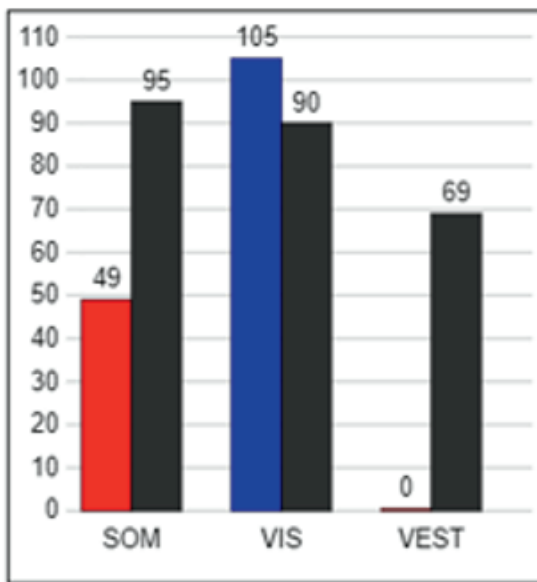


Case Study: Persistent Sensation of Falling Post Stroke & Brainstem Tumor Removal.

Patient Background: Patient is a 68-year-old male with a complex neurological history. He suffered a stroke caused by a blood clot that traveled through a patent foramen ovale to his brain. Subsequently, he underwent surgery to remove a brainstem tumor and received radiation treatment thereafter. During surgery, cranial nerve VI was manipulated, resulting in severe eye misalignment that was later corrected surgically. He no longer reports head pain following the tumor removal.

Presenting Complaints: Patient's primary concern is a persistent sensation of falling, particularly when bending over, standing up quickly, or standing with feet together and eyes closed. He denies experiencing true dizziness but often feels as if he is drugged, especially when fatigued. He also reports difficulty maintaining balance in crowded environments, occasional nausea and fatigue (sometimes attributed to his eyes), and a need to hold onto walls when moving in the dark. He is also unable to golf, one of his favorite recreational pastimes, due to his inability to stand without losing his balance while swinging a club. While he has not fallen recently, he has a history of previous falls.

Sensory Score



Equilibrium Score

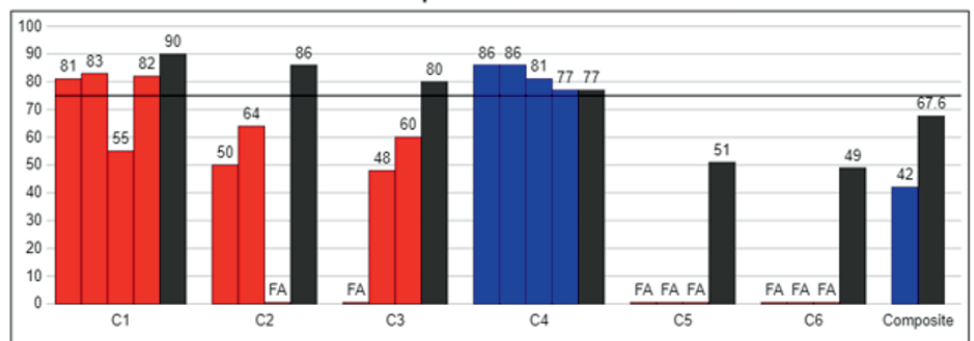


Chart Explanation: A Clinical Test of Sensory Interaction on Balance (CTSIB) chart is a tool used by clinicians to assess a patient's balance and identify which sensory systems—visual, vestibular (inner ear), and/or somatosensory (touch and joint position)—might be impaired. The chart records a patient's stability under different conditions (firm and soft surfaces, eyes open and closed) that selectively challenge these systems. The black bars represent the norm for that age group. Results shown in red indicate performance below norm, and blue indicates at or above the norm. SOM=Somatosensory, VIS=Vision, VEST=Vestibular System

Clinical Findings: Exam revealed double vision with eye tracking, incomplete right eye movement, abnormal gaze holding/convergence, and positive Romberg and Sharpened Romberg (eyes open/closed), indicating significant proprioceptive and vestibular deficits. He was unable to perform tandem or single-leg stance bilaterally and showed a marked drop in dynamic visual acuity with head movement (7 lines). Gait pace was normal but imbalanced. CTSIB testing showed a composite score of 42 (somatosensory 49, visual 105, vestibular 0). Findings confirm heavy reliance on visual input, moderate somatosensory impairment, and absent vestibular contribution, consistent with vestibular sensory visual mismatch (VSVM). In VSVM, overdependence on vision causes severe instability when cues are reduced or in visually complex environments, increasing fall risk.

