Expanding treatment strategies for persistent non-vertiginous dizziness

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A Practical Approach to the Diagnosis and Treatment of Dizziness/Vertigo
Objectives:

- **Define** persistent non-vestibular symptoms, impairments and disability
- Briefly describe **differential testing** of persistent non-vertiginous dizziness
- Discuss standardized **outcome measures** to quantify impairments/disability associated with persistent non-vertiginous dizziness.
- Understand the **proposed pathogenesis** of abnormal sensory weighting/dominance and/or autonomic nervous system maladaptation
- Discuss **key treatment strategies** based on impairment-driven paradigm to successfully manage and facilitate recovery in non-vertiginous dizziness
- Discuss **novel interventions** to address the complex presentation this patient population

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Defining **Persistent Non-vertiginous Dizziness**:

Primary disabling c/o **NOT vertigo, oscillopsia, diplopia**

- Visual motion sensitivity (Hypersensitivity to vision)
  - Intolerance to complex, busy, and/or moving environments (e.g. stores, driving, crowds, reading, scrolling computer)
- Generalized unsteadiness & Spatial discomfort with definable Sensory Organization Dysfunction or misweighting problems
  - Perceptions of verring (no ataxia and rarely fall)
- Prominent associated anxiety w/ or w/o panic
- Fatigue
- Cognitive dullness, Head fullness, “crazy head”
- High threat, fear-based motoric balance behaviors,
  - poor stabilization and poor confidence
- Generalized motion intolerance without vertigo
Causes of chronic dizziness or persistent non-vertiginous dizziness

- Post Concussion Syndrome (PCS)
- Vestibular Migraine (VM) and Migraine Associated Dizziness (MAD)
- Mal De Debarquement Syndrome (MdDS)
- Psychiatric
  - Anxiety with and without panic
  - Obsessive Compulsive Disorders
  - Depression
  - Past Trauma
- Incomplete compensation, or poorly healed peripheral vestibular lesion
  - BPPV, Unilateral Vestibular loss (e.g. Neuritis, Labyrinthitis), status post surgical (e.g. Vestibular Schwannoma, superior canal dehiscence)
  - Complicating Co-morbidities (e.g. central compensation failure(10%), peripheral neuropathy)
  - Insufficient activity/movement
  - Behavioral conditioning or mal-adaptation complication
- Persistent Postural Perceptual Dizziness (PPPD)
  - Visual vertigo
  - Space and motion dysfunction

Persistent Postural-Perceptual Dizziness (PPPD or 3PD)

- PPPD is NOT a psychiatric DISORDER
- WHO ICD-11 Proposed Classification: Diseases of the ear and mastoid process
  - Diseases of the inner ear
  - AA51 Disorders of Vestibular Function
  - AA51.5 Chronic Vestibular Syndromes
  - AA51.53 PPPD DIZZINESS
- PPPD defined by the World Health Organization:
  "Persistent non-vertiginous dizziness, unsteadiness, or both lasting three months or more. Symptoms are present most days, often increasing throughout the day, but may wax and wane. Momentary flares may occur spontaneously or with sudden movement. Affected individuals feel worst when upright, exposed to moving or complex visual stimuli, and during active or passive head motion. These situations may not be equally provocative. Typically, the disorder follows occurrences of acute or episodic vestibular or balance-related problems. Symptoms may begin intermittently, and then consolidate."
Persistent Non-vertiginous Dizziness

Diagnostic Criteria for PPPD

• **Primary symptom** (dizziness, unsteadiness, non-spinning vertigo present >50% of time for >3 months
  • “Persistent” (present for prolonged periods)
  • Wax/wane spontaneously or provoked
  • Tend to increase as day progresses
  • Most experience symptoms every day or nearly every day
  • Dizziness
    • cloudiness, fuzziness, heaviness, lightness, spatial orientation not sharp, visual focus not clear
  • Unsteadiness:
    • instability, wobbling, feelings of veering without directional preponderance
  • Non-spinning vertigo:
    • false/distorted sensations of swaying, rocking, bobbing, bouncing internal (inside head or body or external (occurring in environment)

• **Onset** shortly after an event causing acute vestibular symptoms or that disrupts postural control
  • Acute/episodic/chronic vestibular syndromes(25-30%)
  • Migraine (15-20%)
  • Panic/anxiety(15% each)
  • Concussion/whiplash(10-15%)
  • Autonomic disorders (7%) or other events capable of producing dizziness, unsteadiness, altered balance (e.g. cardiac dysrhythmia, adverse drug reactions)
  • Acute or episodic precipitant,
    • symptoms typically settle, may by intermittent at first, then become persistent quality
  • If chronic precipitant, symptoms may develop slowly/worsen gradually
Persistent Non-vertiginous dizziness

Diagnostic Criteria for PPPD

• Symptoms **exacerbated** by
  • Upright posture, active/passive motions, exposure to moving visual stimuli/complex visual pattern

