‘’POST-CONCUSSION SYNDROME AND VISUAL-VESTIBULAR INTEGRATION DYSFUNCTION”

SEPTEMBER – 2019

NEURO-OPTOMETRIC REHABILITATION LEVEL II EDUCATION

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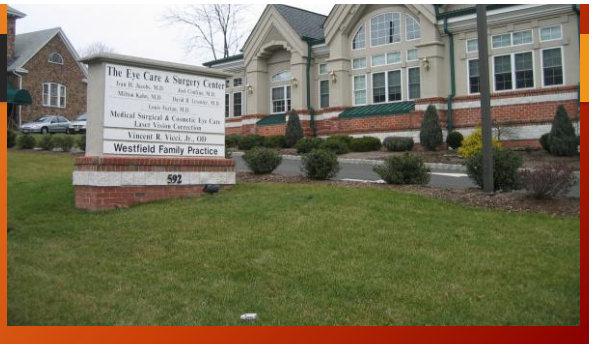


POST-CONCUSSION SYNDROME AND MILD TRAUMATIC BRAIN INJURY

HEAD INJURIES BY THE NUMBERS:

2, 500, 000 – The number of Americans treated in Emergency Rooms for traumatic brain injuries each year: Centers for Disease Control and Prevention

Experts speculate that perhaps just as many – or more - hit their heads and never have it checked out.

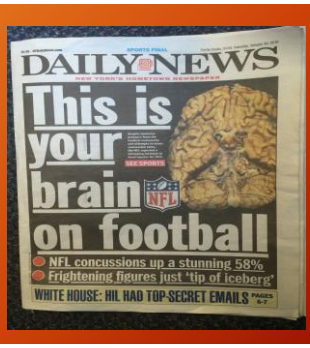
13 : The number of seconds between traumatic brain injuries in the United States: Brain Injury Association of America

137: Number of Americans who die every day due to a traumatic brain injury related injury : Brain Injury Association of America

33% - 52% : Percentage of people who suffered major depressive disorders in the first year after a traumatic brain injury : Various studies

10% : consider suicide : Journal of Neurotrauma
15% : try to kill themselves : Journal of Neurotrauma

28% : Percentage of former NFL players expected to develop long-term cognitive problems – ex. dementia – as a result of concussions or chronic traumatic encephalopathy (CTE) : NFL's own study


DAILY NEWS
This is your brain on football
NFL concussions up a stunning 58%
Frightening figures just 'tip of iceberg'
WHITE HOUSE: HIL HAD TOP-SECRET EMAILS


ANOTHER
BLOW FOR NFL
League sees reported concussions spike
58%

Late Giants safety Tyler Sash found to have advanced CTE Chronic traumatic encephalopathy (CTE), a degenerative brain disease that is caused by repeated head trauma, has been diagnosed in the brain of former New York Giants safety Tyler Sash. Sash died in September at the age of 27 after an accidental overdose of pain medications.

HEAD CASES: TOP 10 SPORTS FOR CONCUSSIONS:

1. BICYCLING
2. FOOTBALL
3. BASEBALL AND SOFTBALL
4. BASKETBALL
5. WATER SPORTS, SUCH AS DIVING, SURFING, WATER SKIING
6. OFF-ROAD SPORTS ON POWERED RECREATIONAL VEHICLES (ATV'S AND GO-CARTS)
7. SOCCER
8. SKATEBOARDING AND SCOOTERING
9. ACCIDENTS IN GYMS AND HEALTH CLUBS
10. WINTER SPARTS (SKIING, SNOWBOARDING, SNOW MOBILING, AND OTHERS

ImPACT TESTING:

1. MOST WIDELY USED AND SCIENTIFICALLY VALIDATED COMPUTERIZED CONCUSSION EVALUATION SYSTEM
2. THE ONLY FDA CLEARED CONCUSION ASSESSMENT AID FOR AGES 5 TO 59
3. AN ESTIMATED 4 TO 5 MILLION CONCUSSIONS OCCUR ANNUALLY WITH INCREASES EMERGING AMONG MIDDLE SCHOOL ATHLETES

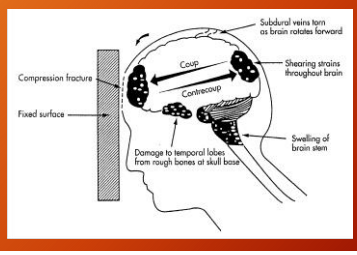
"MILD" TRAUMATIC BRAIN INJURY

Acquired Brain Injury and Visual Deficits

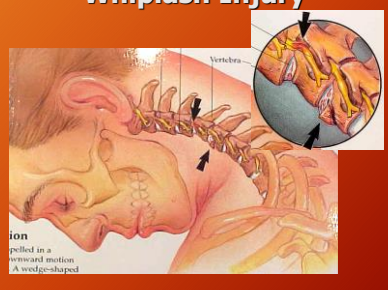
- Acquired brain injury is an insult to the brain. It can result from a blow to the head, stroke, or neurological dysfunction.
- One common deficit may be in a person's visual system

http://www.neurotraumaregistry.com

Coup Contra-coup Injury



Whiplash Injury



PEARL: WHENEVER THERE IS A TRAUMATIC BRAIN INJURY OR POST CONCUSSION SYNDROME CONSIDER THE GREAT POSSIBILITY THAT SOME MANIFESTATION OF A WHIPLASH TYPE OF INJURY HAS ALSO OCCURRED.

Acquired Brain Injury and Visual Deficits

- In the United States, approximately one person every sixteen seconds suffers some form of acquired brain injury. Additionally, there are approximately thirty thousand people per year who are hospitalized for other forms of brain insult such as CVA and diseases such as cerebral palsy and multiple sclerosis.

http://www.braininjuries.org

Acquired Brain Injury and Visual Deficits

- Vision deficits can significantly decrease a person's functional ability and independence.
- Occupational Therapists develop visual exercise programs that enhance performance of activities of daily living in order to increase an individual's safety and independence.
- Physical Therapists follow through with exercise programs while performing standing activities and ambulation with patients.

Acquired Brain Injury and Visual Deficits

- The common visual symptoms often associated with acquired brain injury are:
- Diplopia (double vision)
- Pursuits (eye tracking ability)
- Saccades (difficulties with shifting gaze quickly from one point to another)
- Accommodative inability (focusing)
- Binocular vision (eye alignment)
- Glare sensitivity
- Inability to maintain visual contact

http://www.braininjuries.org

Goals of Neuro Optometric Vision Rehabilitation

- Improve visual motor and visual processing skills to facilitate rehabilitation efforts in deficit areas
- Improve problems with mobility and balance related to visual midline shift
- Improve functional skills related to vision, i.e. such as reading from binocular dysfunction
- Coordinate care with the rehabilitation team to provide a program that is most effective

Causes of Post-Concussion Syndrome

- In general, post-concussion syndrome follows the occurrence of an injury or trauma to the head. Not all people who suffer mild traumatic head injury experience post-concussion syndrome. This syndrome may be worse in people who have had previous concussions or head trauma. It may also be more severe in those who have early symptoms of headache after injury, or who have mental changes such as amnesia, fogginess or fatigue Other risk factors include younger age and prior history of headaches.

Diagnosis of Post-Concussion Syndrome

- Since symptoms can be vague and attributable to other reasons, it can be difficult to diagnose post-concussion syndrome. There is no definitive test for post-concussion syndrome. Diagnosis is mainly based on a history of head injury and reported symptoms. A physical exam and perhaps a CT or MRI scan of the head, may be done to evaluate symptoms. Other tests may be given to rule out other causes of symptoms, such as infection, bleeding injury to the brain, or poisoning.

Symptoms of Post-Concussion Syndrome

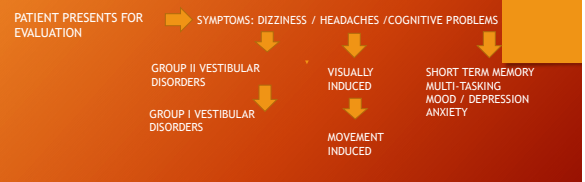
- Symptoms of post-concussion syndrome are often vague and non-specific.
- Commonly reported symptoms include:
- Headache
- Dizziness
- Sleep problems
- Psychological symptoms such as depressed mood, irritability, and anxiety
- Cognitive problems involving memory, concentration, and thinking
- Such symptoms can affect day-to-day life, and inhibit the ability to perform in situations like work.

Treatment of Post-Concussion Syndrome

- Some people with post-concussion syndrome are able to recover with rest and by minimizing stress.
- Some health care providers will also treat symptoms of post-concussion syndrome. For example, migraine or pain medications may be prescribed for those with headache. A specialist such as a neurologist and/or psychiatrist may also be involved to treat mental health symptoms associated with post-concussion syndrome. Antidepressants and psychotherapy may be recommended.

BUT, IS THIS CORRECT?

- HOW MANY PATIENTS THAT YOU SEE HAVE SYMPTOMS THAT JUST "RECOVER WITH REST AND BY MINIMIZING STRESS"?
- FROM A VISUAL STANDPOINT:
- HOW DO WE DIFFERENTIATE THE PRIMARY CLASSES OF POST-CONCUSSIVE PATIENTS AND FLOW CHART OF TREATMENT?



FROM A VISUAL STANDPOINT, ONE OF THE MOST IMPORTANT DIFFERENTIATIONS THAT MUST BE MADE EARLY-ON IS WHETHER THERE IS VESTIBULAR INVOLVEMENT OR NOT. THIS WILL DETERMINE THE DIRECTION AND ORDER OF TREATMENT. THIS WILL ULTIMATELY MAKE A BIG DIFFERENCE IN THE EFFICIENCY AND COURSE OF TREATMENT.

