Vestibular Rehabilitation Improves Daily Life Function

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This article reviews recent research that addresses the functional outcomes of intervention for vestibular disorders. Vestibular impairments cause disequilibrium, blurred vision, disorientation, and vertigo. These sensory disturbances and motor impairments in turn cause dysfunction in many activities of daily living and in social interactions that traditional medical treatments do not address. The motor sequelae of some vestibular disorders can be treated successfully with programs of graded exercises and activities, the functional implications of which are described herein. The functional impairments caused by other vestibular disorders, which cannot be treated with graded activities, are also described. These disorders include bilateral vestibular loss caused by connective tissue disorders or by the use of ototoxic medications, tumors of the labyrinth or vestibular nerve, and Meniere's disease. Occupational therapy intervention for these conditions may involve providing adaptive equipment, teaching alternative strategies for performing activities of daily living, and psychological intervention for depression and anxiety.

Evidence in the literature suggests that programs of graded exercises and activities that facilitate repetitive head movements are useful for treating the symptoms of vestibular impairments. These programs gradually increase the range of motion and frequencies through which patients can tolerate head movement. Based on exercises originally described by Cawthorne (1946) and Cooksey (1946), programs incorporating these principles are known as Cawthorne-Cooksey exercises or vestibular rehabilitation.

Symptoms of Vestibular Impairment

Disorders of the vestibular system are characterized by vertigo, disequilibrium, disorientation, and blurred vision (Balog & Honrubia, 1990). Vertigo, a specific kind of dizziness, refers to the illusion of self-motion, usually described as a sense of spinning or falling, although the person is actually sitting or lying still. Vertigo seems to be caused by an inequality in the signals ascending the vestibular nerves to the vestibular nuclei. When the signals are equal, as is the case for persons without disabilities and for persons with total bilateral vestibular loss, the person does not experience vertigo. Persons experience vertigo when one side of the peripheral or central vestibular structures is impaired (the system is bilateral) and the other side is normal, or when the two sides are impaired to varying degrees. A related phenomenon, oscillopsia, may also be described as dizziness. Oscillopsia, the illusion of movement in the visual scene, occurs because of the visual-vestibular interaction in the vestibular system (Fox & Cohen, 1993).

Disequilibrium refers to poor balance or a sense of being unable to correct postural displacements off the gravitational vertical. Because the vestibular system has projections from the vestibular nuclei to the spinal cord, the system generates postural reflexes that compensate for head movement when the head moves off the center of gravity (Keshner & Cohen, 1989). Disequilibrium can be caused by loss or impairment of the labyrinthine righting responses, which generate a compensatory postural reflex to maintain the head's upright position in response to movement of the trunk. Many other signals are also involved in maintaining balance, and vestibular disorders are not the only cause of disequilibrium. Disequilibrium may also be caused by other kinds of sensory loss as well as various orthopedic problems, such as leg-length discrepancy, subluxed bones in the foot, or muscular weakness.

Disorientation refers to the sense of not knowing one's location in egocentric space, such as the direction of the gravitational vertical, or one's location in geographical space. Vestibular function is more directly involved in egocentric orientation (Cohen & Keshner, 1989). Blurred vision can be caused by an impaired vestibuloocular reflex (VOR). This reflex is the compensatory
Oscillpsia, disequilibrium, blurred vision while moving, disorientation, or a combination of the above. The functional assessment of these patients reflects these problems. Therefore, the assessment should include some indication of the amount of vertigo. Evaluating vertigo on a five-point qualitative scale from "no vertigo" to "vertigo with nausea" is valid and reliable (Cohen et al., 1992). The vertigo assessment should include a description of when the vertigo occurs or what stimulates it (Cohen, 1993). Treatment activities can then be designed to mimic those tasks or to include those motions. This information can be used later for reevaluation to determine whether treatment has been effective.

Functional balance should be evaluated during performance of ADLs, with emphasis on those areas likely to be difficult (Cohen, 1993). Most patients have difficulty walking on uneven surfaces and with tasks that involve weight shifting, bending, and reaching, such as transfers, lower-extremity dressing and bathing, taking objects in and out of low or high shelves or cupboards, and gardening. They also have difficulty with tasks that involve rapid head movements, head tilt, and accurate vision while moving, such as driving a car, using a telephone receiver with a shoulder support, and reading labels or signs while walking.

Functional Improvements

Recent data have indicated that a program of vestibular rehabilitation (incorporating balance retraining, conditioning exercises, and repetitive head movements as tolerated) is effective in improving functional motor skills and independence in ADLs (Cohen, 1992) (see Figure 2). These patients typically had difficulty performing essential ADLs that involved rapid head movement (such as driving a car) as well as tasks that involved changing position with reference to gravity (such as bending over to don socks and shoes). After intervention to reduce vertigo and improve balance, patients were much more independent in these ADLs. Similar paradigms with repetitive exercises are useful in improving dynamic balance, as indicated by scores on computerized tests of dynamic balance (Horak, Jones-Rycewicz, Black, & Shumway-Cook, 1992; Shumway-Cook & Horak, 1990). These studies indicate the functional value of intervention for patients with peripheral vestibular deficits but do not address the specific type of treatment most beneficial for these patients. Many patients with acute peripheral vestibular disorders do improve without treatment, but the research to date has not clarified exactly which patients need treatment and which patients do not.

