

TOPICS IN VESTIBULAR PHYSICAL THERAPY



VESTIBULAR REHABILITATION SIG
APTA & Academy of Neurologic Physical Therapy

HIGHLIGHTS FROM THE 2022 INTERNATIONAL CONFERENCE FOR VESTIBULAR REHABILITATION

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Message from the Chair

Rachel Wellons, PT, DPT*
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I think we can all agree that the 2nd International Conference for Vestibular Rehabilitation (ICVR) was a success. To quote the musical “Hamilton”, it was a privilege to be “In the room where it happened”. I’m in awe of the knowledge and passion of the PTs, researchers, physicians, and other healthcare professionals whom I interacted with during the conference.

One of my main takeaways from the conference was fully recognizing the role and connection of the vestibular System to so many other systems. While I was familiar with Dr. Eric Anson’s work, what really sunk in this time was the role of the vestibular system in spatial navigation. This is a role that is critical for our patients to be able to navigate their world effectively. Thinking about his research along with my patient experience, I wonder if this is another reason for the decreased physical activity and social isolation we see with our patients. To help clinicians keep up with research like Dr. Anson’s and others, I’d encourage you to go to the “Dizzy Pub Fare” which is under the Vestibular SIG page of the ANPT website. Dizzy Pub Fare, headed by Rebecca Manning, provides citations monthly for articles pertinent to Vestibular Rehabilitation.

I also appreciated Dr. Brooke Klatt’s talk about the role of the vestibular system in cognition and accommodations for individuals with cognitive impairment. I had not fully appreciated the role and connection of the vestibular system to cognition until her talk. Like the rest of us, I’m used to complaints of “brain fog” but chalked that up to a failure of brain processing capacity. Dr. Klatt’s talk allowed me to appreciate the vestibular/cognitive connection in a whole new light. I have also dismissed vestibular rehabilitation in individuals who were cognitively impaired. What’s the point if they can’t remember to do

their exercises at home or can’t do them properly? Dr. Klatt’s suggestions were ingenious and demonstrated once again that the best researchers have a strong level of clinical experience and knowledge. If you are a clinician interested in participating in research or adding your clinical perspective to research, I strongly suggest you check out the Vestibular SIG’s research Collaboration form. You can list yourself or click on the link to connect with researchers.

My top “Monday Morning” clinical application tips from ICVR were Dr. Colin Grove’s Gait Disorientation Test and adjustments to VOR exercises suggested by Dr. Michael Schubert. I know how valuable our exam time is, so having the Gait Disorientation test already built into another test that I do with almost all of my patients, the Functional Gait Assessment, makes the application seamless. Using this test alongside history and ocular motor exam findings will make me even more confident in ruling in/out vestibular hypofunction. While we all await the commercial application of Dr. Schubert’s research, his small tips to improve the efficacy of VOR exercises are much appreciated: Holding the target close to your face, using a high contrast target, and considering head movement only to the side of the lesion instead of sinusoidal.

I think the most underappreciated but most important talk of the conference was Dr. Alexandre Bisdorff’s on the classification of Vestibular Disorders. Often our patients come to see us without a diagnosis and having a name for what they are feeling is a critical first step in rehabilitation. Physical therapists can utilize the diagnostic criteria laid out by the Barany Society as a checklist to assist with differential diagnosis. Once you have a diagnosis you can utilize one of the Vestibular SIG’s Patient OR Provider Fact sheets to help educate your patient and providers on the diagnosis, management, and role of PT. I look forward to seeing everyone at CSM in San Diego in February.

Introduction to the Topic

Anne K. Galgon, PT, MPT, PhD*

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The International Conference for Vestibular Rehabilitation (ICVR) was conceived in 2016 at the IV Step Conference, where it was recognized that there was a need for scientific and clinical exchanges to improve vestibular rehabilitation practice. The Academy of Neurologic Physical Therapy (ANPT) sponsored the first ICVR in August 2018 in Chicago. The purpose of the conference was to bring together world renowned speakers to present various cutting-edge topics to advance the practice of vestibular rehabilitation (VR). The conference planners foresaw it as a vehicle to “translate research to advanced practice.” The conference featured 27 expert speakers in vestibular research and clinical practice and there were 555 attendees including speakers and exhibitors. The success of the conference confirmed that the time was ripe and vestibular physical therapists around the world were eager to learn. The ANPT has subsequently included the ICVR as a regular event in their 10-year conference plan.

Vestibular rehabilitation has been an advancing area of clinical practice for physical therapists for more than 30 years. A PubMed search with the terms “vestibular rehabilitation” shows the dramatic rise in research and knowledge in VR since the founding of the Vestibular Rehabilitation Special Interest Group in 1995. Since the

first ICVR in 2018, 1435 new articles have been published including 111 clinical trials or randomized control trials. The ICVR is an important forum for disseminating research for evidence based practice, but it also has promoted new ideas for research and spurred more physical therapists to engage in vestibular rehabilitation research.

This edition of the Topic of Vestibular Physical Therapy (TVPT) highlights the 2nd ICVR, which was held in Minneapolis in October 2022. To allow the conference to be held in person it was rescheduled from 2021 due to the COVID-19 pandemic. The conference planners felt that the in-person experience was essential to the exchange of research, new ideas, and clinical experiences. The 552 participants came from 45 different states and 19 countries. The conference featured 22 expert speakers, evening poster sessions, and exhibitors. Most noted were that speakers included more physical therapist researchers. Speakers like Dr. Eric Anson represent an evolving body of PT researchers in vestibular rehabilitation. Dr. Anson won the best research poster at the 2018 ICVR, but was an invited speaker at the 2022 ICVR.

Conference presentations included new ways of measuring cognitive spatial disorders, creating more

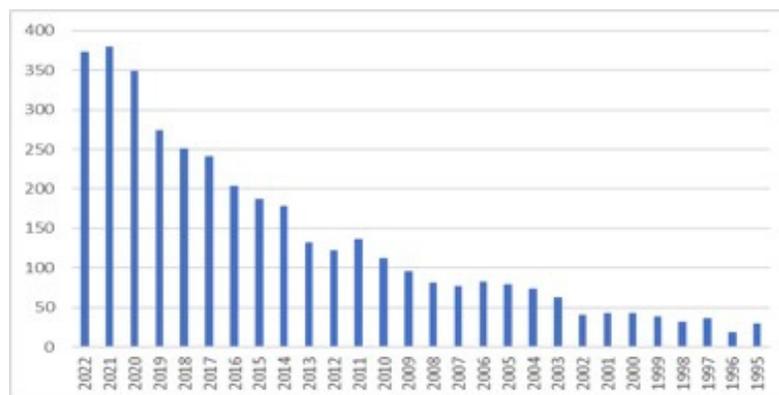


Figure 1: Number of vestibular rehabilitation articles published by year
(Source: Pubmed.gov, search term vestibular rehabilitation, attained 12/21/2022)

challenging gaze stabilization exercises, and adding meaningful activities to vestibular interventions for individuals with cognitive impairments. The conference also presented on expanding areas of practice including vestibular impairments in pediatric patients and in individuals with cognitive disorders, multiple sclerosis, traumatic brain injury, cervical injuries, and cerebellar disorders. The biggest change in conference topics for 2022 was the number of technology-based enhancements to vestibular practice. Some examples included a discussion on diagnostic tools such as vHIT to measure VOR impairment by Dr. Michael Halmagyi, and applications for enhancing vestibular exercise by Courtney Hall, Susan Whitney, and several poster presenters. Additionally, there were several presentations on the clinical trials and application of vestibular implants and balance assistance devices for individuals with bilateral vestibular loss. The list of speakers and presentations is still available on the conference site.

<https://neuropt.org/special-interest-groups/vestibular-rehabilitation/ICVR2022/schedule>

Vestibular physical therapists can also look forward to reading articles on several of the conference presentation topics, which will be available in an upcoming *Journal of Neurologic Physical Therapy* in 2023.