CASE HISTORY: #1

- 11/20/11 15 Y/O FEMALE – PLAYING SOCCER
- STRUCK IN HEAD BY FAST-MOVING BALL
- DAZED / NO LOC.
- FIRST EVALUATED BY THIS PRACTITIONER: 4/28/12

IMMEDIATE SYMPTOMS

- PROBLEMS READING MUSIC AND PLAYING CELLO
- DIFFICULTIES WITH MATHEMATICS (ex. graphs)
- DID NOT FEEL WELL / BAD HEADACHE
- DIFFICULTIES WITH BALANCE AND REACTION TIME
- DX: "MINOR CONCUSSION" BY M.D.
- HEAD PAIN WITH AIRPLANE FLIGHT
- HEADACHES BECOMING SEVERE AND INCREASING WITH INCREASED ACTIVITY AND READING – UTILIZING BOOKS-ON-TAPE
- REDUCTION IN IN-CLASS TIME NECESSARY

HISTORY

- MEDICATIONS: ELAVIL, MULTIPLE VITAMINS, MAGNESIUM, OMEGA – 3'S
- PMH: (-)
- PVH: (-)

AREAS THAT NEED TO BE ADDRESSED

- TREATMENT OF HEADACHES
- TREATMENT OF PROBLEMS WITH BALANCE AND REACTION TIME
- TREATMENT OF READING PROBLEMS
- RETURN TO CLASSES

VISUAL ANALYSIS

- Unaided VAs: 20/20- O.D.; 20/20- O.S.
- Refractive status: no significant in either eye
- with BVA: 20/20- O.D. and 20/20- O.S.
- Nearpoint VAs: 20/20- O.D., 20/20- O.S.
- PERRL
- right handed / left eye dominant

Visual analysis (con't.)

- Motor analysis:
- EOM full and sm. to all. (+)mild dizziness
- CT- distance: orthophoria
- CT- near: orthophoria
- Von Graeffe phorias: 1 eso / orthophoria at distance
- Maddox phoria at near: 1 exo / orthophoria
- Nearpoint BI vergences: 12/20/16
- Nearpoint BO vergences: 18/30/20
- NRA / PRA: +2.50 / -2.50
- Stereopsis: 20 seconds of arc
- Fused X-cyl: -0.25 / unfused X-cyl: -0.25 O.D. / -0.25 O.S.
- NPC: 5 inch blurpoint

Visual Analysis (con't.)

- Ocular health: normal color optic nerves, well delineated, C/D: .3 / .3 O.U.; retinal eye grounds: normal
- Visual fields: (Central 30-2) – within normal limits: O.U.
- OKN: excellent and equal responses in both horizontal directions

Visual analysis: (con't)

Balance and Posture:

- Forward flexion of neck
- Touching walls as walks down the hallway

MY QUESTIONS ARE THESE:

- 1. WHAT IS YOUR DIAGNOSIS?
- 2. WHAT IS YOUR TREATMENT PLAN? IS IT ANY DIFFERENT THAN WHEN YOU WALKED IN HERE YESTERDAY?
- 3. WHAT ARE YOUR EXPECTATIONS?
- 4. WHAT ARE YOU GOING TO TELL THE PATIENT? (HINT: PATIENT EDUCATION)

VESTIBULAR DYSFUNCTION

DIZZINESS
IMBALANCE
VERTIGO
LIGHTHEADEDNESS

HOW COMMON ARE VESTIBULAR DISORDERS?

NEARLY 90 MILLION AMERICANS, OR ONE-THIRD OF THE POPULATION, REPORT BOUTS OF DIZZINESS AT SOME POINT IN THEIR LIVES. OF THESE, 16 MILLION SUFFER FROM INNER-EAR DISORDERS. MANY PATIENTS HAVE THEIR SYMPTOMS MISDIAGNOSED AS SINUS, EYE, NEUROLOGICAL OR PSYCHOLOGICAL PROBLEMS.

Vestibular Dysfunction: Definition

- The system by which we orient ourselves within our environment. It is more than just balance – it involves the perception of where we are located in space as determined through information received by the visual and tactile / proprioceptive systems. When there is a deficiency in the vestibular system, the brain looks to other areas of input that it "trusts" for information that matches past experiences (ie. vision).

BACKGROUND

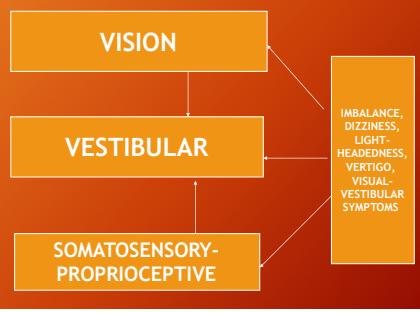
- THE VESTIBULAR SYSTEM
  - brief anatomy and physiology
  - group I vestibular disorders
  - the team approach to treatment
  - current therapy recommendations

CAUSES OF VESTIBULAR DISORDERS

1. WHIPLASH
2. HEAD INJURY
3. VIRAL INFECTIONS
4. HIGH DOSES OF CERTAIN ANTIBIOTICS
5. CEREBRAL VASCULAR ACCIDENTS
6. DETERIORATION SECONDARY TO AGING
7. CONGENITAL PREDISPOSITION
8. BRAIN TUMORS

THE FACTS REGARDING VESTIBULAR REHABILITATION:

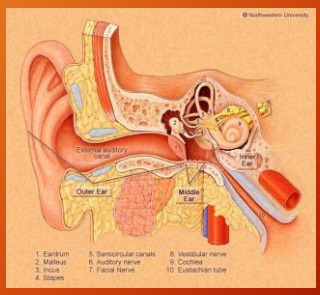
1. RESEARCH HAS SHOWN THAT 80% TO 90% OF PEOPLE WITH BALANCE AND VESTIBULAR PROBLEMS BENEFIT FROM SPECIALIZED THERAPY PROGRAMS
2. THE EFFECTS OF AGING ARE NOT SOLELY RESPONSIBLE FOR LOSS OF BALANCE OR SYMPTOMS OF DIZZINESS
3. EXERCISE, AT ANY AGE, IMPROVES MOBILITY



VESTIBULO-OCULO-CERVICAL TRIAD

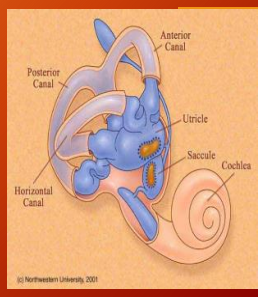
(SPATIO-TEMPORAL ORIENTATION - BALANCE AND POSTURE SYSTEM)

"VESTIBULO-" VESTIBULOCEREBELLUM RECEIVES INPUT FROM INNER EAR ALONG WITH OTHER CENTERS	KEEPS EYES ON TARGET DURING ALL HEAD AND BODY MOVEMENTS GRAVITY DETECTION, BALANCE & POSTURE, MUSCLE TONE DURING ALL ADLs
"OCULO-" VISUAL COMPONENT INFO. FROM EOM (MUSCLE LENGTH & TENSION) & AMBIENT	EXTRAOCULAR MUSCLES AMBIENT VISUAL PROCESSING FOCAL VISUAL PROCESSING
"CERVICAL" NECK RECEPTORS - PROPRIO & EXTERORECEPT.	ORIENT THE HEAD IN SPACE VITAL LINK BETWEEN THE HEAD & REST OF THE BODY



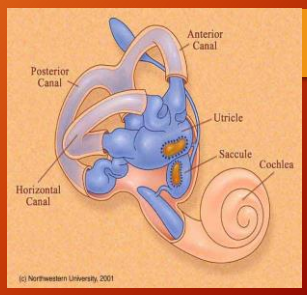
Semicircular Canals

- Three semicircular canals: anterior, posterior, horizontal
- Semicircular canals sense angular head velocity, also referred to as Angular VOR
- Shaking the head up and down (pitch) is sensed by the anterior and posterior SCCs
- Shaking the head horizontally (yaw) is sensed by the horizontal SCCs



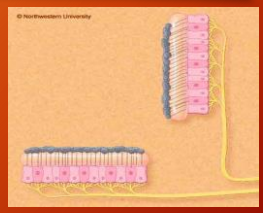
Otoliths

- Sense Linear VOR and Ocular Tilt Reflex
- Saccule: vertically aligned, senses linear movement up and down (riding in an elevator)
- Utricle: horizontally aligned, senses linear movement horizontally (riding in a train on a straight track); also, is responsible for the Ocular Tilt Reflex (step in a hole)



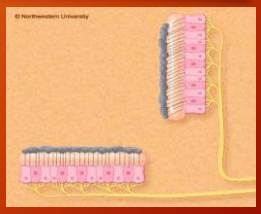
HAIR CELLS

- SCCs contain an area of hair cells (sensory component of the vestibular system) that protrude into a gelatinous matrix known as the cupula
- Otoliths also contain hair cells that protrude into a matrix known as the macula, which is covered by a surface of calcium carbonate crystals called otoconia



HAIR CELLS (CONT.)

- In the SCCs these hair cells bend in proportion to head acceleration (angular) changing the neuronal firing rate of the vestibular nerve
- Linear acceleration cause the hair cells and otoconia of the otoliths to move changing the neuronal firing rate.



SUMMARY

- THE KEY, THEREFORE, IS GRAVITY.