• Symptoms cause significant distress, **functional impairment**

• Symptoms not better attributed to another disease/disorder
  • PPPD may co-exist with other diseases/disorders

Dynamic mechanism for PPPD
www.jvr.web.org/icvd-pppd-dx-crit-18oct16(003)

Predisposing:
Anxiety-related personality traits
Pre-existing anxiety

30%

Precipitating:
• Vestibular
• Other medical

Psychological

70%

Functional (PPPD)

Comorbid psychological:
Anxiety
Phobia
Depression

Respond to triggering event with high anxiety and body vigilance

Co-exist:
* Structural
* Psychologic illnesses

Pre-existing anxiety
Proposed Pathogenesis

“It really is in your head but not like what you think”

Mounting evidence of definable impaired FUNCTIONING of the CNS (neurochemical/neurosynaptic), Rather than structural/disease process

Can get to the same “end point” whether from neuro-sensory system disease or psychological disorders.

Sloane et al, JAGS 1994 Model

Figure 1. The interrelationship between physiological and psychological factors in dizziness.
Incidence of Chronic Dizziness

• Chronic Dizziness PPPD (Persistent Postural Perceptual Dizziness)
  • 25% of all dizzy patients referred to tertiary care, university balance centers
  • 10-25% medically unexplained dizziness
  • Chronic Subjective Dizziness is the 2\textsuperscript{nd} most common dx in tertiary care
    • Between BPPV 1\textsuperscript{st} and VM 3\textsuperscript{rd} (Staab 2012)

• Incidence of Dizziness due to Isolated Psychological Problems (tertiary care)
  • General Anxiety 42%
  • Panic Attacks 28% & Mood Disorders 18%
  • Somatization, Conversion, Malingering 12%

Psychological problems in the dizzy patient

• Psychological problems in patients with dizziness described for 150 years
  • Karl Westphal, 1871
  • Postural control, spatial orientation, and threat assessment integrated components of locomotion

• 40\% of patients with definable peripheral vestibular deficits (PVD) have psychological disorders
  • Clark et al 1994
  • Kroneke et al 1992

• 40\% of patients with psychological disorders test with evidence of “compensated PVD”
  • Jacob 1996

• 15\% of patients with PVD meet criteria for panic and will be more disabled
  • Stein et al 1994

• 30\% of patients with PVD can suffer from chronic dizziness, only 10\% ear related
  • Godemann et al 2005, Heinrichs et al 2007
Reticular formation

- Diffuse network of neurons
- Extends from brainstem to higher levels
  - Cerebellum
  - Basal ganglia
  - Vestibular nuclei
- Inhibition of motor responses

Limbic Brain

- The seat of emotion
- Direct connection to hypothalamus, origin of autonomic nervous system, exerts extreme power over the individual
- Produces the fight or flight response to threat
- Links conscious cerebral functions to unconscious autonomic functions
- Facilitates memory and retrieval

*Caressing, tactile stimulation helps to down regulate*
Hippocampus

• Neuroscientists believe that the hippocampus helps select which memories are stored, perhaps by attaching an "emotion marker" to increase recall.
• Enhanced emotion and motivation and thus visceral regulation.
• Integrates message from inside and outside the body, establishes a sense of personal identity/congruence
• Reduction of volume in Vietnam vets with PTSD
• Decreased volume in patients with prolonged complaints of dizziness

Arousal/memory mechanisms

• Amygdala-determines emotional importance
• Sensory input from locus ceruleus (head and proprioceptive receptors in neck) Positions the head (from orienting to food to threat)
• Orbitofrontal cortex mediates messages to cerebral cortex, brainstem and motor centers.
Persistent Non-vertiginous dizziness

Neurochemical cascades: Migraine Pathogenesis....

Same neurochemical pathway that generates MIGRAINE, generates ANXIETY!!
Furman et al 2008

Afridi, 2005
Arch of Neurology
Central Sensitization of Migraine

- Switch in autonomic balance
- Central processes of the trigeminal afferents
- Third order neurons in the thalamus
  - Retinothalamic mechanism
- Limbic structures and rostral pons
  - Triggered by olfactory input
- Serotonergic neurons in nuclei raphe
- Cortical spreading depression and kindling

Peripheral Sensitization

- Retinal projections to the thalamus
  - Non-image forming pathway maintains circadian rhythms
- Project to primary somatosensory cortex, parietal association cortex and primary and secondary visual cortices
- Connection between trigeminal nerves and upper cervical nerve roots
  - Tenderness in the neck without muscle contractions
- Allodynia
Neurotransmitter Substances

- Histamine
- Acetylcholine
  - Relaxation of smooth muscles
- Serotonin
  - Abnormal platelet aggregation
- GABA
  - Loss of normal inhibitory responses

Persistent Dizziness causes in Post Concussion Syndrome (PCS)

