









# Comparison of the level of confidence to perform daily activities before and after vestibular rehabilitation in patients with vestibular dysfunction

Comparação do nível de confiança para realização de atividades diárias pré e pós reabilitação vestibular em pacientes com disfunção vestibular

Comparación del nivel de confianza para la realización de actividades diarias antes y después de la rehabilitación vestibular en pacientes con disfunción vestibular

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## Abstract

**Introduction:** Vestibular rehabilitation (VR) appears as a therapeutic option in cases of dizziness and postural imbalance. The Activities-specific Balance Confidence Scale (ABC Scale) is a questionnaire used

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### Authors' contributions:

MIBA: data collection and writing of the manuscript.

ASLE: writing of the manuscript.

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to assess the interference of these vestibular symptoms with the individuals' level of confidence to carry out daily activities involving postural balance. **Objective:** to compare the level of confidence to carry out daily activities related to body balance, before and after VR, in patients with vestibular dysfunction. **Method:** Primary, interventional, clinical, longitudinal, prospective, analytical, and noncontrolled study. The sample comprised 14 male and female individuals with peripheral vestibulopathy. The ABC Scale was applied before and after VR. Descriptive and inferential data analysis were performed, using Fisher's Exact test, Student's t-test, and the linear mixed-effects model. **Results:** The sample had 78.57% females and 21.43% males, with a mean age of 59.21 years. There was a statistical difference in ABC Scale results before and after VR ( $p < 0.0001$ ). There was no statistical difference between its scores and sex, age, or the number of therapy sessions. **Conclusion:** It was concluded that this study patients' confidence level changed from low in the pre-rehabilitation phase, to high in the final phase of the intervention, which consolidates the increase in confidence level that led to an improvement of quality of life.

**Keywords:** Dizziness; Vertigo; Rehabilitation; Questionnaires; Labyrinth diseases.

## Resumo

**Introdução:** A reabilitação vestibular (RV) surge como uma opção terapêutica em casos de tontura e desequilíbrio postural. O The Activities-specific Balance Confidence Scale (ABC Scale) é um questionário utilizado para avaliar a interferência destes sintomas vestibulares por meio do nível de confiança dos indivíduos em realizar atividades diárias que envolvem o equilíbrio postural. **Objetivo:** comparar o nível de confiança na realização de atividades diárias relacionadas ao equilíbrio corporal, pré e pós reabilitação vestibular (RV) em pacientes com disfunção vestibular. **Método:** Estudo primário, intervencional, clínico, longitudinal, prospectivo, analítico, não controlado. Participaram 14 indivíduos, do sexo feminino e masculino, portadores de vestibulopatia periférica. Foi aplicado o *Activities-specific Balance Confidence Scale (ABC Scale)* nas condições pré e pós RV. Os dados foram analisados de forma descritiva e inferencial, pelos testes Exato de Fisher, t-Student e o modelo linear de efeitos mistos. **Resultados:** A amostra se caracterizou por 78.57% do sexo feminino e 21.43% do sexo masculino, com média de idade de 59.21 anos. Observou-se diferença estatística quando comparados os resultados do ABC Scale nas condições pré e pós RV ( $p < 0.0001$ ). Não foi verificada diferença estatística entre os escores deste instrumento com as variáveis sexo, idade e número de sessões terapêuticas. **Conclusão:** Foi possível concluir que o nível de confiança dos pacientes dessa amostra modificou de baixo, na fase pré reabilitação, para alto, na fase final da intervenção, o que consolida a ocorrência do aumento no nível de confiança que acarretou melhoria na qualidade de vida.