NYSTAGMUS

- Resting discharge rate of the vestibular nerve with the head still is 100 spikes/sec
- Asymmetric firing of the vestibular nerve causes a nystagmus
- Vestibular nystagmus is a slow phase generated by the vestibular system and a resetting quick phase generated by the saccade system
- Nystagmus is always named in the direction of the fast phase

THE VESTIBULAR SYSTEM ANSWERS THE QUESTIONS:

1. WHERE AM I WITH RESPECT TO IT?
2. WHERE IS IT WITH RESPECT TO ME?

(ORIENTATION AND LOCALIZATION)

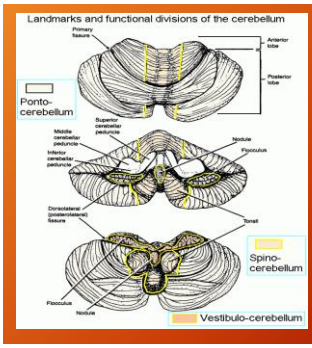
VESTIBULAR SYSTEM =

PERIPHERAL VESTIBULAR SYSTEM +

CENTRAL VESTIBULAR SYSTEM

THE CENTRAL VESTIBULAR SYSTEM

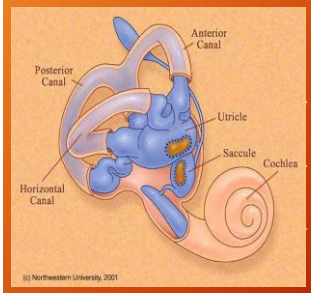
1. VESTIBULAR – OCULAR
2. VESTIBULAR – CEREBELLAR
3. VESTIBULAR – SPINAL
4. VESTIBULAR – CORTICAL



CEREBELLUM

1. VESTIBULOCEREBELLUM CONTROLS BALANCE AND EYE MOVEMENTS
2. SPINOCEREBELLUM ADJUSTS ONGOING MOVEMENTS
3. CEREBROCEREBELLUM COORDINATES PLANNING OF LIMB MOVEMENTS

CEREBELLUM ALSO PARTICIPATES IN MOTOR LEARNING



THE PERIPHERAL VESTIBULAR SYSTEM

INNER EAR OTOLITH ORGANS SENSE GRAVITY CHANGES / LINEAR ACCELERATION

INNER EAR SEMICIRCULAR CANALS SENSE ANGULAR ACCELERATION

AXONS TO SCARPA'S GANGLION → VESTIBULAR NERVE → PONS

THE TEAM APPROACH TO THE TREATMENT OF VESTIBULAR DISORDERS

THE CENTER FOR BALANCE AND VESTIBULAR DISORDERS AT THE KESSLER INSTITUTE FOR REHABILITATION USES A MULT-DISCIPLINARY APPROACH - CONSISTING OF A PHYSICIAN, PHYSICAL AND OCCUPATIONAL THERAPISTS, AUDIOLOGIST, NEURO-OPTOMETRIST AND NEURO-PSYCHOLOGIST

1. ENG (ELECTRONYSTAGMOGRAPHY): A TEST THAT ASSESSES THE BALANCE PORTION OF THE EAR (VESTIBULAR)
2. CAE (COMPLETE AUDIOLOGICAL EVALUATION): A TEST THAT ASSESSES THE HEARING PORTION OF THE EAR
3. COMPUTERIZED AND CLINICAL BALANCE EVALUATION: (POSTUROGRAPHY, BALANCE MASTER) – TESTS THAT EXAMINE HOW THE EYES, MUSCLES AND VESTIBULAR SYSTEMS WORK TOGETHER TO MAINTAIN BALANCE.
4. NEURO-OPTOMETRIC ANALYSIS: A COMPLETE ASSESSMENT OF THE VISUAL SYSTEM.

FLOW CHART OF PATIENTS WITH VESTIBULAR DISORDERS:

1. THE PATIENT IS ADMITTED WITH COMPLAINTS AND / OR SYMPTOMS OF DIZZINESS, DYSEQUILIBRIUM AND IMBALANCE.
2. THE INTAKE PHYSICIAN (PHYSIATRIST OR INTERNAL MEDICINE) ASSESSES GROUP II DISORDERS (CARDIAC AND VASCULAR) THAT MAY BE RELATED TO THE PATIENT COMPLAINTS / SYMPTOMS OF DIZZINESS, IMBALANCE OR DYSEQUILIBRIUM.

   A. THIS WILL INCLUDE AORTIC, CAROTID, VERTEBROBASILAR, SUBCLAVIAN OR CEREBRAL INSUFFICIENCIES

   B. HISTORY IS ACUTE, SUBACUTE OR CHRONIC AND MAY BE DUE TO ARRHYTHMIA, HEART BLOCK, MYOCARDIAL INFARCTION, STENOSES, ULCERS ON VASCULAR EVALUATION AND CT / MRI EVIDENCE OF INFARCTS

FLOW CHART OF PATIENTS WITH VESTIBULAR DISORDERS (CONT.)

3. PHYSICIAN WILL TREAT CAUSE AS DETERMINED BY ABOVE OR MAY WISH TO RULE-OUT NEUROLOGICAL DISEASE

4. REFERAL TO NEUROLOGIST MAY REQUIRE EVALUATION OF POSTERIOR FOSSA DISEASE (CEREBELLUM, BRAINSTEM) OR ATAXIAS (VESTIBULAR SYSTEM, POSTERIOR COLUMNS, VISUAL SYSTEM, CEREBELLUM).

   A. HISTORY AND COURSE IS SUBACUTE AND CHRONIC WITH POSSIBLE NAUSEA, ATAXIA, DIZZINESS OR DIPLOPIA. R/O IS CT / MRI / CSF ABNORMALITIES

   B. PHYSICAL FINDINGS INCLUDE RHOMBERGISM, SPONTANEOUS VERTICAL NYSTAGMUS, POSITIONAL VERTIGO (BUT WITH MINIMAL OR NO NYSTAGMUS OR WITH VERTICAL NYSTAGMUS).

   C. VISUAL SYSTEM PROBLEMS ARE REFERRED FOR NEURO OPTOMETRIC EVAL.

VIDEO-NYSTAGMOGRAPHY (VNG):

1. GAZE TEST: USED TO DETECT NYSTAGMUS THAT MAY RESULT FROM THE PATIENT GAZING center, right, left, upward and downward.

- Any nystagmus recorded during the gaze test is ABNORMAL and can result from either a CNS or peripheral disorder. If the nystagmus is direction-fixed and is suppressed by fixation, it is most likely of peripheral origin. Otherwise, it is likely of a CNS disorder.

2. SMOOTH PURSUIT (TRACKING) - Evaluates the voluntary oculomotor mechanism used to track slowly moving objects travelling on a predictable path.

- Abnormal gain may be attributable to CNS disorders in the absence of visual problems and pharmacological influences.

3. SACCADE TEST: Evaluates the saccadic system for cerebellar and degenerative CNS disorders. Performance is assessed by measuring 3 parameters: latency, accuracy and velocity

- ABNORMAL latency, accuracy and/or velocity are consistent with CNS involvement when ocular disoders and pharmacological influences are ruled out.

4. OPTOKINETIC TEST: Evaluates the involuntary (reflexive) oculomotor system used to stabilize visual fields.

- ABNORMAL results can also be attributed to a peripheral disorder if a spontaneous nystagmus related to an acute lesion is present.

POSITIONAL / POSITIONING TESTS

1. DIX-HALLPIKE TEST: The Dix-Hallpike maneuver is used to test the patient for Benign Paroxysmal Positional Vertigo (BPPV), which is caused by displaced otoconial debris in the semicircular canals.

- Results are considered positive for BPPV when there is a latency period prior to a burst of intense torsional nystagmus with subjective vertigo.

2. STATIC POSITIONAL TESTS: Determine if changes in head and body position cause nystagmus.

- Nystagmus recorded in any position is ABNORMAL. Any nystagmus with vision is an indicator of a central disorder. Direction-fixed spontaneous or positional nystagmus and direction-changing geotropic nystagmus can indicate either a central or a peripheral disorder.

BALANCE TESTING:

1. ROMBERG'S TEST: The Romberg's Test is performed with feet together, once with eyes opened and a second time with eyes closed. The patient stands in the erect position with arms at the sides and is checked for 4 minutes for each test. We also evaluated for sway and/or shakiness.

2. QUIX TEST: The Quix Test is performed with feet together and arms outstretched and index fingers pointing - once with eyes closed and a second time with eyes open and evaluated for a body sway or shakiness. Each test is 4 minutes.

GROUP 1 VESTIBULAR DISORDERS

(VERTIGO ENTITIES THAT INVOLVE PRIMARILY THE VESTIBULAR SYSTEM)

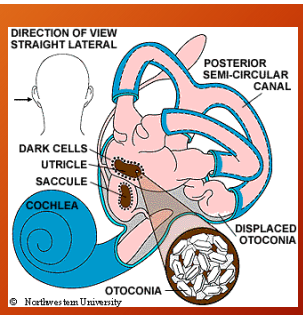
1. VESTIBULAR NEURITIS (ACUTE LABYRINTHITIS)
2. BENIGN PAROXYSMAL POSITIONAL VERTIGO (BPPV)
3. NUCLEO-RETICULAR VESTIBULAR SYNDROME
4. MENIERE'S DISEASE
5. PERILYMPHATIC FISTULA

VESTIBULAR NEURITIS

1. ACUTE SPINNING – NAUSEA AND VOMITING
2. VESTIBULAR NYSTAGMUS
3. IMBALANCE
4. NO HEARING LOSS
5. SHORT LASTING
6. SYMPTOMATIC TREATMENT – ANTI-EMETICS
7. STEROID TREATMENT
8. AMBULATE ASAP

BENIGN PAROXYSMAL POSITIONAL VERTIGO (BPPV)

1. SPINNING
2. POSITIONALLY INDUCED
3. NAUSEA, POSSIBLY VOMITING
4. VESTIBULAR NYSTAGMUS
5. TREAT WITH EPLEY AND SERMONT MANEUVERS



MENIERE'S DISEASE

1. INNER EAR
2. ATTACKS OF SPINNING
3. NAUSEA AND VOMITING
4. HEARING LOSS
5. TINNITUS
6. MEDICAL INTERVENTION – POSSIBLY SURGERY

NUCLEO-RETICULAR VESTIBULAR SYNDROME

1. SITE OF LESION: BRAINSTEM
2. MILD IMBALANCE
3. LIGHTHEADEDNESS / DIZZINESS
4. VIRAL OR TRAUMATIC ETIOLOGY
5. NO HEARING LOSS
6. VISUAL SYMPTOMS OF CENTRAL NATURE
7. RX: OPTIMINE, PERIACTIN
8. VISUAL-VESTIBULAR INTEGRATION THERAPY
9. VESTIBULAR HABITUATION

PERILYMPHATIC FISTULA (CONT.)

