Neuro-Optometric Rehabilitation: Principles and Practice of a Neurological Event

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Introduction

- Building a model of vision to affect rehabilitation
- Vision, posture and motor
- Development and the influence of vision
- Neurological events (acquired and congenital) and the affect on vision
- Understanding visual processing in the brain
- The eye facilitates the brain visual processes

THE VISUAL RELATIONSHIP TO A NEUROLOGICAL EVENT

To grasp the implications about vision and the neurologic event, requires understanding:

- The process of vision
- The developmental relationships to the motor system
- Visual processing in the brain
- The possibilities for maximizing potentials through re-

Vision Impairment or Processing Dysfunction Caused by Disease or Neurological Event Affects

- Mobility
- Reading
- Recognizing faces
- Inability to drive
- Glare sensitivity

Neuro-Visual Processing Dysfunction Affects

- Posture
- Balance
- Spatial orientation
- Attention and concentration
- Binocularity

Balance, Posture, Movement and Spatial Orientation

- Affected by

  -mismatch between vision and sensorimotor information

IMPACT OF VISUAL PROCESSING ON POSTURE AND BALANCE

VISION REHABILITATION

To accomplish this it requires:

- Creating a model of vision for neurorehabilitation
- **Paradigm shift**
- Prisms
- Need for understanding posture and movement
- Need to observe and assess posture

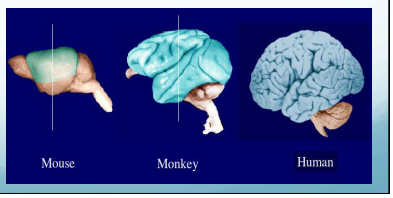
Neuro-Visual Processing: A Model for Visual Rehabilitation

Neuro-Visual Processing Rehabilitation

- Applied principles of movement and posture to understanding of vision processing
- Use of prescribed therapeutic lenses and prisms to affect posture and movement through visual processing

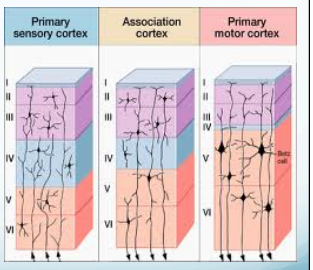
Neocortex

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



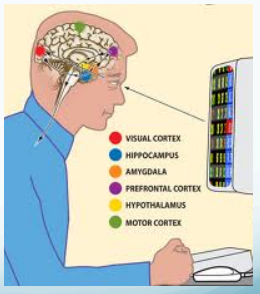
Neocortex

- Composed of six layers (I-VI)
- Layers I - III are mylenated 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)



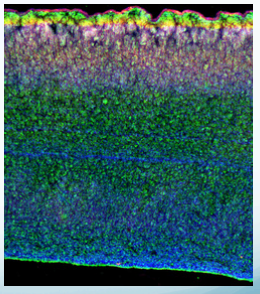
Visual Neocortex

- 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



Research

- Trevarthen, Colwyn. Two Mechanisms of Vision in Primates.Psychologische Forschung. 1968:31; 299-237
  - Two kinds of visual processing function in primates:
    - Focal
    - Ambient

Ambient Visual Process
(C. Trevarthen)

- "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."

Research cont.

- Held, Richard. Dissociation of Visual Functions by Deprivation and Rearrangement. Psychologische Forschung. 1968:31; 338-348
  - Deprivation of motor-sensory feedback results in a higher threshold for discrimination of visuo-spatial stimuli and events

Visual Process	Function	Temporal Function
Focal (Micro)	Detail Discrimination Identification Attention Concentration Oriented to present *Conscious* *(Reactive)* *Corpusular*	Slow Speed in Processing
Ambient (Macro)	Spatial Orientation Posture Balance Movement Anticipates Change *Preconscious* *(Proactive)* *Waveform*	Rapid Speed in Processing

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

Preconscious Ambient Visual Process

- Prenatelly 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

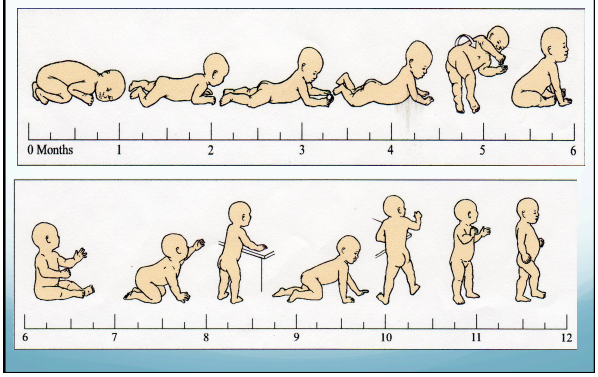
- First to formally document the relationship of vision and motor to child development
- Examined the role of vision in orienting spatially with movement

NEUROFUNCTIONAL MILESTONES

First twelve months of life:

- Control against gravity
- Socialization
- Manipulation
- Communication
- Independent ambulation

THE PROCCESS DURING THE FIRST 12 MONTHS



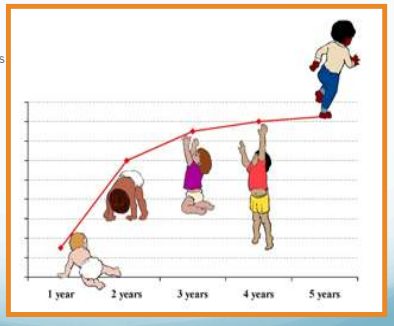
THE PROCCESS AFTER 12 MONTHS OF AGE

Gross and fine movements development

Languaje development

Perceptual cognitive development

Emotional social developmnet



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.

Primitive Reflexes

- An involuntary muscle reaction as a response to a specific stimulus, movement or to a sensation
- Obligatory, stereotyped and predictable.
- Actions originating in the central nervous system that are exhibited by normal infants,(neurologically intact), in response to particular stimuli.
- Reflexes are suppressed by the development of the frontal lobes as a child develops normally.

Primitive Reflexes (cont.)

New Born Reflexes:

- Root reflex. This reflex begins when the corner of the baby's mouth is stroked or touched.
- Suck reflex. Rooting helps the baby become ready to suck.
- Moro reflex.
- Tonic neck reflex.
- Grasp reflex.
- Babinski reflex.
- Step reflex.

Retain Reflexes

Causes of Retained Primitive reflexes:

- Premature birth
- Traumatic birth experience.
- Birth by C-section may lead to retained reflexes.
- Additional causes can include: falls, traumas, chronic ear infections, head trauma, concussions brain infections, vertebral subluxations etc.

NORMAL NEURO FUNCTIONAL DEVELOPMENT

- Skill emerges and refines in all functional systems.
- The constant practice of a task permits the baby 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.
- When the CNS is damaged, the practice of the task in a abnormal neuro postural base and with out inhibiting anormal motor responses leads to strengthening of the abnormal response, narrowing the possibilities of variation and leading to musculoskeletal deformities, diminishing the possibilities of successful function.

PRIMITIVE REFLEXES AND POSTURAL REACTIONS

- The primitive reflexes are neuro-maturational markers
  - They initiate in the gestational period and normally disappear between the 3rd and 6th month after birth.
- Postural reactions are not present at birth
  - Sequentially develop between the 3rd, and 10th month of age.

Vision and Movement

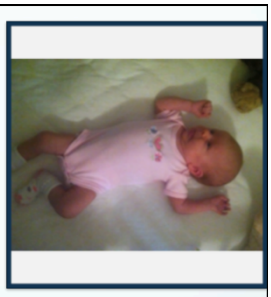
- Vision is thought to be the primary incentive for movement.
- The child must have a concept of the "world out there" before knowing to move out in space. (Gesell)
- A poor base of support may reduce incentive to fight gravity and move out in space.

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

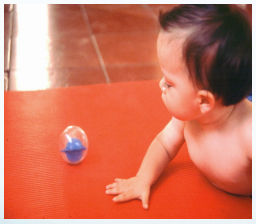
- 1 month old



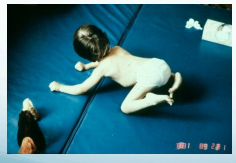
- Head righting elicited by optical righting
- Extension at the neck to capture a visual target

5 months old

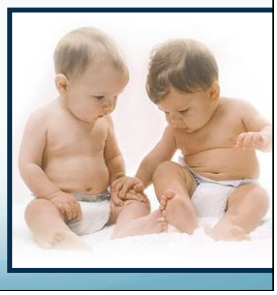
Ambient Vision/Posture cont.



