Evidence has shown that vestibular rehabilitation can be effective in improving symptoms related to many vestibular - inner ear - disorders.\(^1,2\)

People with vestibular disorders often experience problems with vertigo, dizziness, visual disturbance, and/or imbalance. These are the problems that rehabilitation aims to address. Other problems can also arise that are secondary to the vestibular disorder like nausea and/or vomiting, reduced ability to focus or concentrate, and fatigue. Symptoms due to vestibular disorders can diminish quality of life and can impact all aspects of life from economic to social participation as well as can contribute to emotional problems, like anxiety and depression. Additionally, one of the consequences of having a vestibular disorder is that the symptoms frequently cause people to adopt a sedentary lifestyle in order to avoid bringing on, or worsening, dizziness and imbalance that occurs with movement. As a result, decreased muscle strength and flexibility, increased joint stiffness, and reduced stamina can occur from this lifestyle. Treatment strategies used in rehabilitation can also be beneficial for these secondary problems.

**What is vestibular rehabilitation?**

Vestibular rehabilitation (VR) is a specialized form of therapy intended to alleviate both the primary and secondary problems due to vestibular disorders. It is an exercise-based program primarily designed to reduce vertigo and dizziness, reduce gaze instability, and/or reduce imbalance and fall risk as well as address any secondary impairments that are a consequence of the vestibular disorder. For most people who have a vestibular disorder, the deficit is permanent because the amount of restoration of vestibular function is very small. However, after vestibular system damage, symptoms can reduce and function can improve because of compensation. This occurs because the brain learns to use other senses (vision and somatosensory---body sense) to substitute for the deficient vestibular system. The health of particular parts of the nervous system (brainstem and cerebellum of the brain and of the visual and somatosensory sensations) is important in determining the extent of recovery that can be gained through compensation. For many, compensation occurs naturally over time, but for
patients whose symptoms do not reduce and who continue to have difficulty returning to daily activities, VR can assist in recovery by promoting compensation. The goal of VR is to use a problem-oriented approach to promote compensation. This is achieved by customizing exercises to address the specific problem(s) of each individual. Therefore, before an exercise program can be designed, a comprehensive clinical examination is needed to identify problems related to the vestibular disorder. Depending on the vestibular-related problem(s) identified, three principal methods of exercise can be prescribed: 1) Habituation, 2) Gaze Stabilization, and/or 3) Balance Training.

**Habituation exercise** is used to treat symptoms of dizziness that is produced because of self-motion and/or produced because of visual stimuli. Habituation exercise is indicated for patients who report increased dizziness when they move around, especially when they make quick head movements, or when they change positions like when they bend over or look up to reach above their heads. Also, habituation exercise is appropriate for patients who report increased dizziness in visually stimulating environments, like shopping malls and grocery stores, when watching action movies or T.V., and/or when walking over patterned carpets and shiny floors. Habituation exercise is not suited for dizziness symptoms that are spontaneous in nature and that does not worsen because of head motion or visual stimuli. The goal of habituation exercise is to reduce the dizziness through repeated exposure to specific movements or visual stimuli that provokes patients’ dizziness. These exercises are designed to mildly, or at the most, moderately provoke the patients’ symptoms of dizziness. The increase in symptoms should only be temporary, and before continuing onto other exercises or tasks, the symptoms should return completely to the baseline level. Over time, with good compliance and perseverance, the dizziness intensity can reduce due to the brain learning to ignore the abnormal signal.