- Chronic Pain
- Chronic Stress
- Cervical Strain
- Deconditioning
- Pituitary Dysfunction
- Insomnia
- Vestibular Dysfunction
- Oculomotor Dysfunction
- CNS neuropathology
  - Autonomic Dysfunction (cerebral hypoperfusion or attenuated blood flow in the brain)
  - Anxiety/Depression
  - Post Traumatic Stress Disorder
  - Psychosomatic effects (classically conditioned responses)
Dysregulation or uncoupling of finely tuned neurovascular units
THE DILEMMA OF TRAUMA

• “The person experienced, witnessed or was confronted with an event, or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others.” (Diagnostic and Statistical Manual of Mental Disorders, Forth edition)

• “the person’s response”
  • intense fear
  • helplessness
  • horror

• “Trauma is in the brain, not in the experience”

  • The perception that old traumatic procedural memories are actually in the present moment: a corruption of memory

Memories vs sensitizations

• Normal memory
  • Events are remembered as stories
  • Can change over time.
  • Do not evoke intense sensations or emotions

• Traumatic sensitizations
  • Immediate sensory and emotional response
  • Knowledge of event may be absent
  • Dissociation
Traumatic memories

- Connected with “sense of self” and self-awareness
- Fear and fury
- Hyperarousel
- Interfere with forming a well defined, verbal memory of events
- Lose sense of self
- Helplessness
- Look to others for reassurance

Keys to trauma

- The retention of traumatic procedural memories through fear-conditioning and kindling
- Kindled posttraumatic procedural memories provide repetitive, unconscious cue-related input to fight/flight
- Increased dysfunctional autonomic cycling.
- Experiences that are locked into the limbic system through the cortex are not accessible to the conceptual mind.
Fear of being consumed by terrible feelings

- Actively avoid them
- Dissociate feelings
- Bodies tighten and brace against feelings
- Medications, illicit drugs, alcohol

Signs Suggestive of a Traumatic Past

- Tactile Defensiveness
- Defensive Intellectualism
- Breath Alteration
- Boundary Rupture
- Self Sabotage-Affinity to put themselves in the wrong place at the right time!
- Patient Initiated Termination
Sympathetic: Fight/Flight/Freeze

- Adaptation to emergencies
  - General adaptation syndrome
    - Alarm, resistance and exhaustion
- Neurons in medulla
  - Cardiovascular
  - Respiratory
  - Gastrointestinal
  - Baroreceptors
- Excitation!!!

PARASYMPATHETIC: Rest and Digest

- Vagal responses
- “Gut feelings”
- **Increases:** digestion, intestinal motility, fuel storage (increases insulin activity) resistance to infection, circulation to non-vital organs, (skin, extremities...) endorphins, the "feel good" hormones
- **Decreases:** heart rate, blood pressure temperature
  - Inhibition!
**Freeze response**

Life threat while in a state of helplessness
- Numbing through endorphins
- Vagal (parasympathetic)
- Accelerator/Brake

“Discharge” of the freeze response allows “completion” of escape or defense in procedural memory, extinguishes conditioned somatic cues

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**CONDITIONING IN TRAUMA**

- Lack of “completion” imprints the conditioned association of the threat:
  - The sensori-motor experience of the body
  - The emotional state
  - The autonomic state of arousal within procedural memory
  - This association leads to fear conditioning, or traumatization
Parasympathetic Dominance

- Palpitations, nausea, dizziness, indigestion, abdominal cramping, syncope, diarrhea and incontinence, exhaustion.
- IBS, PMS, colitis, chronic fatigue, ulcers, interstitial cystitis (IC)
- Pelvic floor dysfunction (PFD), orthostatic hypotension, gastric reflux
- Increase in abdominal tension and bloating

*Figure 8.2: The autonomic nervous system in trauma.* Tonic input into natural oscillatory systems may lead to increasing oscillations to the extremes of physiologic tolerance. This phenomenon may in part explain the self-perpetuated exaggerated autonomic cycling between arousal and dissociation in PTSD.
Dysregulation

• “The loss of the ability to regulate the intensity of feelings is the most far reaching effect of early relational trauma”

• The loss of the ability to regulate intensity of feelings and the intensity of physiological changes is the most common complaints.

Shield from dangerous impulses within patient’s own personality, as well as attack from others.

Van der Kolk & Fisher, 1994

Character representations of Parasympathetic Dominance

• These patients do not like change, as with appointments.
• Hard to conceptualize: may need to use pictures.
• Create safe place in office, do NOT get between the client and door!
• Minimal hand gestures, safe body posture.
Persistent Non-vertiginous dizziness

Normal Efficient, Subconscious Balance System

Following any Insult to the Balance system.....