- 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



In supported sitting flexes the trunk over the pelvis to look up, in upright sitting uses head flexion over the trunk to see and touch



Flexion Develops Convergence, Infraduction and Focalization

Extension Develops Divergence, Sursumduction and Ambient Orientation

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

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'
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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 individuals needs:

  Less self control, trunk and head

  More self 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.

Post Trauma Vision Syndrome: *Compromise of the Ambient Visual Process*

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Ganglion Cells from Retina

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

Retinal Cells Transverse Through

- Retino-geniculate cortico pathway—P and M cells
- Retino-tectal pathway—M cells for spatial orientation prior to focalization (posture and balance)

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Focal/Ambient Visual Process Neurological Pathway

- Optic Nerve > Optic Chiasm > Optic Tract
- Three Major Synaptic Destinations
  - Lateral Geniculate > Visual Cortex (Focal Processing)
  - Pre-Tectal Nucleus
  - Superior Colliculus

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Neurological Visual Pathway to Superior Colliculus

- Optic Tract via Superior Brachium
- Occipital Cortex via Optic Radiations (through Lateral Geniculate)
- Spinotectal Tract (from Spinal Cord and Medulla)

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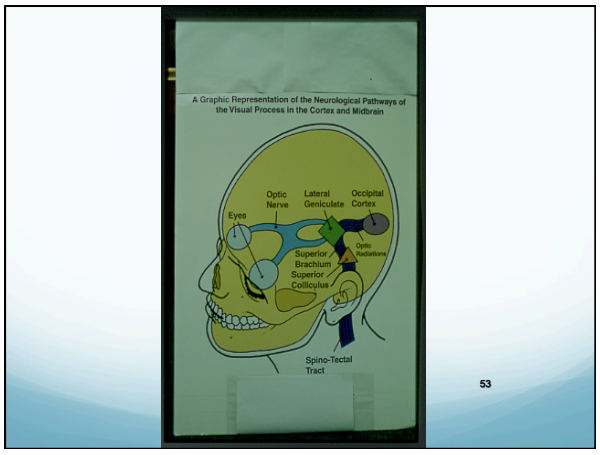
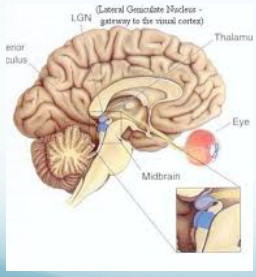


Lateral Geniculate



- Dorsal Ganglion – relay and distribution of visual information to portions of brain other than occipital cortex
- Ambient Vision – 20% peripheral fibers match and relay with axons delivered to superior colliculus

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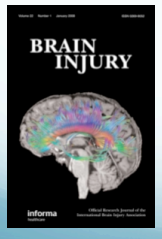
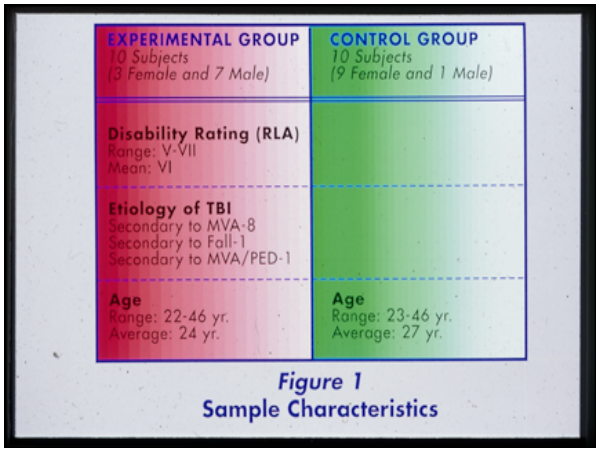
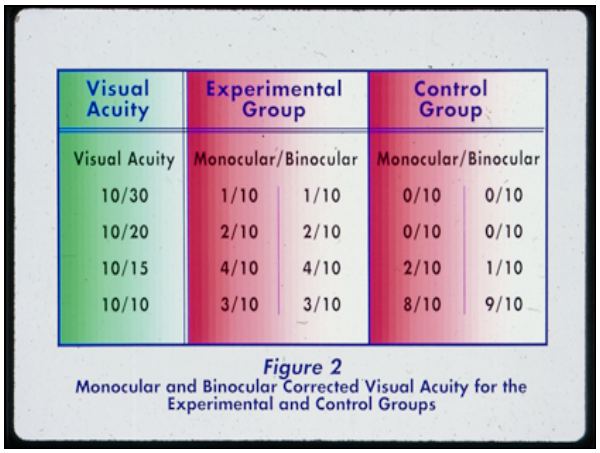
Visual Evoked Potentials (VEP) Evaluating Treatment for Post Trauma Vision Syndrome (PTVS) in Patients with Traumatic Brain Injury (TBI)



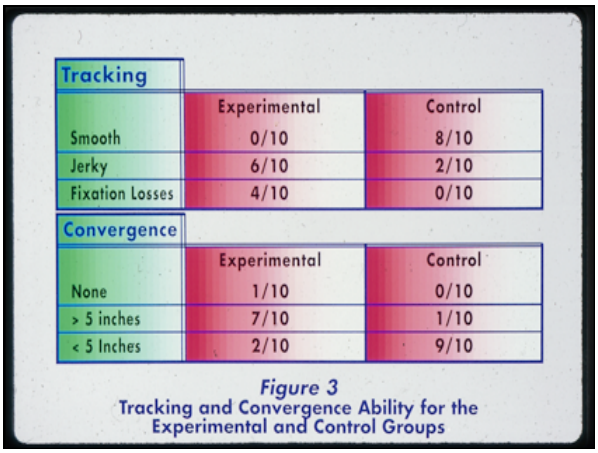
- William V. Padula OD
- Stephanie Argyris MD
- John Ray MS
- Brain Injury (1994) 8:2 125-133





Visual Acuity	Experimental Group		Control Group	
Visual Acuity	Monocular/Binocular		Monocular/Binocular	
10/30	1/10	1/10	0/10	0/10
10/20	2/10	2/10	0/10	0/10
10/15	4/10	4/10	2/10	1/10
10/10	3/10	3/10	8/10	9/10

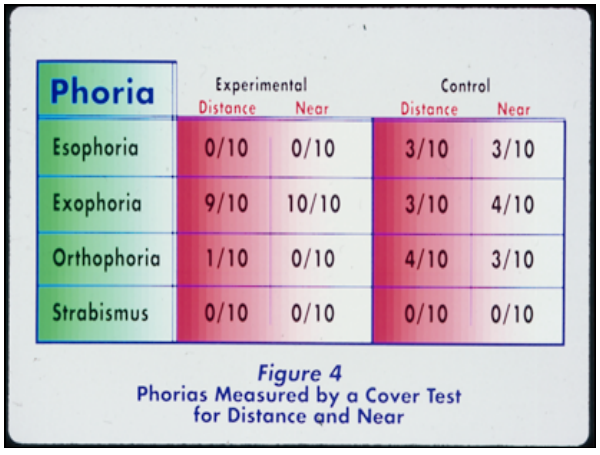
Figure 2
Monocular and Binocular Corrected Visual Acuity for the Experimental and Control Groups



Tracking	Experimental	Control
Smooth	0/10	8/10
Jerky	6/10	2/10
Fixation Losses	4/10	0/10

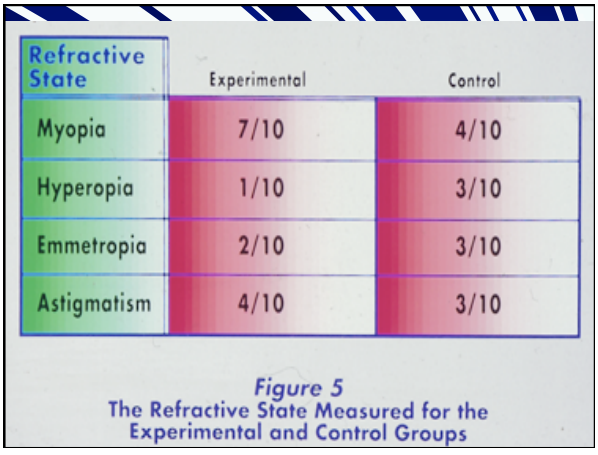
Convergence	Experimental	Control
None	1/10	0/10
> 5 inches	7/10	1/10
< 5 Inches	2/10	9/10

