methods of re-organizing the ambient visual process with the proprioceptive process and the base of support
• To recognize the effectiveness of prisms in conjunction with movement
Goals (cont.)

- To understand PTVS relative to motor dysfunction
- To understand VMSS relative to motor dysfunction
- To recognize the appropriate approaches for stabilizing PTVS beyond prism and bi-nasal occlusion
- To learn facilitation of movement to engage the ambient process with the proprioceptive system
Goals for Level II

- To build on the base of understanding involving the base of support and the visual process
- To advance concepts of movement when the base of support is more stable
- To advance concepts of the use of yoked and asymmetrical yoked prisms in conjunction with PTVS and VMSS
- To create an understanding of binocularity relative to dysfunction between the ambient visual process and the motor system
- To develop an advanced understanding of how to utilize prisms in conjunction with NVPT to affect binocular problems such as strabismus as well as spatial dysfunction
- To utilize technology for assessing VMSS
Goals for Level III

- To develop an understanding of how to engage the focal process of vision without compromising the relationship of the ambient process with the motor system.
- To work with advanced methods of NVPT in conjunction with bi-modal visual processing.
- To understand the technology for assessing the bi-modal visual process affecting organization of space movement, and higher perceptual functioning.
- To develop treatment strategies that recognize three levels of visual dysfunction as well as incorporating three levels of NVPT methods to affect rehabilitation.
Light and the Eye

- Light is both wave like and corpuscular (particles or quanta)
- Only 10% of the light reaching the eye gets to the receptors
- We cannot see an individual quanta of light but our receptors can signal an individual quanta.
- However, it takes about 5 quanta of light for the brain to experience a flash of light
Light and the Eye (cont.)

- Light is both corpuscular and wave-like
- Two different visual processes in the brain experience light in different formats
- A balance between how we experience these two forms of light qualities is critical for us to perceive and function in our world
Neocortex

- Outermost layer of the cortex
- 2.5 mm. thick
- Follows the contours and folds of the cortex
- 80% of the human brain
Neocortex

• Composed of six layers (I-VI)
• **Layers I - III** are myelinated fibers and axons (II and III project to other areas of the neocortex)
• **Layer IV** receives input connections from outside neocortex especially from thalamus (feed forward)
• **Layer V-VI** are output connections to outside neocortex especially thalamus and brain stem (feedback)
Visual Neocortex

- Composed of the original six sub-layers plus an additional 3 layers of neocortex
- Additional sub-layers are because of the significant increased input especially from thalamus
Visual Neocortex

- ½ million cortical columns
- 30 billion neurons
- 300 million pattern recognizers
Visual Neocortex Pattern Recognition

- Serves by organizing lines and patterns of information
- Simultaneous relays with other pattern recognizers to enhance or inhibit erroneous data
- Determines useful data by redundancy and averaging
Vision

- Attempts to establish relationships
- Matches with the sensorimotor system
- Attempts to bring balance to reinforce sensorimotor information
Vision (cont.)

- Seeks form
- Attempts to create form
- Seeks containment
- Although form and containment are infinite for vision
- It attempts to bring understanding through dimension and experiential organization
<table>
<thead>
<tr>
<th>Visual Process</th>
<th>Function</th>
<th>Temporal Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focal (Micro)</td>
<td>Detail Discrimination, Identification, Attention, Concentration, Oriented to present <em>Conscious (Reactive) Corpuscular</em></td>
<td>Slow Speed in Processing</td>
</tr>
<tr>
<td>Ambient (Macro)</td>
<td>Spatial Orientation, Posture, Balance, Movement, Anticipates Change <em>Preconscious (Proactive) Waveform</em></td>
<td>Rapid Speed in Processing</td>
</tr>
</tbody>
</table>
### Post Trauma Vision Syndrome (PTVS)

#### Characteristics
- Exotropia
- Exophoria
- Convergence Insufficiency
- Accommodative Insufficiency
- Oculomotor Dysfunction
- Increased Myopia

#### Symptoms
- Diplopia
- Blurred vision (varies)
- Perceived movement of objects or patterns
- Headaches
- Astenopia
- Hallucinations
- Photophobia
Implications of PTVS Affecting Movement

- Focalization causes isolation
- Spatial changes in motor become restricted
- Ambient causes inability to release motor state from present position
- Increased abnormal postural tone
- Increased abnormal postural tone reinforces over-focalization
- Focalization interferes with perception
Visual Mismatch Causes

- Confusion of the experience
- An attempt to apply reasoning and understanding
Visual Closure

- Causes visual closure or the attempt to complete the visual experience.
- Closure is the attempt by vision to maintain consistency through consistency.
Visual Closure

• Affects both time and space
• Captures an experience and completes it
• Let’s us function by anticipating what we expect to see
Confabulation

- When there is conflicting data the brain interprets or confabulates the impression
- An attempt to explain outcome
Visual Time and Space

- Vision uses movements of the eyes to apply time to spatial dimension
- **Saccades** (quick eye movements) provide 'snap-shots' of the world
- Each fixation creates a difference compared to previous patterns and relates time of movement between pattern recognition
Ganglion Cells from Retina

- Magnocellular—shape and movement (rapid)
- Parvocellular—detail information contained in shape (much slower)
- Konicocellular
Visual Models of Organization

- Learning theories demonstrate models of performance that vary in relationship between the 'Stimulus' and the 'Response'
- Traditionally the 'Stimulus – Response' (S-R) model is used in primary care
- However, the Ambient visual process is preconscious
- Therefore a response occurs prior to the stimulus
- This leads to a “Response-Stimulus-Response” (R-S-R) Model
The ambient visual process is **preconscious**

Therefore, the **matching of spatial visual information with the sensorimotor system** represents that a **response is made prior to the awareness of the stimulus**

The **anticipation** about visual processing that is **spatially oriented** gives time to the process to evaluate the nature of the neuro-visual process prior to the stimulus presentation.

In turn, we are developing a **model of performance** that is **anticipatory in nature and is a response before the stimulus is presented.**
Light and Visual Processing

- The focal process is like a camera and uses mostly 'snapshots' through saccades (quick eye movements)
- It slows down time and because of this it primarily uses the corpuscular (particle) nature of light
- The ambient process fills in the gap with spatial information and anticipates through its preconscious ability to create relationships
- The ambient process is fast and speeds up time and uses mostly the wave form of light
- *Without the ambient process vision would appear as a series of overlain images that compress like an accordion or the bellows of a camera*
Ambient Visual Process

• “At any instant, an extensive portion of the behavioral space around the body is mapped by this ambient visual mode…"

• “The spatial scope of focal vision is, at any instant, very restricted.”