3. DIAGNOSIS:
   - A. CONTROVERSIAL
   - B. CLINICAL FINDINGS / TESTS NOT PARTICULARLY SENSITIVE
   - C. TRANSTYMPANIC ELECTROCOCHLEOGRAPHY
   - D. LASIX TEST
   - E. DEFINITIVE AT THE TIME OF SURGERY
4. TREATMENT:
   - A. HEAL SPONTANEOUSLY – BED REST
   - B. SURGICAL – PATCH LEAK
   - C. NEURO-OPTOMETRIC INTERVENTION
   - D. DIURETICS – LASIX, DIAMOX, DANDELION TINCTURE

PERILYMPHATIC FISTULA:

1. DEFINITION: A RUPTURE OF THE OVAL AND, LESS COMMONLY, THE ROUND WINDOW WITH SUBSEQUENT DEGISCENCE BETWEEN THE INNER EAR AND MIDDLE EAR RESULTING IN INAPPROPRIATE STIMULATION OF LABYRINTHINE RECEPTOS. THIS, IN TURN, CASUES DISORIENTATION IN VISUALLY COMPLEX SITUATIONS.
2. SYMPTOMS:
   - A. VERTIGO
   - B. FLUCTUATING HEARING LOSS (LATE COMPLICATION)
   - C. TINNITUS
   - D. CHRONIC LOW-GRADE NAUSEA
   - E. UNCOMFORTABLE IN CROWDS, ESCALATORS, TREE LINED STREETS
   - F. HIGH INCIDENCE OF PANIC ATTACKS / ANXIETY DISORDERS
   - G. ENDOLYMPHATIC HYDROPS (MENIERE'S DISEASE)
   - H. CERVICAL MYODYSTONIA (ABNORMAL MUSCLE TONE)
   - I. PERSISTENT OR EXERTIONAL HEADACHE

PERILYMPHATIC HYPERTENSION

1. EXCESS PERILYMPHATIC PRESSURE
2. SYMPTOMS SIMILAR TO PLF SYNDROME
3. DIAMOX → SURGICAL POSSIBLE (IF NOT ALREADY DONE)
4. VESTIBULAR HABITUATION PROGRAM
5. NEURO-OPTOMETRIC INTERVENTION

TREATMENT OF GROUP I DISORDERS:

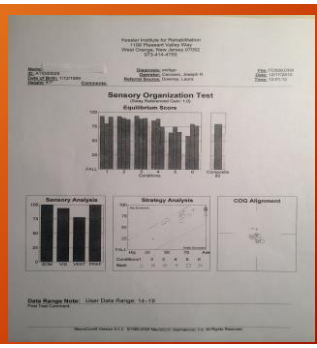
1. THESE DISORDERS ARE BEST DIAGNOSED THROUGH THE SERVICES OF A NEURO-OTOLOGIST
2. DIAGNOSIS / IMPRESSION OF CENTRAL VS. PERIPHERAL DISORDER WILL DETERMINE THE ORDER AND DIRECTION OF THERAPY ADMINISTERED
3. ANALYSIS MAY INCLUDE QUIX, ROMBERG, ENG, LASIX-TESTING, ROTARY CHAIR
4. TREATMENT MAY INCLUDE:
   - A. PRESCRIPTION OF ANTI-SEROTONIN MEDICATION (PARTICULARLY WITH BRAINSTEM INVOLVEMENT OR PROLONGED COURSE); OPTIMINE, PERIACTIN, DROPERIDOL.
   - B. SURGICAL INTERVENTION – PLF
   - C. DIET RECOMMENDATIONS FOR METABOLIC ABNORM.
   - D. ALLERGY MEDICATIONS
   - E. POSTERIOR CANAL PLUGGING
   - F. MECLYZINE / ANTIVERT

VESTIBULAR SYSTEM THOUGHTS

THE VESTIBULAR SYSTEM IS A PRIMITIVE, AUTOMATIC SYSTEM THAT WILL ONLY DEPEND UPON THE INPUT FROM OTHER SENSORY SYSTEMS (VISION AND PROPRIOCEPTION) TO A VARYING DEGREE – DEPENDING UPON THE EFFICIENCY OF THAT INDIVIDUAL'S PARTICULAR VESTIBULAR SYSTEM AND ITS INTEGRATIVE CONNECTIONS. WHEN THERE IS A PROBLEM IN THE VESTIBULAR SYSTEM, THE BRAIN LOOKS TO THE OTHER SENSORY INPUT SYSTEMS FOR MORE "ACCURATE" INFORMATION AND THE INDIVIDUAL MAY BECOME OVERLY SENSITIVE TO THOSE STIMULI. THE HIGHER LEVEL CORTICAL PROCESSES CAN "OVER-RIDE" THE LOWER, MORE PRIMITIVE SYSTEMS - REQUIRING SIGNIFICANTLY GREATER ENERGY AND EFFORT TO SUSTAIN SUCH A FUNCTIONAL OVER-RIDE.

POSTUROGRAPHY:

SENSORY ORGANIZATION TESTING



Kessler Institute for Rehabilitation
1199 Pleasant Valley Way
West Orange, New Jersey 07052
973-414-4755

Sensory Organization Test

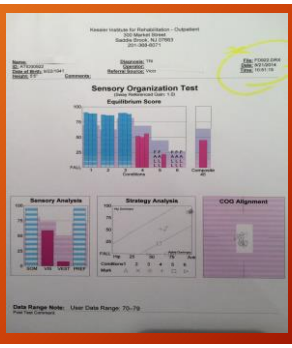
Equilibrium Score

Sensory Analysis

Strategy Analysis

COG Alignment

Data Range Note: User Data Range: 14–19



Kessler Institute for Rehabilitation - Outpatient
300 Market Street
Saddle Brook, NJ 07663
201-368-6071

Sensory Organization Test

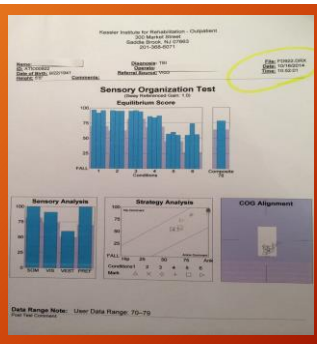
Equilibrium Score

Sensory Analysis

Strategy Analysis

COG Alignment

Data Range Note: User Data Range: 70–79



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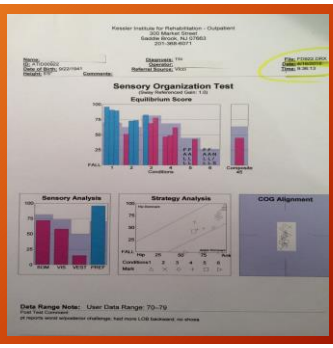

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COG Alignment

Data Range Note: User Data Range: 70–79

SPATIAL LOCALIZATION VS. SPATIAL AWARENESS

SPATIAL LOCALIZATION

SPATIAL LOCALIZATION DEPENDS UPON:

1. THE AREA OF THE RETINA WHERE THE IMAGE IS LOCATED
2. THE POSITION OF THE EYE IN THE ORBIT

"WHERE IS IT?"

THE VISUAL "ANCHOR POINT" IS THE FOVEA (WHICH CANNOT BE SEPARATED FROM THE TOTAL BODY)

SPATIAL AWARENESS

(EGOCENTRIC LOCALIZATION)

IS A FUNCTION OF VISUAL, VESTIBULAR & POSTURAL COMPONENTS

"WHERE IS IT IN REFERENCE TO ME OR WHERE AM I IN REFERENCE TO IT?"

THE SPATIAL "ANCHOR POINT" IS THE STERNUM
(MIDLINE)

SPATIAL AWARENESS

PROPRIOCEPTIVE INFORMATION FROM THE EXTRAOCULAR MUSCLE FIBERS

- → CORTEX (VIA SUPERIOR COLLICULUS)
- → VESTIBULAR SYSTEM
- → FLOCCULUS OF THE CEREBELLUM
- → VESTIBULOSPINAL CENTERS (FIBERS) THAT INTERACT WITH THE NECK

MAJOR SUBCORTICAL PATHWAYS FOR EYE MOVEMENTS

- Vestibular nerve, Nucleus prepositus
- Flocculus of cerebellum, Posterior parietal cortex ..... vestibular nuclei

- Inferior olive, Vestibular Nucleus
- Pontine Nuclei, Reticular Tegmenti ..... cerebellar flocculus

- Pons, Frontal eye fields
- Parieto-temporal-occipital ..... pontine nuclei

- Superior Colliculus, Frontal eye fields ..... reticular tegmenti pontis nucleus

- Retina, Visual cortex
- Frontal eye fields, Parieto-temporal-occipital ..... superior colliculus (superficial)

- Frontal eye fields, Posterior Parietal Cortex, Substantia Nigra
- Midbrain Tegmentum, Nuclear Reticular Tegmenti, ... superior colliculus (deep)
- Medial Reticular Formation

DUKE ELDER:

"TWENTY PERCENT OF THE OPTIC NERVE FIBERS COMING FROM THE RETINA NEVER GET TO THE HIGHER VISUAL CENTERS IN THE OCCIPITAL LOBE BUT GO INSTEAD TO THE SUPERIOR COLLICULUS AND THEN TO THE MORE PHYLOGENETICALLY PRIMITIVE PHOTOSTATIC (POSTURAL) AREAS OF THE HEAD AND NECK"

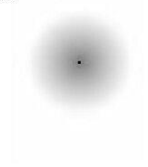
THE BIMODALITY OF NEUROLOGY AND VISUAL PROCESSING
AMBIENT-FOCAL PROCESSING

AMBIENT PROCESS	FOCAL PROCESS
1. EXTENSIVE	1. INTENSIVE
2. FIBERS TO MIDBRAIN - 20% OF THOSE LEAVING THE EYE	2. FIBERS TO LATERAL GENICULATE BODY AND VISUAL CORTEX
3. WHILE ONLY 20% OF FIBERS, ARE FROM MOST OF THE RETINA	3. FIBERS MAINLY FROM FOVEA & NEAR MACULA
4. IS NOT DEPENDENT UPON INTER-CORTEX CONNECTIONS	4. DEPENDS UPON INTER-CORTEX CONNECTIONS
5. SYSTEM PRIMARILY AMBIENT AT BIRTH	5. CULTURAL TASKS ARE PRIMARILY FOCAL (EX. ACADEMIC)
6. PROCESSING IS FAST AND SENSORY AWARENESS TRANSIENT	6. PROCESSING IS SLOW AND SENSORY AWARENESS SUSTAINED

CLINICAL PEARL:

THE VISUAL CHANGES NOTED WITH VESTIBULAR DYSFUNCTION ARE PREDOMINANTLY ASSOCIATED WITH INCREASED FOCALIZATION AT THE EXPENSE OF DECREASED AMBIENT AWARENESS. UNFORTUNATELY, IT IS THE AMBIENT AWARENESS THAT IS NEEDED FOR GOOD VESTIBULAR FUNCTIONING AND MOVEMENT THROUGH SPACE. THE DEGREE OF SHIFT IN AWARENESS WILL OFTEN DEPEND UPON PREDISPOSING FACTORS (EX. REF. ERROR, STRABISMUS, ETC.)

Keep staring at the black dot. After a while the gray haze around it will appear to shrink.



PROCESSING STYLES:

FOCAL ←----------|----------→ AMBIENT
HIGH ACHIEVERS LEARNING DISAB.
READERS ADHD
AUTISTIC SPECTRUM

THEREFORE WE MUST LOOK AT THE INNATE PROCESSING STYLE OF THE INDIVIDUAL AS WELL.

VISUAL COMPONENT:

1. VISUAL SCREENING – ADMINISTERED THROUGH THE OCCUPATIONAL THERAPY DEPARTMENT – WILL DETERMINE APPROPRIATENESS OF REFERRAL TO VISION CLINIC / NEURO-OPTOMETRIC CONSULTANT
2. NEURO-OPTOMETRIC ANALYSIS WILL DETERMINE THE PRESENCE / ABSENCE OF OVERT VISION PROBLEMS THAT WILL INTERFERE WITH VISUAL PROCESSING THAT *COMPOUNDS* DIZZINESS PROBLEMS. SUCH PROBLEMS MAY INCLUDE:
   - A. UNCORRECTED REFRACTIVE PROBLEMS
   - B. DIFFICULTIES WEARING GLASSES
   - C. VISUAL STRAIN WILL COMPOUND DIZZINESS WITH ATTEMPTED VISUAL CONCENTRATION
   - D. PRESENCE / ABSENCE OF BINOCULAR VISION DISORDERS INCLUDING: IV, III, VI, INTERNUCLEAR OPHTHALMOPLEGIA DECOMPENSATION OF HETEROPHORIAS, ETC.
   - E. FOCAL / AMBIENT INCOMPATIBILITIES

SIGNS AND SYMPTOMS OF VISUAL-VESTIBULAR INTEGRATION DYSFUNCTION

DIZZINESS / LIGHTHEADEDNESS / DISORIENTATION (DLD):

1. MALLS, STORES, CROWDS, PARTIES, FAMILY GATHERINGS
2. LARGE OPEN SPACES
3. MOVING VEHICLES
   - A. LARGE TURNS, SPEED, ACCELERATION / DECELERATION
   - B. DRIVER VS. PASSENGER
   - C. FRONT SEAT VS. BACK SEAT
4. REPETITIOUS VISUAL PATTERNS
   - A. CARPETS, WALLPAPER DESIGNS, FLOOR PATTERNS
5. WINDSHIELD WIPERS
6. SNOW, RAIN
7. CHANGES IN BAROMETRIC PRESSURE / IONIC ALTERATIONS
8. ALTERATIONS IN FLUID BALANCE –COLDS, ALLERGIES, SINUS INF.

SIGNS AND SYMPTOMS OF VISUAL-VESTIBULAR INTEGRATION DYSFUNCTION

(CONTINUED)

9. COMPUTER / TELEVISION SCROLLING OR ACTION
10. LIGHT ALTERATIONS
    - A. WALKING ON PATHWAY WITH LIGHT THROUGH TREES
    - B. LIGHT TO DARK ADAPTATION
11. DEPTH PERCEPTION PROBLEMS (ESP. AT NIGHT)
12. LIGHT SENSITIVITY (CENTRAL)
13. DIFFICULTIES WEARING GLASSES / CHANGES
    - A. BASE CURVATURES / CHANGES
    - B. CYLINDER / CHANGES
    - C. SIZE OF LENSES / CHANGES

IMPORTANT POINTS TO REMEMBER:

1. YOU DO NOT HAVE TO HAVE A "VISION PROBLEM" TO HAVE VISUALLY INDUCED DIZZINESS.
2. THE VISUAL SYSTEM INTERACTS WITH MANY OTHER SYSTEMS OF THE BODY AND OFTEN REFLECTS DIFFERENT STRESSES WITHIN THOSE SYSTEMS.
3. THE VISUAL SYSTEM CAN BE UTILIZED TO OVER-RIDE PROBLEMS IN THE VESTIBULAR / BALANCE SYSTEMS WHILE THEY ARE "UNDER REPAIR" (IE. HEALING).

IMPORTANT POINTS TO REMEMBER: (Cont)

4. THE VESTIBULAR SYSTEM LOOKS TO THE VISUAL SYSTEM FOR MORE ACCURATE INFORMATION REGARDING THE CURRENT STATUS OF THE SURROUNDING VISUAL ENVIRONMENT.

5. KEEP IN MIND THAT THE AMBIENT SYSTEM IS THE SYSTEM BY WHICH THE VESTIBULAR SYSTEM OBTAINS MOST OF ITS INFORMATION FOR MOVEMENT AND BALANCE. IF THE AMBIENT AWARENESS IS TRANSIENT OR SENDING BACK DISTORTED INFORMATION -PARTICULARLY WHEN THE FOCAL SYSTEM IS SUSTAINING ("ON") - THEN THE PRIMARY MEANS OF OBTAINING MORE ACCURATE INFORMATION ABOUT THE ENVIRONMENT IS MISSING OR INSUFFICIENT.

THE OPTOMETRIST'S GOAL IS TO "NORMALIZE" THE INPUT FROM THE VISUAL SYSTEM TO THE VESTIBULAR SYSTEM THROUGH WHATEVER MEANS THAT WE MAY FIND APPROPRIATE:

TOOLS:

A. CONTACT LENSES, LASIK
B. BASE-IN PRISMS
C. TINTING
D. VISION THERAPY – DECOMPENSATION
E. FRAME SELECTION, BASE CURVES, BIFOCAL CONSID.
F. VESTIBULAR HABITUATION THERAPY
G. VISUAL-VESTIBULAR INTEGRATION THERAPY
H. EXERCISE

CONTACT LENSES:

- THE PURPOSE OF THE CONTACT LENS IS TO REDUCE AND / OR ELIMINATE ANY PERIPHERAL DISTORTIONS THAT ARE CAUSED BY OPHTHALMIC LENSES
- THIS IS PARTICULARLY TRUE FOR PROGRESSIVE ADDITION LENSES AND MANY BIFOCALS
- NO MONOVISION CONTACT LENSES
- MULTI-FOCAL ARE DESIRABLE – PARTICULARLY WITH SMALL PUPILS
- MAY NEED TO TREAT DRY-EYE CONCURRENTLY

AMBIENT ENHANCEMENT (CONTINUED)

- LASIK MAY BE HELPFUL
- CLEAR-LENS EXTRACTION
- CATARACTS:
  - A. NEVER ALLOW MONOVISION
  - B. USUALLY BRING BACK CLOSE TO EMMETROPIA OR IF THEY WERE PREVIOUSLY A LOW MYOPE

PRISMS – A VALUABLE TOOL

- PRISM: A REFRACTIVE MEDIUM WHICH ALTERS THE DIRECTION (AND SUBSEQUENT LOCALIZATION) OF LIGHT EMANATING FROM AN OBJECT
- YOKED PRISMS: TWO PRISMS, USUALLY OF EQUAL PRISMATIC POWER, SET IN FRONT OF EACH EYE WITH THEIR BASES SET IN THE SAME DIRECTION – CAUSING EQUAL SHIFTS IN LOCALIZATION OF THE OBJECT BEING VIEWED. YOKED PRISMS ARE DESIGNATED BY THE DIRECTION IN WHICH THE BASES ARE PLACED. (REORIENTS THE SENSORY COMPONENT OF VISION AS WELL AS THE ENTIRE MOTOR COMPONENT IN THE BODY)

YOKED PRISMS:

- YOKED PRISMS STIMULATE MOVEMENT AWARENESS.
- MOVEMENT INCLUDES ALL TEMPORAL AND SPATIAL CHANGES IN THE SYNERGIES THAT EXIST IN THE BODY.
- SYNERGIES ARE THOSE CLASSES OF MOVEMENTS WHICH HAVE SIMILAR KINEMATIC CHARACTERISTICS, COINCIDING ACTIVE MUSCLE GROUPS AND CONDUCTING TYPES OF AFFERTATION (EX. WALKING, TALKING, BREATHING).
- THE OPTICAL PROPERTIES OF PRISMS CREATE SPATIAL REARRANGEMENTS WHICH, IN TURN, AFFECT TEMPORAL CHANGES FOR THE WEARER. MAN HAS A RICH EXPERIENCE OF MOVEMENT AND, THEREFORE, WHEN CHANGE IS INITIATED, IT BECOMES EASIER FOR HIM TO DISTINGUISH THE QUALITY OF HIS MOVEMENT.