Figure 3
Tracking and Convergence Ability for the Experimental and Control Groups



Phoria	Experimental		Control	
	Distance	Near	Distance	Near
Esophoria	0/10	0/10	3/10	3/10
Exophoria	9/10	10/10	3/10	4/10
Orthophoria	1/10	0/10	4/10	3/10
Strabismus	0/10	0/10	0/10	0/10

Figure 4
Phorias Measured by a Cover Test for Distance and Near



Refractive State	Experimental	Control
Myopia	7/10	4/10
Hyperopia	1/10	3/10
Emmetropia	2/10	3/10
Astigmatism	4/10	3/10

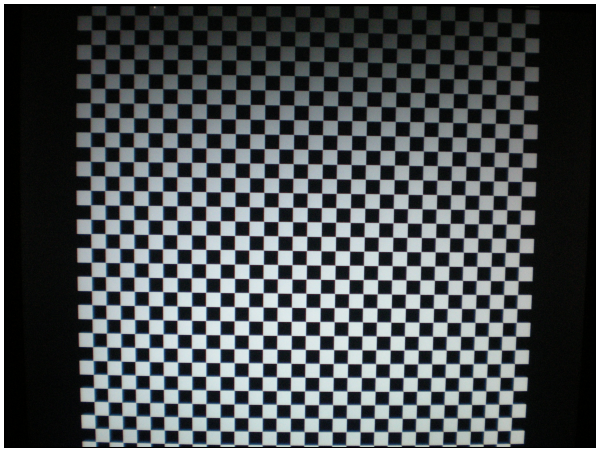
Figure 5
The Refractive State Measured for the Experimental and Control Groups

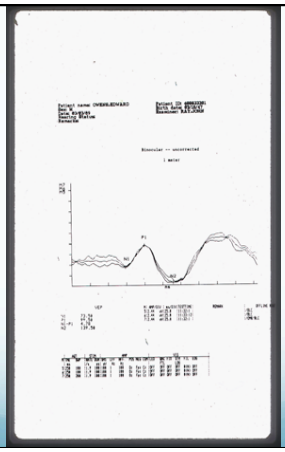
Bell Retinoscopy	Experimental	Control
13-14 inches (normal)	0/10	8/10
12-11 Inches	2/10	2/10
10-11 Inches	4/10	0/10
9-10 inches	3/10	0/10
8- 9 inches	0/10	0/10

Book Retinoscopy	Experimental	Control
Plano to +0.25	0/10	6/10
+0.25 to +0.50	2/10	4/10
+0.50 to +0.75	7/10	0/10
+0.75 to +1.00	1/10	0/10

Figure 6
Accommodative Findings for the Experimental and Control Groups

Visual Evoked Potential





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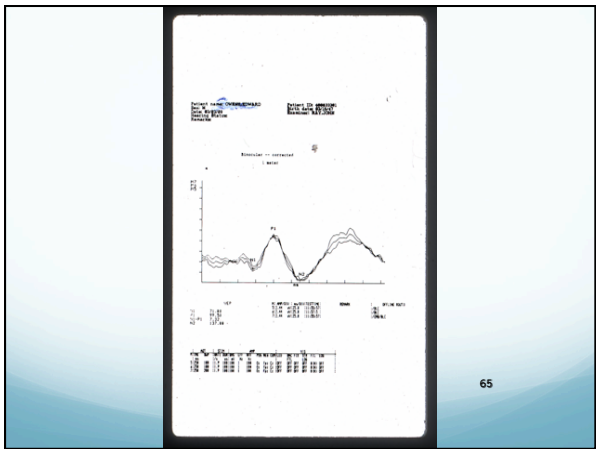
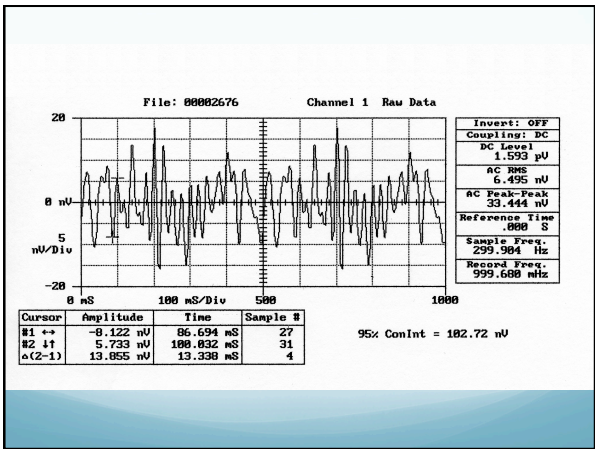
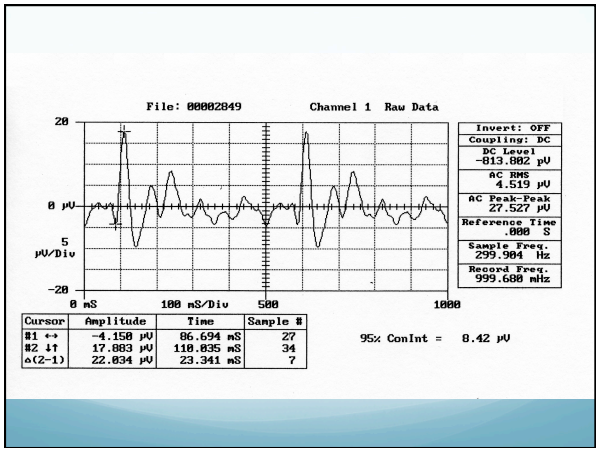
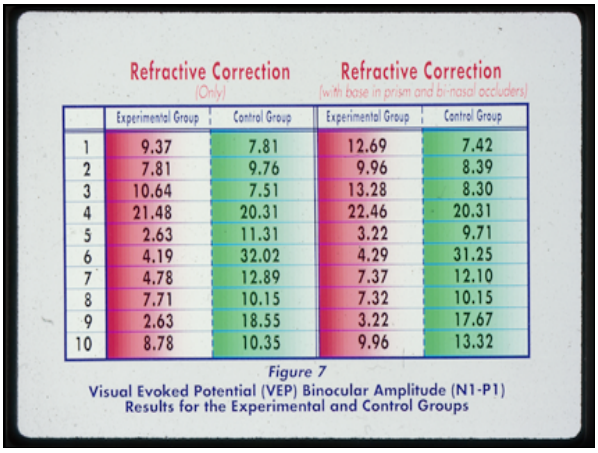


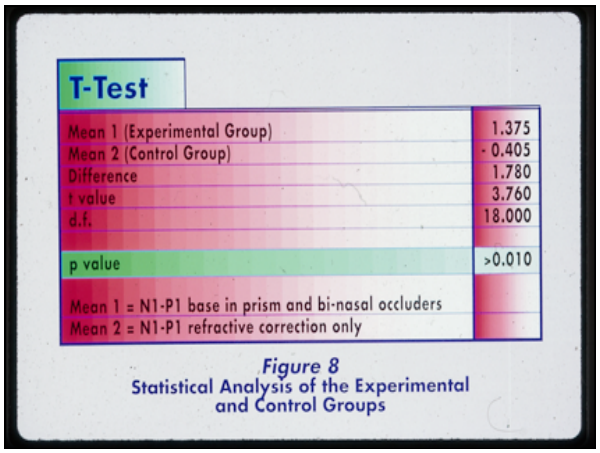






	Refractive Correction (Only)		Refractive Correction (with base in prism and bi-nasal occluders)	
	Experimental Group	Control Group	Experimental Group	Control Group
1	9.37	7.81	12.69	7.42
2	7.81	9.76	9.96	8.39
3	10.64	7.51	13.28	8.30
4	21.48	20.31	22.46	20.31
5	2.63	11.31	3.22	9.71
6	4.19	32.02	4.29	31.25
7	4.78	12.89	7.37	12.10
8	7.71	10.15	7.32	10.15
9	2.63	18.55	3.22	17.67
10	8.78	10.35	9.96	13.32

Figure 7
Visual Evoked Potential (VEP) Binocular Amplitude (N1-P1) Results for the Experimental and Control Groups