**Palavras-chave:** Tontura; Vertigem; Reabilitação; Questionário; Doenças do labirinto.

## Resumen

**Introducción:** La rehabilitación vestibular (RV) aparece como una opción terapéutica en casos de mareos y desequilibrio postural. La Escala de Confianza en el Equilibrio Específica de Actividades (Escala ABC) es un cuestionario utilizado para evaluar la interferencia de estos síntomas vestibulares a través del nivel de confianza de los individuos en la realización de actividades diarias que involucran el equilibrio postural. **Objetivo:** comparar el nivel de confianza en la realización de actividades cotidianas relacionadas con el equilibrio corporal, pre y post rehabilitación vestibular (RV) en pacientes con disfunción vestibular. **Método:** Estudio primario, intervencionista, clínico, longitudinal, prospectivo, analítico, no controlado. Participaron 14 individuos, hombres y mujeres y con vestibulopatía periférica. La Escala de Confianza del Equilibrio Específica de Actividades (Escala ABC) se aplicó en condiciones previas y posteriores a la RV. Los datos fueron sometidos a análisis descriptivo e inferencial mediante la prueba exacta de Fisher, t-Student y el modelo lineal de efectos mixtos. **Resultados:** La muestra se caracterizó por 78,57% del sexo femenino y 21,43% del masculino, con una edad media de 59,21 años. Hubo diferencia estadística al comparar los resultados de la Escala ABC en condiciones pre y post RV ( $p < 0,0001$ ). No hubo diferencia estadística entre los puntajes de este instrumento con las variables sexo, edad y número de sesiones terapéuticas. **Conclusión:** Fue posible concluir que el nivel de confianza de



los pacientes de esta muestra pasó de bajo, en la fase de pre-rehabilitación, a alto, en la fase final de la intervención, lo que consolida la ocurrencia del aumento en el nivel de confianza que llevó a una mejora en la calidad de vida.

**Palabras claves:** Mareos; Vértigo; Rehabilitación; Cuestionario; Enfermedades del laberinto.

## Introduction

Dizziness is defined as the sensation of disordered body balance due to an illusion or imprecise perception of movement, imbalance, or visual disturbance, which in turn is caused by conflicting integration of sensory information that aids body control<sup>1</sup>. This is one of the most common symptoms to affect both sexes, with a greater prevalence among older adults, estimated at 85%<sup>2</sup>.

Vestibular symptoms have a significant impact on the quality of life (QOL), reflecting on these people's physical and psychological safety. Psychological symptoms may be accompanied by the fear of falls, which leads to a loss of self-confidence and fear of doing daily activities that require body balance<sup>3</sup>.

Vestibular rehabilitation (VR) has been proposed as a therapeutic option to minimize vestibular symptoms and, therefore, its interference with QOL. It works based on neuroplasticity mechanisms through adaptation, habituation, and substitution processes to speed vestibular system compensation. It is grounded on global conditioning practices and specific exercises that in combination improve body balance and control<sup>4</sup>.

Some questionnaires can be used to quantify dizziness symptoms and monitor treatment effects. For instance, the Activities-specific Balance Confidence Scale (ABC Scale), developed by Powell and Myers<sup>5</sup>, aims to assess the subject's level of confidence to maintain the balance necessary to do functional daily activities and helps screen possible risks of falls<sup>6</sup>. This instrument is indicated to assess and monitor the patient's post-VR performance.<sup>7</sup>

Many scientific studies in this field highlight the use of different questionnaires to address how dizziness and other vestibular symptoms interfere with and restrict the patient's QOL. However, ABC Scale has been little used in the national literature to compare levels of confidence before and after VR treatment<sup>5</sup>.

Hence, this study aimed to compare the level of confidence of patients with vestibular hypofunc-

tion to do daily activities that require body balance before and after VR.

## Method

This study was approved by the Research Ethics Committee of the Onofre Lopes University Hospital (HUOL) – Federal University of Rio Grande do Norte (UFRN), under evaluation report number 1.808.228.

This is a primary, longitudinal, interventional, prospective, analytical, and noncontrolled clinical study.