Functional testing revealed a Mini-BESTest score of 7/28 (severe balance dysfunction), DHI 56/100 (moderate-severe handicap), and TUG of 11s (within normal limits for age, though not reflective of other impairments). During testing, the patient reported nausea that improved as the session progressed.

Assessment and Plan: Patient demonstrates substantial limitations in static and dynamic balance, gaze stability, and mobility safety, all of which significantly impact his independence and quality of life. These findings are consistent with peripheral vestibular dysfunction and oculomotor impairment related to his neurological history. He is an appropriate candidate for skilled physical therapy, with a good prognosis for improvement in balance, proprioception, and coordination. Therapy will focus on enhancing his safety and independence in daily activities; there are currently no barriers to his participation in therapy.

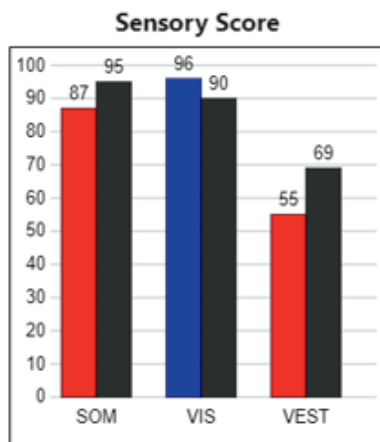
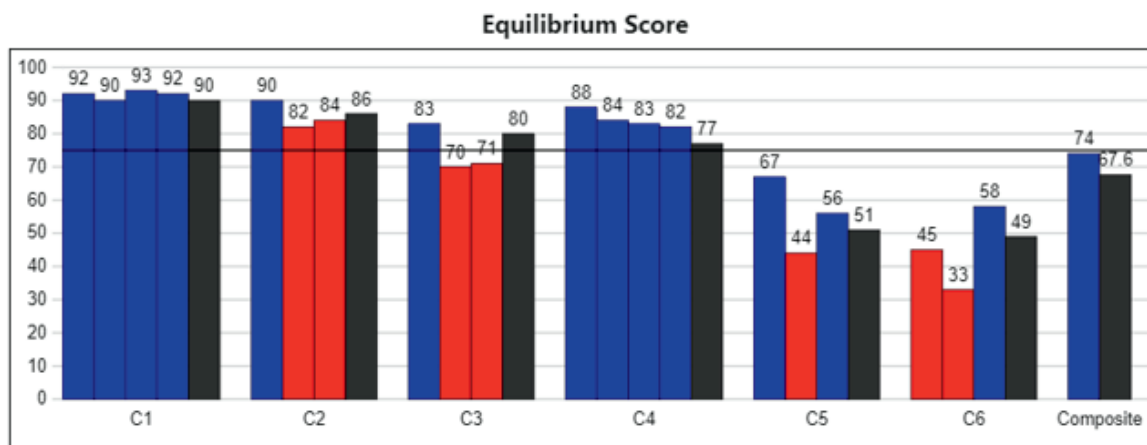


Treatment Approach Utilizing FYZICAL's Unique Vestibular Rehabilitation Paradigm: FYZICAL's approach to vestibular rehabilitation is distinguished by its comprehensive focus on sensory integration, progressive challenge, and real-world functional recovery. The program begins with a thorough assessment using advanced tools to identify the specific contributions and deficits of the vestibular, visual, and somatosensory systems. Therapy is then tailored to address the patient's vestibular sensory visual mismatch (VSVM) and severe balance issues.