Featured in this edition of TVPT are individual perspectives on the conference. Four physical therapists provided clinical perspectives on

knowledge or pearls they learned at the conference and how they have or plan to incorporate the knowledge into their practice. These therapists have varied clinical practice experience, both in the number of years practicing and in clinical environments. I would like to thank Lisa Heusel-Gillig, Sara Oxborough, Emma Van Sickle, and Danny Ludwig for their contributions.

Additionally, four poster presentation awardees are highlighted. Congratulations to the awardees and all the poster presenters who added to the success of the conference. Fifty-six posters were presented over two evenings and 87% of attendees stated that poster sessions were worth their time to view them.

The ICVR would not have been so successful without the help of many people. This included members of the conference planning committee, program committee, marketing committee, and poster session and review committee. Individuals also worked to recruit sponsors, attain raffle items, organize onsite volunteers, develop exhibition hall activities, and organize poster judging. These individuals and other onsite volunteers are listed and pictured on page 25 of this edition of TVPT. Thank you to everyone for your service to support this great event. The conference planners would also like to thank the support of the ANPT board of directors and the executive staff who put in countless hours to make the conference happen. Thank you to all of our sponsors and exhibitors who are listed on page 19.



ICVR planning committee

From left to right,
Anne Galgon, Susan Whitney,
Becky Olson-Kellogg, Rachel Wellons

The Role of Vestibular Dysfunction in Cognitive Impairment: Implications for Vestibular Rehabilitation

Lisa Heusel-Gillig, PT, DPT*
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Introduction:

Each conference I have attended during my career as a vestibular physical therapist has given me ideas on how to improve my clinical practice. The clinical pearls that I have chosen to discuss were selected from a presentation on “Cognitive Considerations in Vestibular Physical Therapy” by Brooke Klatt, PT, DPT, Ph.D. as well as “Spatial Vestibular Perception: Implications for Rehabilitation” by Eric Anson, PT, Ph.D. The first clinical pearl: there is a strong association between individuals with cognitive impairments and vestibular dysfunction. Specifically, individuals with dementia, including Alzheimer's Disease (AD), presenting with balance or navigation impairments should be evaluated for vestibular dysfunction. Vestibular impairment is two times more common in people with AD than in older adults without any cognitive deficits.(1) The second pearl: patients with known vestibular and cognitive deficits can benefit from vestibular physical therapy (VPT) as long as modifications are made. VPT can improve gait stability and balance in this population.(2, 3)

Clinical perspective:

In Dr. Klatt's presentation, she discussed that the vestibular system is responsible for visuospatial ability including navigation, spatial awareness, and memory, as well as distance/depth perception. Cognitive domains associated with vestibular function include attention, executive function, memory, and visuospatial ability. The input from the vestibular system to the hippocampus, which stores this spatial memory, is important for all these functions.

Therefore it is of no surprise that spatial cognition is lost first in patients who transition from healthy aging to AD. She also discussed a Johns Hopkins study from 2017-2019 that showed only five out of 800 patients with AD were referred for VPT.

Dr. Klatt also discussed ways to modify vestibular exercises so that they are meaningful to the patient with dementia. She used the example of allowing the patient to choose a favorite vacation destination (the beach) and a food item that was disliked (beets) and used pictures of each for the gaze stability exercises (horizontal VOR –like saying NO for beets, vertical VOR like saying YES for the beach). Utilizing familiar music with the appropriate beat for clear focus on the target can also be used. Spatial skills can be improved with many treatment interventions including virtual reality, navigation-based video games, dance, and art projects.

Dr. Anson discussed the presence of three vestibular signaling pathways including VOR, posture/gait, and vestibular cognition. His focus was on the last pathway of vestibular cognition, which is divided into bodily self-consciousness, visual perception (self-motion, spatial orientation, and spatial navigation), spatial learning, spatial memory, and object spatial memory. Both route and place-based spatial navigation in vestibular patients are impaired.(4)

Dr. Anson described three tests for spatial ability including the Triangle Completion Test, the Gait Disorientation Test, and Spatial Orientation Test; all which can easily be performed in the clinic. The Triangle Completion Test is performed with vision removed.

The PT guides the patient for two meters, then a right turn for one meter, and then the patient attempts to return to the original starting point. Both the angle and distance are recorded. Research has shown that individuals with both unilateral and bilateral loss have angular point error.(5, 6) The Gait Disorientation Test compares Task 1 and Task 8 on the Functional Gait Assessment (FGA). Minimal detectable change (MDC) is 3.7 seconds between eyes open and closed. Patients with unilateral and bilateral vestibular loss have more difficulty than control subjects.(7) The Spatial Orientation Test shows bilateral vestibular loss individuals have 20% more errors than subjects without vestibular disorders.(8)

Clinical application:

This case study demonstrates how meaningful activities were incorporated into intervention for a patient with cognitive impairments. The patient is a 78 year old woman with dementia who had a sudden onset of hearing loss and dizziness. She was brought to her initial appointment by her niece and was referred for VPT and vestibular testing. Bithermal caloric testing revealed an 89% reduction of function on the left side. The initial physical therapy evaluation measures are presented in Table 1 under visit 1.

Visit 1: The initial home exercises prescribed included: gaze stability exercises in sitting with an “X” on the back of my business card, near and far targets, gait with head turns with a wider base of support, balance on firm and foam with eyes open and closed in a corner with a chair in front when her niece could supervise.

Visit 2: Two weeks later, the patient reported that her niece had been unable to practice the home exercises with her and she had not remembered the home exercises except walking in the halls with a wider base. Therefore, the treatment and home exercise program was modified to be more meaningful and improve compliance as suggested by Dr. Klatt.

The gaze stability exercises were modified by using a card with YES written on it for vertical head turns and a NO card for horizontal head turns.

While practicing, she verbally repeated the word while turning her head. She was able to remember the exercise when reviewing it again at the end of the session. Her niece was asked to tape the cards on the side of her TV so that she will remember to perform the exercise daily when she watches the morning news and her favorite afternoon show. During the session, she tapped a balloon in the sitting position which encouraged head turns, gaze shifting, and visual focusing on letters written on the balloon. She also engaged in a Scavenger Hunt Card Matching Game where playing cards Ace through King are placed at various heights around the clinic. The patient drew a card from the deck and found the matching number to encourage memory, navigation, head turning, and visual focusing.

Visit 3: The patient reported that she had performed the walking exercises as well as the gaze stabilization exercises with the targets on the TV. She was able to perform the exercises correctly with only occasional reminders to increase the range of the vertical head turns. She was retested on computerized DVA with minimal improvements while her FGA improved by seven points from the initial evaluation (See Table 1). She was able to stand on Airex foam for 30 seconds with feet apart and eyes closed. She also performed the Gait Disorientation Test and Triangle Completion Test. Her results showed navigational deficits when visual information was removed and supported continued therapy to address these deficits. She practiced a task by taking steps with her right and left feet forward, sideways, and backward following a handout placed on the wall at eye level. This activity simulates using a stepping strategy as if being bumped or losing balance. She was able to follow the directions without cues. Her niece noted that she would tape the instruction sheet on the bathroom door for daily practice.

Plan of care for continuing physical therapy: The patient has been scheduled for two more sessions. She will continue to practice in the clinic the tasks on the FGA including walking with head turns,

Table 1: Outcome measures for the first three visits.