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

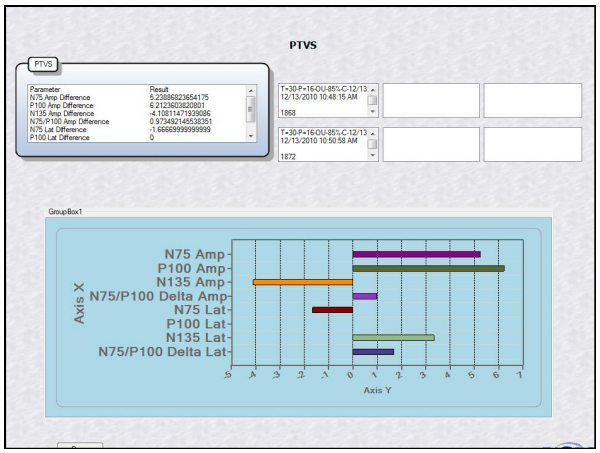
Results of the VEP Research

Experimental

- Reduced monocular and binocular acuity
- Difficulty initiating pursuits and saccades
- Insufficiency of accommodation
- Convergence insufficiency
- Increased myopia
- Increased exophoria (strabismus eliminated from the study)

Control

- Normal monocular and binocular acuity
- Normal pursuits and saccades
- Normal range of accommodation
- Normal range of convergence
- Mixed refractive states
- Mixed states of phoria



PTVS Affects

- Development
- Cognition
- Attention
- Concentration
- Memory
- Speech and language
- Motor performance

Development Affected by PTVS

- Proactive affect of vision and motor is compromised
- Vision dysfunction causes developmental delays
- Learning interference
- Problems with communication

Cognitive Interference

- PTVS causes over-focalization or and isolation on detail without creating relationships
- Interferes with relationship of release of focalization
- Disrupts time and space by focal binding
- Affects memory

Speech and Language

- Speech requires temporal context between thought, language and oral motor response
- PTVS over-focalization interferes with release
- Causes inability to release thought-language-oral motor flow
- Affects temporal relationships which ambient vision provides for speech-language fluency

Interference with Motor

- Focal binding compromises preconscious proactive relationship between ambient and motor
- Movement becomes conscious and isolates function

Over-Focalization of Vision

- Causes inability to release detail
- Environment becomes over stimulation
- Movement in the environment (i.e.. busy crowded environment) becomes chaos to the visual process
- Print on the page becomes a mass of detail
- Movement of eyes are projected into the field causing movement of print or the ground being walked on

PTVS Focal Binding

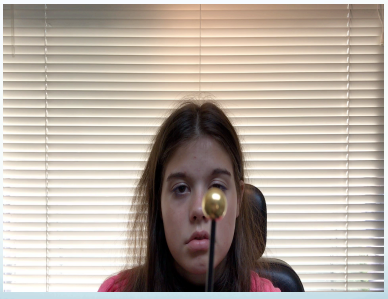
- What does it look like to the patient?
  - The isolation on detail is like driving in a *snow storm at night with your high beams on*
  - It creates a spatial disorientation that becomes more severe the more movement there is in the environment
  - This causes increased concentration by the patient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

PTVS Focal Binding Behavioral Characteristics

- (Video – BF-BD)
- Perceptual tunneling
- Confusion
- Confabulation
- Inability to form accurate visual closure
- Increases abnormal postural tone
- Visual Midline Shift Syndrome (VMSS)

Affecting Plasticity of Neuro-Visual Processing in PTVS

- Prisms affect space and time
- A prism expands and compresses space as well as time
- Focal Binding is a compression of peripheral space (and time) with expansion of central space (and time)
  - Post Trauma Vision Syndrome (PTVS)
  - The **collapse of the 'Response' before the 'Stimulus**'
  - This yields a 'Stimulus-Response" processing system



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

Ambient Visual Process

- Sensorimotor Integration with:
  - -Kinesthetic
  - -Proprioceptive
  - -Vestibular
- Feed Forward to Visual Cortex/Frontal:
  - -Binocular Fusion
  - -Search/Scan
- Feed Back from Cortices

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Ambient Process (cont.)

- Preconscious and proactive
- Brings forward all possibilities for neuro-organization
- Receives feedback from the cortex
- It is a relative process that
  - READJUSTS and ADAPTS relative to the matching with sensorimotor information and feedback from the cortex

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

Binocularity cont.

- Result
  - ***- strabismus***
  - ***- deficiencies in pursuits (x and y axis)***
  - ***- deficiencies in saccadic fixations (x, y and Z axis)***
  - ***- dysfunction of convergence (z axis)***
- Research:
  - Nashold and Seaber (1972) Stereotactic Lesions of Midbrain

Demonstration

- Focalize in the periphery
- Standing Balance
- Standing balance with feet apart
- Standing on one foot carrying brief case with open eyes and closed eyes
- Saccades and Pursuits

Implications of PTVS Affecting Movement

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

When is a Convergence Insufficiency not a Convergence Insufficiency?

- When it is

Post Trauma Vision Syndrome.

Body Movements

- Body components of movement use 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 away o crossing midline in sagittal plane or transverse plane

Planes of Body Motion are:

Sagittal Plane

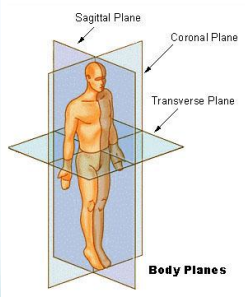
- The Sagittal plane passes through the body front to back dividing it into left and right.

Frontal 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)

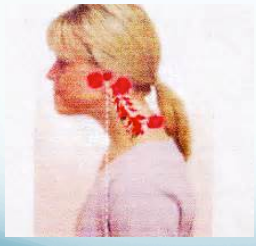
Observation of Posture

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?

Abnormal Head and Neck Posture

Capital Extension



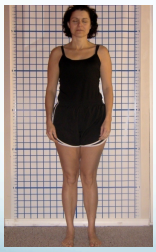
Capital Flexion

Shoulder and Pelvic Tilt

Observing Lateral Postural Mal-Alignment - VMSS

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 ?

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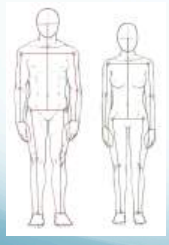
Checklist: Assessing Posture

Observation of Posture

- Flexion/Extension
- Tone high, low or fluctuating
- High stepping
- Scuffing soles of feet
- Circumvection step
- Toe in
- One foot rotated out or in

Observation 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

Sym. Asym.

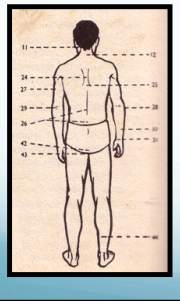
- Head
- Neck
- Shoulders
- Arms
- Hands
- pelvis
- Knees
- Ankles
- Feet

Describe:

Asymmetry is constant to right or left side?

Describe:

Observation in Standing Dorsal View



- Ears in alignment.
- Neck in alignment.
- Shoulder alignment.
- Intra-scapulae space (aduction, abduction)
- Elbows in alignment
- Pelvis in alignment
- Knees in alignment
- Heesl in alignment

Oservbed asymmetries indicate vertical mis-alignment right/left, and or transverse

Mis-alignment posterior/anterior.

*Positioning is needed to promote even weight bearing over BOS to permit lateral and anterior/posterior postural adjustments

DORSAL VIEW

Observe:

Sim. Asym.

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

Describe

Compare if asymmetry is constant or variable on the right / left side

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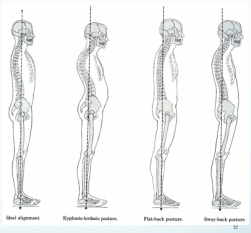
Alignment and Mis-alignment Lateral View

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.



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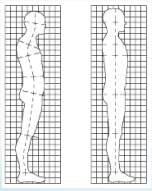
OBSERVATION STANDING LATERAL VIEW

Ear, shoulder, pelvis, knee and ankle in alignment



Abnormal Normal

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

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LATERAL VIEW

- Observe

good deficient

- Cervical curve .....
- Dorsal curve (mild or inexistent)
- Lumbar curve .....
- .....

aligned anterior posterior

- Head/Shoulder.....
- Shoulder/Pelvis.....
- Pelvis /Knee.....
- Knee/Foot.....

- Describe
  - Cervical Curve .....
  - Dorsal Curve .....
  - Lumbar Curve .....