Core elements of the FYZICAL paradigm for vestibular rehab include:

- **Sensory Reweighting and Integration:** Exercises systematically challenge and retrain the brain to integrate input from all three sensory systems. This often involves performing balance tasks with altered or reduced sensory inputs (e.g., standing on foam with eyes closed). The goal is to decrease reliance on visual cues and restore vestibular contributions to postural control.
- **Gaze Stabilization and Oculomotor Training:** Targeted activities improve the vestibulo-ocular reflex (VOR), enhancing gaze stability during head movement and reducing sensations of dizziness or visual blurring.
- **Dynamic Balance and Dual-Tasking:** Therapy emphasizes movement in complex, real-world scenarios, such as walking while turning the head or performing cognitive tasks. This maximizes carryover to daily life and builds confidence.
- **Technology and Safety:** FYZICAL often incorporates overhead safety harness systems, which allow patients to safely push their limits without risk of falling, enabling greater challenge and faster progress than traditional therapy environments. Advanced diagnostic technology, including the use of Infrared Video Oculography (IVOG) goggles and the specific Clinical Test of Sensory Interaction and Balance (CTSIB) protocols, is commonly utilized at FYZICAL. IVOG (Infrared Video Oculography) goggles are used to precisely evaluate the patient's oculomotor function and vestibular responses by tracking eye movements in various positions and during head movements. This technology allows clinicians to objectively distinguish between peripheral and central vestibular deficits, as well as detect subtle abnormalities in eye tracking, nystagmus, or gaze stability that may not be visible on standard clinical exam. The use of IVOG provided detailed data on the patient's oculomotor impairment, confirming deficits in gaze holding and dynamic visual acuity. The CTSIB is performed using an instrumented platform to objectively measure postural sway and quantify the patient's reliance on somatosensory, visual, and vestibular inputs for balance. This very useful technology enables clinicians to accurately identify the root causes of the patient's symptoms and tailor the rehabilitation plan to address both vestibular and oculomotor deficits.
- **Multidisciplinary and Individualized Progression:** Treatment intensity and complexity are continually adjusted based on patient response and reassessment, ensuring steady improvement while minimizing setbacks. This model differs from traditional therapy by prioritizing the restoration of sensory integration—rather than compensation or isolated strengthening—and by using advanced safety technology and real-world functional training. For this patient, this approach is designed to restore independence, reduce fall risk, and optimize quality of life following significant vestibular dysfunction.

Progress After JUST 10 Physical Therapy Visits: After 10 sessions of targeted vestibular rehabilitation using FYZICAL’s Balance Paradigm, the Patient has demonstrated substantial progress in multiple domains of balance and functional mobility. His CTSIB composite score improved from 42 at baseline to 67 (target 75), reflecting enhanced overall stability. The somatosensory sub score rose from 49 to 74, and most notably, the vestibular score increased from 0 to 46, indicating much better utilization of vestibular input for balance. Concurrently, his reliance on vision decreased, as evidenced by a reduction in the visual sub score from 105 to 97. Functional testing showed his Mini-BESTest score improved dramatically from 7 to 25 (target 28), and his Dizziness Handicap Inventory (DHI) decreased from 56 to 24, revealing a significant reduction in perceived handicap due to dizziness and disequilibrium. He is now able to stand on one foot for 10 seconds on the left and 14 seconds on the right, and his tandem stance times are 42 seconds on the left and 34 seconds on the right, reflecting measurable gains in static balance.



**See chart explanation on page 1.*

While the progress to date has been very encouraging, patient continues to experience some degree of imbalance and fatigue after therapy sessions, which affects activities such as rising from the floor and confidence in returning to golf. The remaining deficits—particularly in vestibular and composite balance scores—continue to affect his ability to perform more complex or dynamic functional tasks safely. Ongoing therapy will focus on further enhancing vestibular and somatosensory integration, advancing balance and coordination exercises, and gradually introducing golf-specific and functional training to help the patient achieve his personal goals and maximize independence. It is expected that within another 6-8 weeks, this patient will reach and achieve all his goals.



31 Bangor Mall Blvd. Bangor, ME 04401

(P) 207-291-5714 | (F) 207-433-1246 | fyzical.com/twin-city-bangor-me