**Gaze Stabilization exercises** are used to improve control of eye movements so vision can be clear during head movement. These exercises are appropriate for patients who report problems seeing clearly because their visual world appears to bounce or jump around, such as when reading or when trying to identify objects in the environment, especially when moving about. There are two types of eye and head exercises used to promote gaze stability. The choice of which exercise(s) to use depends on the type of vestibular disorder and extent of the disorder. One type of gaze stability exercise incorporates fixating on an object while patients repeatedly move their heads back and forth or up and down for up to a couple of minutes. One example is:
The other type of gaze stability exercise is designed to use vision and somatosensation (body sense) as substitutes for the damaged vestibular system. Gaze shifting and remembered target exercises use sensory substitution to promote gaze stability. (Add picture from Han 2011 – see link – fig 2 – OK to use as long as original article is properly cited) The exercises that use sensory substitution to promote gaze stability are particularly helpful for patients with poor or no remaining vestibular function, like those with damage to both inner ears.4

**Balance Training exercises** are used to improve steadiness so that daily activities for self-care, work, and leisure can be performed successfully. Exercises used to improve balance should be designed to address each patient’s specific underlying balance problem(s).7 Also, to promote changes in balance, the exercises need to be moderately challenging, but safe enough so patients do not fall while doing them. Features of the balance exercises that are manipulated to make them challenging, include:

- Visual and/or Somatosensory cues
- Stationary positions and dynamic movements
- Coordinated movement strategies (movements from ankles, hips, or combination of)
- Dual tasks (performing a second task while balancing)

Additionally, balance exercises should be designed to reduce environmental barriers and fall risk. For example, the exercises should help improve patients’ ability to walk outside on uneven ground or walk in the dark. Ultimately, balance training exercises are designed to help improve standing, bending, reaching, turning, walking, and if required, other more demanding activities like running, so that patients can safely and confidently return to their daily activities.

For patients with **Benign Paroxysmal Positional Vertigo (BPPV)**, the exercise methods described above are not appropriate to resolve this type of vestibular disorder. Through assessment, the type of BPPV is identified, and depending on the type, different repositioning maneuvers can be performed to help resolve the spinning that occurs due to position changes.8,9
For more details about BPPV, including the type of VR exercises used, see VEDA’s Benign Paroxysmal Positional Vertigo Handout. After BPPV has been successfully treated, and symptoms of spinning due to position changes have resolved, a portion of patients will continue to report non-specific dizziness (symptoms other than spinning) and/or imbalance. Treatment using habituation exercise and/or balance training may be indicated for these patients.4

**What should patients expect from Vestibular Rehabilitation?**

VR is usually performed on an outpatient basis, although in some cases, the treatment can be initiated in the hospital. Patients are seen by a licensed physical or occupational therapist with advanced post-graduate training.

VR begins with a comprehensive clinical assessment that should include collecting a detailed history of the symptoms and how these symptoms affect daily activities. The therapist will document the type and intensity of symptoms as well as discuss the precipitating circumstances. Additionally, information about medications, hearing or vision problems, other medical issues, history of falls, previous and current activity level, and the living situation will be gathered. The assessment also includes administering different tests to more objectively evaluate the problems. The therapist will screen the visual and vestibular systems with various tests that observe how well eye movements, body movements and balance are being controlled by these systems. The examination may also include tests of: sensation (which includes gathering information about pain), muscle strength, extremity and spine range of motion, coordination, posture and walking ability.

A customized exercise plan is developed from the findings of the clinical assessment, results from laboratory testing and imaging studies that may have been done, and input from patients about their goals for rehabilitation. For example, a person with BPPV may undergo a canal repositioning exercise for the spinning they experience, while someone with gaze instability and dizziness due to vestibular neuritis (a deficit from a weakened inner ear) may be prescribed gaze stability and habituation exercises, as well as balance training to improve balance. An important part of the VR is to establish an exercise program that can be performed regularly at home. Compliance with the home exercise program is essential to help achieve rehab and patients’ goals.

Along with prescribing and progressing exercise, patient and caregiver education is an integral part of VR. There is tremendous value in providing education about the science behind vestibular problems and giving the patients an explanation of how their specific problems relate to the difficulties they may have with functioning in everyday life. Also, the therapist can provide information about
how to deal with any difficulties and discuss what can possibly be expected from VR. Education is important for patients because it takes away much of the mystery of what they are experiencing, which can help reduce any anxiousness that may occur because of the vestibular disorder.

**Are vestibular rehabilitation exercises difficult to do?**

The exercises are not difficult to learn, but that doesn’t mean they are easy to do!