Conclusion :

Analysis of Posture

Alignment on a wheel chair

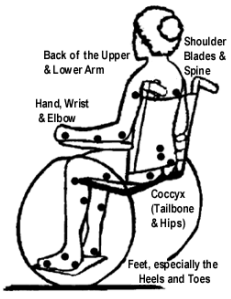
Head, shoulders, arms

Alignment over the BOS

Leg alignment

Feet alignment

Good alignment on a wheel chair



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?

Vision/Posture Affected by VMSS

- Congenital - lacks sensorimotor organization and reinforcement of vision
- Acquired - experience does not match reality
- Tone
- Hemiparesis, Quadraplegic, 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

Visual Midline Shift Syndrome

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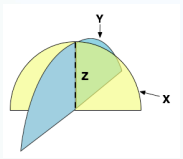
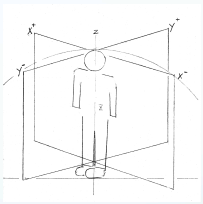
Graphical Representation of Visuo-Spatial Volume





$$\frac{X^2 + Y^2 + Z^2}{r^2} = \frac{}{128} 1$$

Visual Midline Syndrome (VMSS)

" The Shift in concept of visual midline occurs from a mismatch of information in the sensory-motor feed back loop between the ambient visual process and the other sensory and motor systems averaging information causes a shift in the visual midline and in turn a distortion of space." (W. Padula)

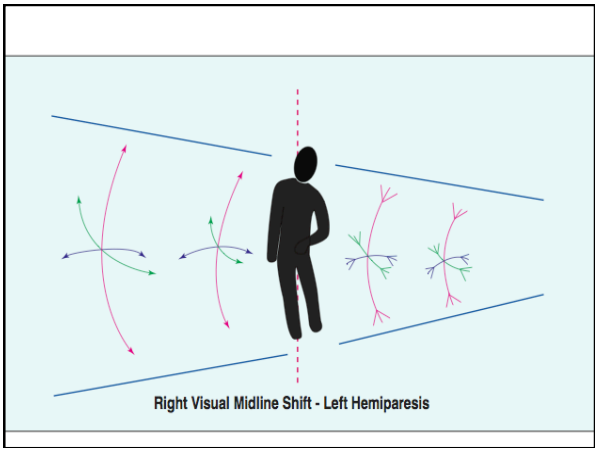
The body will resolve this mismatch by leaning either toward the affected side, (uncompensated state) or away from the affected side (compensated state).

VMSS cont.

- The body mass is displaced either laterally or anterior/posterior, or in a combination of directions, depending on the influence of the imbalances of tone and the attempt of the person to get a sense of stability that allows for safe mobility and efficient manual performance.

VMSS Direction of Weight Shift

- Left or right , lateral shift
- Anterior or posterior.
- Diagonal: combination of lateral shift with anterior or posterior shift.

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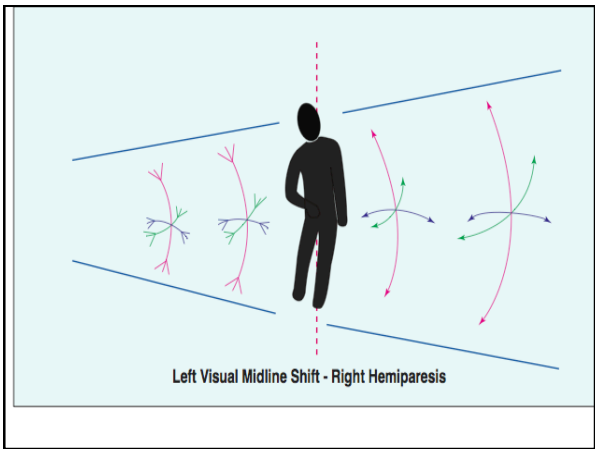
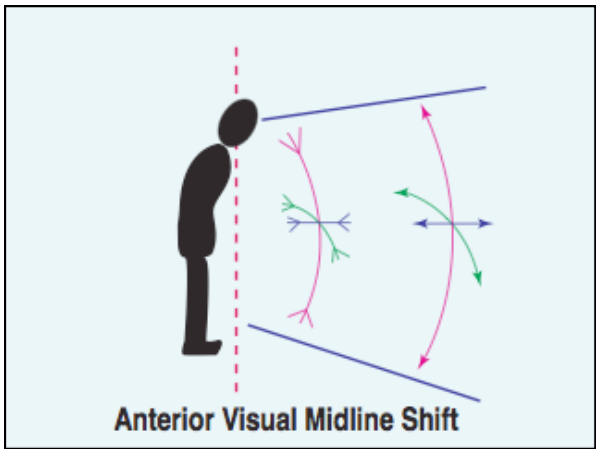
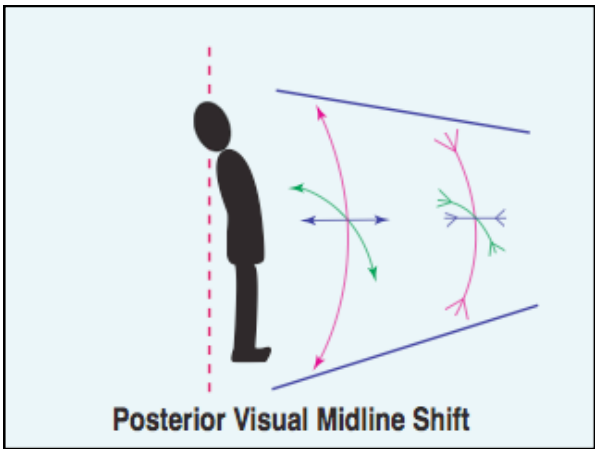

Left Visual Midline Shift - Right Hemiparesis

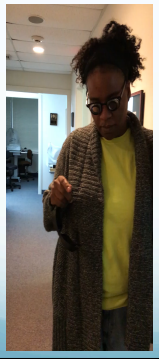

Anterior Visual Midline Shift


Posterior Visual Midline Shift

Postural Change with Yoked Prisms


IMPACT OF VISUAL PROCESSING ON POSTURE AND BALANCE

EFFECT OF YOKED PRISMS ON POSTURE AND BALANCE




Research Demonstrates

- Visual Midline Shift Test statistically correlates with lean/drift
- Yoked prisms realigns visual midline
- Lean and drift during ambulation correlates statistically with shift in visual midline
- Yoked prisms realigns visual midline thereby

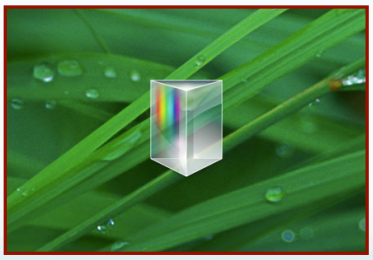
  - increasing weight bearing on the affected side

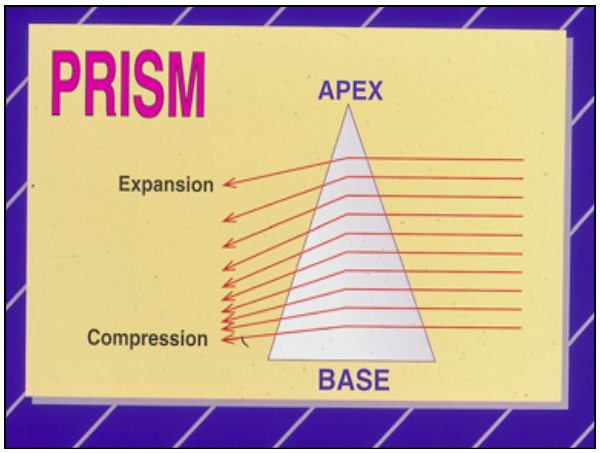
  - reduces or eliminates lean or drift during ambulation

VMSS Case Study-Video

- MK
- EH
- MB
- AC

Prisms





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

Apex

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

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 Effect of Base Right Prism

- X axis - compression on right and expansion on the left
- Y axis - unchanged
- Z axis - expansion on the right and compression on the left

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 Effect of Base Left Prism

- X axis - compression on left and expansion on the right
- Y axis - unchanged
- Z axis - expansion on the left and compression on the right

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 downward
- Therapeutic effect: increased weight bearing posteriorly, extension and an erect posture

The Effect of Base Down Prism

- X axis – unchanged
- Y axis – compression at far and expansion at near
- Z axis - compression at eye level and above / expansion below eye level

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 (z-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

The Effect of Base Up Prism

- X axis – unchanged
- Y axis – expansion at far and compression at near
- Z axis - expansion at eye level and above / compression below eye level

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

Prescribing Yoked Prisms

- Streff discussed the effects of yoked prisms in

  Optical effects of "Plano" yoked prisms with curved surfaces. Am Opt J. 1973;44:717-721.