<u>Outcome measure</u>	<u>Visit 1</u> <u>(Evaluation)</u>	<u>Visit 2</u>	<u>Visit 3</u>
ABC	93%		
FGA	12/30	16/30	19/30
GAIT SPEED	2.91 ft/sec	4.00 ft/sec	3.56 ft/sec
mCTSIB	1=30/30 sec 2=24/30 sec 3= 28/30 sec 4=0/30 se		1=30/30 2=30/30 3=30/30 4=2/30
COMPUTERIZED DVA (LogMAR Change) Normal values L=0.499 R=0.530	L=0.84 R=0.53	L=0.84 R=0.34	L=0.64 R=0.42
GAIT DISORIENTATION TEST	Unable to perform		EO=5.2s sec EC=12s
TRIANGLE COMPLETION TEST	Unable to perform		35° veer to right from starting point

Abbreviations: L= leftward, R= rightward, ABC = Activities of Balance Confidence, FGA = Functional Gait Assessment, mCTSIB = modified Clinical Test of Sensory Integration of Balance

walking with alternating eyes open and closed every three steps, and walking forwards and backwards every five steps to improve navigational walking. Balance will be challenged by progressing the balloon toss from sitting to standing and practicing balance with eyes open and closed on foam and gradually decreasing the base of support, and progressing x1 gaze stability exercises in standing.

Discussion:

The pearls I learned from Dr. Klatt and Dr. Anson regarding patients with cognitive or visuospatial deficits were valuable to my clinical practice. I have made certain that treatment sessions and home exercises are meaningful and easy for my patients. The presentations reminded me to be more creative with home programs so that patients are more compliant. The changes seen in this case study exemplify some of these changes. This person lived alone in an assisted living facility and could perform functional activities, such as walking on her own. However, it was difficult for her to remember and follow through with the rest of her exercise

program as she had minimal caregiver support. Simple visual reminders to perform the gaze stability exercises and multidirectional stepping activity assured better compliance and recovery. However, continued communication with the family to set up the home exercises helped as well.

I have also modified my clinical practice based on these pearls. First, I have made a conscious effort to screen for vestibular dysfunction in patients with cognitive impairments. The Dix Hallpike and Roll tests, head impulse test, and DVA are quick tools that may identify problems requiring further testing or additional treatment. Our clinic has also set up a Triangle Completion Test in a large area with easy access. The clinic has now collected data on several patients with known bilateral and unilateral vestibular loss and a long COVID-19 patient with complaints of spatial difficulty. I have also been measuring the walking speed times for eyes open and eyes closed while my patients perform the FGA, but now am utilizing the MDC for interpreting the Gait Disorientation Test.

Lastly, based on the Johns Hopkins study that Dr.

Klatt cited, more awareness and communication are needed to ensure appropriate referrals are made to vestibular clinics. I have reached out and encouraged neurologists in our Comprehensive Cognitive Clinic to prescribe vestibular testing and rehabilitation for their patients with balance deficits as well as navigation or visuospatial impairments.

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ICVR 2022 presentation session



Importance of Orientation and Weight of the Cupula in Atypical BPPV

Sara Oxborough, PT
M Health Fairview

Introduction:

As a treating vestibular therapist, The 2nd International Conference for Vestibular Rehabilitation (ICVR) is a conference I was looking forward to since the last one in 2018. The best vestibular clinicians and scientists from around the world on one stage bringing the latest research and best practices for 650 eager participants. Having seen Dr. Janet Helminski present at past CSMs and learning about canal jams and apogeotropic posterior canal (PC) BPPV, I was certain something in my practice was about to change. Dr. Helminski's presentation, "Importance of Orientation and Weight of the Cupula in Atypical BPPV," highlighted how important it is to consider the orientation of the cupula in Benign Paroxysmal Positional Vertigo (BPPV). Furthermore, she discussed the concept that downbeating nystagmus might not actually be anterior canal (AC) or ageotropic PC BPPV, it might actually be PC cupulolithiasis.

Clinical perspective:

Dr. Helminski's session encouraged me to reflect on past patients that presented with downbeating nystagmus in Dix Hallpike testing and upbeating

torsional nystagmus during Roll test. The incidence of AC BPPV is postulated to be about 3% of all diagnosed BPPV (1) and incidence in the PC is about 80-90%. (2) Therefore, if you see someone with BPPV, you are most likely to be treating the PC. In addition, downbeating nystagmus can also be central in nature which must be considered. Dr. Helminski's session began with a brief anatomy review which is important when considering the orientation of the cupula during various BPPV tests. In the PC, the initial ampullary segment is 20 degrees below horizontal and the kinocilium is positioned closer to the long arm of the canal. As a result, ampullofugal (away from the ampulla) endolymphatic flow will cause excitation of the PC afferents and upbeating nystagmus, and ampullopetal (towards the ampulla) flow causes inhibition and downbeating nystagmus. See Figure 1. (3,4)

During the Dix-Hallpike test, with the typical 20 degrees of neck extension, the plane of the cupula is vertical so if the debris is attached to the cupula, there will be no deflection and no nystagmus (Figure 2-B). Moving the head further into 40 degrees of extension, there is now deflection towards the utricle causing ampullopetal flow which results in

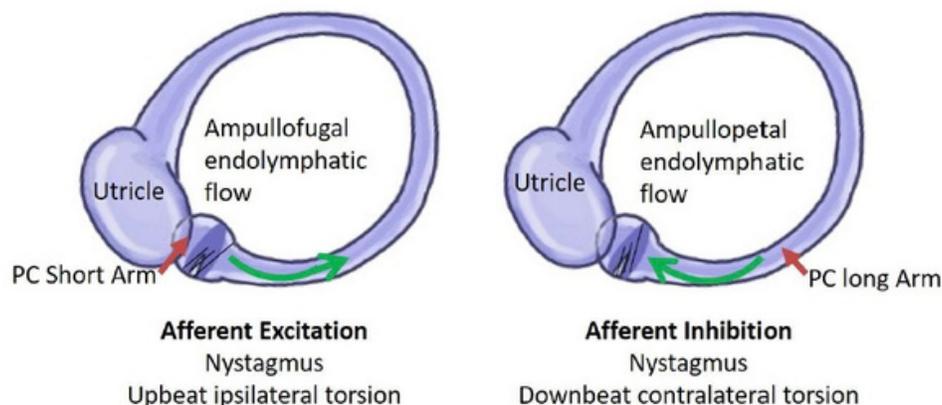


Figure 1. Posterior canal afferent inhibitory and excitatory patterns

downbeating contralateral torsional nystagmus (Figure 2-C). To further confirm these findings, the Half Hallpike test can be used, which is similar to the Supine Roll test (Figure 2-D). In this position of 30 degrees of neck flexion and rotation to the suspected involved side, the patient would present with upbeating ipsilateral torsional nystagmus. The cupula is now horizontal to the Earth, and the attached otoconia will cause ampullofugal movement resulting in excitation. One final position to confirm these findings would be an inverted release (Figure 2-E), which would result in inhibition of the involved PC afferents.

Another atypical finding might be a negative Dix-Hallpike test, but with an upbeating ipsilateral torsional nystagmus on return to sit. This can be indicative of otoconia in the short arm of the canal. In this case, otoconia move from the utricle to the short arm and then onto the cupula. This causes the cupula to deflect towards the long arm generating an excitatory response of the afferents of the PC.

There are other forms of atypical PC BPPV that will not be reviewed here.

As atypical BPPV and AC BPPV both often present with downbeating nystagmus, start with a Supine Head Hanging Position (SHHP) or neck extension. (5,6) This position can treat AC or convert the atypical PC to typical PC. This is why it is beneficial to do a SHHP with nearly any downbeating nystagmus suspected to be BPPV.

Clinical Application:

Following the ICVR I treated a patient in the cancer rehabilitation unit who stated that she had been very dizzy the night before while rolling in bed. She was leaving the next day to go hiking and was very upset. Her husband was a Neurologist and had treated her previously with a modified Epley with no success. I performed an examination and assessed her for BPPV based on her subjective symptoms. During testing I found slight downbeating nystagmus with the Dix Hallpike test and decided to apply Dr. Helminski's approach. Table 1 details the results of the testing sequence.