- **Misweighting of sensory information** with heavy dominance on vision and underweighting of proprioception and even reciprocal inhibition of vestibular information
- **Heightened awareness** to motion/destabilizing cues and conscious motor control
- Amygdala Perceives **THREAT** driving increased autonomic dysregulation of sympathetic and parasympathetic responses
### The balance system “Overrides”

- **Cortex/Thalamus**
- **Vestibular nuclei**
- **Cerebellum**
- **Amygdala**
  - Perceived threat
- **Vestibular nuclei**
  - Cerebellum
- **Cortex**
- **Heightened awareness**
- **Conscious Motor control**
- **Vision**
- **Somato-sensory**
- **Brainstem Autonomic control**
- **VSR & COR**
- **VOR**
- **Ocular tilt response**
- **Fight or flight**

### Boundaries

- Small safe world, “invisible but real”
- Collective experiences, positive and negative
- Senses - smell, vision, hearing, vestibular, taste, touch, proprioception and nociception help form these boundaries
  - Eventually tell us where we as a perceptual whole end, and the rest of the world begins
  - Threat, hurt, violence, shame; in a state of perceived helplessness.
Personal Boundary

- Energetic sense of self that extends beyond the physical body
  - Valerie Hunt, PT, Ed.D, Professor Emeritus of Physiological Science at UCLA
- In health, extends 2’-4’ outside body
- Helps us to define sense of safety
- Helps to define a sense of privacy
- Collapses during traumatic experience

Regardless of the cause...we need to get them better
Differentiating Subjective Complaints

What do they mean by Dizziness?
What is driving the Disability?

The Fine ART of the Dizzy History

◆ **Quality**: Instead of spinning its more constant vague sensations of motion & vague unsteadiness
◆ **Associations**: stress, marked with FEAR/worry
◆ **Triggers**: wider variety triggers including environmentally
◆ **Duration**: Very persistent with NO severe definable events other than onset
**Differentiating Subjective complaints**

(SMD=Space and motion discomfort)

<table>
<thead>
<tr>
<th></th>
<th>Vertigo</th>
<th>Motion Sick</th>
<th>SMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length/Duration</td>
<td>Shorter/defined</td>
<td>Slow build, Long duration</td>
<td>Immediate sensation</td>
</tr>
<tr>
<td>Trigger</td>
<td>Vestibular Stimulation</td>
<td>Real or illusory Sense of motion</td>
<td>Unusual/busy Visual cues</td>
</tr>
<tr>
<td>Predictability</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Primary c/o</td>
<td>Spinning/ Postural disturb</td>
<td>Malaise &amp; Nausea</td>
<td>Dizzy, phobic rx, Imbalanced</td>
</tr>
<tr>
<td>Nystagmus</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Pathology</td>
<td>P&gt;C vestibular dysfunction</td>
<td>Unknown</td>
<td>Unknown Abn CTSIB</td>
</tr>
<tr>
<td>Role of Meds</td>
<td>Often contra indicated</td>
<td>Needed</td>
<td>?Habitate Visually?</td>
</tr>
</tbody>
</table>

**Dizziness Handicap Inventory (DHI)**


- 25 item “Self perceived handicap”
- Grouped “because of your problem…”
  - Function
    - What is it difficult
  - Emotion
    - Do you feel...
  - Physical
    - What increases your symptoms
- Reliable, high test-retest (Pearson’s r=.97)
Quantifying Visual Vertigo and Space and Motion Discomfort (SMD)

- Situational Vertigo Questionnaire (SVQ)
  - Pavlou, 2004

- Visual Vertigo Analog Scale (VVAS)
  - Adapted from Longridge
Persistent Non-vertiginous dizziness

### Visual Vertigo Analogue Scale

Dannenbaum J. Vestib Res 20011; 21(3): 153-9

<table>
<thead>
<tr>
<th>Situation</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking through a supermarket aisle</td>
<td>10</td>
</tr>
<tr>
<td>Being a passenger in a car</td>
<td>10</td>
</tr>
<tr>
<td>Being under fluorescent lights</td>
<td>10</td>
</tr>
<tr>
<td>Watching traffic at a busy intersection</td>
<td>10</td>
</tr>
<tr>
<td>Walking through a shopping mall</td>
<td>10</td>
</tr>
<tr>
<td>Going down an escalator</td>
<td>10</td>
</tr>
<tr>
<td>Watching a movie at the movie theater</td>
<td>10</td>
</tr>
<tr>
<td>Walking over a patterned floor</td>
<td>10</td>
</tr>
<tr>
<td>Watching action television</td>
<td>10</td>
</tr>
</tbody>
</table>