- It was determined that:

  1. There is a predictable relationship for head turn to achieve maximum clarity for the refractive status of myopes vs. hyperopes.

  2. Myopes rotate their head to look through the apex and hyperopes rotate their to look through the base

Prescribing (full-time wear) Yoked Prisms (cont.)

- To achieve symmetry of optical elements, the prisms should be center beveled.
- Ogle (1952) found size and curvature distortion.
- To minimize the distortion, the base curve should be increased.

  - the higher the refractive correction the more curvature of base curve needed.

- A minus (-) 6.75 base curve is effective for most myopes and hyperopes up to 5 diopters.

Prescribing (full-time wear) Yoked Prisms (cont.)

- The higher the amount of prism, the greater the amount of base curve needed to reduce distortion.
- The higher the amount of refractive state, the greater the amount of base curve needed to reduce distortion.
- The higher the amount of prism and/or refractive correction, the smaller the eye size of the frame needed.

Curved vs. Flat Prisms

Curved Prisms

- Prescribed for compensation of strabismus
- Prescribed for VMSS
- Effective for full-time wear to reduce distortion

Flat Prisms

- Prescribed for therapeutic or short term use to treat VMSS
- Not recommended for full-time wear
- Not recommended for full-time correction of strabismus

Fresnel Prisms

- Has been prescribed for treatment of strabismus and homonymous hemianopia
- Not recommended for prescription of yoked prisms to treat VMSS
- Fresnel prisms can fall off and be positioned incorrectly by patient
- Must be cleaned regularly
- There is significant distortion in Fresnel prisms

Yoked Prisms

- Effective for treatment of visual-postural imbalance
- Two prisms positioned with the base end of the prism in the same direction
- Causes an image shift toward the apex – Focal Visual Process
- Causes a shift of the center of mass toward the base – Ambient Visual Process

Checklist: Assessing Posture

Checklist: VMSS Postural Analysis

- Alignment of the head and neck
  - ❑ Head tilt left or right
  - ❑ Head forward and chin out (capital extension)
  - ❑ Head back with chin tucked (capital flexion)
  - ❑ Head not aligned on neck and shoulders
  - ❑ Neck shifted laterally or anterior-posterior
- Position of the shoulders
  - ❑ Left shoulder elevated
  - ❑ Right shoulder elevated
  - ❑ Shoulders (both) elevated
  - ❑ Shoulder(s) rounded forward
  - ❑ Scapula abducted (shifted outward)
  - ❑ Scapula adducted (shifted inward)

Checklist: VMSS Postural Analysis

- Trunk alignment and dynamic movement
  - ❑ Trunk aligned over the pelvis
  - ❑ Trunk active and disassociated
- Pelvic alignment
  - ❑ Tilt left or right
  - ❑ Tilt anterior or posterior

Checklist: VMSS Postural Analysis

- Foot position
  - ❑ Rotated inward
  - ❑ Rotated outward
  - ❑ Ankle pronation: one or both ankles
  - ❑ Dropped arch: one or both arches
- Weight bearing
  - ❑ Pressure on the anterior or toes
  - ❑ Pressure on the posterior or heels
  - ❑ Pressure on one foot (leg) more that the other
  - ❑ Toes elevated with step (one or both feet)
  - ❑ Toes curled with step (one or both feet)
  - ❑ Scuffs soles of feet on floor with step (one or both feet)

Checklist: VMSS Postural Analysis

- Stride length and direction
  - ❑ Longer stride with either foot/leg
  - ❑ One foot/leg with diagonal projection
  - ❑ Scissor step
  - ❑ Circumvection (out and around) step of one foot/leg
  - ❑ High step on one side
- Cadence
  - ❑ Equal timing for the number of left and right steps per 10 steps

Checklist: VMSS Postural Analysis

- Postural tone
  - ❑ Low tone
  - ❑ High tone
  - ❑ Fluctuating tone
  - ❑ Tone increases with fixations and pursuits
- Vision and direction of gaze
  - ❑ Eyes directed down at floor
  - ❑ Eyes directed to one side
  - ❑ Eyes in constant movement (saccades)
  - ❑ Develops 'tunnel vision'
  - ❑ Lacks awareness of where they are looking

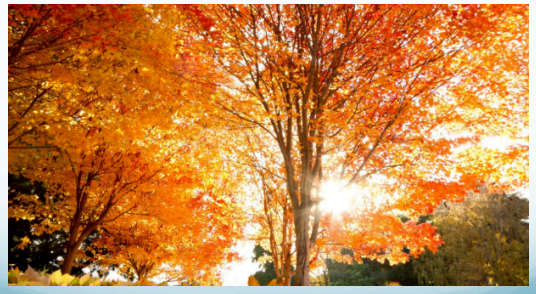
Checklist: VMSS Postural Analysis

- Balance
  - ❑ Drifts to the left
  - ❑ Weight shift to the left
  - ❑ Drifts to the right
  - ❑ Weight shift to the right
  - ❑ Weight shift forward (anterior) weight bearing on toes
  - ❑ Weight shift forward (anterior) weight bearing on heels
  - ❑ Weight shift backward (posterior) weight bearing on toes
  - ❑ Weight shift backward (posterior) weight bearing on heels
  - ❑ Collapses into the affected side
  - ❑ Weight shift away from the affected side

Observation of Posture

- Flexion/Extension
- Tone high, low or fluctuating
- High stepping
- Scuffing soles of feet
- Circumvection step
- Toe in
- One foot rotated out or in

Lunch Break



Prescribing Yoked Prisms

Prescribing Yoked Prisms

- Observation of posture is critical in determining the correct position of yoked prisms
- Yoked prisms may be positioned in a frame in any orientation and are best prescribed using the exact position on a 360 degree protractor

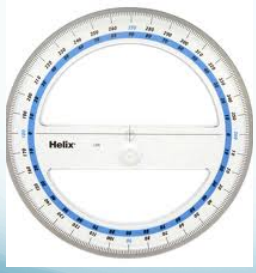
Prescribing Yoked Prisms (cont.)

- Example
  - Prism axis
    - OD: Plano with 5 diopters of prism @ 135 degrees
    - OS: Plano with 5 diopters of prism @ 135 degrees
    - OD: +1.00 -0.50 x 90 with 3 diopters prism @ 300 degrees
    - OS: +1.00 -0.50 x 90 with 3 diopters prism @ 300 degrees

Prescribing Yoked Prisms (cont.)

- Many optical labs lack the sophistication and experience to fabricate prism prescriptions correctly
- Always check the prism prescription after it is made especially if it is made outside of your own office or laboratory
- Many labs will only fabricate prisms in the 90 or 180 degree axis (base up, base down, base left or base right)
- The majority of patients with VMSS have a combination of a lateral and an anterior-posterior shift of VMSS and require yoked prisms prescribed at an oblique angle or degree

Prescribing Yoked Prisms (cont.)

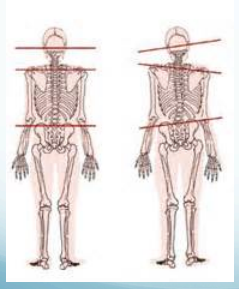


- Memorize the degrees of the protractor as if looking at the patient with glasses on
- From the objective or front view 0 degrees is always at the 3 o'clock position

Prescribing Yoked Prisms (cont.)

- 0 degrees is at the 3 o'clock OD nasal position and OS temporal position
- 90 degrees is at 12 o'clock OU
- 180 degrees is at the 9 o'clock OD temporal position and OS nasal position
- 270 degrees is at 6 o'clock OU

Prescribing Yoked Prisms (cont.)



- Always prescribe the least amount of yoked prism appropriate to cause the desired effect of improved postural orientation
- Observe postural position in static sitting, static standing and dynamic ambulation
- Look for position of the pelvis in relation to the shoulders

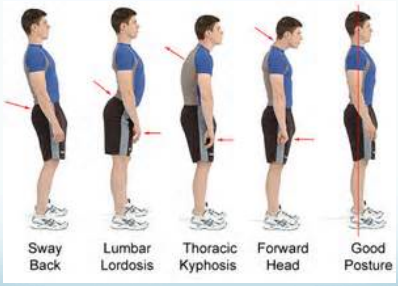
Prescribing Yoked Prisms (cont.)

