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Vestibular Rehabilitation

presented in partnership with Salus University
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Presenter Biography

- Associate Professor, School of Audiology, Pacific University
- Adjunct Assistant Professor, Osborne College of Audiology, Salus University
- Sub-Contractor for Balance Component, NHANES 2019-2020
- WOC appointment for the NCRAR
- Wife, daughter, sister, friend, and doggy-mom.

Course Aims

- This course aims to educate the Audiologist on the principles of Vestibular Rehabilitation Therapy, and equip the Audiologist to immediately guide her or his dizzy patient on the path to recovery.

Course Learning Objectives

- 1) State and describe the three main types of Vestibular Rehabilitation Therapy (VRT).
- 2) Rank the predicted outcomes of VRT by the type and degree of vestibular and balance disorder.
- 3) Identify one “daily” task that can be used for the various types VRT, and what would not be appropriate as VRT.

Step 1: What is V(B)RT?

- Vestibular (and Balance) Rehabilitation Therapy is the long-term, movement-based treatment of vestibular disorders, with the aims to improve functional outcomes.
- As audiologists, we focus do not focus on the “and Balance” part of VBRT, but when we improve vestibular function, we should improve balance.

Step 1: What is V(B)RT?

- Does not include short-term treatments, such as Canalith Repositioning Procedure, medications, or surgery, but can be used in combination with these to improve overall outcomes.
- Using the Herdman model, there are three main types of VRT:
 - Adaptation
 - Habituation
 - Sensory Substitution

VRT: What does it look like?

- VRT is a fluid mosaic.
 - Patient-based
 - Function-based
 - Goal-based
- Exercises range from seated to walking, with movement of the eyes, head, or both.
- Ranges from including high-level technology or no tech at all.

Cawthorne Cooksey Exercises

- In bed or sitting
 - Eye movements -- at first slow, then quick
 - up and down
 - from side to side
 - focusing on finger moving from 3 feet to 1 foot away from face
 - Head movements at first slow, then quick, later with eyes closed
 - bending forward and backward
 - turning from side to side.
- Sitting
 - Eye movements and head movements as above
 - Shoulder shrugging and circling
 - Bending forward and picking up objects from the ground
- Standing
 - Eye, head and shoulder movements as before
 - Changing from sitting to standing position with eyes open and shut
 - Throwing a small ball from hand to hand (above eye level)
 - Throwing a ball from hand to hand under knee
 - Changing from sitting to standing and turning around in between
- Moving about (in class)
 - Circle around center person who will throw a large ball and to whom it will be returned
 - Walk across room with eyes open and then closed
 - Walk up and down slope with eyes open and then closed
 - Walk up and down steps with eyes open and then closed
 - Any game involving stooping and stretching and aiming such as bowling and basketball

<http://www.dizziness-and-balance.com/treatment/rehab/cawthorne.html>

VRT: What's happening

- General concepts:
- Neural recalibration of vestibular input for vestibular mismatch
- Neural recalibration of sensory weighting of the three main inputs to balance: vision, vestibular, and somatosensory
- Teaching of new skills, to compensation for vestibular loss

Flashback: Vestibular Education

- Quick show of hands- how many of you, listening to day, had distinct vestibular coursework for your Audiology education (AuD or Master's level)?
- How many of you had, within it, education on the treatment of vestibular disorders (surgery, CRP, medication, etc.)?
- How many of you had, within it, education on therapy-based treatment of vestibular disorders?

Vestibular Education: Current

Is it important?

- YES!
- 73% of faculty respondents said “Critical” or “Moderately” important
- 81% of recent grads stated “Critical” or “Moderately” important
- “Slightly Important”: 27% faculty, 19% recent grads
- “Not important”: 0%

Are we doing it?

- Not really...
- Faculty:
 - 13% report “not covered”
- Recent Grads:
 - 38% report “not covered”

Vestibular Education: Need

- Agrawal et al (2013): NHANES data revealed that 35% of people over 40 have postural sway issues, and 85% of those over the age of 80 evidenced balance disorders
- Data from Criter and Honaker: Falls more prevalent in patients in the Audiology clinic (68%) than non-patients (28%)
- Vestibular rehabilitation therapy reduces falls (show in studies, past 20+ years)
- *Summary: If you are working with Audiologic patients, you're probably working with patients who are at a falls risk, so it would behoove you to know more.*

Back to VRT: Who does it?