This sequence confirmed that the BPPV diagnosis

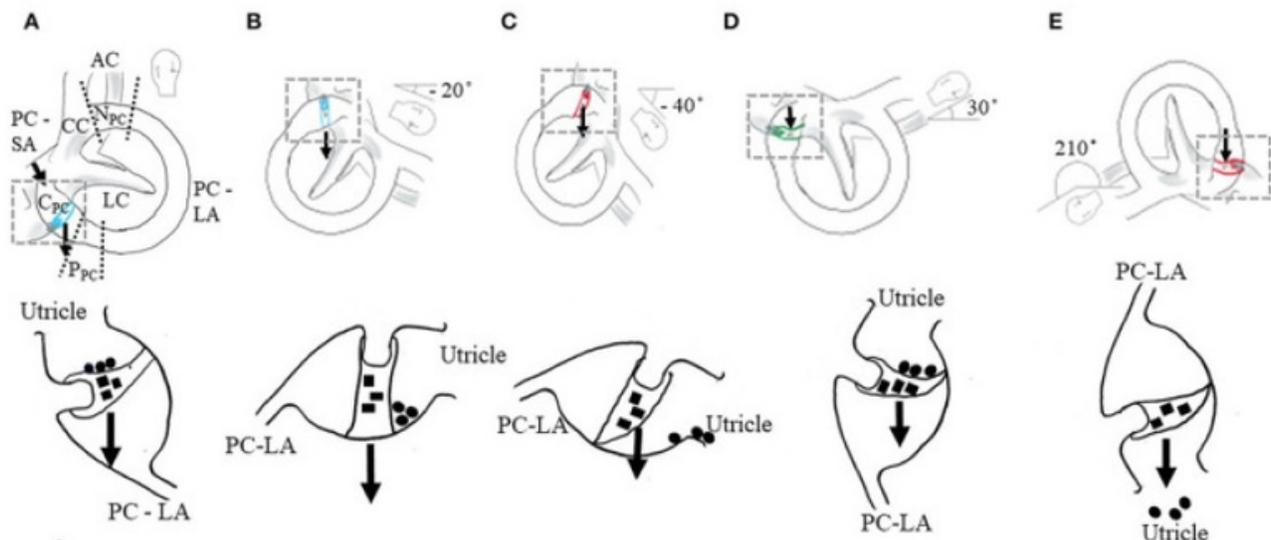


Figure 2: Debris adhered to the cupula (squares) and debris in the short arm of the posterior canal (PC) (circles), in various test positions, a) sitting, b) in Dix-Hallpike with 20 degrees of head extension, c) 40 degrees of extension, d) Half Dix-Hallpike, and e) inverted release position.

Abbreviations: SA = Short arm, LA = long arm

was a Right PC cupulolithiasis. Following the information described in Dr. Helminski's presentation, I performed a neck extension treatment to move the otoconia from the cupula into the canal. She had asked to take the goggles off due to nausea, therefore it was unclear if I had caused an ipsicanal switch to canalithiasis as occurred with her case study patient. I followed this up with a Modified Epley (4) and upon retest she was negative. The patient returned two weeks later and was symptom free. She was able to go on vacation and go hiking. Prior to ICVR, I may have still treated this as a Right PC cupulolithiasis simply due to the persistent nystagmus found in Half Hallpike, but would not have started with a neck extension treatment to attempt to convert to canalithiasis. I may have also assumed this was AC and performed a neck extension treatment but would not have followed up with any subsequent maneuvers. I also would not have confirmed my findings by moving the head into 40 degrees of extension in Dix- Hallpike testing.

Discussion:

This patient case is just one example of where otoconia can be located in atypical PC BPPV, and my intervention was successful. Had I not been successful I would have performed a Demi Semont maneuver as the otoconia were likely to be on the

utricle side instead of the canal side.(4) As downbeating nystagmus is not common and it requires some conceptualization to understand the effect of orientation on the PC BPPV, I would recommend anyone who treats BPPV to read the published case report by Dr. Helminski "Case report: Atypical patterns of nystagmus suggest posterior canal cupulolithiasis and short-arm canalithiasis". This open access journal article will allow you to view images to further your understanding of atypical PC.

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Table 1: Positional testing sequence and results.

Positional Test	Direction of Nystagmus	PC Afferent Excitation / Inhibition
Dix Hallpike Right	Negative / slight downbeating nystagmus	Inhibitory
Dix Hallpike Right with 40 degrees extension	Downbeating Left Torsional Nystagmus, persistent	Inhibitory
Half Hallpike Right	Upbeating Right Torsional Nystagmus, persistent	Excitatory
Return to sit / upright	Negative	None
Supine Head Hanging Position	Downbeating Left Torsional Nystagmus	Inhibitory

Is It Worth Evaluating Vestibular Impairments in Individuals With A History of Falls and No Complaints of Dizziness?

Emma VanSickle, PT, DPT
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Introduction:

A clinical pearl I learned during the International Conference for Vestibular Rehabilitation (ICVR), was taken from a presentation titled, “Long-term Safety and Efficacy Outcomes for a First-in-Human Clinical Trial of Vestibular Implantation to treat Adult-onset Bilateral Vestibular Hypofunction,” by Charles C. Della Santina, Ph.D., MD. I was reminded not to overlook the function of the vestibular system when evaluating patients who report no dizziness symptoms. Individuals may demonstrate balance impairment, frequent falls, gait abnormality, or reduced quality of life due to poor vestibular sensory integration, all without experiencing dizziness.(1-3) I have found this clinical pearl useful when evaluating patients with the diagnosis of frequent falls and an unclear etiology of balance deficits.

Clinical application:

Prior to the ICVR, I evaluated a 74-year-old female, presenting for balance impairments following an appointment with a neurologist due to frequent falling. Any acute central pathology was ruled out with an unremarkable MRI of the patient’s brain. She did not report dizziness surrounding her falls but did identify an imbalance with household tasks and ambulation. Her medical history was significant for four falls in the past year, migraines, and benign paroxysmal positional vertigo (BPPV) over one year ago. The patient did not report current dizziness symptoms matching her previous episode of BPPV. She also did not report dizziness symptoms with exercise for gaze stabilization, visual motion habituation, or ambulation with dynamic head movement; though, she did demonstrate balance deficits with all tasks. I initiated an intervention and home exercise program

of vestibular exercises, dynamic gait, and the use of a four-wheeled walker, for safety with community mobility, to develop the patient’s plan of care.

I implemented my clinical pearl and performed oculomotor, vestibular, balance, and positional assessments with the patient following the ICVR. The oculomotor examination revealed hypometric horizontal saccades. During balance testing, she demonstrated increased postural sway but no reported dizziness when standing on a firm surface during repeated head movements and during the VOR Cancellation test. Results of the Modified Clinical Test of Sensory Integration of Balance, Functional Gait Assessment, and Activities of Balance Confidence Scale are presented in Table 1. Positional tests presented with a short duration right horizontal nystagmus in the right Supine Roll test and an upbeat left torsional nystagmus in the left Dix Hallpike test. I proceeded with a diagnosis of bilateral BPPV, with a right horizontal canalithiasis and a left posterior canalithiasis.

The patient was treated across three sessions before nystagmus resolved. The patient required two visits for treatment of the right horizontal canalithiasis using the Gufoni Maneuver, and one visit using the left Canalith Repositioning Maneuver for posterior canalithiasis.(4) Following the resolution of the patient’s BPPV, she demonstrated no deficits with saccadic eye movement, improved vestibular sensory integration, reduction of postural instability with dynamic gait, and increased confidence with household tasks. See Table 1 for comparison of outcome measures both pre- and post-BPPV treatment. I have continued to provide physical therapy (PT) intervention for further improvement of the patient’s postural control and

Table 1: Outcome measurements pre and post CRM interventions

Outcome measures	Score Pre- CRM	Score Post-CRM
Modified Clinical Test of Sensory Interaction in Balance	Condition #1: 30s Condition #2: 30s Condition #3: 19s Condition #4: 0s	Condition #1: 30s Condition #2: 30s Condition #3: 30s Condition #4: 12s
Functional Gait Assessment	11/30 points	22/30 points
Activities Specific Balance Confidence Scale	50.6%	60.0%

Abbreviation: CRM = canalith repositioning maneuver

vestibular sensory integration with head movement, gait, and balance activities.(5)

Discussion:

I have learned to complete a full oculomotor and vestibular examination for patients presenting to PT with balance impairment. Dr. Della Santina and colleagues have shown that vestibular pathology can have a negative impact on a patient's quality of life; further, a subjective report of no dizziness may still involve vestibular pathology.(1,2) As such, I now routinely complete an oculomotor and vestibular examination in patients presenting for neurologic and balance PT, to avoid missing involvement of the vestibular system and to improve patient outcomes.