• “There are processes which lead automatically to segregation of ambient and focal visual analysis…complimentary receptor functions.”

• “A second form of interaction appears to involve reciprocal inhibitory coupling and serves attention shifts from one mode to the other.”
PTVS Focal Binding

- What does it look like to the patient?
  - The isolation on detail is like driving in a snow storm at night with your high beams on
  - It creates a spatial disorientation that becomes more severe the more movement there is in the environment
  - This causes increased concentration by the patient in order to single out the detail of attention or demand
  - In turn it causes Perceptual Tunnel Vision (PTV)
PTVS Focal Binding

- Visual Evoked Potential (VEP)
  - Shows increased amplitude with the addition of base in (Bl) prism OU
  - This document over-focalization and spatial (ambient) compromise of visual processing
Imbedded PTVS Focal Binding

- The VEP provides further evidence demonstrating that over time patient continues to over focalize and imbed the state of PTVS
- Characteristics
  - Negative N-75
  - Multiple peaks following the P-100
  - Negative N-135
N-75 Decrease in Negative Amplitude

- A decrease in the negative amplitude of the N-75
**Significant N-75 Negative Wave**

- Indicates over-focalization
- Lack of preconscious nature of ambient visual process
- Demonstrates visual process that is bound by focal conscious process
- **Stimulus-Response binding** rather than Response (preconscious) - Stimulus (focal) – Response (ambient/focal)
- Reduction in N-75 with BI prism OU indicates a release in focal binding
- Significant Behavior:
  - Person has difficulty changing fixation and will have difficulty with busy crowded environments and/or difficulty initiation reading activities
N-135
Decrease in Negative Amplitude
Significant Negative Wave N-135

- Indicates an inability to release from focal stimulus response which suppresses the re-establishment of ambient process as the preconscious base.

- A release in the negative N-135 with BI prism and binasal occlusion demonstrates an ability to re-establish the ambient base after the P-100 response.

- Elicited behavior from significant negative N-135:- - Person’s reading speed and comprehension decreases the longer the person reads.
**Significant Multiple Peaks**

- Indicates an ‘echo’ of focal information with lack of release

- A decrease in multiple peaks with BI prism and/or bi-nasal occlusion indicates an ability to release the focal visual process and allow for re-establishment of the ambient preconscious

- Significant behavior:
  - Patients with multiple peaks may report a shadowing of the object or ‘trailers’ when they watch a moving object. In extreme cases patients may report diplopia but if the object moves they will report on object moving at a different speed than the other. (There may also be a difference in sizes between the two objects.)
**PTVS Focal Binding**

**Behavioral Characteristics**

- (Video)
- Perceptual tunneling
- Confusion
- Confabulation
- Inability to form accurate visual closure
- Increases abnormal postural tone
- Visual Midline Shift Syndrome (VMSS)
Treating and Rehabilitation of PTVS Focal Binding

- Requires more than just prescribing BI prism.
- The clinician must begin to understand the depth of the motor relationship to the ambient process in order to affect the imbedded condition of PTVS.
- Traditional vision therapy (VT) will further imbed the condition of Focal Binding in PTVS.
- NVPT is the ‘bridge’ to re-ground the ambient process with motor.
Understanding Neuro-Visual Processing

- First understand
- How vision develops
- How the ambient and focal visual process organize with motor
- How the visual skills occur in relationship to development
- Why a neurological event affecting vision affects motor and vice versa
Three Reflexes

- **Compensatory Reflex** – keeps eyes fixed in relation to the gravitational point (ambient visual process relative to the sensorimotor base)
- **Orientational Reflex** – keeps eyes fixed on a motionless object
- **Vergence Fixation and Reflex** – keeps eyes fixed on an object in motion
Vergence During Development

- Brought into functional relationship with vast variety of movements of the body whole and fine
  - head rotations, flexion and extension
  - trunk, shoulders and legs
  - arms and hands
- Flexion – extension
- Abduction – adduction
- Circumduction
Vergence/Movements (cont.)

- All movements and vergence create visual-spatial experience that are refined through feed forward and feedback
- Vision plays the dominant role for both curiosity about the environment and motor stability/coordination
- **Vision develops from its motor base**
Vision Development

- The ontogenetic interpretation of vision in development must provide a systematic account for growth of motor patterns of a total action system.
- Normal vision and development requires an active movement system and an encouraging environment for exploration between the spatial visual process and vision for curiosity.
The "big, booming, buzzing world" idea that infants are bombarded by stimuli does not do justice to vision and its profound relationship to development

- Arnold Gesell MD
Sensorimotor Development

- Occurs in relationship to the initial proprioceptive support with the reflexes
- This occurs to ground the senses in the motor system
- The grounding enables suppression of the reflexes
- The visual-spatial organization with motor is the first to develop
- The visual-spatial experience must remain ‘plastic’
The Eye as a Camera

- This concept has tended to obscure the developmental factors which determine organization of visual function
- The eye is facilitated by the brain
- The brain looks through the eyes
- The process of vision is one of duality
Early Phylogenetic Origin

- Originate as a photo-sensitive cell in the protoplasm of a primitive creature
- However, this primitive receptor is still related to a motor system
- Movement has always been the original nature of vision
- Today the primary function of vision is to direct movement and reinforce posture
### Comparison

<table>
<thead>
<tr>
<th>The Eye</th>
<th>Muscle Tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 million photo-receptors</td>
<td>150 million fibrils in a cross-section of a single fibril</td>
</tr>
<tr>
<td>70% of all the sensory nerves in the body</td>
<td></td>
</tr>
<tr>
<td>80% of all that we learn occurs through vision</td>
<td></td>
</tr>
</tbody>
</table>
Ocular Apparatus

- Ocular apparatus directly and indirectly connected to sub cortex and the total neuro-motor system
- Vision emanates from an action system
- The action system evolves vision to support and organize with:
  - proprioception first
  - then to support posture
  - finally to coordinate movement
Developmental Reflexes

- **Attitudinal Reflex:**

  20 wks. fetus:
  
  - asymmetrical attitudinal response with torsion of the head turned toward the extended arm
  
  - genesis of the Tonic Neck Reflex
### Developmental Reflexes (cont.)