Values > .7 Associated with disabling space and motion discomfort

Patient Scored with 60/76 or 3.1

SITUATIONAL VERTIGO QUESTIONNAIRE

Vertigo is the medical term used for symptoms which patients often describe as feelings of unexplained disorientation, dizziness, light-headedness, lightheadedness or unsteadiness. Please rate a number to indicate the degree to which each of the situations listed below causes feelings of vertigo, or makes you vertigous. If you have never been in one of the situations then for that item write “N.T.” for “Not tried”.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riding as a passenger in a car on straight, flat roads</td>
<td></td>
</tr>
<tr>
<td>Standing in a lift while it stops</td>
<td></td>
</tr>
<tr>
<td>Standing in a lift while it moves at a steady speed</td>
<td></td>
</tr>
<tr>
<td>Riding in a car at a steady speed</td>
<td></td>
</tr>
<tr>
<td>Standing or stopping in a car</td>
<td></td>
</tr>
<tr>
<td>Standing in the middle of a wide open space (e.g. large field or square)</td>
<td></td>
</tr>
<tr>
<td>Sitting on a bus</td>
<td></td>
</tr>
<tr>
<td>Standing on a bus</td>
<td></td>
</tr>
<tr>
<td>Heights</td>
<td></td>
</tr>
<tr>
<td>Watching moving scenes on the T.V. or at the cinema</td>
<td></td>
</tr>
<tr>
<td>Travelling on escalators</td>
<td></td>
</tr>
<tr>
<td>Looking at striped or moving surfaces (e.g. curtains, Venetian blinds, flowing water)</td>
<td></td>
</tr>
<tr>
<td>Locations of a cretinous environment or microcells</td>
<td></td>
</tr>
<tr>
<td>Going through a tunnel looking at the lights on the side</td>
<td></td>
</tr>
<tr>
<td>Driving over the brow of a hill, around bends, or in wide open spaces</td>
<td></td>
</tr>
<tr>
<td>Watching moving traffic or trains (e.g. trying to cross the street, or at the station)</td>
<td></td>
</tr>
</tbody>
</table>

Scoring: total sum/10 number not tried
Persistent Non-vertiginous Dizziness

Visual Vertigo Analogue Scale

Indicate the amount of dizziness you experience in the following situations by marking off the scales below. 0 represents no dizziness and 10 represents the most dizziness.

- Walking through a supermarket aisle: 8
- Being a passenger in a car: 7
- Being under fluorescent lights: 6
- Watching traffic at a busy intersection: 8
- Walking through a shopping mall: 9
- Going down an escalator: 6
- Watching a movie at the movie theatre: 8
- Walking over a patterned floor: 9
- Watching action television: 8

Total 69/90
Average 7.7

Significant Anxiety
Negative Scale > 29.9

Significant Depression
Positive Scale < 22

Very slightly or not at all
1
2
3
4
5
moderately
quite a bit
extremely

interested (P)
distressed (N)
excited (P)
upset (N)
strong (P)
guilty (N)
scared (N)

irritable (N)
alert (P)
ashamed (N)
inseminated (P)
nervous (N)
determined (P)
attentive (P)

jittery (N)
active (P)
afraid (N)
hostile (N)
enthusiastic (P)
proud (P)

Positive Affect Negative Affect Scale or PANAS

Persistent Non-vertiginous dizziness

Criteria for a PANIC ATTACK

- Discrete spells intense fear or discomfort that escalate within 8-10 min. with at least four of following:
  - Dizziness/Lightheadedness (50-80%)
  - Nausea
  - Shortness of breath (smothering sensation)
  - Palpitations or tachycardia
  - Trembling or shaking
  - Sweating
  - Choking
  - Depersonalization or de-realization
  - Numbness or paresthesias
  - Flashes (hot flashes) or chills
  - Chest pain/discomfort
  - Fear of dying
  - Fear of going crazy or doing something uncontrolled
Evaluation general guidelines

- Unusual balance performance
  - Increased upper body sway reactions, out of proportion to level disturbance
  - Adopting postures that require increased balance e.g. Momentary single leg stance exposures, narrowed heel-toe walking
- Normal performance but with poor tolerance
- Level of disability doesn’t match clinical findings/impairments
- Aphysiologic/Inconsistent Performance
- **Do NOT over call non-diagnostic findings**
  - Don’t over read non-localizing findings clinical findings IF HISTORY doesn’t support
  - The “gray zone” in diagnostics
  - Non-localizing findings don’t support vestibular illness if subjective c/o inconsistent with vestibular illness

Evaluation Specifics

- Oculomotor Testing (Quality and Tolerance)
  - Smooth, Saccade, Convergence, OPK, VOR cancellation, Cover/uncover or Maddox Rod
- Visual Motion Sensitivity
  - Subjective intolerance: oculomotor testing & CTSIB 3/6
  - Subjective report and questionnaires
- Motion Sensitivity Testing (MSQ)
  - Positioning and positional testing
- CTSIB/SOT Testing
  - **Sensory processing deficits**
    - Best quantified per CTSIB or SOT testing
    - Jacob RJ et al 2009
  - Advocate use of full CTSIB not modified
    - Use checkerboard poster movement to simulate 3/6
    - “Across the board” CDP results
      - Effect of the threat system on balance
IMPORTANCE OF OCULOMOTOR TESTING

• Ocular/vestibular processing issues are common and can be a driving disabling factor with concussion
• Pre-existing ocular motor issues (i.e. Lazy eye) can decompensate following a concussion
• Ocular issues can have impact and delay recovery
• INTERVENTION can be very helpful!!