Data were collected between September 2017 and June 2018. The study began with 18 patients, but three gave up the treatment because of difficulties attending the UFRN speech-language-hearing teaching clinic, as they depended on public transportation from inland state, and one patient reported improvements after three sessions. Thus, the convenience sample comprised 14 male and female patients affected by unilateral peripheral vestibular hypofunction.

The previous nosological and functional diagnosis was reached by an otorhinolaryngologist, who interpreted the results of the clinical assessment and vector electronystagmography. The functional diagnosis was chosen because VR is indicated as the first treatment approach, being strongly recommended, and having a level of evidence I according to the Clinical Practice Guideline of the American Physical Therapy Association Neurology Section, to treat peripheral vestibular hypofunction.<sup>7</sup>

All participants signed an informed consent form.

The inclusion criteria were adult, or older adult male or female patients, diagnosed with peripheral vestibular dysfunction due to unilateral hypofunction, with a history of dizziness, body imbalance, and/or falls. Patients with neurological or neoplastic diseases, central dysfunction, severe visual disorders, changes in the cervical spine, or psychiatric problems that made it difficult or impossible for them to be interviewed, answer the questionnaire,

and/or undergo the treatment were excluded from the study – as well as those diagnosed with benign paroxysmal positional vertigo, as it requires canalith repositioning maneuvers specific to the affected semicircular canal.

All patients had their speech-language-hearing history surveyed to find their complaint characteristics and define the therapeutic approach to be followed.

In the initial session, patients were instructed regarding the treatment, life habits related to body balance, nutritional support, and prevention of falls.<sup>7</sup>

Then they answered the Portuguese version of the ABC Scale<sup>8</sup>, which the researchers read aloud to them. They gave scores ranging from 0 to 100 to the protocol items, in which 0 corresponded to the absence of confidence and 100, to full confidence to do daily activities that require balance. The total score was obtained by summing the results and dividing it by 16 (the number of questions). The level of confidence was defined based on the final score, considering it high when the score was higher than 80%, moderate when it was 50-80%, and low when it was lower than 50%.<sup>8</sup>

Afterward, patients underwent personalized VR according to each patient's symptoms. The exercises were selected from various protocols based on described criteria, such as Cawthorne and Cooksey<sup>9,10</sup> and *Associazione Otologi Ospedalieri Italiani (AOOI)*<sup>11</sup>, and the treatment was based on the Clinical Practice Guideline of the American Physical Therapy Association Neurology Section.<sup>7</sup> These exercises provide conflicting sensory information or sensory provocation associated with vestibulo-ocular reflex and vestibulospinal reflex stimuli.

Patients received written and image instructions along with their companions to do two to three selected exercises at home, twice a day, with 10 repetitions each (gradually, according to each patient's clinical condition). Companions/caregivers received information on the correct vestibular training model to help at home in between visits to the therapist. The number of therapy sessions

ranged from four to 12, depending on the patient's availability to go to the teaching clinic, over 3 months.

After finishing VR and before the discharge, each patient responded ABC Scale again. The otorhinolaryngologist and speech-language-hearing therapist clinically reassessed the cases, being discharged with the suggestion of outpatient follow-up and periodicity according to each situation.

Data were analyzed with basic descriptive statistics. To reach the objectives, the inferential analysis was performed with Fisher's Exact test, Student's t-test for quantitative paired data, and the linear mixed-effect model test. In all analyses, the level of significance was set at 5%.

## Results

There was a 78.57% prevalence of females in the sample, while 21.43% were males. The mean age was 59.21 years, with a minimum of 38 and a maximum of 75 years.

Concerning etiology characterization, 35.71% had vascular dizziness, 35.71% had metabolic dizziness, 14.28% had vestibular neuritis, 7.14% had persistent perceptual-postural dizziness, and 7.14% had Ménière's disease.

The most prevalent associated comorbidities were diabetes mellitus and systemic arterial hypertension (35.71%). Other ones, such as arthritis, arthrosis, headaches, and hypercholesterolemia were reported less often (7.14%).