- **Righting Reflex** (midbrain and pons)
- **Optical Righting Reflex** (cortex)
  - returns organism to the upright position against gravity
- **Statokinetic Reflex**
  - governed by proprioception, visual affectors and oculomotor effectors
Development Beyond the Reflexes

- Organization of the spatial visual process in conjunction with proprioception begins to enable reflexes to become dormant
- The spatial visual process serves as the filter in conjunction with proprioception to suspend reflexes
- Stabilization of vestibular with refinement of kinesthesia enables the higher sensory component of the visual and auditory processes to evolve
Vision and Motor

- Binocularity
- Stereopsis
- Fusion
- Visual skills

Have motor origin
Vision

- A complex sensorimotor response, facilitated by the eyes and extra-ocular motor system, but involving and emanating from the entire action system

- Vision is an act but becomes an act first as a process
VISION POSTURE AND MOVEMENT: The INSEPARABLE DYNAMIC TRIAD

- Human being

Sees
Moves
Hear
Thinks
Remembers
Talks...

AT THE SAME TIME-

(HALSTEAD)
Dynamic Interaction Between Vision and Posture

- A faulty posture impacts negatively on the efficiency of the visual system.

- A faulty visual system impacts negatively on the efficiency of posture and movement.

Where does it start????
Postural-Visual Relationship

- Vision, Posture and Movement are linked at the physiological and functional levels.

- Head righting is reinforced by visual righting.

- Righting Reactions automatically coordinate the ability of the body to change position in order to support sustained visual fixation on an interesting visual target.
Postural-Visual Relationship (cont.)

- Postural **Imbalances** alter the position of the head. This causes:
  - the eyes (vision) to not be in an adequate relationship to the horizon or to the base of support
  - this limits the freedom to **scan** surroundings
A disturbance of posture and movement affects:

- visuo-spatial and temporal information
- this reinforces disturbance of posture and movement
- affects functional elements (related to binocularity) of the eye that are controlled by visuo-spatial / temporal information such as:
  1) accommodation
  2) convergence / divergence
  3) pursuit tracking
  4) saccades
NEURO-FUNCTIONAL DEVELOPMENT

- Survival creates the need for:
  - functional skills and enables physical independence and self sufficiency
Stages in Neuro Functional Development

Gross and fine movements development

Language development

Perceptual cognitive development

Emotional social development
Parallels Between Motor and Visual Development

- Body alignment & stability
- Trunk extension against gravity
- Trunk flexion pro gravity
- Trunk rotation
- Head and neck control

- Ocular Alignment and Horizontal Movements
- Vertical Movements
- Vergences
- Ocular movements crossing midline
Parallels Between Motor and Visual Development

- Bilateral integration
- Bilateral postural control
- Extension against gravity
- Flexion against gravity
- Trunk Rotation on vertical axis
- Control of grasp and release
- Binocularity
- Bi-ocular control
- Sursumduction (eyes up)
- Infrafaction (eyes down)
- Diagonal eye movements
- Fixations and release (focal fixation and ambient release) for pursuits and saccades
NORMAL NEURO-FUNCTIONAL DEVELOPMENT

- Through interaction between vision and sensorimotor systems - skills emerge and are refined in all functional systems.
- The constant practice of a task permits the infant to acquire variability within the normal range according to the ever changing environmental conditions.
- Versatility in the response is a characteristic of normal functional development.
Vision and Movement

- Vision is thought to be the primary incentive for movement.

- The child must have a concept of the “world out there” before knowing to move out in space. (Gesell)

- A poor base of support may reduce incentive to fight gravity and move out in space.
During early normal development, while the baby learns to move, the basic components of movements are used first as isolated responses and gradually in combination. This allows for the development of skilled responses.
Basic Components of Movement

- **Extension**, straightening against gravity.
- **Flexion**, bending pro-gravity.
- **Lateral body displacement** along the vertical body axis.
- **Rotation**, turning around and internal axis.

Skilled movement incorporates combinations of all basic components of movement and requires integration of vision and sensorimotor systems.
Body extension against gravity allows the eyes to:

- Look Up, vertical motilities
- Diverge, binocular eye movement toward the temporal border.
- Look at far, relax focusing
Basic Components of Movement

- Body Flexion allows the eyes to:
  - Look down - develops vertical motilities.

- Convergence - develops binocular eye movement toward the nasal border.

- Look at near - develops and activates focusing.
Lateral body displacement allows the eyes:
- Looking in lateral positions of gaze develops horizontal motilities.
- Enables visual target to be kept in sight even when it moves out of the primary position of gaze.
Basic Movement Components

- **Body Rotation** allows the eyes to:
  - Cross midline, **horizontal, vertical, diagonal and circular motilities**.

Rotation combined with extension, flexion, lateral and displacement, allows the visual system to **scan** all visual space.
Key Concepts for Visual Development

- Alignment
- Postural Control
- Tone
Adaptive Responses to Sensory Input

For efficient responses to visual input the motor system needs:

- Efficient organized Neuro-Postural Base
- Efficient and Dynamic Base Of Support
Efficient Neuro-Postural Base

- Provides the ability of the body to perform disassociated movements.
- Disassociated movement refers to the ability of the body to combine flexion and extension.
- Rotation components in support of a movement and as a counter-balance through the competition of these components.
An Efficient Neuro-Postural Base Includes:

- Normal postural alignment
- Equal distribution of weight
- Ability to weight shift in all directions with graded control
- Efficient righting and equilibrium reactions as an underlying foundation for volitional movement
- Efficient underlying postural control to support efficient volitional movement
- Efficient organization of basic components of movement: flexion-extension-and rotation in all planes of space
- Dynamic interaction of stability and mobility
- Anticipatory initiation for efficient functional movement
Alignment

Alignment refers to the relationship of each body part to each other and to the relationship of the body to the base of support (BOS).
Normal Postural (Musculoskeletal) Alignment Establishes:

- Kinesiological alignment of joint and muscles to activate dynamically and in the best possible efficient functional manner.

