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ORIGINAL ARTICLE

## Immediate effects of an anchor system on the stability limit of individuals with chronic dizziness of peripheral vestibular origin<sup>☆</sup>

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### KEYWORDS

Postural balance;  
Vestibular diseases;  
Dizziness;  
Haptic information

### Abstract

**Introduction:** The symptoms associated with chronic peripheral vestibulopathy exert a negative impact on the independence and quality of life of these individuals, and many individuals continue to suffer from these symptoms even after conventional vestibular rehabilitation.

**Objective:** To evaluate the acute effect of an anchor system for balance evaluation of patients with chronic dizziness who failed to respond to traditional vestibular rehabilitation.

**Methods:** Subjects over 50 years of age, presenting with chronic dizziness and postural instability of peripheral vestibular origin, participated in the study. The limit of stability was evaluated in three positions using the Balance Master<sup>®</sup> system: Position 1, standing with the arms along the body; Position 2, standing with the elbows bent at 90° (simulating holding the anchors); and Position 3, with the elbows bent at 90° holding the anchors. The variables of movement latency, endpoint excursion and directional control of movement were evaluated.

**Results:** Using the anchor system, significant reduction of time in the response at the beginning of the movement compared to Position 1 ( $p < 0.05$ ); increased endpoint excursion in the left lateral direction compared to Position 1 ( $p < 0.05$ ); and more directional control of movement in the anterior and posterior directions ( $p < 0.05$ ) compared to the other positions, were found.

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**PALAVRAS-CHAVE**

Equilíbrio postural;  
Doenças vestibulares;  
Tontura;  
Informação háptica

*Conclusion:* While using the system anchor, individuals with chronic peripheral vestibulopathy showed an immediate improvement in the stability limit in relation to the movement latency, endpoint excursion, and directional control of movement variables, suggesting that the haptic information aids postural control.

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### Efeitos imediatos de um sistema de âncoras no limite de estabilidade de indivíduos com tontura crônica de origem vestibular periférica

**Resumo**

*Introdução:* Os sintomas associados à vestibulopatia periférica crônica têm impacto negativo na independência e qualidade de vida dos indivíduos, e muitos deles continuam a sofrer desses sintomas, mesmo depois de terem passado pela reabilitação vestibular convencional.

*Objetivo:* Avaliar o efeito agudo de um sistema de ancoragem para avaliação do equilíbrio de pacientes com tontura crônica que não responderam à reabilitação vestibular tradicional.

*Métodos:* Indivíduos com mais de 50 anos que se apresentaram com tontura crônica e instabilidade postural de origem vestibular periférica participaram no estudo. O limite de estabilidade foi avaliado em três posições, com o uso do sistema Balance Master®: Posição 1, de pé com os braços pendentes ao longo do corpo; Posição 2, de pé com os cotovelos flexionados em 90° (simulando a posição de segurar as âncoras); e Posição 3, com os cotovelos flexionados em 90° e segurando as âncoras. Foram avaliadas as variáveis de latência de movimento, ponto final da excursão e controle direcional do movimento.

*Resultados:* Com o uso do sistema de âncoras, ocorreu redução significativa no tempo de resposta no início do movimento em comparação com a Posição 1 ( $p < 0,05$ ); aumento no ponto final da excursão na direção lateral esquerda, em comparação com a Posição 1 ( $p < 0,05$ ); e mais controle direcional do movimento nas direções anterior e posterior ( $p < 0,05$ ), em comparação com as demais posições.

*Conclusão:* Enquanto usavam o sistema de âncoras, os indivíduos com vestibulopatia periférica demonstraram melhora imediata no limite da estabilidade em relação às variáveis latência de movimento, ponto final da excursão e controle direcional do movimento, sugerindo que a informação háptica auxilia no controle postural.

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**Introduction**

The majority of symptoms reported by elderly people, such as dizziness, postural instability, gait disturbances and falling incidents,<sup>1</sup> can be the consequences of several diseases originating in the vestibular system.<sup>2</sup> These vestibular system disorders are a significant problem in healthcare.

Dizziness is prevalent in 5–10% of the world's population, and it is the seventh most frequent complaint in women and the fourth most frequent in men. Approximately 47% of men and 61% of women over age 70 years are affected by dizziness. Dizziness occurs in 65% of subjects aged 65 years and older who live in the community and in 81–91% of those of the same age who are treated at geriatric outpatient clinics.<sup>3</sup>

The deterioration of vestibular function lead to falling and has many consequences, including physical impairments (tissue injuries, gait changes); psychological changes (fear of falling, depression); social changes (isolation, dependency); and economic changes (medication costs, rehabilitation).

Postural control, a complex ability that involves postural orientation and the maintenance of balance, depends on central processing inputs related to visual, vestibular, and somatosensory afferent mechanisms,<sup>4</sup> and to the proportional neuromuscular action of efferent mechanisms. The information related to visual, vestibular, and somatosensory systems should be integrated and selected in accordance with the environment and the type of task to be performed in order to maintain postural stability.<sup>5</sup>

In patients with vestibular disorders, disturbances of sensorial integration or information processing that generate conflict among the visual, vestibular and somatosensory systems may be present, which could explain the permanency of symptoms of chronic vestibular disorder, such as the inability to modulate sensory information in a way that is adequate to ensure postural balance.<sup>2</sup>

Among the main therapies recommended for the treatment of vestibular disorders, as well as for multiple otoneurologic symptoms, drug therapies, surgery, and vestibular rehabilitation (VR) should be highlighted. VR is a type

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