Identifying Aphysiologic Behaviors

Gait Characteristics:
- Moment to moment fluctuations: 51%
- Excessive slowness or hesitation: 51%
- Exaggerated sway on Romberg: 32%
  - improves with distractions
- Uneconomical postures: 30%
  - wasted muscular energy
- Extreme caution and restricted steps: 30%
  - walking on ice
- Sudden buckling of knees: 27%

• Found in 9% of neurologic inpatients
Identifying Aphysiologic Behaviors

• Legs scissoring without evidence of spasticity
• Inconsistencies in performance
• Backward Translations on Fukuda Stepping Tests
• Functional inconsistencies with Clinical Testing
• Aphysiologic Behaviors on Computerized Dynamic Posturography
  • Poorer scores on easier conditions than harder
  • Circular sway paths and/or excessive lateral sway without falls
  • Repetitive large amplitude A/P sway
  • Exaggerated delayed motor responses
  • High intertrial variability

Identifying Voluntary Eye Movements

• Voluntary Convergence Spasm
  • Spontaneous convergence w/miosis
  • Patient often describes associated “dizziness”
  • Patient must concentrate distraction influences
  • Not brought out consistently with gaze or positional testing
  • Inconsistent/episodic
  • No other collaborative findings
  • Learned behavior as convergence can suppress nystagmus

• Voluntary Ocular Flutter
  • Doesn’t increase behind closed eye lids
  • Usually associated with vergence eye movements
  • Must concentrate
  • Usually have to converge to get it started
Convergence Spasm
Anne Mucha PT, DPT, MS, NCS

Versus this presentation
Differentiating Convergence Spasm

- **Pathologic**
  - Instability of vergence premotor commands from dorsal midbrain
    - Diencephalon lesion
    - Etiology: TBI, MS, midbrain CVA, pineal tumor, cerebellar lesions
  - More persistent
  - Can be triggered with lateral or up gaze
  - **Usually will have other fixed deficits as well**

- **Voluntary**
  - Volitional convergence accompanied by pupillary constriction
    - Patient must concentrate
    - Distraction influences
  - Inconsistent / Episodic
  - Not brought out with lateral gaze
  - **No other oculomotor defects**
  - **Learned behavior:**
    - Convergence can suppress VOR and nystagmus

Differentiating Flutter

- **Aphysiologic or voluntary nystagmus**
  - Can be learned and not to be confused with flutter
  - Frequently associated with vergence eye movements, pupil constrictions, and eye lid motions
  - Must concentrate

- **True Ocular Flutter**
  - Increases behind closed eyelids
  - Is frequently induced with vertical eye movements
  - Is often associated with cerebellar signs on exam
  - Have to converge to get it to start
Voluntary Nystagmus

Differentiating PPPD versus Anxiety

**PPPD**
- Predominant and disabling Visual Vertigo
- Strong environmental triggers
- Initial trigger more often associated with definable medical event
- PRIMARY RX: **Visual motion desensitization** with graded balance challenge and habituation

**Anxiety**
- More phobic-fear based avoidance
- Predominant fear-based postural/movement strategies
- Initial trigger more often associated with psychiatric triggers
- PRIMARY Rx: **building balance confidence** with progressive movement exposures and graded habituation
Management of persistent non-vertiginous dizziness

- Identify what is driving the persistent symptoms
- Critical to get that under control first
- Look at the whole person
  - “It is more important to know what sort of a patient has a disease, than what sort of disease a patient has.” Sir William Ostler 1911
- Task specificity and principles of vestibular rehabilitation are still critical
EDUCATION:
Reduce Threat & Change Locus of control

Evidence that triggering event is healed
- e.g. No longer ear’s fault

DISCUSS common “complication to healing”

Evidence on capacity to heal
- review NORMAL findings

Empower that what triggers dizziness CAN BE WHAT HEALS THEM!!!!

Concept of capacity to Sensory Re-weight
- ability to help brain choose correct sense

Website is about symptoms which are:
Neurologic
REAL (not imagined) Due to Problem with the FUNCTIONING of the nervous system NOT neurologic disease

www.neurosymptoms.org
 RELAXATION TRAINING: ANS Calming

- Guided Relaxation/mindfulness training/experiencing
- Grounding (G)
- Sound (S) Quieting the Mind
- Breathing (B) training awareness
  - Mindful, diaphragmatic, resonant frequency breathing
- Body Scan: Muscle tension awareness
- Imagery
- Assigned practice 10-40 min daily and frequent GSB during day
  - Podcasts, Scripts, Online, Apps

Example Relaxation/mindfulness resources

- Book: The Mindful Way through Depression by J Mark G. Williams
  - CD included with Jon Kabat-Zinn
- Apps
  - “Calm : 7 free sessions that can be repeated different length, subscription needed to fully use the program
  - “Insight Timer”: Free guided meditations, music tracks, talks and courses
- Online Resources:
  - Martin Rossman: https://thehealingmind.org
  - Tara Brach: https://www.tarabrach.com
Focus on breathing pattern

Breathing

- Oxygenation of the organism can be determined by monitoring how long the patient can pause their breath w/o stress.
  - 20-60 Sec in health
  - 5 Sec in diseased states.
  - Breathing can be trained!!!!
Breathing