- Alignment of the sensory systems (visual-vestibular-cervical triad) in the best possible vertical orientation for maximizing efficient integration and matching between systems.
Body Alignment

- Dependent on the kinesiological alignment of muscle groups which in turn depends on joint alignment.
- Normal postural alignment is the most critical prerequisite for establishing efficient functional movement capabilities.
- The ability to maintain dynamic alignment provides the basis for an organized initiation of movement with graded control of movement components during the process of performing a functional task or movement sequence.
Demonstration

- Response to a visual target according to the quality of the BOS

Efficient/inefficient sitting.

Efficient/inefficient standing.
Postural Control

- Automatic Postural Control
- Adaptive Postural Control
- Anticipatory Postural Control.
Automatic Postural Control

• Ability to regulate the body’s position in space for dual purposes of stability and orientation.
• Requires normal postural tone, normal alignment, reciprocal inervation.
Adaptive Postural Control:

- Ability to modify sensory and motor systems in response to changing task and environmental demands. Also referred to as Equilibrium and Righting Reactions.

- **Equilibrium Reactions** are compensatory movements of the body parts that serve to maintain the center of gravity over the base of support when either the center of gravity or support surface are displaced.

- **Righting Reactions** are use to attain or regain such postures. These reactions are related primarily to visual and vestibular-propiroceptive functions. Deficits in vestibular proprioceptive functioning are most apparent when balance deficits occur under conditions where vision is occluded.
Anticipatory Postural Control

- The ability to utilize sensory and motor information in anticipation of postural demands based on previous sensory experiences and learning. This is also referred to as Postural Background Adjustment (PBA).
- Subtle spontaneous postural adjustments occurring in the trunk and lower extremities in preparation for voluntary movements.
- PBA increases the ease of engagement through movements of the hands such as reaching for a distant object (e.g., with far visual fixations).
- Unconscious awareness of the neck to make compensatory postural adjustments is dependent on integration of vestibular–proprioceptive inputs (visual ambient process).
Normal Postural Tone

- The resting tension of the musculature and the modulation of muscle tensions during movement demands.
- The tension of the musculature must be sufficient to maintain the body against gravity while allowing tonal changes to produce movement.
- The background tone must maintain stability and there must be a corresponding increase or decrease in tone to adjust to the demands of the movement.
- This enables mobility of the joints required to accomplish that movement.
Visual Skills and Postural Alignment Upright Against Gravity

- Pursuits
- Saccades
- Convergence
- Accommodation
Development

- Vision is the primary facilitator of normal development
- Blindness is a predictor of delay in development
- Neurological events (Cerebral Palsy) interferes with development
Vision and Development

- From the earliest moments of life, vision influences development.
- Visual 'conscious curiosity' stimulates movement.
- The ability to move is not served by 'conscious curiosity'.
- Movement is served by visual-spatial 'preconscious' organization with posture and motor.

Slide 89
Preconscious Ambient Visual Process

- Prenatally vision establishes foundation with motor through posture
- At birth child enters gravity-based environment
- In order to cope, child must develop ‘righting response’
- ‘Righting response’ occurs at an automatic level in the central nervous system
Gesell Studies

- First to formally document the relationship of vision and motor to child development
- Examined the role of vision in orienting spatially with movement
First Few Weeks

- Movement occurs away from a surface
- Neuro-motor dysfunction can be identified in the child who fails to accept the visual/spatial movement against gravity
- Dysfunctional baby will have difficulty in the longitudinal midline of the body
Ambient Vision/Posture

- "Righting response" starts with lifting of the head off of a surface
  - purpose: life-saving response
- Weight of head on nose and mouth causing extensor musculature in neck
- causes infant to turn head
- develops visual-spatial match with cervical extension
Ambient Vision/Posture cont.

First few weeks

- child makes effort to move away from physiological flexion and into extension of the neck and trunk
- Movement into extension is matched through the ambient visual process spatially (reinforced by optical-righting)
- Focal visual response follows ambient vision/postural release from flexion
• Alternating head position becomes stimulation for ‘conscious curiosity’ of vision to develop attention ("top-down" visual interest and feedback for motor control)

• Alternation of head position offers change in visual environment

• Change in posture begins to organize 3-dimensional world parallel to postural reactions to gravity
Ambient Vision/Posture cont.

- **Feedback** refers to motor control
- **Feed forward** refers to arrangement of the postural set
- **Quality of movement is directly related to the quality of the initiating posture**
Disassociation of Focal Processing from Ambient

- Occurs when refinement of movement is present
- Disassociation of head and trunk occurs with extension of the neck
- Allowing the head and neck to move without the body following
- Cervical-Ocular-Vestibular Triad
Lateral Extension and Flexion

- Accompanied with shift of visual midline and shift of lateral gaze for focalization
Trunk Mobility

- Prepares the child for the subtle adjustments of position made as an adult to sit and stand while keeping eyes focused on an interesting target
- Flexion and extension are associated with vision to organize trunk control
- Leads to the ability to disassociate ambient from focal visual processing
Ambient Vision and Posture

“We are in error to think of the postural orientation of the infant without recognizing the influence of the ambient visual process.”

Christine Nelson, PhD, OTR
Four Months

- Child masters extension against gravity in prone
- Head-righting reaction in relation to the trunk enables head to position more vertically relative to supporting surface
- Vision (ambient) seeks vertical alignment while vestibular confirms vision with useful head movements
- Vision (focal) disassociates to view environment

Grasp: Whole Hand
Postural Control and Vision

- **Lateral shift** in weight is important for **trunk** postural control.
- **Vision** orients through ambient and leads through focal curiosity.
- **Leads to pivot by 7 mo.**
An Erect Posture Against Gravity

- By 12 mo. The child stands to take his first steps
- The child is fascinated with the feeling of body position upright against gravity
- Vision is purely ambient in nature and little regard is given to interest in a toy and focalizing on detail
- Movement is led by vision (ambient) and postural relationships
- By 14 mo. vision (ambient) and posture become automatic and focalization on the toy provides the stimulation for movement
Visual skills are directly related to developmental milestones involving:

- Flexion
- Extension
- Alignment of the body upright against gravity
- Trunk Rotation

(Perspective Question: If visual skills develop from an action (motor) system, if the action system becomes impaired what will happen to the visual skills?)
Base of Support
- **Base of support**: body parts in contact with a support surface that exerts a counterforce against the body's applied force.
- When standing the outline of the feet are the base of support.