The most reported complaint was vertigo associated with changes in head position or sudden body movements (57.14%), followed by instability associated with dizzy head and imbalance (14.29%). Concomitant neurovegetative symptoms appeared less often (7.14%).

The number of therapy sessions ranged from three to seven – 14.29% had only three, 42.86% had four, 21.43% had five, and 7.14% had six or seven sessions.

The comparison, with Fisher's Exact test, between ABC Scale results before and after VR is shown in Table 1.

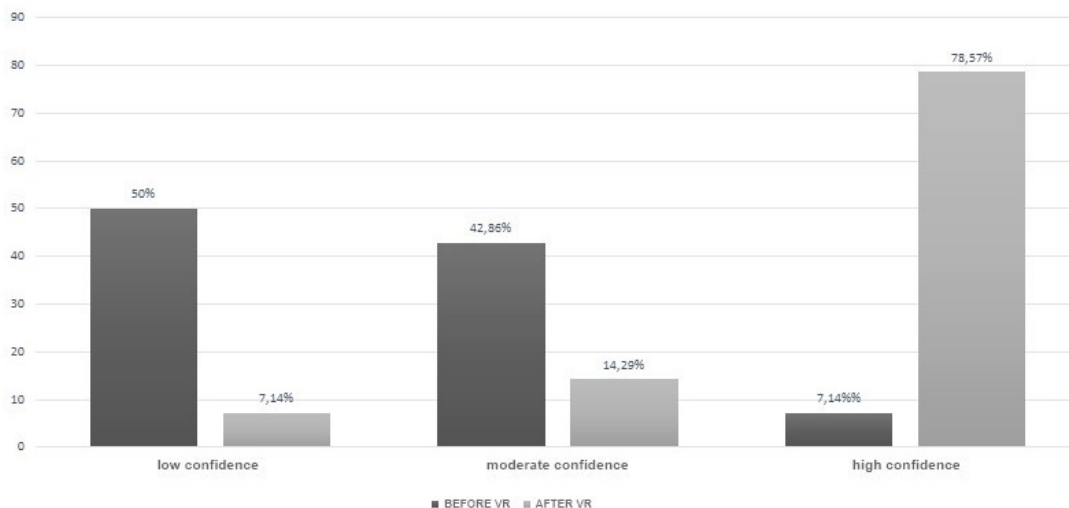
**Table 1.** Distribution of descriptive measures of the ABC Scale scores before and after vestibular rehabilitation (n = 14 patients)

Time	N	Mean	SD	Minimum	Median	Maximum	p-value
Before	14	0.47	0.21	0.17	0.50	0.94	<0.0001
After	14	0.83	0.18	0.43	0.89	1.00	

Caption: N = number of patients; SD = standard deviation  
The test used: Fisher’s Exact test

A statistical difference was found between the study individuals’ ABC Scale total scores before and after VR ( $p < 0.0001$ ).

The boxplot of the difference between ABC Scale scores before and after VR is shown in Figure 1. It characterizes the predominance of a low level of confidence before the intervention, and a high level of confidence after it.