Figure 2. Level of functional disability on six activities of daily living (ADLs) for patients when healthy and before and after vestibular rehabilitation. Mean disability score is the mean of the median scores on several tasks. Rx = treatment. Adapted with permission from Cohen, H. (1992). Vestibular rehabilitation reduces functional disability. Otolaryngology—Head and Neck Surgery, 107, 638-643.
Recent research has addressed the use of graded purposeful activities designed to increase head movements that have the same parameters as the Cawthorne-Cooksey exercises (Cohen et al., 1992, 1993). Activities are designed to stimulate vertigo while the subject is occupied by something other than the movement or the vertigo. Preliminary data indicated that even a minimal program of simple head exercises practiced daily at home improves functional independence. Preliminary data also suggested that patients who participate in a more rigorous program at an outpatient clinic with an occupational therapist improve even more. Figure 3 shows performance on representative ADLs before and after intervention for both home treatment and outpatient treatment groups, including grocery shopping, home management skills, and lower-extremity dressing. As with the previous data set, patients were greatly impaired in performing many ADLs, especially tasks requiring rapid head movements and bending over or otherwise changing position with reference to gravity, and patients improved greatly in these functional areas after receiving occupational therapy.

Alternative Functional Intervention Strategies

Not all vestibular disorders can be treated with classic vestibular rehabilitation. Studies in the literature have included patients with primarily peripheral, labyrinthine disorders (such as vestibular neuronitis), benign paroxysmal positional vertigo, postconcussive syndrome, or labyrinthitis. Some disorders cannot be treated with this technique, such as a bilateral loss due to connective tissue disorders or use of ototoxic medications for other conditions, and tumors of the labyrinthine structures, which are traditionally treated medically or surgically. Nevertheless, occupational therapists do have a role in providing adaptive equipment and work simplification techniques to solve the vestibular symptoms seen in these patients.

Meniere’s Disease

Meniere’s disease presents a special problem. This inner-ear disorder, characterized by unpredictable attacks of severe vertigo and tinnitus (cracking or other noise in the ears), hearing loss, and a sense of pressure or fullness in the ear is of unknown etiology. It is apparently caused by intermittent increases of fluid in the inner ear. This disorder cannot be treated successfully with the kinds of exercise and activity programs described above. Instead, the usual treatment is medical and, in severe cases, surgical.

Research on the functional problems of patients with Meniere’s disease has suggested that these patients have significant functional impairments during periodic attacks of tinnitus and vertigo (Cohen et al., 1993). The associated hearing loss and the unpredictability of attacks

![Figure 3](http://ajot.aota.org/)

**Figure 3.** Level of functional performance on three ADLs after two different programs of graded activity and exercise.
of vertigo cause functional impairments as well (Cohen et al., 1993; Ewell, 1992). Although no studies have addressed occupational therapy intervention with these patients, it is likely that many patients with this inner-ear disorder could benefit from occupational therapy to improve their functional skills. The kinds of intervention that may be valuable include adaptive reorganization of the physical environment to make the workplace and the home safer in the event of a sudden attack of vertigo, techniques to reduce the amount of motion needed to sit down safely at the onset of an attack of vertigo, and alternative means to perform some tasks while sitting down. Because of the disruption in life-style caused by this problem, patients often withdraw from social activities and recreational activities. Occupational therapy may also be useful in dealing with these problems by helping the patient to adapt to the environment or the activities as needed.

Central Vestibular Lesions

Physicians often have difficulty diagnosing central lesions of the vestibular system. Occupational therapists may see patients with lateral medullary syndrome, also called Wallenberg's syndrome, a cerebrovascular accident of the posterior inferior cerebellar artery. This artery supplies the vestibular areas of the cerebellum and the vestibular nuclei in the brainstem. This syndrome is characterized by poor balance, poor oculomotor control, and mixed somatosensory loss to the face (Jung & Nissen, 1991).

Other central lesions that involve vestibular loss include cerebellar lesions that damage or compress the vestibulocerebellum and some traumatic brain injuries. These patients have poor balance and vertigo; unfortunately, they have so many other problems that the vestibular impairments can go undetected until long after discharge from rehabilitation services. In these cases, vestibular rehabilitation treatment combined with the patients' other rehabilitation programs improves functional performance in ADLs, decreases vertigo, and improves balance (Cohen, 1992).

Conclusion

Vestibular impairments cause vertigo, blurred vision, disequilibrium, and disorientation. These symptoms can be extremely disabling and cause dependence in ADLs, including self-care skills, home management tasks, community mobility, job tasks, and avocational activities. These impairments affect all aspects of daily life. Therapy programs of graded activities and exercises to facilitate head movements in space are useful in reducing vertigo and improving balance. Occupational therapists can also improve function by adapting the home and work environments as needed for safety and efficiency. This kind of treatment has been shown to be effective in improving functional performance in daily life skills. ▲

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