Figure 4.6: Examples of bases of support as seen from above: (a) one-legged standing, (b) two-legged standing, and (c) standing with a cone.
Asymmetrical Base of Support
Wide base of support
Narrow base of support
Base of Support Changed Through:

- Visual system: prisms, several forms of occlusion
- Motor system: Positioning, external aids
Weight Distribution over the BOS
Tools to Manipulate the Relationship of the Body to the BOS

- Use of optical elements (prisms, lenses, occlusion)
- Positioning
- Head and trunk movement facilitated from:
  - Central points of control
  - Shoulder and pelvic girdle
The Components of Movement
Body Movements

- Body components of movement are used in NVPT
- **Extension**, away from the base of support, increased angle between joints, against gravity
- **Flexion**, toward the base support, approximation of one body segment to another body segment, decreased angle between joints
- **Rotation** crossing midline in sagittal plane or transverse plane
Planes of Body Motion are:

**Sagittal Plane**
- The Sagittal plane passes through the body front to back dividing it into left and right.

**Frontal (Coronal) Plane**
- The frontal plane divides the body into front and back.

**Transverse Plane**
- This plane divides the body into top and bottom. Movements in this plane are rotational in nature.
Anatomical Neutral

- Standing upright
- Legs together and knee straight
- Toes pointing straight forwards
- Arms by the side
- Palms facing forwards
Human Posture is influenced by a number of interconnected factors:

- Muscle tone (i.e. high or low)
- Body shape and size (i.e. height and weight)
- Gravity
- The surface (e.g. uneven ground, slopes, sand, footwear)
- The task in hand
- Length of time required to be in a particular posture
- Level of health, well-being or emotional state
Eye Movements

- Versions in all directional planes
- Vergences in all positions of gaze
Facilitation of Quality Responses from the Visual System through the Motor System

- Use of proprioceptive input (BOS)

- Use of kinetic Input (extension, flexion, rotational movements)
Movements Used in Neuro-Visual Postural Therapy (NVPT)
Basic Movement Components and Vision

- Movement components can be elicited from the head and trunk (central points) or from upper and lower extremities (distal points).
- The point of control is decided according to the individual's needs:
  - Less control: trunk and head
  - More control: upper and lower extremities
Basic Movement Components and Vision

- Extension movements allows eyes to:
  - Look Up
  - Diverge
  - Look at far
Motor with Vision

- Flexion movements allows the eyes
  - Look down
- Converge
- Look at near
Head and Trunk Rotation Allows the Eyes to

- Look and expand for orientation
- Cross midline

Rotation combine with extension and flexion allows the visual system to capture all visual space with Horizontal, vertical, diagonal and rotational motilities.
Observation of Posture
Symmetry Along the Vertical Axis

Observation of standing posture.
- Where is most weight bearing?
- Shoulders in alignment?
- Iliac Crest alignment?
- Feet support?
Standing Posture

Front View

Shoulders parallel with pelvis, knees, and ankles

In normal:
- Head in midline.
- Neck lateral aspects equal in length.
- Shoulders in symmetrical alignment.
- Arms symmetrically hanging to the sides.
- Palms of hands place to lateral aspect of tights.
- Pelvis in symmetrical alignment.
- Knees in symmetrical alignment.
- Ankles in symmetrical alignment.
- Both feet symmetrically at ground.

Asymmetries indicate structural midline shift, on the vertical axis right/left. Scoliotic posture (cervical or dorsal or lumbar level) flexed or turning head to one side or the other are signs of structural midline shift.

*Positioning is needed to promote symmetry on vertical axis, equal weight bearing over BS, sitting, kneeling or standing allowing expression of Balance and equilibrium responses to occur to both sides.
FRONTAL VIEW

OBSERVE

- Skin
- Arms
- Head
- Neck
- Shoulders
- Hips
- Hands
- Pelvis
- Knees
- Ankles
- Feet

Describe:

Asymmetry is constant to right or left side?

Describe:
Observation in Standing Dorsal View

- Ears alignment.
- Neck alignment.
- Shoulder alignment.
- Intra scapulae space (adduction, abduction)
- Elbow alignment
- Pelvis alignment.
- Knee alignment
- Heel alignment

Observed asymmetries indicate vertical misalignment right/left, and/or transverse misalignment posterior/anterior.

*Positioning is needed to promote even weight bearing over BS and permits lateral and anterior/posterior postural adjustments.
DORSAL VIEW

Observe:  

Sim.  Asim.
• Head
• Neck
• Shoulders
• Arms
• Hands
• Pelvis
• Knees
• Ankle’s
• Feet

Describe

Asymmetry is constant to Right /left side?
Alignment and Mis-alignment
Lateral View

According to spine curvatures cervical and lumbar (Coronal axis)

1. Ideal alignment: corresponding cervical and lumbar curvature, pelvis in neutral posture.
2. Kyphosis, Lordotic postures, are exaggerations of spine curvatures pelvis is in retroversion, posterior shift of structural midline.
3. Flat back, reduction of cervical curvature, pelvis is in ante version posture, cervical curvature, anterior structural midline shift.
4. Sway back, pelvis in retroversion posture, posterior structural midline shift.
In normal

- Soft cervical curve.
- Non existent dorsal curve
- Soft lumbar curve corresponding with cervical curve
- Neutral pelvic alignment.
  - Neutral knee alignment
  - Neutral maleolae alignment

The shift in structural midline is in the anterior/posterior plane head in A or V

Positioning is needed to shift weight back or front according to midline shift

More even weight bearing will normalize tone, and allow limbs to move freely

Ear, shoulder, pelvis, knee and ankle in alignment
LATERAL VIEW

- Observe
  - Cervical curve
  - Dorsal curve
  - Lumbar curve
  - Head/Shoulder
  - Shoulder/Pelvis
  - Pelvis/Knee
  - Knee/foot

- Describe
  - Cervical Curve
  - Dorsal Curve
  - Lumbar Curve

Conclusion:
Analysis of Posture

Alignment on a wheelchair
Head, shoulders, arms
Alignment over the BOS
Leg alignment
Feet alignment
Good Alignment in a Wheel Chair

- Back of the Upper & Lower Arm
- Shoulder Blades & Spine
- Hands, Wrist & Elbow
- Knees & Hips
- Feet, especially the Heels and Toes
Observation of Posture

You should be looking for any and all of the following:
- Are the shoulders in line and level?
- Are the hips in line and level?
- Are the knees in line and level?
- Is the head shifted to the right or left?
- Are the ears level?
Postural Disorganization
Standing in Relation to Visual
Midline Shift Syndrome
(VMSS)
Shoulder and Pelvic Tilt

