COMMENTARY

Reduced self-motion perception due to bilateral vestibulopathy

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ABSTRACT

Measurements of vestibular reflexes are the main component of the current diagnostic criteria for Bilateral Vestibulopathy (BV). However, clinical significance of these thresholds in this particular population has not yet been thoroughly established and they are not frequently assessed. The purpose of this study was to examine patterns of self-motion perception performance and vestibular function in BV patients. It also compared perceptual self-motion thresholds between BV patients and control participants.

Key Words: *Blurred vision*

INTRODUCTION

Bilateral vestibulopathy is a chronic condition in which one or both of the bilateral labyrinths, the vestibular nerves, the brain, or a combination of these, are deficient. Unsteadiness while moving or standing, movement-induced blurred vision (oscillopsia), and unsteadiness that is worse in low light or on uneven terrain are all symptoms. As diagnostic criteria, these signs and symptoms are combined with verified bilaterally diminished or absent angular Vestibular-Ocular-Reflex (VOR) function. There may also be additional symptoms like depression, anxiety, cognitive decline, and a higher risk of falling. This may result in a decline in quality of life and have significant socioeconomic effects.

Since BV is a chronic, diverse condition that affects the vestibular system differently, it can manifest clinically in a variety of ways. As a result, it presents a diagnostic difficulty because various results from diagnostic tests can be discovered, such as a clinical Head Impulse Test result that is deceptively normal (due to compensatory covert saccades) and normal results from a rotatory chair test. This leads to frequent under- or incorrect diagnosis.

Reflexes are primarily measured by the diagnostic procedures now used to diagnose BV, such as the caloric test, Video Head Impulse Test (vHIT), and torsion swing test. Perceptual self-motion thresholds, however, are not frequently assessed. Given that about one-third of patients with vestibular problems perform normally on the common diagnostic tests that assess reflexes, this might be complimentary. Additionally, a network of different brain regions and structures, including those in the cortex (such as the ventral intraparietal area, the parieto-insular vestibular cortex, and the medial superior temporal area), the cerebellum (such as the nodulus/uvula and the fastigial nucleus), the thalamus (such as the ventroposterior complex), and the brainstem, are involved in the perception of self-motion (vestibular nuclei in the dorsolateral pons and medulla).

Different testing paradigms, such as in-depth research-directed protocols or a newer, quicker, more clinically oriented testing paradigm, can be used to determine perceptual thresholds. The provided stimuli are determined by the subject's responses on prior trials (adaptive approach); the subject is not permitted to make an indifferent response (i.e., the subject is instructed to guess when he or she is unsure about the perceived stimulus: forced-choice); only one stimulus is presented (one-interval paradigm); and the subject must distinguish between a positive or a negative stimulus (e.g. a rightward from a leftward motion: recognition task).

The sort of stimulus employed and the quantity and type of motion-directions assessed differ between extensive research-based protocols and the more therapeutically oriented testing methodology. The longer, research-oriented tests use a fixed frequency with sinusoidally formed acceleration profiles as its stimulus type. The testing paradigm that is clinically focused relies on stimuli with the longest exposure to steady peak acceleration (plateau phase), which might be regarded as the primary stimulus parameter of concern. Due to platform restrictions, this suggests that these stimuli are not frequency-fixed. Research-oriented protocols use two-option paradigms when testing different motion-directions, whereas the clinically-oriented protocol uses a twelve-option paradigm.

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Recognizing one interval While the more clinically focused twelve-option testing paradigm has a maximum testing time of one hour, research-oriented protocols for detecting self-motion perception as a function of frequency use two-option tasks with testing times ranging from three to twelve hours. Because vestibular loss impairs attention function, the clinically oriented test may be more useful to clinical practice and easier to interpret for individuals with BV.

Since testing of vestibular reflexes were only conducted on patients with BV, the real vestibular function of the people in the control group remained unknown. Exclusion criteria for control patients, however, included having a present (or prior) vestibular disorder; as a result, their vestibular function was anticipated to be within the normal range.

The findings of this study would have been primarily underestimated if vestibular impairments had been present in some control participants. When examined using the clinically oriented testing paradigm, self-motion perception is markedly reduced in BV patients compared to control subjects for almost all rotations and translations. Additionally, in BV patients, diminished self-motion perception is typically linked to decreased residual vestibular function. Due to the relatively smaller somatosensory contribution compared to other motion profiles and directions, yaw rotations are where this is most noticeable. This may make rotations in the yaw plane the vestibular organs' most sensitive representation of self-motion sense. It is suggested that research settings and maybe future clinical practice examine self-motion perception as a functional outcome measure for vestibular implantation.