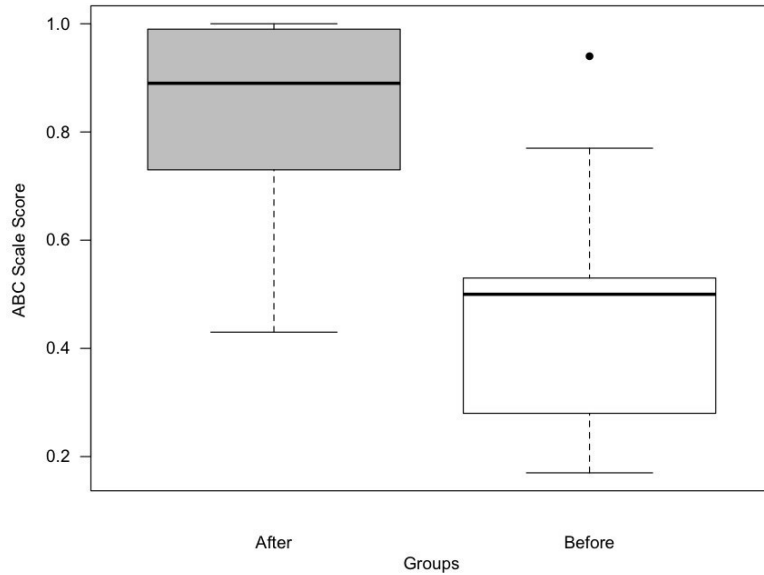


**Figure 1.** Graphical representation of the qualitative analysis of the level of confidence with the ABC Scale, before and after vestibular rehabilitation

The qualitative characterization of the ABC Scale before and after VR is presented in Figure 2.

No statistically significant difference was found in the comparative analysis between ABC

Scale scores before and after VR regarding sex ( $p\text{-value} = 0.2726$ ), age ( $p\text{-value} = 0.8739$ ), or the number of therapy sessions ( $p\text{-value} = 0.5272$ ).



**Figure 2.** Graphical representation of the comparison of ABC Scale total scores before and after vestibular rehabilitation

## Discussion

Symptoms like dizziness and body imbalance, which are related to vestibular dysfunction, can interfere greatly with QOL. When they are constant, they negatively affect daily activities, particularly involving physical, functional, and emotional aspects<sup>3</sup>.

In the last years, national and international studies addressing the assessment and rehabilitation of body balance disorders have described the importance of VR in patients with vestibular dysfunction to improve its symptoms, with consequences on QOL<sup>3</sup>.

Questionnaires such as the ABC Scale are important instruments for being easy to access, inexpensive, and quick to apply, while also predicting rather precisely the risk of falls<sup>6</sup>.

The total number of therapy sessions ranged from four to 12, with a predominance of four VR sessions (42.86%). The research by Manso, Ganança, and Caovilla<sup>12</sup> verified a total of 10 sessions. The number of VR sessions varies depending on factors such as motivation, age, associated diseases, and vestibular disease etiology<sup>13</sup>. Most patients in this study lived inland and depended on public transportation to go to the treatment clinic in the state capital – which often prevented them from scheduling more sessions.

The ABC Scale was considered a useful instrument to compare the level of confidence of this study's patients with vestibulopathies to do daily activities that require balance after VR (Table 1), agreeing with the study by Moiz et al<sup>6</sup>.

The statistical difference in the level of confidence before and after the intervention, which was demonstrated here, was also reported by Brugnera et al.<sup>14</sup> in their study in 13 individuals with vestibular disorders, treated with vibrotactile biofeedback in VR, and assessed with the ABC Scale (Figure 1).

The qualitative analysis of the ABC Scale (Figure 2) verified a predominance of a low level of confidence (50%), followed by a moderate one (42.86%), before VR. This agrees with the findings in the literature,<sup>6</sup> which describe those patients with vestibulopathies, when submitted to the ABC Scale, show low to moderate levels of confidence to do activities of daily living. As for the predominating level of confidence after VR, the study by Brugnera et al.<sup>14</sup> analyzed the levels of confidence after VR and found them to be high, corroborating the results of the present study.

No evidence of statistical differences was found between sex, age, and the number of therapy sessions with scores before and after VR, which resulted from the sample makeup.

This study considered that using VR as a therapeutic approach helped increase the level

of confidence to do activities that require body balance when the person has unilateral peripheral vestibular hypofunction. VR enables such patients to overcome negative feelings like anxiety and insecurity and recover their confidence, thus positively interfering with their QOL<sup>3</sup>.

The ABC Scale is easy to apply, analyze, and interpret, and is well-understood by patients.