- Anterior-posterior shift should be evaluated by observing the relationship of the position of the head and neck to the position of the pelvis
- Look for an anterior or posterior tilt of the pelvis relative to the weight bearing on the feet
- Anterior pelvis tilt – pressure forward or on toes
- Posterior pelvis tilt – pressure posterior or on heels

Prescribing Prisms to Affect Posture and Weight Shift

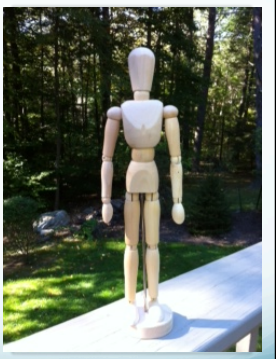
Visual Midline Shift	Prism Orientation
Weight Shift Right (Lt Hemiparesis)	Base Left
Weight Shift Left (Rt Hemiparesis)	Base Right
Weight Shift Anterior	Base Down
Weight Shift Posterior	Base Up

Postural Variations with Anterior-Posterior Shifts



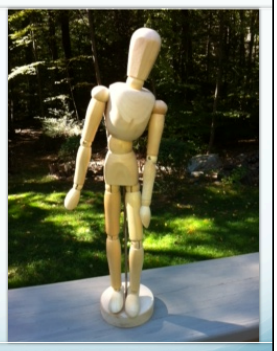
Posture

- Standing erect posture upright against gravity
- Head an neck in alignment over the shoulder girdle
- Shoulders aligned over the pelvic girdle
- Pelvis aligned over the feet
- Equal weight bearing over both feet



VMS with Right Weight Shift

- VMS to the right
- Weight shift to the right
- Shoulders elevated on the right
- Pelvic tilt down and right
- Increased weight bearing on the right

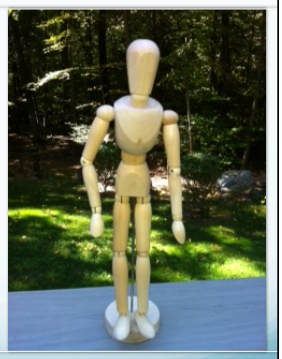


VMS with Left and Posterior Weight Shift

- VMS to the left
- Shoulders elevated on the left
- Pelvic tilt down and left
- Increased weight bearing on the left lower extremity and posterior (on left heel)

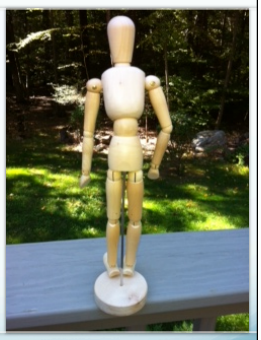
VMS Posterior Weight Shift

- Weight shift posterior (on heels)
- Anterior upper body lean in flexion



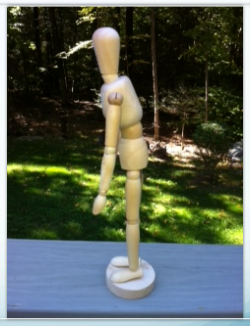
VMS Posterior Weight Shift (Posterior View)

- Weight shift posterior (on heels)
- Anterior upper body leans forward to avoid falling with increases flexor tone



VMS Anterior Weight Shift

- Weight shift anterior (on toes)
- Upper body flexion with capital extension of the head and neck to avoid falling



VMS Anterior Weight Shift

- Anterior weight shift with upper body using extensor pattern going back to avoid falling forward
- Anterior pelvic tilt
- Weight on toes

VMS Anterior and Right

- Anterior weight shift and to the right
- Increased weight bearing on the right foot

VMS Anterior and Right Weight Shift (Posterior View)

- Anterior and right weight shift
- Increased weight bearing over the right foot
- Elevated right shoulder
- Pelvic tilt down and to the right

Trunk Disassociation

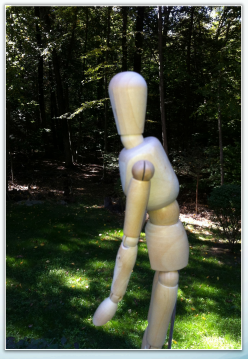
- Trunk disassociation with rotation of the shoulders opposite the step
- Producing arm swing and diagonal weight shift of the hips over the extended foot

Trunk Disassociation (Posterior View)

- Trunk disassociation with rotation of the shoulders opposite the step
- Producing arm swing and diagonal weight shift of the hips over the extended foot

VMS Posterior Pelvic Tilt

- VMS posterior
- Produces pelvic tilt posteriorly
- Compensating upper body flexion
- Weight shift posterior on heels

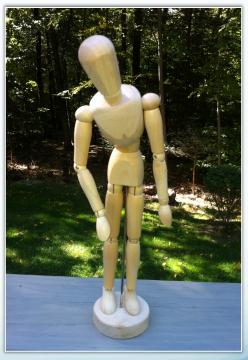


VMS Anterior Pelvic Tilt

- Weight shift anterior (on toes)
- Pelvic tilt anterior
- Upper body compensating extension

VMS Anterior and Left Weight Shift

- Anterior weight shift and to the left or affected side
- Flexion posture
- Increased weight on the left toe
- Shoulder higher oh the left
- Pelvic tilt to the left

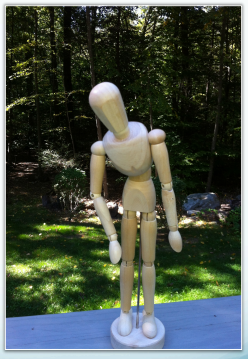


VMS Anterior Weight Shift

- Anterior weight shift (on toes)
- Flexion posture

VMS Anterior and Right Weight Shift

- Weight shift anterior and right
- Flexion posture
- Often a Paradoxical VMS into the affected side

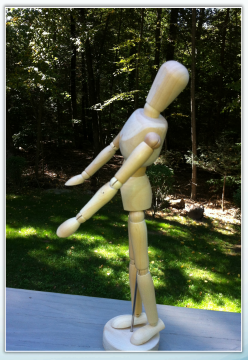


VMS Anterior and Right Weight Shift (Side View)

- Weight shift anterior and right
- Flexion posture
- Often a Paradoxical VMS into the affected side

VMS Anterior Weight Shift and to the Right

- Weight shift anterior and to the right (on rt toe)
- Upper body with compensating extension

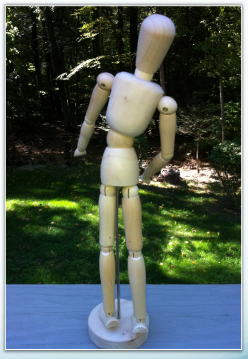


VMS Anterior Weight Shift and to the Right

- Weight shift anterior and right
- Flexion posture
- Often a Paradoxical VMS into the affected side

VMS Anterior Weight Shift and to Left (Posterior View)

- Increased weight shift anterior and left
- Upper body compensating extension
- Elevated shoulders on the left
- Pelvic tilt down and to left



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)

Practicum: Weight Shift

Practicum (Anterior-Posterior Postural Shift)

- Form small groups and take turns walking on your toes and heels
- Observe the variations in postural alignment by observing others in the group
- Pay attention to variations in alignment of the shoulder, head and neck, and pelvis
- Feel the variations of your own body between walking on your heels and then toes.
- Is there capital extension or flexion?

Practicum (Anterior-Posterior Postural Shift) cont.

- How does walking on your toes or heels affect compensation of your shoulders, head and neck, and pelvis?
- Does this affect arm swing or ability to rotate the head and neck?
- Does walking on your heels or toes affect what you are seeing?
- Where were you looking or don't you remember?
- Were you seeing the entire room or were you just concentrating on the ability to move?

Practicum (Lateral Postural Shift)

- In small groups walk on the left or right side of both feet
- Observe the postural compensations needed to accomplish this difficult movement
- Note changes in the subjects shoulders, head and neck and pelvis to compensate
- What is the feeling of postural alignment when you are the subject?
- Is there a head tilt?