- Oxygen is a natural anti-inflammatory
- High blood pressure can be related to poor breathing
- Sleep disturbance when breathing is not normal
- Increase in upper quadrant tension
- Modulates anxiety/relaxation

Associative Awareness Technique ™

- Reflex relaxation
- Change negative association by creating positive sensory, emotional and cognitive awareness.
- Identify and manage the “startle reflex”
- Uses the law of reciprocal inhibition
- Neuroplasticity
- Behavioral conditioning
Mechanoreceptors

- Touch
  - Cutaneous stimulation
- Pressure
  - Weighted blanket, weights on/through shoulders
- Temperature
  - Neutral Warmth
- Sound
  - Inner voice, language and music

Habituation=Guided neuroplasticity

- Habituation WITH emphasis on control/groundedness
  - Small doses, long rest periods
  - Calm fight/flight responses
  - Primary goal is control of symptoms
  - Watch for inefficient stabilization/high threat behaviors

☐ ID & Rx patient’s exact trigger

- Progress intensity as tolerance builds & autonomic reactivity decreases
- GOAL: reduce sensitivity to head/visual motion intolerance
  - 3-5 repetitive motions (2-4 minutes), rest, repeat 3 sets, TID
  - Visual tracking and or slow VORx1 in sitting (supine if needed) 10-20 seconds up to 1-2 minutes, TID
  - Add into standing & gait: 90, 180, to 360 degree turns independently then within gait
Sensory REWEIGHTING FOR PROPRIOCEPTION:

- Surface orientation/GROUNDING
  - Taught sitting & supine initially
  - Describing centering pressure and body resonance with resistance, weightshift, leg press/lifts and pelvic motions (CORE IMAGRY)
  - Attention to areas of tension, heaviness, lightness, effect on breath
  - Teach concrete “resources” to distract/replace “dizziness”
- Initially with eyes open as soon as possible eyes closed (soft gaze)
- Prescribed somatosensory “games” as much eyes closed as comfortable, NOT just ground but BODY FOCUS
  - Supine, Sitting, Standing wide to narrowing feet 5 min daily, Progress to Tai Chi always DEMANDING no distraction from breath/ground or evidence fight/flight
- If NOT careful we can MAKE patients “too surface dependent”, this is only the beginning and needs to progress to VESTIBULAR LOADING

SENSORY REWEIGHTING (cont.)

- Vestibular Uptraining (verticality perception)
  - Once somatosensory confidence built
  - Sitting dynadisc eyes closed
    - Sitting on pillows/dynadisc 2-4 minutes Daily
  - Sitting tiltboard weight shifts eyes closed
  - Standing foam progressions both COG and LOS
  - Standing tiltboard (A/P and Lateral) or BOSU
    - Teaching head righting, perception of hip vs ankle motion
  - Treadmill with visual tasking/sway referencing
- Dissociative movements & Open integrated motions
- Successful movement experience
  - Optimal balance NOT standing still but controlling/enjoying movements
“Safety Behaviors”

- Promote activities that DON’T require safety behaviors and progress until NO need for “safety behaviors”
- GET HEAD UP WHEN WALKING
- Cues to STOP TOUCHING THE FURNITURE
- Careful use of Assistive devices
  - Expectation of faster gait
  - EXPECTATION that will be needed for short period

Treatment of Oculomotor Deficits

- No evidence smooth pursuit, saccade, or VORc deficits can be improved but....
  - Anecotally and theoretically: Role of exercises in forcing compensatory strategies and habituative effects
- Convergence Spasm
  - Needs referral
  - Medical Rx: Cycloplegic drops, Botox, Lens corrections/prisms
  - No evidence convergence exercises can improve
- Convergence Insufficiency Training anecdotally helpful
  - Referral to Behavioral Optometry if no response in 2-4 sessions
Convergence Insufficiency

- Near Point Convergence (NPC)
  - Normal without diplopia is <6 cm (2.4”) from nose (Scheiman M 2003)
  - > or = 5 cm: Convergence Insufficiency
  - Recovery should be with in 3 cm

- Watch for deviation of eye at moment c/o diplopia

- Accomodative insufficiency
  - Primary c/o blurriness

Appreciating “Physiologic Diplopia”
Convergence Insufficiency Rx

- **Pencil Pushups (1-2 minutes, 1-3x/day)**
  - Gradually bring pencil in toward nose with letting it double, hold, then slowly return out
  - Check for suppression (can use ruler with pipe clamp)

- **Teach physiologic diplopia (1-2 min, 1-3x/day)**
  - with pen and finger at eye level in a line, one near and one behind or far
  - Focus on the one in front and the one behind should “double”
  - Focus on the one in back and the one in front should “double”

- **Connected Dots on Card (1-2 min, 1-3x/day)**
  - Teach them to describe what see: “V” or “X”

- **Additional Eye Games for variety of issues related especially to reading tolerance**
  - Great Website: http://www.eyecanlearn.com/