- Uneven shoulders
- Curve in spine
- Uneven hips
Abnormal Head and Neck Posture

Capital Extension  Capital Flexion
Postural Disorganization
Lateral view
Vision/Posture Affected by VMSS

- Congenital - lacks sensorimotor organization and reinforcement of vision
- Acquired - experience does not match reality
- Tone
- Hemiparesis, Quadriplegic, Diplegic
The Ambient Process and Proprioception

- Proprioception becomes the base or platform for the ambient process in development.
- Without the proprioceptive base the sensorimotor systems related to kinesthesia, vestibular and tactile become isolated.
- The Ambient Process seeks Proprioception and Proprioception seeks the Ambient Process.
Post Trauma Vision Syndrome (PTVS)

- Causes a disassociation between the ambient process and proprioception
- The effect produces a series of characteristics and symptoms
- The disassociation produces compromise affecting posture and balance
Neuro-Visual Postural Therapy (NVPT)

- Patients with PTVS often cannot re-establish the relationship with the motor-sensory system with prisms alone.
- Traditional vision therapy does not establish a bridge between the ambient visual process and proprioception.
- Vision therapy can imbed PTVS when emphasis is placed on the focal process without proper facilitation between the ambient process and proprioception.
Characteristics of Disassociation Between the Ambient Process and Proprioception

- Postural imbalances
- Lack of extensor tone in seated or standing posture
- Imbalance observed in the plane of the shoulders compared to the pelvis
- Increased abnormal postural tone in the neck and shoulders or on one side of the body
VMSS (cont.)

- Shift in visual midline reinforces postural imbalance
- Compromise of feed-forward affects ambient preconscious
- Vision becomes reactionary rather than proactive
VMSS (cont.)

- Collapse of ambient causes over-focalization
- Avoidance of periphery with movement
VMSS (cont.)

- Effect of VMSS on posture and vision
  - interference with posture directly affects the preconscious nature of ambient vision
  - feed-forward and feed-back is disrupted leaving focalization
Strabismus and VMSS

- VMSS shifts to the fixating eye in addition to anterior/posterior variation
  Demo: VMSS shift with fixating eye

- Strabismus can cause and/or reinforce lateral flexion and extension
  Demo: Diplopia with vertical prisms
  - Patching vs. Central Occlusion Patch (COP)
Observations of VMSS

- Walking
  - observe shoulders and pelvis for expansion and compression (Demo)
  - a shoulder raised and the pelvis tilted down on one side may be the direction of weight shift and VMSS

Demo: Stepping without weight shifting
Observing Anterior-Posterior Mal-Alignment of Posture - VMSS
Observations VMSS (cont.)

- Anterior/posterior
  - look at wear on soles of the shoes
  - circumversion step may indicate posterior and/or lateral shift
  - scuffing the soles of shoes on floor may indicate anterior shift

Demo: Sit to stand in posterior VMS (BD yoked prisms)
Demo: Sit in posterior VMS and read chart
Observations VMSS (cont.)

- Lean forward may indicate an anterior or posterior VMSS
  - observe the pelvis
  - if pelvis is in a posterior tilt the person may be leaning forward with upper body to compensate (Posterior VMSS)
  
  Demo: BU and BD prism influencing posture and vision
Observing Lateral Postural Mal-Alignment - VMSS
Postural Tone and Prismatic Effect

- If flexion and extension represents the expression of the motor-sensory distortion, change in tone is the fluency of this expression
- Flexion, extension and body alignment must be observed by the clinician to understand how to affect with prisms
Postural Tone (cont.).

- Tone and the body’s relationship to the base of support will be the determining factor as to which way the prism will be positioned to be effective.
- The Physical, Occupational and Speech Therapist together with the Optometrist become the integral team for rehabilitation.
In the youngest fetal infant tone is:

- minimal
- flaccid
- uneven
- patchy
- precarious

It rises and falls
Tone (cont.)

- Mid-range fetal infant tone is:
  - responsible for more integration
  - organization of spatial orientation of the eyes relative to oculomotor position
  - organization of the Righting Reflex and oculomotor position
  - organization of the Compensatory Reflex relative to the gravitational point
Development of Vision

- Requires **graded motoric control of neck** in all positions of space
- The **preconscious matching** of visual spatial information with neck proprioceptors, and vestibular automation enables alignment of the head to be perpendicular to the base of support
- This ultimately **frees** the child to organize the focal visual process using the ambient process as a platform to explore
Development of Vision For Motorically Impaired Child

- The lack of organization between the ambient process, neck proprioceptors and the vestibular system causes interference with postural alignment of the head.
- This lack of matching support interferes with ability to develop pursuits, saccades, convergence and accommodation.
- Binocular dysfunction occurs due to inability of ambient/sensorimotor matching of information.
Vision Impairment and Postural Abnormality

- A vision impairment (optic nerve atrophy) affecting ambient process interferes with the Optical Righting Reaction to reinforce head righting
- Seen in Landau Reaction in prone, extension is limited and this will diminish postural responses
- In turn, this further interferes with ability to use vision for joy and spontaneity as in normal child
- Conscious (focal) visual scan becomes limited due to lack of ambient/postural organization
The normal child uses the relationship between vision and posture as the first means of communication.

- The child being fed in a highchair will pull the eyes and head away to indicate that he does not want more food.
- The eyes are not disassociated from the neck and move with head movement.
- At a later stage (14 mo.) the child will be able to organize ambient vision with posture while using focal to explore the environment while in motion.
Vision, Learning and Postural Disorganization

- Without vision/postural organization sensorimotor data acquired by the child about the environment will be fragmented.
- Without the ambient process to establish spatial relationships the focal process isolates and fragments information.
Vision, Learning and Postural Disorganization cont.

- This is observed in the child with learning problems and postural disorganization
- Due to the interference in ambient/postural developmental organization, the central nervous system never succeeds in regulating automatic postural reactions
- This leads to a conscious (focal) attempt by the child to concentrate on maintaining body balance
- This leads to distractibility due to visual processing/postural disorganization
Human Ocular Motility

- Alignment of head upright over vertebrae allows for head and eye movement
- Bimodal visual process permits disassociation of focal and ambient process
- Visual scan is primarily with eyes and is supported by cervical rotation
Binocularity

- The ambient process is initially responsible for integration of the images from the two eyes and supports occipital cortex in the establishment of binocularity.