Practicum (Lateral Postural Shift)

- How does walking on the sides of your feet affect compensation of your shoulders, head and neck, and pelvis?
- Does this affect arm swing or ability to rotate the head and neck?
- Does walking on sides of your feet affect what you are seeing?
- Where were you looking or don't you remember?
- Were you seeing the entire room or were you just concentrating on the ability to move?

Practicum: Weight Shift / Yoked Prisms

Practicum (Anterior-Posterior Postural Shift) Yoked Prisms

- In small groups, take turns and walk with Base Up and then Base Down yoked prisms
- Note the feeling of using these prisms affecting your postural alignment
- Observe the person walking with the prisms to note changes in alignment of head and neck in relationship to the shoulders and the pelvis
- Note even subtle shifts in weight bearing anteriorly (toward the person's toes) or posteriorly (toward the person's heels)

Practicum (Anterior-Posterior Postural Shift) Yoked Prisms (cont.)

- Does each person in the group have the same postural shifts or are there variations?
- Do some not show and changes to either Base Up or Base Down yoked prisms?
- Do some show only changes to one or the other pair of yoked prisms?
- Why are there some who don't show a change?
- Why do some feel significant changes and others don't feel any change?

Practicum (Lateral Shift) Yoked Prisms

- Does each person in the group have the same postural shifts or are there variations?
- Do some not show and changes to either Base Up or Base Down yoked prisms?
- Do some show only changes to one or the other pair of yoked prisms?
- Why are there some who don't show a change?
- Why do some feel significant changes and others don't feel any change?

Practicum: (Lateral Shift) Yoked Prisms (cont.)

- Is the Base Left or Base Right yoked prism giving the same effect as walking on the same side of both feet?
  - What are the similarities?
  - How is using the yoked prism different than the feeling of the previous practicum of walking on the side of your feet?
- Can you feel the drawing effect of being pulled to one side as you walk?
- Are you seeing the same way you were before the prisms? (Disregard the curvature and distortion from the prisms.) Were you aware of space or did your vision seem to isolate or 'tunnel' as you experienced shifts in posture and balance

Neuro-Visual Postural Therapy with Yoked Prisms

POSTURAL/MOVEMNT CONCEPTS IN NVPT

NVPT

- NVPT consists of
  - **Facilitating vision and posture** in order to influence the quality of the patients' movements and incorporates
  - Facilitation, inhibition and key points of control.
  - **Facilitation** is a key technique used by Bobath practitioners to promote motor learning. It is the use of sensory information (tactile cue through manual contacts, verbal directions) to reinforce normal movement patterns and to discourage abnormal ones.
  - **Inhibition** interferes with expression of abnormal movement/posture.
  - The Bobaths' declare that: Facilitation and Inhibition are the 2 faces of the same coin.

Key Points of Control

- **Key points of control** refers to parts of the body that are advantageous when facilitating or inhibiting movement/posture.
- The Key points can be at:
  - Proximal body more control from the handler
  - Distal body less control from the handler

NPT
Nelson-Magrun-Benabib (Munitz) 1980....

- Uses basic concepts of:
  - -Neuro-Developmental Therapy (NDT/ Bobath)
  - -Psychology of Perception
  - -Learning theories

NEURO-POSTURAL CONCEPT
NELSON MAGRUN BENABIB 1982

- Direct physical handling to facilitate Righting and Equilibrium Reactions as an integrative influence on sensory motor organization.
- Use of Vision to match with motor responses

NVPT

Nelson-Padula-Magrun-Benabib (Munitz) 1984…..

- Uses basic concepts of
  - NPT, Neuropostural TX
  - NDT, Neurodevelopmental/Bobath TX
  - Neuro Optometry TX
- It is a multidisciplinary approach
- Visual responses are match with motor responses.
- For the matching of the two systems to happen, the patient is using a Neuro Optometric Rehabilitation Rx and Therapy is provided in the most appropriate posture.

Where do we begin?

- Visual: Neuro-Optometric Rehabilitation full assessment
- Posture and movement: Identification of postural deficiencies

Where do we begin? (cont.)

- Knowing the available tools:
  - Visual: lenses and prisms
  - Facilitation of Postural Reactions

Where do we begin? (cont.)

- Postural Intervention
  - Choice of BOS
  - Choice of starting posture
  - Facilitation of an active posture
  - Facilitation of postural adjustments body displacements, to support visual responses.
  - Upright posture that the patient can hold with or with out external assistance: standing, kneeling, sitting, lying over a wedge.
  - The posture should provide stability and allow for mobility

Surfaces

- Stable:
  - Standing on ground, firm wedges, beams, chairs, benches.
- Mobile:
  - Inflatables, balls, rolls, wedges, T stool

NVPT

- The treatment approach should utilize:
  - Optical elements
  - Posture/movement as a facilitator for the organization of visual responses to match with body movement
  - Direct guidance of postural changes
  - The aim is to provide new experience in postural adaptation

THERAPEUTIC INTERVENTION

- To be effective must allow for:
  - Integration of information from multisensory origins according to age and environmental demand.
  - Sensory intervention must be offered in meaningful context.
  - The therapy experience will lead to improved performance, visual and posture/movement

GOALS IN NVPT

- Improve postural control while responding to visual tasks.
- Improve visual skills with or with out body movement.

POSTURAL CONTROL AND PERCEPTION

- Propioceptive, auditory and visual perception happen in a framework of time and space.
- The brain, the physical body and the sensory receptors have a bilateral organization that is disrupted when there is BI

POSTURAL CONTROL AND PERCEPTION (cont.)

- Postural control and perception requires:
  - A secure base from which movement is expressed, both through vision and with body movement.
  - Dynamic interchange between symmetry and asymmetry in posture/movement while visual symmetry is maintained.

Lateral Weight Transfer

- Weight shift with eyes closed and then open

Lateral Weight Transfer

- Weight shift with eyes closed and then open

Lateral Weight Transfer

- Weight shift with eyes closed and then open

Lateral Weight Shift

Lateral Weight Shift

Lateral Weight Shift

Anterior-Posterior Weight Shift

Lateral Weight Shift Kneeling

Lateral Weight Shift Kneeling

PRONE EXTENSION

Reaching with eyes and hands, out of mid line, fosters extension and weight bearing over one side of the body, maintaining stability on that side, and freedom to move on the other side.

Wedge Extension Fixations

NEURO-VISUAL-POSTURAL INTERVENTION

- E.G.
- 5 years
- DX: Spastic Quadriplegia; more left side involvement; good cognitive function.
- Goals of Intervention.
  1. Reduce fear of movement.
  2. Facilitate free movement of limbs.
  3. Establish rotational components of movement.
  4. Refine basic visual skills.

Creating a Stable Base of Support

Postural Alignment with Fixation

Visual Fixation with Lateral Extension and Trunk Displacement

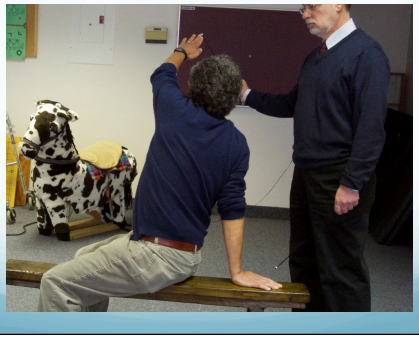
Visual Fixation with Lateral Extension and Trunk Displacement

Fixation with Trunk Rotation on a Stable Base of Support

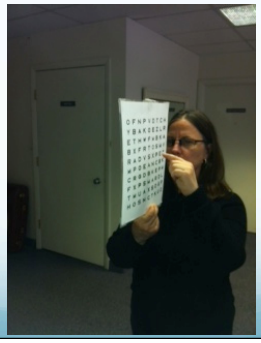
Fixation with Trunk Rotation (Lateral Extension and Flexion)

Fixation, Trunk Rotation and Extension Creating Stabile Support

Fixation, Trunk Rotation and Extension Creating Stabile Support



Septum



NEURO-VISUAL PROCESSING REHABILITATION (NVPR): AN EMERGING MODEL

- NVPR incorporates *prescriptive* Prisms, Lenses and Bi-nasal occlusion to treat Post Trauma Vision Syndrome (PTVS and Visual Midline Shift Syndrome (VMSS)
- Neuro-Visual Postural Therapy is a specialized utilizing prisms with movement
- ***NEURO-VISUAL PROCESSING REHABILITATION** is the model **for the 21st century***

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