

Effectiveness of Brand Daroff and Water-Based Exercise in Patients with Vertigo: A Case Report

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Abstract

The displacement of otoliths into the semicircular canals causes the most common type of peripheral vertigo, known as Benign Paroxysmal Positional Vertigo (BPPV). This condition can disrupt balance and increase the risk of falls, especially when the head position changes suddenly. The purpose of this case report is to determine how effective the combination of Brandt-Daroff exercises and hydrotherapy is in improving balance in BPPV patients. A 69-year-old woman with vertigo underwent the Dix-Hallpike maneuver and an intervention consisting of Brandt-Daroff exercises and hydrotherapy twice weekly under supervision for six weeks. Balance evaluation was conducted before and after therapy using the M-CTSIB (for static balance) and TUG-T (for dynamic balance). Following the intervention, the TUG-T score decreased from 21.5 to 18, indicating improved mobility and patient response. The M-CTSIB score also increased significantly, particularly for eyes closed and unstable surfaces, from 15 to 22. Conditions without visual support also improved, indicating good vestibular adaptation. Patients reported no longer experiencing vertigo when changing positions and being able to engage in activities without fear of falling. These results suggest that Brandt-Daroff exercises and hydrotherapy can serve as non-pharmacological methods to improve balance and quality of life for patients with BPPV.

Keywords: brandt daroff, hydrotherapy, physical therapy, BPPV, vertigo.

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Introduction

Dizziness, lightheadedness, and unsteadiness are common clinical symptoms of vertigo in the general population (Sirait et al., 2024). Although vertigo is not a dangerous long-term condition, its symptoms can disrupt balance and body coordination, and vertigo and balance disorders are also significant risk factors for falls in the elderly population (Meilani et al., 2021). Vertigo attacks can occur during productive years and may happen while engaging in activities, potentially leading to falls, fractures, or even death (Harditya et al., 2023). Aside from headaches and lower back pain, vertigo is the third most common complaint in healthcare facilities (Mayasari et al., 2020). The prevalence in Indonesia is quite high, with 38.7% in the 41–50 age group, and women are at higher risk than men (Ramadhani, 2022; Natasya et al., 2023).

Vertigo is classified into vestibular and non-vestibular based on its etiology. There are two types of vestibular vertigo, namely peripheral and central, which can be caused by dysfunction of the peripheral vestibular apparatus as seen in patients with type 2 diabetes mellitus (Komalasari et al., 2022). Disorders of the

labyrinthine system cause the peripheral type, which typically occurs suddenly after a change in head position. One example is Benign Paroxysmal Positional Vertigo (BPPV), the most common peripheral vestibular disorder, caused by the detachment of otoliths from the utricle into the semicircular canals, leading individuals to feel as though movement is occurring when the head position changes (Pranowo et al., 2018). BPPV increases the risk of falls and reduces quality of life, although not significantly (Herlina et al., 2019). Non-vestibular vertigo, on the other hand, can be caused by conditions outside the vestibular system. These include vestibular migraine, psychogenic issues, and cerebral circulation disorders (Thompson et al., 2015).

Input from the somatosensory, vestibular, and visual systems is integrated into the body's balance system. Loss of postural stability can be caused by damage to one of these systems (Ghassani et al., 2024). With the aim of reducing vertigo recurrence and repositioning otoliths back into the utricle, the Brandt Daroff exercise is one of the non-pharmacological physical therapies for BPPV (Zein et al., 2024; Hilton et al., 2016). This exercise helps stretch the semicircular canals and break down the otoliths into smaller particles, which are then moved



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back to the utricle through head maneuvers (Zein, 2024). Additionally, this exercise can enhance central vestibular system habituation (Bhattacharyya et al., 2017). The Brandt Daroff maneuver can be performed at home with the assistance of a therapist or family member, provide that it is not performed immediately after another maneuver has been performed. Research findings (Laksono et al., 2022) after three sessions of Brandt-Daroff exercises showed a significant improvement in vertigo symptoms. The Brandt-Daroff exercise is one exercise that reduces vertigo symptoms. However, its effectiveness is inconsistent when used alone and is better when combined with other vestibular rehabilitation exercises (Bagri et al., 2024).