- Audiologists
- Physical Therapists
- Occupational Therapists
- Optometrists- oculomotors
- Non-prescribed exercises:
 - Tai Chi classes
 - Yoga
 - “Balance-focused training” at a local gym
 - Exercises gleaned from the internet

VRT: Who Benefits?

- Most benefit: Stable, unilateral vestibular injury
- Examples: Vestibular neuritis, labyrinthitis

- Least benefit: Fluctuating, central pathology
- Examples: Multiple sclerosis, Alzheimer’s disease

VRT: Who benefits? Rankings!

- | | |
|------------------------------------|------------------------|
| ▪ Transient Ischemic Attack (TIA) | 1. Vestibular Neuritis |
| ▪ Superior-Canal Dehiscence (SSCD) | 2. TIA |
| ▪ Neuritis | 3. SSCD |
| ▪ Auto-immune disease | 4. Auto-immune disease |

VRT: Who doesn't benefit?

- Poor compliance predicts the worst outcome of all.
- Patients with fluctuating pathologies will still see some benefit, just limited.

VRT: Other Factors

- Psychological factors
 - Anxiety
 - Depression
 - High levels of stress
- Central co-morbidities paired with vestibular disorders
 - Migraine
 - Untreated visual loss
 - Oculomotor abnormalities
 - Overall poor health

VRT: Summary “So Far”

- What is VRT?
 - Long-term intervention to improve vestibular and balance function
- Who does VRT?
 - Audiology, **PT**, OT, Optometry...
- Who Benefits?
 - Most: Stable vestibular injury
 - Least: Fluctuating, non-vestibular balance insult (i.e., MS)
- *Need to treat other confounding pathologies first for best VRT outcomes*

VRT: The Nitty Gritty

Three main categories of VRT

- Adaptation/Gaze Stabilization
- Habituation
- Sensory Substitution

VRT: Adaptation

- Adaptation, sometimes also referred to as “gaze stabilization” focuses on improving vision in dynamic conditions (aka, the vestibulo-ocular reflex.)
- Information from the cerebellum (nodulus) provides feedback to the vestibular nuclei, adjusting firing rate.




VOR/Adaptation Exercises: “Level 1”

Task:

- Focus on stationary target (reading) with head movements
- Increase speed as ability increases

Conditions:

- Horizontal
- Vertical
- Seated (VOR 1 video)
- Standing
- Walking



Figure 2A: Look straight ahead. Figure 2B: Turn your head 45 degrees towards the right. Figure 2C: Turn your head 45 degrees towards the left.

Note: Business card should be positioned at eye level. (c) T.C.Hain, 2002

<http://www.dizziness-and-balance.com/treatment/rehab/gaze%20stab.html>




VOR/Adaptation Exercises: “Level 1.5(?)”

Task:

- Focus on moving target with **head stable**
- Saccades
- Smooth pursuit
- Increase speed as ability increases

Conditions:

- Horizontal
- Vertical
- Seated
- Standing

Example: until 1:14 of <https://www.youtube.com/watch?v=dXRhUjP7pSs>

VOR/Adaptation Exercises: “Level 2”

Task:

- Focus on moving target (reading) with head movements
- Movements of target and head should be in the same direction
- Increase speed as ability increases

Conditions:

- Horizontal
- Vertical
- Seated
- Standing
- Walking

Example: start at 1:16 of <https://www.youtube.com/watch?v=dXRhUjP7pSs>

VOR/Adaptation Exercises: “Level 3”

Task:

- Focus on moving target (reading) with head movements
- Movements of target and head should be in OPPOSITE directions
- Increase speed as ability increases (as possible)

Conditions:

- Horizontal
- Vertical
- Seated (video VOR3)
- Moving – seated (i.e., physio ball) (video VOR2)
- Standing
- Walking

Adaptation

- Exercises must be performed at multiple frequencies; exercises at one frequency do not carry over to other frequencies
- Visual engagement is critical, as we are also engaging the reticular formation, and utilizing visual input as part of the adaptive feedback (from the cerebellum).