BASE IN PRISMS

MOVES VISUAL SPACE OUTWARD
REDUCES TONICITY OF POSTURE MUSCULATURE OF UPPER BACK AND NECK
EXPANDS VISUAL SPACE VOLUME
EMPHASIZES BACKGROUND AS OPPOSED TO FIGURE
OFTEN USED WITH POST-TRAUMA VISION SYNDROME OR VESTIBULAR DYSFUNCTION PATIENTS

ORDERING PRISMS:

- PRISM MUST BE GROUND-IN!!!!!!!!!!!! (DO NOT ALLOW DECENTRATION)
- 0.50 In O.U., 1.0 In O.U., 2.0 In O.U. mostly
- Crizal lenses
- If low myope or hyperope can combine with Rx. Do not change base-curves. May go with PL=0.50 In O.U. at first
- Tinting: Anifra (10 – 12 % blue-green) indoors; Transitions initially (x-tra active); Polaroid gray outdoors

"SUPERMARKET" RULES

- 1. SHOP IN THE SAME STORE EACH WEEK
- 2. GO AT AN "OFF TIME"
- 3. PRISMS TO BE WORN
- 4. HAT OR VISOR WITH A BRIM
- 5. HOLD ON TO THE CART!
- 6. MAKE LIFE INTO THERAPY: ex. "MALL WALKING"

TRAVEL:

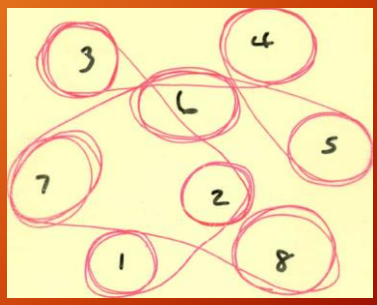
1. CHANGES IN AIR PRESSURE – EARPLANES, DRAMAMINE (1 HOUR BEFORE) / ANTIHISTAMINE
2. PLAN THE TRIP WELL. GET TO THE AIRPORT LONG BEFORE NECESSARY.
3. DRIVING: MOST PATIENTS WITH VESTIBULAR DEFICITS ARE BETTER DRIVERS THAN THEY ARE PASSENGERS. MUST WATCH SPEED, CURVES, PERIPHERAL DISTORTIONS (BRIDGES), TIME IN THE VEHICLE, LOW VEHICLES / HIGH VEHICLES

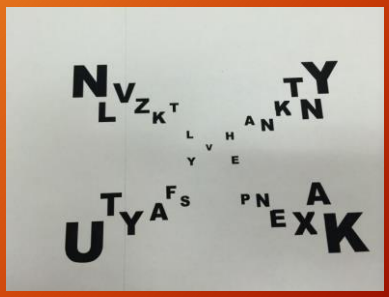
PV=nRT

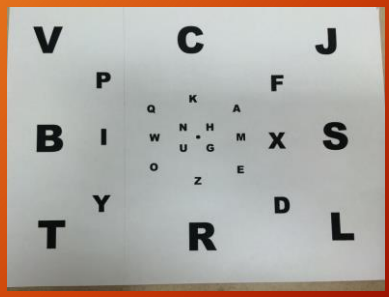
1. PREDOMINANTLY PERIPHERAL VESTIBULAR DISORDERS
2. RECOMMENDATIONS THAT CAN BE MADE REGARDING TRAVEL, PLACES TO RETIRE, DAY PLANNING

TREATMENT OF AMBIENT VISUAL PROCESSING DYSFUNCTION

- VERTICAL YOKED PRISMS
- BASE-IN PRISMS
- BINASAL OCCLUSION
- PERIPHERAL AWARENESS TECHNIQUES
- A. CONTINUOUS MOTION
- B. THUMB ROTATIONS
- C. PERIPHERAL AWARENESS CARD
- D. HARMON CIRCLES
- E. SACCADIC FIXATOR (CENTRAL FIXATION)







DYNAVISION 2000

WAYNE SACCADIC FIXATOR

VISUAL-VESTIBULAR INTEGRATION THERAPY IN THE OUTPATIENT CLINIC:

- SENIOR OCCUPATIONAL THERAPISTS
- USE OF YOKED PRISMS WITH MOVEMENT IN SPACE
- STARTING WITH SMALL AMOUNTS AND WORKING TOWARD LARGER ONES
- MAY UTILIZE DYNAVISION, SACCADIC FIXATOR

VISUAL-VESTIBULAR INTEGRATION DYSFUNCTION

- EMPHASIZE SCANNING AND PERIPHERAL AWARENESS TRAINING
- ROTATABLE YOKED PRISMS
- BINOCULAR FUSION EXTENSION
- ACCOMMODATIVE ROCK PROCEDURES
- HOME PRACTICE: HARMON CIRCLES, CONTINUOUS MOTION, FORM FIELD CARD, THUMB ROTATIONS WITH AWARENESS

THE USE OF YOKED PRISMS IN VESTIBULAR DYSFUNCTION

VERTICAL YOKED PRISMS:

- **BASE DOWN PRISMS** (MONOCULAR OR YOKED)
- MOVES VISUAL SPACE UPWARD – FARTHER FROM ONE'S CENTER OF GRAVITY (EFFECT OF LOOKING UPHILL, RELOCALIZING SPACE AWAY WITH OBJECTS SEEN AS LARGER AND CREATING POSTURAL CHANGES:
  - EYES MOVE UPWARD
  - CHIN MOVES UPWARD AND OUTWARD
  - CENTER OF GRAVITY SHIFTS FORWARD
  - PELVIS SHIFTS TO TILT DOWNWARD
  - BODY MOVES FORWARD ON TOES.
- DEEMPHASIZE FIGURE AND EMPHASIZE GROUND, ENABLING INDIVIDUAL TO FUNCTION MORE PERIPHERALLY
- EX: TBI PATIENTS WITH FLEXION

VERTICAL YOKED PRISMS (CONTINUED)

- BASE-UP PRISM (MONOCULAR OR YOKED)
- A. MOVES VISUAL SPACE DOWNWARD AND IN TOWARD ONE'S CENTER OF GRAVITY (EFFECT OF LOOKING DOWNHILL)
- B. RELOCALIZING SPACE INWARD WITH OBJECTS SEEN AS SMALLER – CREATING POSTURAL CHANGE AS FOLLOWS:
  - 1. EYES MOVE DOWNWARD
  - 2. CHIN MOVES DOWN AND INWARD
  - 3. CENTER OF GRAVITY MOVES BACKWARD
  - 4. PELVIS SHIFTS TO TILT DOWNWARD
  - 5. BODY MOVES BACK ON HEELS
- C. DEEMPHASIZE GROUND AND EMPHASIZE FIGURE – ENABLING THE PERIPHERAL INDIVIDUAL TO FUNCTION MORE CENTRALLY
- D. EX: TBI PATIENT SHOWING EXTENSION AND MOTOR SPASTICITY WHEN ATTEMPTING TO WALK

TREATMENT OPTIONS:

1. CONTACT LENSES
2. LASIK REFERRAL
3. ELIMINATE BIFOCALS (PARTICULARLY PROGRESSIVES)
4. LOW-POWER BASE IN PRISMS
5. PERIPHERAL AWARENESS ACTIVITIES
6. ENHANCEMENT OF OCULOMOTOR SKILLS
7. ENHANCEMENT OF BINOCULAR VISION SKILLS
8. TINTING / LIGHT THERAPY
9. MAGNET THERAPY
10. PATIENT EDUCATION
11. VESTIBULAR HABITUATION THERAPY

MEDICATIONS: NOTE

- 1. MECLIZINE (ANTIVERT)
- 2. ATIVAN, VALIUM (ANTI-ANXIETY)
- 3. OPTIMINE
- 4. CYPROHEPTADINE (PERIACTIN)
- 5. RESPONSE? DOSAGE? SYMPTOMS VS. CAUSE?

Photophobia / light sensitivity

- COenzymeQ10 + Magnesium
- ----------

Inflammation

- Curcumin Phytosome Mesiva – 500 mg. bid

LEAVIN' ON A JET PLANE?

- EARPLANES
- "LIGHT"
- BONINE – 1 HR. BEFORE
- LEAVE EARLY

TINNITUS:

BIOFLAVINOIDS

(B'S AND C'S)

Clinical Pearl:

- It is so very important to realize that you may or may not have an established vision "problem", however, it is the interactions with the vestibular system from which you must guide your thinking and treatment of the patient. If you do have a vision problem that may be interfering with the vestibular functioning, then you must take care of that problem first."

WHEN ASSOCIATED WITH DIPLOPIA OR DISRUPTION OF THE FOCAL SYSTEM, YOU MUST ELIMINATE THAT PROBLEM FIRST BEFORE YOU CAN BEGIN TO BECOME SUCCESSFUL IN WORKING WITH THE VESTIBULAR SYSTEM

EX: PONTINE CVA / TRAUMA, PC ANGLE TUMOR, ETC.