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Using Technology to Optimize Care of Patients with Bilateral Vestibular Hypofunction

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Introduction:

At the International Conference for Vestibular Rehabilitation (ICVR) 2022, Dr. Susan Whitney DPT, Ph.D., NCS, ATC, FAPTA closed the conference by presenting Recent Evidence in Vestibular Rehabilitation: The Use of Apps and Beyond. She emphasized that technology and telehealth in vestibular rehabilitation are here to stay. As I heard it, get on board with incorporating technology into practice or get left behind.

While Dr. Whitney was referring to tablet, phone, or computer-based applications for vestibular rehabilitation, Dr. Charles Della Santina presented on outcomes for eight recipients of a vestibular implant, a technological advancement that has the potential to drastically change recovery and rehabilitation for patients with bilateral vestibular hypofunction (BVH). This novel implantable device “provides artificial sensation of head rotation by electrically stimulating the three semicircular canal branches of the vestibular nerve”.(1) Dr. Della Santina’s presentation focused on the functional and behavioral outcomes for these eight patients as reported in the New England Journal of Medicine (1), including measures of posture, gait, quality of life and hearing. More importantly, Dr. Della Santina invited physical therapists to begin to identify avenues for their role in the pre-operative and post-operative management of these patients.

Clinical perspective:

As experts in rehabilitation of gaze stability, balance, and gait, physical therapists are uniquely qualified to assist in managing the care of vestibular implant patients.

The most recent clinical practice guideline on Vestibular Rehabilitation for Peripheral Vestibular Hypofunction (2) stated a strong recommendation that physical therapists should offer vestibular physical therapy (VPT) for patients with BVH based on level one quality evidence. The authors noted improvements in dizziness symptom burden, gaze stability, balance, and gait. Current treatment modalities focus largely on vestibular ocular reflex adaptation and substitution exercises and up-regulation or substitution for use of visual and somatosensory input to contribute to postural control during balance and gait. Despite evidence-based practice, it is also clear that patients with BVH have significantly decreased quality of life and there is a substantial economic burden on both patients and society.(3)

In addition to traditional VPT, alternative approaches to improve balance, gait, and quality of life are being studied and implemented including the use of subconscious levels of vibrotactile feedback at the waist through wearing a “balance belt” to substitute tactile information for interoceptive cues for self-motion perception to improve postural control.(4) The vestibular implant differs in that it restores sensation of head rotation by electrically stimulating the branches of the vestibular nerve correlating with each semicircular canal, (1) and has been shown to partially restore vestibular ocular reflex function.(5)

The role of the physical therapist for vestibular implant patients may include pre-habilitation with a focus on traditional VPT, introduction to adaptation gaze stability exercises, and generalized strengthening and conditioning exercises.

Physical therapists may consult with an implanting surgeon when activating the device to determine appropriate stimulation thresholds based on VOR and balance function. Adjustments should be based on up to date assessments of gaze stability/VOR function (video head impulse testing, instrumented dynamic visual acuity), postural control (bedside and instrumented sensory organization testing), and dynamic gait (Functional Gait Assessment, instrumented gait analysis) as well as measures of spatial navigation such as the Gait Disorientation Test (6) and Triangle Completion Test.(7)

A consideration for physical therapists in their involvement with patients post vestibular implant is their level of training with regard to the complexities of VOR function and the restored head motion stimulation provided by the implant. There are some differences between physiologic VOR and prosthesis delivered stimulation that are well detailed by Boutros et al.(5) Physical therapists would need to collaborate effectively with the surgeons and engineers on the vestibular implant team to develop a strong working knowledge of these differences and their potential impact on observed eye movements, head motion, spatial perception, and other vestibular system mediated functions.

Lastly, physical therapists and surgeons should engage in research investigating the role and potential benefit of post-surgical and post-activation rehabilitation to optimize the patient's gaze stability, postural control, and dynamic gait, and ultimately improve their activity and participation restrictions. Dr. Della Santina's team showed trends towards improvement in posture, gait, and quality of life without including post-implantation rehabilitation and patients may benefit further in these domains by adding further VPT intervention following their surgery and activation.

Patients with BVH often plateau with traditional VPT. (8-10) A 2015 study (8) showed that 39 to 86% of BVH patients demonstrated significant improvement on certain outcome measures but not all, and

outcomes could be dependent on a number of baseline variables such as age (increased age led to high discharge dynamic visual acuity scores), and dynamic gait index (DGI) score (lower DGI led to higher disability at discharge). They also found that a smaller percentage of BVH patients improved and to a lesser extent than patients with unilateral vestibular hypofunction. A retrospective case series from 2001 (9) showed significant changes were demonstrated by only 33 to 55% of BVH patients on a variety of outcome measures and there was no change in the patient's risk of falling, their number of falls, and the use of assistive devices. A systematic literature review in 2012 (10) showed moderate strength evidence that exercise based VPT improved measures of body structure and function but had limited evidence to support improvements in measures of activity or participation. These findings potentially lead to chronic disability and ongoing fall risk which contributes to activity and participation restrictions, resulting in reported decreased quality of life and increased economic burden.(3) New treatment technologies such as the vestibular implant (1) and the balance belt (4) have the potential to improve care and outcomes for these patients, but still have some time until they become available to a majority of patients. The clinical practice guideline (2) provides up to date treatment recommendations for patients with BVH including a minimum of once daily balance exercises for six to nine weeks (per expert opinion, consider prescribing two to three balance sessions per day for potentially greater effectiveness). Balance exercises should be combined with gaze stability exercises four to five times per day for a minimum of 20 to 40 minutes daily. Physical therapists should also consider the impact of comorbidities on recovery when determining the duration of VPT for individuals with BVH.

Clinical Application:

The potential advanced treatment options for BVH discussed at ICVR 2022 and in this perspective

piece, led me to reflect on a recent BVH patient that I treated over the summer and discharged just prior to the conference. The patient was in their 70s and had been hospitalized last fall with endocarditis requiring valve replacement surgery, prolonged intensive care unit and hospital stay due to complications, and a course of intravenous aminoglycoside antibiotics. After undergoing inpatient and outpatient rehabilitation to regain their basic mobility, they were referred to VPT for “dizziness”.

My vestibular evaluation revealed positive head impulse test bilaterally with video head impulse test showing low gains in all canals except left lateral canal (0.82 with overt saccades) suggestive of BVH. Measures of participation showed severe dizziness symptom burden per Dizziness Handicap Inventory (DHI) (11) 76/100 and poor balance confidence of 47% per the Activities Specific Balance Confidence Scale (ABC). Activity measures included measures of dynamic gait and fall risk using the Functional Gait Assessment (FGA) and gait speed using the 10-meter walk test (10MWT). FGA revealed significant fall risk with a score of 8/30 (<22 fall risk (12) for community dwelling older adults) and a slow gait speed of 0.39 meters per second on 10MWT. Other measures of body function showed impaired sensory organization scoring 58/120 seconds (with falls in both eyes closed conditions) on the modified clinical test of sensory interaction (mCTSIB). The patient’s stated goal was to return to ambulating without an assistive device, which they were able to achieve after about six weeks of VPT. The patient was seen for VPT two times per week for six weeks, then weekly for another six weeks. Treatment focused on adherence to previously cited gaze stability and static and dynamic balance exercises as per the CPG. (2) Further dynamic challenges including the use of virtual reality, ambulating on uneven surfaces and ramps, and functional lower extremity strengthening exercises such as step-ups and repeated sit to stands were also incorporated. Education was provided on the importance of implementing a home aerobic training

program with a goal of achieving 150 minutes of moderate intensity activity per week, and a number of implementation and monitoring strategies (rate of perceived exertion, heart rate monitoring, and talk test) were discussed.