The exercises can sometimes be tedious; however committing to doing them is key to helping you achieve success. Setting up a regular schedule so that you incorporate them into your day is very important. Exercises may, at first, make your symptoms seem worse. But with time and consistent work, your symptoms should steadily improve, and then, you will find that you are able to participate more in the activities of your daily life.

**Factors that can impact recovery**

When patients participate in VR, different factors can impact the potential for recovery. For example, the type of vestibular disorder affects recovery. Patients that have a stable vestibular disorder, such as vestibular neuritis or labyrinthitis, have the best opportunity to have a satisfactory resolution of symptoms. When patients have a progressive vestibular disorder, like with multiple sclerosis, or a fluctuating condition, like with Migraine and Meniere’s, which causes spontaneous attacks of dizziness or vertigo, compensation can be difficult to achieve, and therefore, success with VR is more difficult. There are also differences in response to VR depending on whether you have one or both inner ears involved, or whether the problem lies within the vestibular parts of the brain as opposed to the ear(s). In patients with progressive or fluctuating disorders, to improve the chance for success with VR, it is important that these disorders also be managed medically. Patients with Vestibular Migraine may benefit more from VR by implementing behavioral changes (reduction of migraine triggers and participation in cognitive behavioral treatment) and/or using pharmacological therapy to help reduce or eliminate the headache attacks. Although VR does not treat the attacks of vertigo that patients with Meniere’s disease experience, if the frequency of these attacks is reduced with diet and medication, or if indicated, reduced with a more aggressive chemical or surgical type of treatment, then VR can possibly help reduce symptoms that occur between attacks. The goal of medical management is to help stabilize the disorder as best as possible to allow for compensation to occur. As a consequence, the exercise strategies used in VR will have a better chance to promote compensation and reduce vestibular-related symptoms.
Although there are differences in potential recovery if patients have a unilateral lesion (only one ear affected by a vestibular disorder) as compared to having a bilateral lesion (both ears are affected), with unilateral lesions generally having a better course of recovery as compared to those with bilateral lesions, VR does facilitate recovery in patients with bilateral lesions.\textsuperscript{14,15} Lastly, for patients with central vestibular disorders, the structures of the brain that allow for compensation are affected, which limits the amount and speed of recovery. However, these patients need not be excluded from VR because research has shown that patients can make gains with VR, so a trial course of VR should be attempted to see how much recovery can be made.\textsuperscript{3}

Other factors that can potentially limit recovery:

- **Sedentary lifestyle**
  Being inactive can lead to suboptimal levels of health and fitness, which can cause secondary problems. Also, this lifestyle can further decrease the tolerance to movement by decreasing the threshold that it takes to aggravate the symptoms of dizziness and unsteadiness. In turn, desire to be active is reduced even more, thus creating a vicious cycle. Slowly and progressively, training the body to increase tolerance to movement and promote physical fitness is a goal of VR and can address this factor.

- **Pain**
  In general, pain contributes to imbalance and is associated with increased risk of falls in older adults.\textsuperscript{16} Also, because pain can be a major reason why people restrict their movement and activity level, it can contribute to the vicious cycle of being sedentary and the consequences of being sedentary. Furthermore, pain restricts full participation in VR because the reduced ability to do the exercises, which will limit VR’s effectiveness. For these reasons, pain should be routinely assessed and managed with physical therapy and medical interventions, as needed, so that results of VR can be maximized.

- **Presence of Other Medical Conditions**
  It is more difficult to accomplish the goals set in VR when patients have multiple medical conditions to deal with in addition to having a vestibular disorder. In fact, any condition that reduces the ability to perform the exercises that are needed to be done will lessen the chances of achieving success. Additionally, just like pain is a factor that increases the risk of falling, certain medical conditions (cardiovascular, arthritis, foot problems, vision problems, neurological diseases, cognitive impairments) are also factors that increase fall risk.\textsuperscript{17} Assessment and a proactive, multi-factorial approach to management of these conditions should be done.