1. **OCCLUSION**
2. **SPOT PATCH**
3. **LOW-POWER FRESNEL NEUTRALIZATION**

VESTIBULAR HABITUATION & COMPENSATION

1. **BRAIN PLASTICITY REPROGRAMS PATHWAYS IN VESTIBULAR LOSS AND DYSFUNCTION – CEREBELLAR FUNCTION**
2. **VESTIBULAR REHABILITATION PROVIDES STRATEGIES FOR THE VESTIBULAR SYSTEM THAT OVERRIDE OR REPLACE THE DYSFUNCTION OR LOSS**
3. **THE PROCESS IS FACILITATED BY STABILIZATION OF THE FUNCTION OF THE DAMAGED VESTIBULAR SYSTEM**
4. **THE PROCESS IS RETARDED BY FLUCTUATIONS IN VESTIBULAR FUNCTIONING AND DAMAGE TO ANY OF THE 4 SYSTEMS INVOVLED IN THE MAINTENANCE OF BALANCE AND ORIENTATION**

SPECIALTY VISUAL-VESTIBULAR PROCEDURES:

1. OBTAIN "BUSY" PATTERN OF WALLPAPER AND PLACE ON LARGE BACKGROUND.
2. OBTAIN FIXATION POINT AND PUT ON LONG STURDY WIRE
   - A. MAINTAIN FIXATION ON FIXATION OBJECT AND KEEP BACKGROUND STILL
   - B. MAINTAIN FIXATION ON FIXATION OBJECT AND VARY / MOVE BACKGROUND
   - C. KEEP BACKGROUND STILL AND MOVE OBJECT
   - D. WALK WHILE DOING THESE PROCEDURES
3. ADD YOKED PRISMS OF VARYING DEGREES AND DIRECTIONS

VESTIBULAR HABITUATION THERAPY:

1. CERTIFIED THERAPISTS
2. EPLEY AND SERMONT MANUEVERS FOR BPPV
3. PROPRIOCEPTIVE & SOMATOSENSORY EVALUATIONS:
   - ` A. BALANCE MASTER / POSTUROGRAPHY
   - B. FOAM & DOME ANALYSIS
   - C. VOR ANALYSIS
   - D. POSTURAL STABILITY
1. HOME THERAPY:
   - A. BRANDT-DOROFF EXERCISES
   - B. MODIFIED CAWTHORNE-COOKSEY EXERCISES

ANXIETY / PSYCHOLOGICAL

AN INHERENT PROBLEM THAT OCCURS WHEN WORKING WITH PATIENTS THAT PRESENT WITH VESTIBULAR DYSFUNCTION IS THE DIFFICULTIES THAT THEY HAVE WITH ANXIETY AND NERVOUSNESS. THEY ARE OFTEN TOLD THAT THEY ARE "CRAZY" AND THAT THEIR SYMPTOMS ARE "ALL IN THEIR HEAD". THIS IS NOT TO MENTION: "YOU LOOK GREAT!" (IE. YOU WALK, YOU TALK - THEREFORE YOU MUST BE DOING VERY WELL!).

PATIENTS WITH VESTIBULAR DYSFUNCTION EXPERIENCE AN INSECURITY / DISTRUST REGARDING THEIR POSITION IN SPACE - LEADING TO A DISTRUST IN MOVEMENT, DIFFICULTY IN INTERPRETATION OF THEIR PLACE IN THE WORLD AND DIFFICULTY IN INTERPRETING THE WORLD IN GENERAL.

NUTRITIONAL TREATMENT:

1. LOW SALT
2. REMOVE CAFFEINE
3. COPPER SUPPLEMENTS (3 MG / DAY)
4. OTOSPONGIOSIS = OTOSCLEROSIS
   - A. DIDRONEL + CALTRATE + MONOCAL
     2 WEEKS…….4 WEEKS…….5 WEEKS
   - B. FULL PROTOCOL: 2 YEARS; MORE COMMON IN WOMEN
5. TINCTURE OF DANDELION

VEDA

VESTIBULAR DISORDERS ASSOCIATION
P.O. BOX 4467
PORTLAND, OREGON 97208-4467

CASE HISTORY: #1

- 11/20/11 15 Y/O FEMALE – PLAYING SOCCER
- STRUCK IN HEAD BY FAST-MOVING BALL
- DAZED / NO LOC.
- FIRST EVALUATED BY THIS PRACTITIONER: 4/28/12

IMMEDIATE SYMPTOMS

- PROBLEMS READING MUSIC AND PLAYING CELLO
- DIFFICULTIES WITH MATHEMATICS (ex. graphs)
- DID NOT FEEL WELL / BAD HEADACHE
- DIFFICULTIES WITH BALANCE AND REACTION TIME
- DX: "MINOR CONCUSSION" BY M.D.
- HEAD PAIN WITH AIRPLANE FLIGHT
- HEADACHES BECOMING SEVERE AND INCREASING WITH INCREASED ACTIVITY AND READING – UTILIZING BOOKS-ON-TAPE
- REDUCTION IN IN-CLASS TIME NECESSARY

HISTORY

- MEDICATIONS: ELAVIL, MULTIPLE VITAMINS, MAGNESIUM, OMEGA – 3'S
- PMH: (-)
- PVH: (-)

AREAS THAT NEED TO BE ADDRESSED

- TREATMENT OF HEADACHES
- TREATMENT OF PROBLEMS WITH BALANCE AND REACTION TIME
- TREATMENT OF READING PROBLEMS
- RETURN TO CLASSES

VISUAL ANALYSIS

- Unaided visual acuities: 20/20- O.D.; 20/20- O.S.
- Refractive status: no significant in either eye with BVA: 20/20- O.D. and 20/20- O.S.
- Nearpoint visual acuities: 20/20- O.D., 20/20- O.S.
- PERRL
- right handed / left eye dominant

Visual analysis (con't.)

- Motor analysis:
- EOM full and sm. to all. (+)mild dizziness
- CT- distance: orthophoria
- CT- near: orthophoria
- Von Graeffe phorias: 1 eso / orthophoria at distance
- Maddox phoria at near: 1 exo / orthophoria
- Nearpoint BI vergences: 12/20/16
- Nearpoint BO vergences: 18/30/20
- NRA / PRA: +2.50 / -2.50
- Stereopsis: 20 seconds of arc
- Fused X-cyl: -0.25 / unfused X-cyl: -0.25 O.D. / -0.25 O.S.
- NPC: 5 inch blurpoint

Visual Analysis (con't.)

- Ocular health: normal color optic nerves, well delineated, C/D: .3 / .3 O.U.; retinal eye grounds: normal
- Visual fields: (Central 30-2) – within normal limits: O.U.
- OKN: excellent and equal responses in both horizontal directions

Visual analysis: (con't)

- Balance and Posture:
- Forward flexion of neck
- Touching walls as walks down the hallway

MY QUESTIONS ARE THESE:

- 1. WHAT IS YOUR DIAGNOSIS?
- 2. WHAT IS YOUR TREATMENT PLAN? IS IT ANY DIFFERENT THAN WHEN YOU WALKED IN HERE YESTERDAY?
- 3. WHAT ARE YOUR EXPECTATIONS?
- 4. WHAT ARE YOU GOING TO TELL THE PATIENT? (HINT: PATIENT EDUCATION)

Diagnosis:

- Central vestibular dysfunction with visual-vestibular integration dysfunction / Post Trauma Vision Syndrome - secondary to traumatic brain injury

Treatment Recommendations:

- Two sets of prisms:
- 0.5 base-in O.U. for walking and movement purposes
- 2 base-down O.U. yoked for reading and nearpoint activities
- Occupational therapy: rotatable yoked prisms with movement, saccadic fixator, scanning the environment
- Physical therapy: continued cranio-sacral therapy
- Add in Cawthorne-Cooksey and Brandt-Daroff procedures for vestibular habituation and assess with Physical Therapy

Results:

- Utilizing prisms for full-time in school (base-in for movement and base-down for nearpoint work).
- No longer experiencing headaches.
- Accomplishing all her schoolwork.
- No longer difficulty with Math graphs.

Future considerations

- Already finding that she does not need the prisms (base-in) all the time.
- Base down prisms will likely be of a more permanent nature – depending upon visual demand and postural changes
- Sports in future?

PATIENT ANALYSIS: P.J.

1. BIRTH: 10/25/36 (57 Y.O. WM)
2. HX: 11/10/03 ADMITTED TO HUMC WITH NAUSEA, VOMITTING, SPINNING WHILE LIFTING WEIGHTS
3. CT: ICH OF 4TH VENTRICLE WITH EDEMA
4. TX: BURR HOLES, POST. FOSSA CRAN. & EVAC., VP SHUNT
5. PMH: OPEN HEART / CABG, HTN, HYPERCHOLEST., GOUT, MI, (?) CVA
6. 1/19/04: TRANSFER → KIR-EAST

7. SX: L WKNESS, DEC. ST MEMORY, L VII, DIZZINESS, BLURRED VISION
8. VHX: BIL. CATS 01' (DIFF. 2ND COUMADIN REMOVAL), S.V. LENSES DIST.
9. 1/21/04: O.D. O.S.

VA: BVA: 20/25 20/50

NEAR: 20/30-2 20/40-2

AMSLER: CENTRAL DISTORTION O.S.

POOR RET. REFLEXES: VIT. DEBRIS

PERRL, MILD L. VII,

-EOM: FULL, HORIZ. NYSTAG IN ALL POS OF GAZE

-CTd: ORTHO, CTn: MOD. EXO

-DIST. PH: 9 ESO (H), 0.5 L HYPER (V)

-NEAR PH: 10 EXO

-OPHTH: NYSTAG., ONH: WNL, TONO: WNL

-VF: WNL

-OKN: R→L BETTER THAN L→R, SMALL ANGLE

10. DX:
    a. RESIDUAL VI
    b. CME O.S.
    c. VESTIBULAR DYST. / NYSTAG.
    d. VIT. DEBRIS - S/P BIL. CATS.
11. TX:
    a. LET CME CLEAR
    b. POSS. PRISM @ DIST.