After three months of VPT, they had made significant improvements in all reported measures of symptoms, balance, and fall risk. Their DHI score decreased to 28/100 suggesting mild dizziness burden (11), and balance confidence on the ABC improved to 87%. Their FGA improved to 18/30 suggesting decreased fall risk and two times the minimal clinically important difference (MCID) for older adults. (13) Gait speed on the 10MWT improved to 1.02 meters per second. Sensory organization function remained consistent at 64/120 seconds, with falls in both eyes closed conditions. These outcomes were consistent over the last two re-evaluations suggestive of a plateau in their recovery.

At this time, I discussed this progress with the patient and identified the plateau in recovery, as well as expected outcomes for patients with BVH.(8-10) I emphasized the importance of continued gaze stability and balance exercises through their home exercise program to maintain the progress made. I also continued to emphasize the importance of regular aerobic and strengthening exercises to maintain tolerance to daily activities and reduce fatigue. The patient showed significant improvements despite increased age and lower baseline dynamic gait scores which may have suggested greater disability (8) and had improvements in activity and participation measures greater than those previously reported (10), as well as the ability to ambulate without an assistive device.(9) However, the patient commented several times that they still felt off-balance and were not completely satisfied with their amount of recovery, as is the case with many BVH patients. With the information I learned at ICVR 2022, I would have been better able to advocate or educate the patient

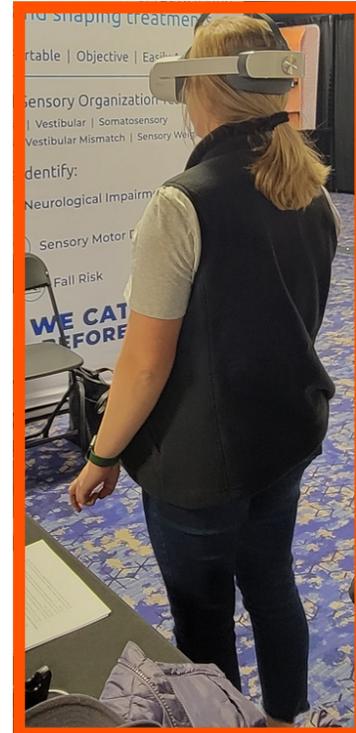
about other treatment modalities.

Discussion:

For patients who are not responsive to VPT or who plateau, there are other options to consider including the use of “high technology balance exercises” such as moving platforms or virtual reality (summarized in the CPG (2)) and sensory augmentation or substitution treatments such as the “balance belt”. These treatments can be added now to the care of BVH patients to improve their quality of life and function while we await the availability of cutting-edge treatments such as the vestibular implant.

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Participants explored technology in the exhibition hall

Best Research Poster Winner

Motor Learning of the Video Head-impulse Test by Experienced and Novice Vestibular Physical Therapists

Anne K. Galgon(1), Nijiera Addison(2), Phillip Chen(3), and DeJ'a Crippen(4)

1=Saint Joseph's University, Physical Therapy Department, PA., 2= Memorial Hermann Memorial City, TX. 3=Strive Physical Therapy at St. Francis Hospital, NJ., 4=Body Central Physical Therapy, AR

Purpose: The video head-impulse test (vHIT) has added significant diagnostic capability to health professionals,(1,2) and could assist clinical decision making of vestibular physical therapists (VPT). The vHIT provides object measurement of vestibular ocular reflex (VOR) gain and compensatory corrective saccades often missed during the clinical head impulse test (2,3) when vestibular hypofunction is present. However, learning to use new technology may be a barrier to utilization. Learning of the vHIT has been examined in medical students (4) and medical technicians,(5) but has not been investigated in physical therapists. Therefore, the purpose was to investigate the acquisition and retention of performing the vHIT by novice and experienced clinicians using a motor learning paradigm.

Participants: Ten experienced VPT (4 males, 6 females, mean age 34.4 ± 10.7) and 10 third-year DPT students (6 males, 4 females, mean age 24.9 ± 1.4) participated.

Methods: Participants completed two practice sessions using the vHIT. In each session, the participants practice 100 trials in five 20 repetition blocks for each of 6 different head impulses including left and right lateral, left anterior, right posterior, right anterior, and left posterior. For retention, participants performed two 10 repetition blocks. Performance measures included percent of impulses accepted by vHIT software (% accepted), average and standard deviation (SD) of peak head velocity, and VOR gain for each block (epoch). A successful performance was defined as $\geq 70\%$ accepted head impulses. Learning curves for percent correct and the peak head velocity measures were used to assess change in

performance during acquisition and retention. A 3-way repeated-measure ANOVA analyzed the effect of practice (epoch and session) and group on percentage accepted and average and SD of peak head velocity. Hedge's g was used to measure overall effect size from early to late acquisition. A mixed method intraclass correlation evaluated intrarater reliability of the VOR gain measurement in each session.

Results: During acquisition, there were no group effects on percentage accepted or the peak head velocity measurements. There were main effects for session and epoch on percentage accepted for both lateral impulses ($P < 0.05$) and effect sizes were large. For vertical (anterior and posterior) impulses there were only main effects of epoch on percentage accepted ($P < 0.05$) and effect sizes were small to large. There were main effects of epoch on average peak head velocity for right laterals and SD of peak head velocity for left lateral and right anterior impulses ($P < 0.05$), but no between session effects on any impulse direction. Performances were maintained at retention for all directions, but several participants in both groups did not reach 70% accepted by retention for the vertical head impulses. Group main effects were shown at retention in a few impulse directions. Intrarater reliability of the VOR gain was poor in the first session and moderate to good by session two and at retention.

Conclusion: Experienced and student physical therapists attained $>70\%$ accepted on lateral vHITs within two practice sessions and maintained learning during retention testing. Anterior and posterior vHITs

require more practice to attain 70 % accepted. Practice did not affect average peak head velocities, but the consistency of impulses (SD of peak head velocity) appeared to improve with practice. Although within rater consistency of VOR gains improved, vertical VOR gain regression curves were poor quality. Group differences in retention may be due to longer retention intervals for the experienced VPT. Understanding the learning requirements may support the adoption of the vHIT by physical therapists.

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Honorable Mention Research Poster Winner

People Living with Advanced Multiple Sclerosis Demonstrate Unique Strategies to Compensate for Vestibular-ocular Reflex Deficits

Colin R. Grove(1), Andrew Wagner(2), Brian J. Loyd(3), Leland E. Dibble(4), Michael C. Schubert(1,5)

1=Johns Hopkins University, Department of Otolaryngology-Head & Neck Surgery, Laboratory of Vestibular NeuroAdaptation; 2=The Ohio State University, Department of Otolaryngology-Head & Neck Surgery; 3=The University of Montana, School of Physical Therapy and Rehabilitation Sciences; 4=The University of Utah, Department of Physical Therapy and Athletic Training; 5=Johns Hopkins University, Department of Physical Medicine and Rehabilitation

Purpose: There are one million people living with multiple sclerosis (PLWMS) in the United States. One-third of PLWMS experience MS-related vertigo. Abnormal vestibular-ocular reflex (VOR) gains or the presence of compensatory saccades (CS) on video head impulse testing (vHIT) suggests central vestibular dysfunction in PLWMS. CS are reflexive eye rotations that move the eyes in the opposite direction of a head impulse that are used to reduce gaze position error (GPE). We report novel vHIT findings in PLWMS that may further inform rehabilitation decision-making.

