VEDA
LIFE REBALANCED

VISION

GAZE STABILITY

The vestibular and vision systems work in harmony to stabilize our gaze.

ARTICLE

082

DID THIS ARTICLE HELP YOU? SUPPORT VEDA @ VESTIBULAR.ORG

5018 NE 15th Ave.
Portland, OR 97211
1-800-837-8428
info@vestibular.org
vestibular.org

Vision Challenges with Vestibular Disorders

By Michael C. Schubert, PT, PhD, Kenneth Ciuffreda, OD, PhD, FCOVD-A, Allen H. Cohen, OD, FCOVD, and Cheryl Israeloff, OD

Vestibular disorders often cause difficulty with vision because the vestibular and visual systems work together to stabilize vision.

THE EYE-EAR CONNECTION

The 'eye ear' connection is known as the vestibulo-ocular reflex (VOR). The VOR plays a critical role in maintaining eye stability during head motion. This is known as gaze stability. The VOR also sends signals to the postural muscles of the trunk, arms, and legs, which help us maintain our balance.

A disrupted or impaired VOR can result in abnormal vestibular nystagmus, a reflexive motion in which the eyes appear to jerk in one direction and then slowly reset in the opposite direction.

HOW THE VISUAL AND VESTIBULAR SYSTEMS WORK TOGETHER

The visual and vestibular systems send signals back and forth to inform our brains about our movement in space. When a person has a vestibular disorder, the inner ear sends abnormal signals to the eye muscles. This can cause a slight misalignment of the eyes. It is essential to address these misalignments to achieve optimal symptom reduction.

The inner ear includes a unique type of sensory hair cell that responds to head motion. When the head rotates, the hair cells move, and this triggers the firing rate in the vestibular nerve, which sends this signal to the brain, eyes, and postural muscles.

In the absence of motion, both inner ears are sending a signal to the brain. The amount of signal from the left and right ears should be similar. Typically, this signal becomes asymmetric when the head rotates to one side. For example, when the head turns toward the right, the firing rate from the right vestibular nerve increases while the firing rate from the left vestibular nerve decreases. The brain interprets the difference in firing rate as a rotation (or motion) of the head. This information is used to provide stability to the eyes and postural muscles during head motion, helping us maintain balance. Therefore, if the vestibular system is not working correctly in one ear (or both), then the brain does not receive

NYSTAGMUS IS A REFLEXIVE MOTION WHERE THE EYES APPEAR TO JERK ONE DIRECTION (FAST) AND THEN SLOWLY RESET IN THE OPPOSITE DIRECTON.

correct information about head motion from the vestibular nerves, which results in symptoms such as vertigo, imbalance, or oscillopsia (jumping vision).

VISUAL PROBLEMS ACCOMPANY VESTIBULAR DISORDERS

It is common for patients with vestibular disorders to experience significant visual complaints, such as focusing on an object or perceiving that objects are moving from side to side or revolving around them (vertigo). Their visual field may jiggle or bounce during head motion (oscillopsia), or they may have double vision (diplopia). The eyes often feel tired and strained.

Many patients with a vestibular disorder may also experience photosensitivity (discomfort in bright light) and other vision problems, such as intense discomfort with flickering lights, particularly from fluorescent lights or highly reflective surfaces. Environments with a combination of fluorescent lighting and busy patterns or moving objects are especially problematic, which is why shopping in large stores may be very difficult. Special tints can be prescribed to reduce these symptoms.

Reading text on a printed page can be difficult for people with an impaired VOR, because the small head motion destabilizes gaze. The result is words and letters that appear to oscillate and shift. Reading text on a computer monitor may be problematic due to heightened sensitivity to screen flickering or scrolling pages of text. Scrolling text is challenging due to the motion of the words and the increase in the number of eye movements that are needed to be performed.

Patients with vestibular disorders are acutely aware of any visual distortion. Therefore, consideration needs to be given to determine the appropriate type of lens correction to use. Frame selection and base curve of the lens are essential to minimize any distortion.

VISUAL DEPENDENCE

Individuals with vestibular disorders often experience a visual dependence, where the brain becomes reliant on vision to maintain balance due to unreliable signals from the inner ear. This may lead to symptoms when a person's visual field is overwhelmed, for example, by busy patterns on wallpaper, or when they lack a point of fixation, such as in darkness or wide-open spaces. Typical comments from such patients include:

- "Being in a crowd of people or wide-open spaces makes me feel disoriented and panicky."
- "I often take a cart in the grocery store, even when I'm only shopping for one item."
- "I become so frustrated in public places; I would rather just stay home."

EVALUATION

During a routine eye exam, in-depth testing of the binocular system is not typically done. Therefore, eye misalignments are often not detected. This is especially true when the misalignment only manifests with specific head movements. Consequently, it is recommended that patients consult with an optometrist who specializes in Neuro Optometric examinations and treatment. The Neuro Visual Optometric evaluation assesses the visual, ocular motor, and focusing skills necessary for stabilizing the sensory-motor components of the vestibulo-ocular reflex (VOR).