12. 6/2/04: FOLLOW-UP
    A. LEFT EYE HAS CLEARED
    B. CLOUDINESS NOTED O.D.
    C. VA: O.D. O.S.

BVA: 20/50 20/30

NEAR: 20/60- 20/40

D. PHORIA: 6 ESO @ DIST.

ORTHO VERT.

9.5 EXO @ NEAR

13. TX: YAG LASER O.D.: 6/16/04:

BEST CORR. ACUITY: 20/20-2

YAG LASER O.S.: 6/17/04:

BEST CORR. ACUITY: 20/25

13. RESULTANT:
- VERTICAL DIPLOPIA WITH RX
- OBJECTS BOUNCING AROUND (CEREBELLAR)
- NEUT: 4 BASE OUT/ O.5 LEFT HYP.
- LIES DOWN: DIZZ. SUBSIDES
- TEGRETOL DECREASING
- DECISION: WAIT

14. 7/22/04
- DECREASED TEGRETOL: IMPR. DIZZ. AND NYSTAGMUS
-½ IN PRISMS - GOOD RESPONSE - WEARING CONSTANTLY - MOSTLY WHEN OUT OF THE HOME
-OPOT / OPPT - 3X/WK @ KIR-NORTH
-VISUAL-VESTIB. INT. DYSF.
- VESTIB. HAB.

Case Analysis

- 1/20/02: 41 y/o wf, sudden onset of dizziness and imbalance
- 3/02: exacerbation of symptoms → J.L. Tx: Optimine, Lasix testing, endoscopy; Dx: Right PLF
- 10/8/02: R-PLF repair 2 leaks / shunting
- Sx: dizziness in grocery stores, malls, crowds; moving vehicles: ok, no good when stops
- PMH: unremarkable except hypercholesterolemia
- Meds: Synthroid, Lipitor
- VisHx: unremarkable

Case Analysis (cont.)

- VISUAL ANALYSIS: dist. near
  a. VA: unaided VA: R: 20/20- 20/30+2
  L: 20/20 20/20-4
  b. Refractive: unremarkable
  c. Externals: unremarkable
  d. Motor: unremarkable except stereopsis (depth discrimination: 70 seconds of arc –normal: 20 to 25 seconds of arc expected)
  e. Ocular Health: unremarkable
  f. Visual Fields (confrontation): all normal but produces dizziness and slow to respond
  g. OKN: monocular disorganized and jumpy

CASE ANALYSIS (CONT.)

- Dx: Visual-Vestibular Integration Dysf. (specifically with difficulty processing peripheral stimuli)
- Tx: 1 Prism Diopter Base-In O.U.
- 11/22/02: Follow-up. Did very well with prisms. Returned to work with computer and desk work
  a. stereopsis: 70 seconds of arc (unchanged)
  b. Tx.: Vestibular-Habituation Therapy with physical therapist, Visual-Vestibular Integration Therapy with occupational therapist.

CASE ANALYSIS (CONT.)

- 1/24/03: F/U: consistent mistakes at work
  Dx: working hard at focusing;
  Tx: nearpoint lenses; O.T.: central skills enhancement therapy
- 2/7/03: near Rx helpful but difficult to wear when turning head;
- 7/1/03: PLF repair
- 8/7/03: F/U: some difficulty with weather changes, ocean movements, near→far fixational changes; depth perception, localization, reading
  a. Stereopsis: 30 seconds of arc.
  b. Tx: Rotatable prism therapy for increased peripheral awareness.

PATIENT: k.D.: History

- 2009: third trimester of pregnancy – lost vision in right eye
- MRI Analysis: negative; dx: optic atrophy
- Delivered baby, vision improved; only when driving and looking over shoulder symptoms noted
- 2/2011: Contrast MRI: meningioma compressing optic nerve and second tumor that was asymptomatic
- Surgical resection to remove sphenoid wing tumor – some residual on f/u MRI
- OT sessions: 1/2012
- Out of work: 4 months
- Experiencing shaking of the hand – mistakenly thought to be due to anxiety (but denied by psychology)

/

- Sensitivities continued to worsen and in July of 2012 experienced true vertigo symptoms and losing cognitive processing ability
- Began working with an O.D. who worked on convergence issues
- Worked with O.T.R. on vestibular issues – specifically utilizing a treadmill
- Vertical eye movements were difficult
- Otology felt ECOG (evoked potentials), VEMP and ENG were all negative for peripheral lesion
- Continues to note difficulties in stores, malls, crowds, walking in dark, riding in a moving vehicle, near-to-far changes in focus,
- Does not note problems with repetitious visual patterns and weather changes

VISUAL ANALYSIS (1/15/13):

1. UNAIDED VA'S: O.D.: 20/20 O.S.: 20/20
2. NO SIGNIFICANT REFRACTIVE ERROR O.U.
3. PUPILS: PERRL; LARGE
4. MOTOR: EOM FULL AND SMOOTH TO ALL;
   COVER TESTING: ORTHOPHORIA AT DISTANCE (VON GRAEFFE: ORTHO VERTICAL AND HORIZONTAL; MODERATE EXOPHORIA
   NEAR (Maddox 2 to 3 exo); convergence reserves: intermittent splitting and refusing; NPC: 5/3/4 OKN: absent in both horizontal directions.
5. Ocular Health: normal
6. Visual Fields: normal

Diagnosis:

1. Visual vestibular integration dysfunction
2. Convergence Insufficiency

Treatment:

- Rx: ½ In O.U. with 12% Anifra (blue-green) tinting

- 4/8/13: "Prisms helped almost immediately"; much better for turning of the head.
- Working with O.T.R. (Beth): any time there is a lapse in therapy time (insurance), will relapse (can even get a dysfluency of speech)
- Cannot do fire drills (is a teacher) or assembly programs
- Recommended: Cambridge Psychological

- Follow up findings:
  1. Cover testing at near: orthophoria
  2. Nearpoint of convergence: 4 inch blur
  3. OKN: excellent responses in both horizontal directions
  4. Base-out vergences: 20/ >35
  5. Base-in vergences: 14/18/14

Recommendations:

1. Keep walking with the prisms
2. OTR: begin work with rotatable yoked prisms (very difficult to date)

7/16/13 – follow-up:

1. Working with 2 prism diopter and 4 prism diopter yoked prisms with movement – with beth
2. Working with treadmill and various eye movements laterally and vertically
3. The prisms have "made me able to multi-task"
4. Fluorescents and outdoor very difficult – utilize anifra indoors and polaroid gray #3 Outdoors
5. Binasal occlusion worked well with reading

10/17/13: follow-up

- Uses a small amount of Xanax (0.5 mg.) and helps her significantly
- Has worked up to 12 prism diopters of rotatable prism
- Light sensitivity has improved
- Add syntonics
- Add split hart charts / near-far charts, ball-chart activities, midline tapping
- Consider cranio-sacral therapy

Patient: A.P.

- Birth: 8/7/96; grade: 12
- 12/2/13: showering before school – straight down on the floor – concussion
- Stresses the day before with college applications
- Taking Vivance (appetite suppressant – low blood sugar?)
- Audition for the school play that afternoon – could not dance
- Problems during with going up stairs
- Increased light sensitivity and sound sensitivity
- Physical medicine recommended limited school schedule
- Concussion induced headaches since the beginning
- Music coaches located in NYC – ride in was palatable – ride home was difficult

Symptoms:

- Auditioning – dancing – resulted in nausea and dry heaving
- Dizziness in large crowds, malls, stores, crowded hallways
- Partial in-school / partial home study
- History of motion sickness, acid reflux as a child, anxiety disorder, chronic ear infections as a baby – bilateral myrengotomies at 18 months
- Problems with depth perception and feels most comfortable on the floor
- Reads for 30 to 45 minutes → headaches
- Memory and word retrieval issues
- Had been doing a lot of texting and t.v. watching – curtailed
- Current medications: Allegra-D, Lorazepam and Amoxycillin

Visual analysis:

- 1. Unaided Va's: O.D.: 20/20 O.S.: 20/20
- 2. Refractive: no essential refractive error o.u.
- 3. nearpoint VA's: O.D.: 20/20 O.S.: 20/20
- 4. pupils: perrl; right handed / right eye dominant
- 5. eom: full and smooth to all positions of gaze, no nystagmus
- 6. Cover testing: distance and near: orthophoria;
  - Von Graeffe phoria: orthophoria in vertical and horizontal planes
  - Maddox Phoria: 2.5 – 3.0 exo
  - Stereopsis: 20 seconds
  - Nearpoint vergence ranges: narrowed
  - Nearpoint accommodative ranges: PRA: +0.50 / NRA: +2.00
- 7. ocular health: normal
- 8. visual fields: normal
- 9. okn responses excellent in both horizontal directions of rotation

Diagnosis:

1. Visual vestibular integration dysfunction
2. Accommodative insufficiency
3. Photophobia

Recommendations:

1. Plano = ½ in O.U. (grind in)
2. +0.25 O.U.= 2 down O.U.
3. Cranio-sacral massage

THANK YOU FOR YOUR ATTENTION THIS MORNING! ANY QUESTIONS THAT I CAN BE OF ASSISTANCE?

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CONCLUSION

- No one technique may be successful in treating patients with vestibular dysfunction, however, the more tools that we have in our armamentarium, the better.
- The "normalization" and maximization of visual efficiency will always support the functional aspects of vestibular dysfunction and alleviate - to some degree - the symptomology suffered by our patients.