Convergence Progression

- **Broc String Level 1**
  - Teach and describe what see (physiologic diplopia)
  - “Fuse” beads far, middle, near 10 secs/10 x then as able move near bead closer

- **Broc String Level 2 (Bug on string)**
  - Just one bead on string (fixate on end, notice 2 crossing) slowly move bead up (trombone slide) with goal to do this without the bead

- **Broc Sting Level 3 (Convergence Surprise)**
  - Just one bead on string
  - Patient closes eyes and randomly place bead, open eyes and fixate
  - Repeat 10 x

- **Barrel or 3 Dot color cards**
  - Report one barrel that is mixture (luster) of colors and others should be seen as double
  - Fixate middle 10 sec, closes 10 seconds, cont to alternate
  - Level 2 Alternate between dot and a distance target holding for 10 seconds
Reducing Visual Motion Sensitivity
(Anthony Oleski, OPK motion sickness/visual)

- **Education concept of Sensory Re-weighting** (ability to choose correct sense)
- **Integrate Relaxation skills** into all exercises

- **Compensation skills** if necessary until
  - Decreasing optic flow: sun glasses, extended blink
  - Natural lighting, screen contrast,
  - Rose tinted glasses (FL-41 tint), (IRLEN institute)

Visual motion Desensitization PROGRESSIONS

- **OPK stripe (OKN Strips APP) in sitting** (generate nystagmus and “stare thru” soften 10 seconds to 2 minutes)
  - Sitting, wide stances to semi-heel toe position and cushions eventually
- **90 “look behinds” 3x TID**
  - Progressed to 180, to 360 degree turns in stance and then to within gait
- **Tennis ball on wall drills 2–5 minutes daily**
  - initially with full relaxation/grounding as main focus and infrequent tosses
  - Standing, more frequent
  - Add balance challenge as able
Umbrellas & Disco balls

- **Umbrella spinning**
  - 1-2 mins TID
  - supine, sitting, standing, balance challenge
  - Monitor carefully for normalized stabilization NO fight/flight

- **DiscoBall immersion**
  - 10-20 minutes, sitting, standing, walking/balance
  - Hanging a focus point in room (Marsden ball)???
  - www.spencersonline.com 20$ “Udo Disco Ball”
  - www.starlight.com $99.00 (wall mounted) “Starball”

Grocery Store/library

- 4 intervals of casual walking
  - until symptoms raise 2 points (1-10)
  - Note time and repeat and build

- EASY store, EASY time of day
  - Busier, more complex

- Goal 20–30 minutes
  - No items
  - increase finding items from 5–10 to 20–30 items
  - advancing demands postural demands
  - NO safety behaviors

- Advance till NO AVOIDING!!
IPAD YouTube..

- **IPAD Visual games when sitting, to standing, to eventually with walking (10-20 MINUTES)**
  - Picture scanning
  - Card games that were provocative
  - YouTube Specific environment exposures
  - Needs to be specific to patient

- **PHONE APPS**
  - Card games that were provocative

Virtual Reality & Immersed OPK......
Stripes to virtual grocery stores, stable ground to moving...
NEUROPLASTICITY AND HEALING TRAUMA

- Therapy rewire the brain and takes time
- Regulatory skills restore homeostasis, reduce serum cortisol, restore the hippocampus
- Mindfulness and attunement skills inhibit the amygdala, enlarge frontal cortex
- Fear extinction of traumatic memory cues inhibits kindling
- Empowerment replaces helplessness
- Increased frontal cortex, hippocampus in meditation
Therapeutic Alliance

• “The therapist ability to form an alliance is possibly the most crucial determinant of his effectiveness.”
  • Luborsky et al (1985)

• Therapeutic alliance: subtle, dynamic relationship between patient and therapist. Not an intervention or technique, rather vehicle within which therapeutic process is facilitated.
  • Schore

Therapeutic Presence

• Safety
• Establish a non Threatening Presence
• Be able to Allow the Client to Downregulate
• Be Congruent
• Meet all levels
• Create a sense of security, normalize their experience
Therapeutic Presence

• Therapy is not the “talking cure” but the “communicating cure”
• Not what to do for the patient or what to say to the patient, but how to be with the patient

The Saga of the difficult patient

• Does not respond as one would expect
• Rebound effect
• Relapse, etiology unclear
• Reactive
• “High Maintenance”
• Physical findings inconsistent
Primary secret of a successful life is balancing stressors and resiliency

SUMMARY

• Persistent non-vertiginous dizziness is common and can be very disabling
• Pathogenesis is Multifactorial and Interactive
• Number of standardized assessment to help to quantify impairments to allow optimal exercise prescription and some definable diagnostic criteria are available
• Mounting evidence that graded exposures to provocative visual stimuli can lessen disability if it can be accomplished without abnormal autonomic reactivity
• Patients can Sensory Reweight and thru graded movement experiences normalize balance confidence and lessen space and motion discomfort
• PT is being found to be effective at lessening disability