<sup>6,8</sup> Hence, its use is relevant because it makes it possible to investigate the person's difficulties in doing activities of daily living due to the interference of vestibular symptoms. It also demonstrates the need for early intervention in patients with a low level of confidence to prevent falls and their complications.<sup>8,14</sup>

As in any clinical trial, this study had limitations, as previously pointed out, such as its sample size and the difficulty of patients who live inland to attend weekly therapy sessions in the clinic. Therefore, further studies should encompass larger samples, separating subjects by nosological diagnosis and age range.

## Conclusion

It was concluded that the study patients' level of confidence changed from low before the rehabilitation, to high in the final phase of the intervention. This consolidates the increase in the level of confidence that improved the quality of life.

## References

- Martins TF, Mancini PC, Souza LM, Santos JN. Prevalence of dizziness in the population of Minas Gerais, Brazil, and its association with demographic and socioeconomic characteristics and health status. *Braz J Otorhinolaryngol.* 2017; 83(1): 29-37.
- Ganança MM, Munhoz MSL, Caovilla HH, Silva MLG. *Conduas na vertigem.* São Paulo: Moreira Jr; 2004.
- Aratani MC, Ricci NA, Caovillaa HH, Ganança FF. Benefits of vestibular rehabilitation on patient-reported outcomes in older adults with vestibular disorders: a randomized clinical trial. *Braz J Phys Ther.* 2020; 24(6): 550-9.
- Ramos S, Ramos RF, Ganança CF, Ramos BF. Reabilitação vestibular. In: Neto SC, Júnior JFM, Martins RHG, Costa SS (eds). *Tratado de otorrinolaringologia e cirurgia cervico facial.* 2a ed. São Paulo: Editora Roca; 2011. p. 551-62.
- Powell LE, Myers AM. The Activities-specific balance confidence (ABC) scale. *J Gerontol A Biol Sci Med Sci.* 1995; 50(1): 28-34.
- Moiz JA, Bansal V, Noohu MM, Gaur SN, Hussain ME, Anwer S et al. Activities-specific balance confidence scale for predicting future falls in Indian older adults. *Clin Interv Aging.* 2017; 12: 645-51.
- Hall CD, Herdman SJ, Whitney SL, Cass SP, Clendaniel RA, Fife TD, et al. *Vestibular Rehabilitation for Peripheral Vestibular Hypofunction: An Evidence-Based Clinical Practice Guideline.* *J Neurol Phys Ther.* 2016; 40(2): 124-155.
- Marques AP, Mendes YC, Taddei U, Pereira CAB, Assumpção A. Brazilian-Portuguese translation and cross-cultural adaptation of the activities-specific balance confidence (ABC) scale. *Braz J Phys Ther.* 2013; 17(2): 170-8.
- Cawthorne T. The physiological basis for head exercises. *J Chart Soc Physiother.* 1944; 3: 106.
- Cooksey FS. Rehabilitation in vestibular injuries. *Proc R Soc Med.* 1946; 39(5): 273-8.
- Vicini C, Vannucchi P, Alpini D. *Manuale pratico di riabilitazione vestibolare.* Firenze: F&F Parretti Grafiche; 1989.
- Manso A, MM Ganança, Caovilla HH. Vestibular rehabilitation with visual stimuli in peripheral vestibular disorders. *Braz J Otorhinolaryngol.* 2016; 82(2): 232-41.
- Evangelista ASL, Cordeiro ESG, Nascimento GFF, Gazzola JM, Araújo ES, Mantello EB. Atuação fonoaudiológica na reabilitação vestibular com o uso de tecnologias: revisão integrativa da literatura. *Rev. CEFAC.* 2019; 21(6): e2219.
- Brugnera C, Bittar RSM, GreTERS ME, Basta D. Effects of vibrotactile vestibular substitution on vestibular rehabilitation: preliminary study. *Braz J Otorhinolaryngol.* 2015; 81(6): 616-21.



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