- Interference with the relationship between ambient processing and the early reflex reactions together with the sensorimotor system will directly affect visual skills and binocularity.
Binocularity cont.

- Interference with postural organization between the ambient process and posture will compromise the ability of the child to utilize the ambient process for release of the focalization (fixation) leading to dysfunction of pursuits, saccades, convergence and accommodation.

- Interference with the relationship between ambient processing and the early reflex reactions together with the sensorimotor system will directly affect visual skills and binocularity.
Movement and Binocularity

• Human
• Head position can be manipulated during movement to accommodate cognitive interests due to disassociation between ocular movement and head movement
• Can maintain interest on detail while orienting spatially
Summary

- Vision is bi-modal in process
- The ambient vision is the first process that the child is born with
- The purpose of this hierarchy is to enable the vision to organize with ‘Righting Reactions’ and the sensorimotor system to organize body movements to be upright against gravity
Summary cont.

- The ambient process establishes organization of posture with vestibular, kinesthetic and proprioceptive systems.
- The focal process of vision serves interest and is conscious.
- The ambient process serves spatial organization, posture and balance and it is preconscious.
Summary cont.

- Vision (ambient) leads in postural organization of flexion and extension after basic reflexes

- After basic reflexes vision should become the leading process to work with the sensorimotor systems for postural organization and plasticity

- The ambient process is plastic whereas the focal process remains high in plasticity so long as the ambient process is dynamically integrated with the sensorimotor system
Summary cont.

• If dysfunction occurs due to a motor impairment (i.e., cerebral palsy) the focal process compromises the ambient process and plasticity is diminished.

• If there is a vision impairment affecting peripheral vision the ambient process will be compromised affecting plasticity of vision and organization of posture to support higher visual processing and function.
Key Points

- Vision is dominate but must remain plastic in order to support posture and development.
- The ambient process is critical for development, spatial organization, posture, balance and movement for normal development.
- Any compromise of the relationship between the ambient process and the sensorimotor system (i.e., cerebral palsy, Friedreich’s Ataxia, Niemann-Pick Syndrome, Autism) will affect balance, posture, movement and ultimately the plasticity of vision.
Prisms (cont.)

- Used monocularly or binocularly to correct for strabismus or deviation in alignment of the eyes (prisms positioned for two eyes with base end in opposite directions)
- NOR use: Yoked Prisms
- Yoked prisms are two prisms positioned before each eye with the base end oriented in the same direction
Prisms (cont.)

- With base end in opposite directions images are shifted in opposite directions
- With base end in same direction (yoked) images are shifted in the same direction
Yoked Prisms

- Image shifted toward the apex end of prism for Focal Visual Process
- Ambient Visual Process doesn’t see image shift
- For Ambient Process it is as if the person moved and the image did not

- this is the key for understanding Neuro-Visual-Postural Therapy and Neuro-Optometric Rehabilitation
The Base Right Prism

<table>
<thead>
<tr>
<th>Apex</th>
<th>Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Expands in the horizontal plane (x-axis) or to the left of the subject</td>
<td>• Compresses in the horizontal plane (x-axis) or to the right of the subject</td>
</tr>
<tr>
<td>• Compresses in the near-far plane (z-axis)</td>
<td>• Expands in the near-far plane (z-axis)</td>
</tr>
<tr>
<td>• Vertical plane is unchanged</td>
<td>• Vertical plane is unchanged</td>
</tr>
</tbody>
</table>
The Effect of Base Right Yoked Prism

- Shift of visual midline to the right
- Shift of the image to the left
- Feeling of being pulled to the right
- Ground appears to slope to the right
- **Therapeutic Effect:** increased weight bearing on the right side
The Base Left Prism

Apex
- **Expands** in the horizontal plane (x-axis) or to the right of the subject
- **Compresses** in the near-far plane (z-axis)
- Vertical plane is unchanged

Base
- **Compresses** in the horizontal plane (x-axis) or to the left of the subject
- **Expands** in the near-far plane (z-axis)
- Vertical plane is unchanged
The Effect of Base Left Yoked Prism

- Shift of visual midline to the left
- Shift of the image to the right
- Feeling of being pulled to the left
- Ground appears to slope to the left
- **Therapeutic Effect: increased weight bearing on the left side**
The Base Down Prism

**Apex**
- **Compresses** near far **superior** plane of the subject (z-axis)
- **Expands superior** vertical plane of the subject (y-axis)
- Horizontal plane is unchanged (x-axis)

**Base**
- **Expands near far inferior** plane of the subject (z-axis)
- **Compresses inferior** vertical plane of the subject (y-axis)
- Horizontal plane is unchanged (x-axis)
The Effect of Base Down Yoked Prism

- Shift of visual midline posterior
- Shift of the image upward
- Feeling of being pushed backward and smaller
- Ground appears to slope upward
- Therapeutic effect: increased weight bearing posteriorly, extension and an erect posture
The Base Up Prism

Apex
- Compresses inferior near-far plane of the subject (z-axis)
- Expands inferior vertical plane of the subject (y-axis)
- Horizontal plane is unchanged (x-axis)

Base
- Expands superior near-far plane of the subject (z-axis)
- Compresses superior vertical plane of the subject (y-axis)
- Horizontal plane is unchanged (x-axis)
The Effect of Base Up Yoked Prism

- Shift of visual midline anterior
- Shift of the image downward
- Feeling of being pulled forward and taller
- Ground appears to slope downward
- **Therapeutic Effect:** increased weight bearing forward
Yoked Prisms (cont.)

