



ORIGINAL ARTICLE

Subjective visual vertical with the bucket method in Brazilian healthy individuals[☆]



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KEYWORDS

Ear;
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Abstract

Introduction: The capacity of a healthy individual to estimate the true vertical in relation to the Earth when a fluorescent line is aligned in a completely dark room is called the subjective visual vertical.

Objective: To evaluate subjective visual vertical using the bucket method in healthy Brazilian individuals.

Methods: Binocular subjective visual vertical was measured in 100 healthy volunteers, 50 females and 50 males. The volunteers indicated the estimated position in which a fluorescent line inside a bucket reached the vertical position. A total of ten repetitions were performed, five clockwise and five counterclockwise. Data were tabulated and analyzed statistically.

Results: It was observed that the highest concentration of absolute values of vertical deviation was present up to 3°, regardless of gender, and the vertical deviation did not increase with age. The analysis of the mean of the absolute values of deviations from the vertical of 90% of the sample showed a maximum value of 2.6°, and at the analysis of 95%, the maximum value was 3.4° deviation from the vertical.

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Orelha;
Equilíbrio postural;
Membrana otolítica

Conclusion: The bucket method is easy to perform and interpret when assessing the deviation of the subjective visual vertical in relation to the true vertical in healthy Brazilian individuals. © 2016 Associação Brasileira de Otorrinolaringologia e Cirurgia Cérvico-Facial. Published by Elsevier Editora Ltda. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Vertical visual subjetiva com o método do balde em indivíduos brasileiros hígidos**Resumo**

Introdução: A capacidade que um indivíduo hígido tem em estimar a vertical verdadeira em relação à Terra, quando alinha uma linha fluorescente em uma sala completamente escura é denominada de Vertical Visual Subjetiva (VVS).

Objetivo: Avaliar a VVS com o método do balde em indivíduos brasileiros hígidos.

Método: A VVS binocular foi medida em 100 voluntários hígidos, 50 do gênero feminino e 50 do masculino. Os voluntários indicaram a posição estimada em que uma linha fluorescente no interior de um balde alcançou a posição vertical. Foram realizadas 10 repetições, cinco no sentido horário e cinco no anti-horário. Os dados foram tabulados e submetidos à análise estatística.

Resultados: Observou-se que a maior concentração dos valores absolutos dos desvios da vertical esteve presente até 3°, independente do gênero e o desvio da vertical não aumentou conforme a idade. À análise da média dos valores absolutos dos desvios da vertical de 90% da amostra, foi encontrado o valor máximo de 2,6° e à análise de 95% o valor máximo foi de 3,4° de desvio da vertical.

Conclusão: O método do balde é fácil de realizar e de interpretar na avaliação do desvio da vertical visual subjetiva em relação à vertical verdadeira de indivíduos brasileiros hígidos.

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Introduction

The inner ear, also called the labyrinth, can be divided into anterior labyrinth, which contains the hearing organ (cochlea) and posterior labyrinth, comprising the three semicircular canals (lateral, superior, and posterior) and the vestibular system, which includes the utricle and the saccule.¹ The inner ear vestibular system receptors consist of two types of structures: one cupula-endolymphatic system in the three semicircular canals, sensitive to angular accelerations, and an amalgam of otoliths within a viscoelastic membrane at the level of the utricular and saccular macula, sensitive to linear accelerations.¹ Concomitant with information from the visual and proprioceptive systems, the cortical otolith afferents also participate in spatial orientation, motion perception, the mental representation of the body in space,¹ and the perception of verticality.^{2,3}

The ability to judge whether the objects are in the vertical position is called subjective visual vertical (SVV).

In a healthy individual, the otolith organs alone can construct the SVV, even in cases of deprivation of visual and proprioceptive stimuli; in unilateral vestibular dysfunction, the recovery of SVV seems to be associated with the possibility of effectively using proprioceptive and exteroceptive information, particularly those of the plantar surface.⁴

The bucket method, the object of our research, was initially designed⁵ and then compared⁶ with the sophisticated and standardized hemispheric dome method,⁷ showing that

the distribution of SVV values was similar for the two methods, thus demonstrating that the bucket method can become part of routine clinical examinations, as it is inexpensive and easy to perform.

In the dome method, a hemispheric dome covered with colored dots and a linear target is rotated randomly and the individual is instructed to align the target through a video game control, making it as vertical as possible; in the bucket method, a bucket is rotated and the individual indicates when a fluorescent straight line displayed in the inferior and inner part of the bucket reaches a vertical position.⁶ In the bucket method, the range of absolute deviations of the SVV values in relation to the true vertical in healthy subjects was $0.9 \pm 0.7^\circ$ (mean \pm standard deviation); no significant effect of age or gender was identified.⁶

Another study indicated that the bucket method is useful to describe spatial deficits in patients with proven vestibular disorder, but not as a screening test. In 50 healthy subjects, the mean (standard deviation, minimum/maximum) of the absolute values of vertical deviation was 1.2° (0.7; $0^\circ/3.2^\circ$) for females; and 1.0° (0.8; $0^\circ/2.7^\circ$) for males.⁸

In Brazil, SVV was evaluated in 30 healthy Brazilian individuals by adjusting a virtual line in the vertical position with a computer mouse, projected on a white screen. The mean deviation of SVV was $-0.372^\circ \pm 1.21$; representing six repetitions.⁹

Another study with of 160 healthy Brazilian individuals determined the SVV using a 24-cm portable stick with

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