Participants: Six PLWMS (mean age 57.4 ± 16.0 years-old, 4 females, and Expanded Disability Status Scale scores from 3 to 4.5) who reported dizziness and/or imbalance and had brainstem or cerebellar lesions were included in this analysis. All participants had a neurologist-confirmed diagnosis of MS; Dizziness Handicap Inventory Total Score $> 0/100$, Self-reported history of ≥ 2 falls in the prior 12 months, Activities-specific Balance Confidence Scale $< 80\%$, and/or Dynamic Gait Index Total Score $< 19/24$; no other central nervous system diagnosis, and no peripheral vestibular dysfunction. The study protocol was approved by the University of Utah and all participants provided informed consent.

Methods: Yaw plane vHIT data (Natus Medical Incorporated, Taastrup, Denmark) were analyzed using custom MATLAB(TM) code that partially

automated the analyses for VOR gain; the peak velocity, latency, and gain of CS; and GPE.(1,2) VOR gain was calculated by dividing the area under the eye velocity curve by the area under the head velocity curve. CS gain was calculated by taking the summed area under the curves of both CS divided by head velocity. Gaze position error (GPE) was calculated as the difference in eye position from the target (0°) at the conclusion of the head impulse, when head velocity reaches $0^\circ/s$. The amplitude of the recruited overt saccade was calculated as the difference between eye position at the onset and offset of the saccade. The data for this analysis was gathered as part of a study funded by the Multiple Sclerosis Society (NMSS RG-1701-26763).

Results: All participants had abnormal VOR gains bilaterally (right = $0.4 [0.3-0.5]$, left = $0.7 [0.6-0.7]$, $p=0.033$). CS responses differed by impulse direction (covert CS peak velocity: $67.1 [83.6-54.1]$ degrees/second, right vs. $181.3 [186.2-155.4]$ degrees/second, left, $p=0.08$; overt CS peak velocity: $56.6 [71.7-41.4]$ degrees/second, right vs. $165.2 [190.6-149.3]$ degrees/second, left, $p=0.013$; CS latency: $157.7 [138.8-170.8]$ milliseconds, right vs. $233.1 [212.2-251.7]$ milliseconds, left, $p=0.049$; Cumulative CS gain: $0.3 [0.2-0.3]$ right vs. $0.5 [0.5-0.5]$ left, $p=0.011$; and GPE: $9.8 [8.6-11.4]$ degrees, right vs. $5.4 [4.0-6.4]$ degrees, left, $p=0.015$). During impulses that revealed modestly reduced VOR gain,

people living with severe MS appeared to generate slow, micro-saccadic compensatory eye movements that gradually reduced the GPE that was induced by the head impulse.(2) One participant lacked the ability to generate CS during head rotations towards their more involved right side; however, they could generate delayed CS during head rotations towards the less involved left side.(2)

Conclusions: Micro CS and typical CS, which differed in amplitude, velocity, and ability to reduce GPE, were used to compensate for severe or mild VOR gain deficits during rightward and leftward impulses, respectively. Thus, PLWMS employed unique gaze stabilization strategies that depended on the residual VOR gain on the side ipsilateral to head rotation. Based on these data, PLWMS may require personalized gaze stability training that addresses their idiosyncratic strategies in compensating for reduced VOR gain.

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ICVR Poster sessions



Best Case Study Poster Winner

The Feasibility of Physical Therapy Diagnosis and Treatment of BPPV in an Emergency Room Setting: A Case Report

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Introduction: BPPV is the most common type of peripheral vertigo.(1) Many patients seek care for dizziness in the Emergency Department (ED). Despite its frequency, BPPV is often misdiagnosed, incorrectly treated, or there is a delay in receiving care from knowledgeable providers. There is some evidence that early treatment of BPPV reduces falls in the elderly (2) and lowers recurrence rates.(3) The purpose of this poster was to illustrate the role of physical therapy in early diagnosis and treatment of BPPV in an ED setting using a case report.

Case Study: Our patient is a 66 year old male who presented to the ED for evaluation of 2 days of intermittent dizziness, including room spinning dizziness after bending forward to tie his shoe. Our case illustrates how an individual can be successfully examined, diagnosed with right posterior canal BPPV, and treated with Canalith Repositioning Maneuvers (CRM) within one physical therapy session in the ED of a large teaching hospital, in accordance with the clinical practice guidelines. Our outcomes include a negative Dix-Hallpike test on subsequent testing. Additionally, the patient's symptoms were fully resolved and he was able to ambulate independently with a gait speed of 1.11 m/s and tandem gait greater than 10 steps. The patient was able to discharge home and return to work and leisure activities. Education was provided on the mechanism of BPPV, treatment plan, and a vestibular PT clinic for further treatment should his symptoms recur.

Discussion: The literature supports vestibular therapy in the ED setting. In one pilot study of evaluation of dizziness in the ED by a physical therapist, they found no adverse events, and participants had an increase in definitive diagnoses.(4) In older adult patients, who present with falls, timely treatment of underlying BPPV

could significantly reduce their fall risk.(2)

Additionally, earlier involvement of physical therapy could reduce hospital length of stay and hospital costs.(5) Some barriers to physical therapy in the ED include a lack of awareness from providers on the role of PT in vestibular rehabilitation. Additionally, the ED is a fast paced environment, often with space limitations, and physical therapy departments may have time constraints for availability of providers.(6)

Conclusion: Overall, this case study highlights how physical therapists are uniquely positioned to provide effective diagnosis and treatment of BPPV in the ED, as well as high-quality education on pathophysiology, follow-up care, and strategies to reduce fall risk. Early diagnosis of BPPV treatment with a CRM can reduce healthcare costs of unnecessary imaging, reduce fall risk, and avoid unnecessary vestibular suppressant medication.

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Honorable Mention Case Study Poster Winner

Utilizing the Updated Vestibular Hypofunction Clinical Practice Guidelines: A Case Series

Lisa Heusel-Gillig(1), Connie Weglarz(2), Holly Roberts(3)

1=Emory University Healthcare, 2=Barrow Out-patient Neuro-Rehabilitation Center, 3=University of Puget Sound, School of Physical Therapy

Purpose: The purpose of the poster was to show the importance of utilizing the new vestibular hypofunction clinical practice guidelines (1) to ensure functional recovery and contrasts two patients following vestibular schwannoma resections.

Case Series: The first case was a female who started vestibular PT three weeks after her surgery. Since she was in her acute stage of recovery, VOR x1 exercises were performed three times/day for a total of 12 minutes a day. She was also given balance and dynamic gait activities to perform including gait with head turns, eyes closed, static balance on firm and foam with eyes open and closed, and gait for endurance. She was seen weekly for four visits, then two more visits every four weeks. The second case was unfortunately not referred for vestibular physical therapy (VPT) until six months after her surgery. Her initial outcome measure scores including ABC, DHI, mCTSIB, DGI, and computerized DVA were significantly impaired. Her recovery was more prolonged and slower due to her history of migraines, persistent postural perceptual dizziness (3PD), and anxiety/depression. Since she was in the chronic stage of recovery from her vestibular hypofunction, VOR x1 exercises were prescribed for a total of 20 minutes/day as well as 20 minutes of gait and balance exercises and endurance gait. She also was prescribed habituation exercises for her 3PD. She was seen every other week for six visits. Both cases reached their goals and returned to their previous functional activities without dizziness.

Discussion: The main discussion points for the poster included: patients with vestibular schwannoma resections should receive prompt interventions as an early vestibular intervention has been shown to lead to better outcomes.