- Ambient process does not perceive (conscious) image shift
- Ambient process is preconscious
- Ambient process is related to sensorimotor systems
- Change in the ambient process is a preconscious interpretation of the shift of ego center as it relates to motor-sensory understanding of position within environment and visual midline
Yoked Prisms used in Neuro-Visual Processing Rehabilitation

- A neurological event affects ambient processing relationship with motor-sensory
- Any change in motor-sensory information is immediately matched by ambient process ability to alter its state
- **Ambient process** is a RELATIVE processing system motor-sensory information for **FEED FORWARD**
- **Focal process** is non-relative to motor-sensory information and serves as a **FEEDBACK** source for balance and posture. (It also serves as a directive for specific goal or task oriented action.)
Neuro-Visual Processing Rehabilitation (NVPR)

- The ambient process interprets motor-sensory distortion as a distortion of space that is internal or within.
- The expression of this distortion by the ambient process is a compression and expansion of space.
- This compression and/or expansion will reinforce postural imbalance as well as visual field loss (homonymous hemianopia).
Yoked Prisms

- Place the base end of the prisms in the direction:
  - Toward the direction opposite the observed lateral or anterior-posterior postural extension or VMS
  - Prisms will usually be positioned base end toward the affected side
  - Paradoxical Effect: persons collapses into the side of flexion or the affected side therefore place base end of prisms away from the direction of collapse or VMS
Observation of Posture

- Flexion/Extension
- Tone high, low or fluctuating
- High stepping
- Scuffing soles of feet
- Circumversion step
- Toe in
- One foot rotated out or in
Visual Postural Analysis
Yoked Prisms Realign Visual Midline

120° - 40°
- Artic
- Sense
- Localization
- Long
- More
Vision/Posture Affected by VMSS

- Congenital - lacks sensorimotor organization and reinforcement of vision
- Acquired - experience does not match reality
- Tone
- Hemiparesis, Quadriplegic, Diplegic
VMSS (cont.)

- Shift in visual midline reinforces postural imbalance
- Compromise of feed forward affects ambient preconscious
- Vision becomes reactionary rather than proactive
VMSS (cont.)

- Collapse of ambient causes over-focalization
- Avoidance of periphery with movement
  - Demo: Yoked Prism with movement
  - Demo: Yoked Prism with tracking
  - Demo: Yoked Prism with posture
VMSS (cont.)

- Effect of VMSS on posture and vision
  - interference with posture directly affects the preconscious nature of ambient vision
  - feed-forward and feed-back is disrupted leaving focalization
Paradoxical VMSS
Effect of Yoked Prisms on a Child with Mild CP, Cognitive and Visual Impairment and No Tissue Restrictions

Mismatch of structural midline and visual midline, that affects the body relationship to the ground and horizon.

Yoked Prisms resolved the mismatch between structural and visual midlines.
Positioning without Yoked Prisms  Positioning with Yoked Prisms (base down/left)
The Fulcrum Concept

In order to have efficient matching, postural alignment, stability-mobility, kinesiological joint and muscle function need to be organized, along with a functionally efficient visual system.

Visual Process

Ambient/Focal — Cervical/Somatosensory

Neuro Postural Base
The visual system cannot lead posture and movement if the postural system cannot make the adaptation.

Visual Postural System
Fulcrum Concept

Visual

Neuro Postural
If the visual system is not efficient the postural system cannot adapt.
Fulcrum Concept

- In cases of minor visual inefficiency, the visual system can perform more efficiently when the postural system is organized (i.e., adapt the postural base by changing seating or use of dynamic insoles etc.).
- In cases of minor postural disorganization, the postural system can perform more efficiently through visual intervention to improve efficiency of the visual system (i.e., prisms and lenses.)
When there are more significant problems (as in TBI) both systems must be addressed in tandem and with various degrees of emphasis as the normal matching improves. This process of re-matching requires variations and interactions of dynamic increments to achieve efficiency. Sometimes more emphasis on one aspect, and then another as the process regains incremental organization.
Strabismus and VMSS

- VMSS shifts to the fixating eye in addition to anterior/posterior variation
  Demo: VMSS shift with fixating eye
- Strabismus can cause and/or reinforce lateral flexion and extension
  Demo: Diplopia with vertical prisms
    - Patching vs. Central Occlusion Patch (COP)
Observations of VMSS

- Walking
  - observe shoulders and pelvis for expansion and compression (Demo)
  - a shoulder raised and the pelvis tilted down on one side may be the direction of weight shift and VMSS

Demo: Stepping without weight shifting
Observations VMSS (cont.)

- Anterior/posterior
  - look at wear on soles of the shoes
  - circumvection step may indicate posterior and/or lateral shift
  - scuffing the soles of shoes on floor may indicate anterior shift

Demo: Sit to stand in posterior VMS (BD yoked prisms)
Demo: Sit in posterior VMS and read chart
Observations VMSS (cont.)

- Lean forward may indicate and anterior or posterior VMSS
  - observe the pelvis
  - if pelvis is in a posterior tilt the person may be leaning forward with upper body to compensate (Posterior VMSS)

Demo: BU and BD prism influencing posture and vision
POSTURAL CONTROLS THAT CAN BE USED IN NVPT
POSTURAL CONTROLS

• To maintain a static posture:
  Chairs, benches, stools, stabilizers, rolls, solid wedges, big pegs attached to working surface, pelvic belt.

• To challenge balance and equilibrium:
  Gymnastic balls, inflatables rolls, inflatable wedges and circles balance beam, balance board, tumbling, unilateral or bilateral weight shifting, in all directions
Straddle sitting

When straddle sitting, the body weight is equally distributed over the buttocks, which avoids misalignment on the vertical axis right and left. It also promotes better anterior/posterior alignment.
CONTROL FROM THE SEAT

[Image: Diagram of a person sitting in a seat with a support system and a woman sitting in a similar position.]
Mobile Surface

- While sitting over a mobile surface, the trunk maintains itself in active extension, the weight is on the ischial tuberosities, postural adjustments take place in all directions, the head is in midline, arms, hands and eyes are in the best position to perform without excessive stress.
MOBILE AND STABLE SURFACES

The wedge can be mobile or stable, can be used in both directions, to get pelvic tilt forward or backward.  

Pelvic adjustments in both directions forward and backward.
Mobile Surfaces

Challenge balance to maintain an alert active trunk

Control even weight bearing over gluteous and feet
An active and aligned trunk is a stable reliable platform for hand use, and a stable platform for the head, which provides a stable base for the eyes. The result is better Visual and Hand Function.
The arms feel heavy. The hands are clumsy. The head is not a stable platform for the eyes.
POSITIONING IN STANDING

A standing frame provides secure standing posture and freedom of hand and eye movements.
Without Postural Control the visual system cannot explore environment.

With Postural Control the visual system can relate to environment.
Lecturer’s Editorial Note

- The use of lenses and prisms must be in accordance with professional licensing standards and restrictions.
- We emphasize that through interdisciplinary service and inclusion of optometrists practicing Neuro-Optometric Rehabilitation within the rehabilitation model can the service be in the best interests of the patient.