The eyes are a window into the inner ear. Some laboratory tests used to diagnose a vestibular disorder involve evaluation of the vestibular system based on eye movements. For example, electronystagmography (ENG) is a battery of tests to measure brain and vestibular-originated eye movements. Included in the test battery is the measurement of nystagmus that may occur when the head is placed in certain positions or when one ear is stimulated with warm (or separately cold) water or air, known as the caloric test. The eye movements are recorded using small electrodes placed on the skin around the eyes or with a video camera mounted to a goggle frame (known as video-nystagmography or VNG). Rotation testing employs the same electrodes or goggles to measure the relationship between the velocity of the head and eyes during whole-body rotation.

TREATMENT

The first approach to resolving most vision problems associated with visual-vestibular disorders is to eliminate ocular or functional visual issues, such as eye fixation and eye movement, focusing, and binocular teaming problems. An evaluation by an optometrist (OD) specifically trained to address the vestibular patient is necessary to diagnose and treat these problems.

Neuro-optometric treatments are an essential component of treatment, especially if an underlying focusing, ocular malalignment, visual acuity, or visual processing problem is suspected in addition to the vestibular disorder. Such optometric therapies may involve the use of corrective lenses, including prisms and spectacles, tints, and treatments to enhance vision and functional visual skills, such as fixation, eye movement, focusing, and eye teaming ability. It is crucial to address any visual problems, no matter how small, for vestibular rehabilitation therapy to be maximally effective. Vestibular physical therapy incorporates exercises aimed at improving gaze and gait stability, reducing head motion-induced dizziness, decreasing fall risk, and enhancing overall fitness.

DON'T AVOID MOVEMENT

Vestibular disorders can be disabling and thus tempt those affected to stay home and avoid head motion or visual stimulation. However, this will undermine the brain's ability to adjust and recover. Treatment is most effective when visual and vestibular therapies are combined.

REFERENCES

1. Akdal G, Ozge A, Ergör G .The prevalence of vestibular symptoms in migraine or tension-type headache. J Vestib Res. 2013 Jan 1;23(2):101-6. doi: 10.3233/VES-130477.
2. Fife TD, Tusa RJ, Furman JM, Zee DS, Frohman E, Baloh RW, Hain T, Goebel J, Demer J, Eviatar L. Vestibular testing techniques in adults and children: report of the therapeutics and technology subcommittee of the American Academy of Neurology. Neurol. 2009; 55:1431–1441.
3. Desmond A. Vestibular Function: Evaluation and Treatment. New York: Thieme; 2004.
4. Eckhardt-Henn A, Breuerb P, Thomalskec C, Hoffmann SO, Hopf HC. Anxiety disorders and other psychiatric subgroups in patients complaining of dizziness. J Anxiety Disord. 2003;17(4): 369–388.
5. Cha Y-H, Lee H, Santell LS, Baloh RW. Association of benign recurrent vertigo and migraine in 208 patients [published online ahead of print January 16, 2009]. Cephalalgia. Accessed April 9, 2009.
6. Fransson PA, Patel M, Magnusson M, Berg S, Almbladh P, Gomez S. Effects of 24-hour and 36-hour sleep deprivation on smooth pursuit and saccadic eye movements. J Vestibular Res. 2008;18:209–222.
7. Quarck G, Ventre J, Etard O, Denise P. Total sleep deprivation can increase vestibulo-ocular responses. J Sleep Res. 2006;15(4):369–375.
8. Cohen A. Vision Rehabilitation for vision-vestibular dysfunction. The role of the Neuro-optometrist. Neurorehabilitation. 2013 (32): 483-492

NOTES:

VESTIBULAR DISORDERS ASSOCIATION
5018 NE 15th Ave. Portland, OR 97211
1-800-837-8428 info@vestibular.org vestibular.org

Did this free publication from VeDA help you?

You can ensure that educational articles like this continue to be available to vestibular patients like you by making a tax-deductible gift to VeDA today.

SUPPORT VEDA

One-time gift: ☐ $40 ☐ $50 ☐ $75 ☐ $100 ☐ $250 ☐ other

Monthly gift: ☐ $10 ☐ $15 ☐ $25 ☐ $35 ☐ $50 ☐ other

☐ Check this box if you prefer that your donation remain anonymous.

PAYMENT INFORMATION

Donations gladly accepted online at **http://vestibular.org**. Check or money order in US funds, payable to VeDA.

Visa MC Amex Discover _____ _____ _____
Card number Exp. date CVV code

_____
Billing address of card (if different from mailing information)

MAILING INFORMATION

Name _____ Telephone_____ Email _____
Address _____ City_____ State/Province _____ Zip_____
Country _____