(2, 3) Delay of treatment may cause complications such as 3PD and may lead to increased use of medical resources and cost.(4) Since the motion and visually provoked dizziness of the second case was addressed with an individualized habituation and optokinetic stimulation home program, she was able to return to functional activities without dizziness or loss of balance with skilled VPT. It has also been shown that evaluating a patient with an acoustic neuroma for VPT prior to surgery for education on expectations, how to perform the gaze stability exercises, and encouraging them to walk and move their head as tolerated soon after the surgery, can also help speed up the recovery.(5)

Conclusion: The Vestibular Hypofunction CPG provided strong evidence that vestibular rehabilitation should be applied to individuals with hypofunction whether they are seen acutely or chronically as exemplified in these two case studies.

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Congrats to the Poster Winners!!!



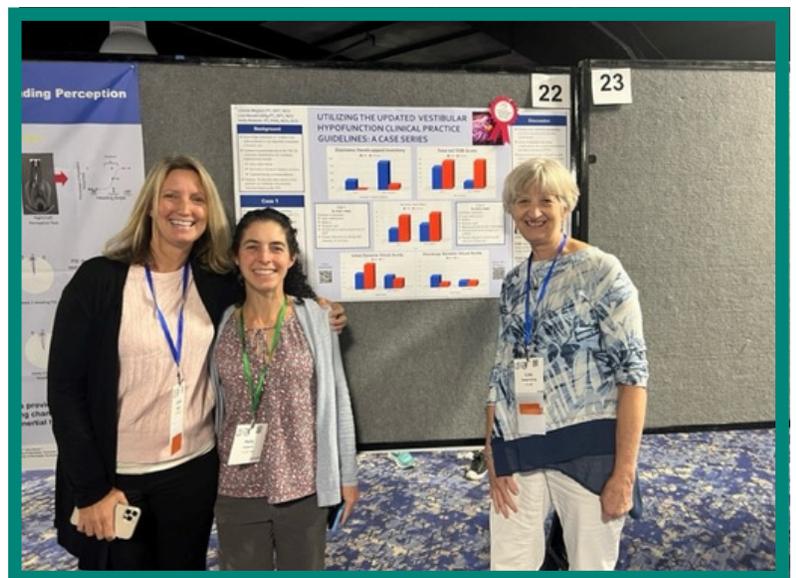
Best Research Poster Winner



Best Case Study Poster Winner



Honorable Mention Research Poster Winner



Honorable Mention Case Study Poster Winner

CSM 2023 Preview

Soniya Patel, PT, DPT* Wellspan Health, York, PA

This year's Combined Sections Meeting will be held in beautiful San Diego, California from February 22-25, 2023, where thousands of physical therapists will join to celebrate the growth and innovation in the field of physical therapy. Special events being held by the Academy of Neurological Physical Therapy this year include the VR SIG business meeting which will take place on Zoom prior to CSM on Monday February 6th at 8 pm EST or you can attend during CSM on February 23rd at 6:30 am PST. Lastly, The Vertigo-Go Dinner will be held on February 23rd, 6-9 pm.

The excitement does not end here! For further information on all the activities happening at CSM please refer to the APTA website for a detailed list of events and sessions. Below are sessions related to vestibular physical therapy. While attending CSM we hope you find these topics tailored to your interest or perhaps intrigue you to learn more. The following events to be held at CSM include:

Wed 8-5 PM

- SP-14266 Sport-Related Concussion: Integrating Optimal Interventions across the Rehabilitation Spectrum *1-day Preconference Course. Presented by: Chelsea Allyn Ortega, PT, DPT, Bobby Jean Sanders Lee, PT, DPT, LAT, Rebecca Ann Bliss, PT, DPT, DHSc, Jason A. Hugentobler, PT, DPT and Kevin Ortega, PT, DPT

Thurs 8-10 AM

- SP-14703 Science Meets Practice 1: Thinking Beyond the Buckets - How do other factors affect concussion incidence and clinical presentation. Presented By: Marie Boo, PT, DPT
- NE-12839 Novel Rehabilitation Strategies for Persons with Vestibular Disorders and Mild Brain Injury Presented By: Susan L. Whitney, PT, DPT, ATC, FAP+TA, Michael C Schubert, PT, PhD, FAPTA,

Laurie Anne King, PT, PhD and Brian James Loyd, PT, DPT, PhD

Thurs 3-5 PM

- NE-14265 Emerging Strategies for the Physical Therapist to Identify and Manage Dysautonomia Presented by Lauren Jamie Ziaks, PT, DPT, ATC and Thomas Koc, PT, DPT, PhD

Friday 11-1 PM

- NE-14635 Beyond Posterior Canal BPPV: Clinical Decision Making and a Critical Appraisal of Treatment Techniques for Anterior & Horizontal Canal BPPV Presented By: Richard Alan Clendaniel PT, PhD, FAPTA and Laura Olsen Morris, PT

Friday 3-5 PM

- GR-13694 More Than a Headache: Concussion in Older Adults Presented By: Rebecca Ann Bliss, PT, DPT, DHSc and Cathy H. Ciolek, PT, DPT, FAPTA

Saturday 8-10 AM

- NE-14485 Migraine Versus Meniere's: What Does Physical Therapy Really Have to Do with It? Presented by Sara Oxborough, PT and Helena Esmonde, PT, DPT

Saturday 1-3 PM

- Neurology-Vestibular Poster Session. Note: There are 41 poster abstracts related to Vestibular Rehabilitation across Thursday, Friday, and Saturday 1-3 pm poster sessions.

Saturday 3-5 PM

- SP-14830 Preventing Concussions in Sport - It's Never Too Late to Try Presented By: Angela Rose Spontelli Gisselman, PT, PhD, Kathryn Schneider, Carolyn Anne Emery, PT and Gerard Farrell

Thank you

ICVR Planners and Volunteers

Planning Committee: Anne Galgon, Becky Olson-Kellogg, Susan Whitney, Rachel Wellons

Program Committee: Susan Whitney, Michael Schubert, Janet Helminski

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Sponsors and Raffle Items Coordinator: Rachel Wellons

Speaker Dinner Planner: Sara Oxborough

Volunteer Coordinator: Sara McDowell

Scavenger Hunt Planner: Emma VanSickle

Poster Session Judges: Jennifer Nash, DeJ'a Crippin (head judges), Cathy Cheng, Claudia Costa, Sheri Donaldson, April Hodge, James (Chia-Cheng) Lin, Karen Skop, Diane Wrisley

Other On-site Volunteers: (Greeters, Registration and ANPT booth helpers) Stacia Bone, Julie Bosworth, Doniele Brasure, Cathy Chang, Naseem Chatiwala, Maureen Clancy, Rene Crumley, Elizabeth Dannenbaum, Sheri Donaldson, Sydney Duhe, Rebecca English, Mary Ann Garcia, Jaqueline Gomes, Colin Grove, Dawn Fitzgerald, Megan Heil, Lisa Heusel-Gillig, Cristin Hovee, Kelly Hussey, Nicole Miranda, Becky Olson-Kellogg, Mary Beth Osborne, Vaghela Panktie, Chuck Plishka, Wendy Schoenewald, Mary Lohse Shepherd, Britta Smith, Debbie Struikma, Jennifer Taylor, Susan Whitney, Diane Wrisley, Barb Young

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Topics in Vestibular Physical Therapy (TVPT) is the official publication/newsletter of the Vestibular Rehabilitation Special Interest Group (VRSIG) of the Academy of Neurologic Physical Therapy (ANPT). The purpose of the publication is to disseminate clinically relevant information to our members who treat individuals who have vestibular related symptoms.

The editors of the TVPT will accept literature reviews, brief research reports, clinical perspectives, conference presentation summaries, and clinical case studies. Editors will support and mentor clinicians who wish to contribute clinical experience and knowledge in this forum. The editors invite members to suggest topics and guest editors with expertise in a targeted topic.

TVPT is published biannually and is available online through the ANPT/VRSIG web page.

<https://www.neuropt.org/special-interest-groups/vestibular-rehabilitation/newsletters>

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