VRT: Habituation

- Focuses on reducing symptom intensity and duration by repeated exposure to offending stimulus, in small doses.
- Can be assessed using standardized tools, or through patient interview

Habituation: MSQ

Standardized Testing: The Motion Sensitivity Quotient (MSQ)

- 16 positions/movements
- Patient is asked to rate intensity (0-5) and duration of symptoms
- Clinician records patient report and looks for nystagmus in all positions
- Printable versions available at http://www.chartercare.org/uploads/appendix_g_motion_sensitivity_test.pdf
- (Video MSQ)

Habituation: “Other” Exercises

Custom-based exercises

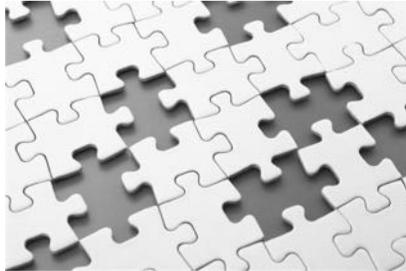
- ASK your patient what triggers symptoms
- Gently guide them through repeated exposures (3-10 minutes, 3 times per day) until symptoms subside (or at least, are at a tolerable level)
- “Maintenance exercises”- consider it a marathon!

Brandt-Dardoff Exercises

- <https://youtu.be/RtLdDLkDbIY>

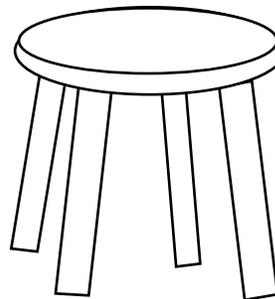
VRT: Sensory Substitution

- Substitution, aka Sensory Substitution is recruiting the other parts of the balance system to “replace” missing vestibular input



Facets of the Balance System: Which Systems?

- Proprioceptive
- Visual
- ~~Vestibular~~
- Autonomic
- Cognitive



Substitution Exercises: Proprioceptive

- Proprioceptive System
- Improve proprioceptive reception and/or input
 - “Sensory” exercises- barefoot, multiple stimuli
 - (Video)
 - Seated, then standing
 - Addition of canes/walking sticks, not for support, but for increased proprioceptive input

Substitution Exercises: Proprioceptive

- Entire-body proprioceptive
- Walking/standing on compliant and/or uneven surfaces
 - Tai Chi
 - Yoga




Substitution: “Engaging the COR”

Task:

- Focus on stationary target (reading) with head movements
- Increase speed as ability increases
- “Gaze stabilization exercises”

Conditions:

- Horizontal
- Vertical
- Seated
- Standing
- Walking



Figure 2A: Look straight ahead
 Figure 2B: Turn your head 45 degrees towards the right.
 Figure 2C: Turn your head 45 degrees towards the left.

Note: Business card should be positioned at eye level. (c) T. C. Hain, 2002

<http://www.dizziness-and-balance.com/treatment/rehab/gaze%20stab.html>




Sensory Substitution Exercises: Visual

Task:

- Focus on moving target with head stable
- Saccades
- Smooth pursuit
- Increase speed as ability increases

Conditions:

- Horizontal
- Vertical
- Seated
- Standing

Example: Up to 1:14
<https://www.youtube.com/watch?v=dXRhUjP7pSs>

Sensory Substitution Exercises: Visual

Task:

- Improve convergent and divergent eye movements
- Increase speed as ability increases
- Seated
- Standing
- Moving a target (video: ConDiVerge)
- Between two targets (video: NearFarVid)

Substitution Exercises: Core Stability

Overall core strength

- Increase physical stamina through walking, stationary bike, etc.
- Small squats
- Yoga/pilates
- Ballet/barre-type exercises
- Water aerobics

Overall strength and falls prevention

- Single-leg stance
- Tai Chi
- Functional reach test, turned exercise
- “Standing crunches”

Sensory Substitution: Psychological and Cognitive

- Overall awareness of weaknesses *and* strengths of balance system
- Use of vibrotactile devices to warn of deviations from center of balance
- Through exposures, calming of the autonomic/emotional response (habituation)

Sensory Substitution: Home Modifications

Use visual cues

- Glasses type
 - Progressive, Bifocal, Single-vision
- Night light

Improve the sensory input

- Remove trip hazards
 - Throw Rugs
 - Electrical Cords
 - Obtrusive lamps, plants, or furniture

VRT Course: Summary

1. VRT is important for our patients
2. Knowledge of VRT is important for Audiologists
3. Not all patients will have the same outcomes
4. VRT is different for each patient, depending on their needs (and pathology)
5. You CAN diagnose *and* treat your dizzy patient

Questions?

VRT: Info for the patient

- Beautiful patient-friendly article on VRT can be found via VEDA at <https://vestibular.org/understanding-vestibular-disorder/treatment/treatment-detail-page>

VRT: Info for the provider

- Good review article (2011): <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3259492/>
- Cool website re: oculomotors: <https://nba.uth.tmc.edu/neuroscience/m/s3/chapter08.html>