- **Certain Medications or Multiple Medications**
Use of medication is a “two edge sword” because on one side it provides needed benefits that are necessary for managing disease, and on the other side, it can cause side effects like dizziness, sedation, muscle fatigue and weakness, and unsteadiness and falls, which only magnifies the problems that already exist due to the vestibular disorder. Additionally, when multiple medications are prescribed, the side effects are compounded. Tinetti and colleague’s work has revealed that not only is taking four or more medications a factor that increases risk of fall, but also certain types of medications like psychoactive medications (sedatives, antipsychotics, and antidepressants), anticonvulsants, and antihypertensive medications are strongly associated to increased risk of falling.

In particular, when it comes to medication usage for vestibular disorders, frequently patients are prescribed medication, like meclizine (Antivert) and diazepam (Valium), for acute symptoms. The goal of these medicines is to act on the brain so that the intensity of dizziness and/or nausea is not as strong. Because these medications suppress brain function, they can be counter-productive with promoting compensation, so it is best to not use them for extended periods of time.

Since there can be a tradeoff between the benefits and risks of using medications, decisions about usage should be done on an individual basis and should include the priorities of each patient as well. For instance, certain medications that reduce blood pressure can cause lightheadedness, which can potentially lead to unsteadiness and/or falls. Determining which is more important, the risk of heart disease and stroke or fall injuries causes a potential dilemma in patient management. Physicians take into consideration which patients are at greater risk of having a stroke, so controlling blood pressure is in the best interest of these patients, as compared to other patients who are at more risk of falling, thus potentially causing a serious fall injury, like of the head or hip, so taking medication that lowers blood pressure too much may not be indicated.

Patients can be helpful with making decisions about medication usage by knowing what their medications are supposed do for them and knowing what the possible side effects are for their medications. This can lead to more effective discussions between patients and physicians about any symptoms that might be experienced from the medication(s). From these conversations, physicians can work toward achieving the same intended benefit, but can also reduce any side effects being experienced by taking different actions:

- Make sure medications are being taken correctly
- Adjust medication dosage
- Eliminate unnecessary medications
- Prescribe a different medication
Emotional Concerns
Anxiety, panic, and depression occur frequently with vestibular disorders and can cause difficulty with managing the symptoms due to the vestibular disorder. Frequently, patients will restrict their activity to avoid increasing their vestibular related symptoms, and thus, use it as a method to help manage their emotional symptoms. This coping strategy limits compensation that is necessary to promote recovery from vestibular disorders. With slow, progressive exposure to movement and activities that is prescribed in VR, patients can experience improvement of symptoms, which can have a positive impact on reducing the emotional symptoms. However, for those patients that are being impacted significantly by emotional conditions, seeking assistance through cognitive behavioral and/or pharmacological therapy to help address these problems is important to be able to achieve the goals of VR.18,19

Decompensation
With compensation, symptoms due to a vestibular disorder can reduce because the brain recalibrates and fine tunes the signals. However, it must be kept in mind that damage to the vestibular system is permanent, so there is potential for symptoms to return. Symptomatic relapses can occasionally occur because the brain de-compensates. This can be due to different emotional and/or physical stressors, like personal or job-related pressures, periods of inactivity, a bad cold or flu, extreme fatigue or chronic lack of sleep, changes in medication, or sometimes surgery.3 Although it is important for patients to consult with their physician to make sure nothing new has occurred, returning to the exercises that promoted the initial compensation can help promote recovery again. Additionally, recovery after de-compensation usually occurs more quickly as compared to the initial compensation.

Where can I find a vestibular rehabilitation specialist?

The Vestibular Disorders Association (VEDA) provides a directory of health professionals who are specially trained to assess and treat vestibular disorders. This online directory offers users the ability to search for providers according to specialty and geographical location. For locate this online directory, visit: vestibular.org/finding-help-support
References


7. Horak FB. Postural orinetation and equilibrium: what do we need to know about neural control of balance to prevent falls?


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