In addition to maneuvers for repositioning otoliths, physiotherapy interventions are often required to improve muscle flexibility, strength, and postural control. Water-based exercise has proven effective for musculoskeletal conditions such as low back pain and could support balance recovery in vertigo patients (Pristianto et al., 2022). Hydrotherapy is a water-based complementary therapy that uses Archimedes' principle (buoyancy) and Pascal's principle (hydrostatic pressure) to improve balance and blood circulation (Mooventhan & Nivethitha, 2016). Studies indicate that hydrotherapy is effective in recovering balance disorders, particularly in the elderly (Yuniarwati, 2019; Pramithasari et al., 2021). Hydrotherapy or aquatic exercise has also been shown to be effective in improving lumbar flexibility in patients with chronic low back pain (Pristianto et al., 2021). Hydrotherapy is also beneficial for improving muscle strength, providing relaxation, and reducing the risk of injury due to muscle spasms (Silfiyani et al., 2021). The techniques provided to patients are tailored to their complaints and do not ignore specific conditions. For example, the water depth is limited from the waist to the chest, and the water temperature ranges from 30-34°C. In addition, special equipment is required, such as Aqua Belts (for buoyancy), Pool Noodles, Ankle Cuffs, Rubber Bands (for strength training), and Underwater Steps/Platforms (for balance training).

However, the majority of studies only apply one type of intervention. Therefore, this report was created to evaluate the effectiveness of combining Brandt Daroff exercises and hydrotherapy in overcoming balance problems in BPPV patients. This study is also a way of applying QS. Al-Maidah: 2 and Surah. Al-Anbiya: 30, which states that water can be a medium for mutual assistance in goodness and healing to improve the quality of life of humanity.

Case Report

The patient is a 69-year-old woman who has been experiencing spinning dizziness for the past month. When there is a sudden change in head position, such as getting up from bed or bending over and then looking up, the vertigo symptoms worsen. Additionally, the patient reports balance issues, nausea, and cold sweats, especially when walking. There is no history of hypertension, head injury, vision problems, or hearing disorders. The patient is willing to undergo comprehensive vertigo rehabilitation.

The physical examination revealed that the patient's general condition was within normal limits, with full consciousness (*compos mentis*), blood pressure of 120/80 mmHg, pulse rate of 82 beats per minute, and body temperature of 35.6°C. No signs

of local neurological deficits were found, and otoscopic examination showed normal results. Laboratory tests, including a complete blood count, electrolytes, and blood glucose levels, showed results within the normal range. To confirm the diagnosis, the Dix-Hallpike provocation maneuver was performed. The results of the maneuver showed the presence of torsional-upbeating nystagmus that appeared after a brief pause and lasted less than one minute, thereby confirming the diagnosis of Benign Paroxysmal Positional Vertigo (BPPV). Management was carried out through a combination of two non-pharmacological interventions, namely hydrotherapy and Brandt-Daroff exercises. The exercise program was conducted over six weeks, starting with once a week for three weeks and increasing to twice a week for the final three weeks. Brandt-Daroff exercises were performed after receiving proper education on the execution techniques, while hydrotherapy was conducted at the Ataya Boyolali Hotel Swimming Pool. All interventions were carried out by enumerators under supervision. Interventions were implemented gradually according to the prepared protocol, including increasing the duration and intensity of exercises each week based on the patient's condition.

This intervention aims to reduce vertigo symptoms, improve body balance, and optimize the patient's quality of life. To assess the effectiveness of the therapy, evaluations are conducted using repeated Dix-Hallpike maneuvers and balance measurements. Static balance testing employs the M-CTSIB (Modified Clinical Test of Sensory Interaction in Balance) method, while dynamic balance testing uses the TUG (Timed Up and Go) test, both before and after the intervention.

The results of the evaluation after six weeks of intervention showed significant improvement. The results of the Dix-Hallpike maneuver after intervention showed that the patient no longer experienced nystagmus. The patient's M-CTSIB score increased significantly, indicating improved static balance. The TUG test results showed a decrease in time from 21.5 seconds to 18 seconds, indicating better dynamic balance. Patients also reported that they no longer experienced dizziness when changing head positions and could perform daily activities without fear of falling. Therefore, it can be concluded that the combination of Brandt-Daroff exercises and hydrotherapy effectively addresses BPPV and accelerates patients' balance recovery. The static balance assessment used the M-CTSIB test, which has significant validity ($r = -0.652$, $p < 0.001$) and an ICC reliability of 0.628 (95% CI = 0.31–0.82). Meanwhile, dynamic balance was measured using the TUG Test, which demonstrates high validity ($r = -0.754$, $p < 0.05$) and good intra- and interrater reliability (Antoniadou et al., 2020; Utomo et al., 2015).

This study has received ethical approval from the Health Research Ethics Committee of the Faculty of Health Sciences, Muhammadiyah University Surakarta, with ethical approval letter No. 1051/KEPK-FIK/IV/2025.

Discussion

In this case, the intervention used for patients with balance disorders caused by Benign Paroxysmal Positional Vertigo (BPPV) was carried out through a combination of diagnostic maneuvers, physical exercises, and hydrotherapy implemented in a planned manner. A distinctive feature of this case was the application of

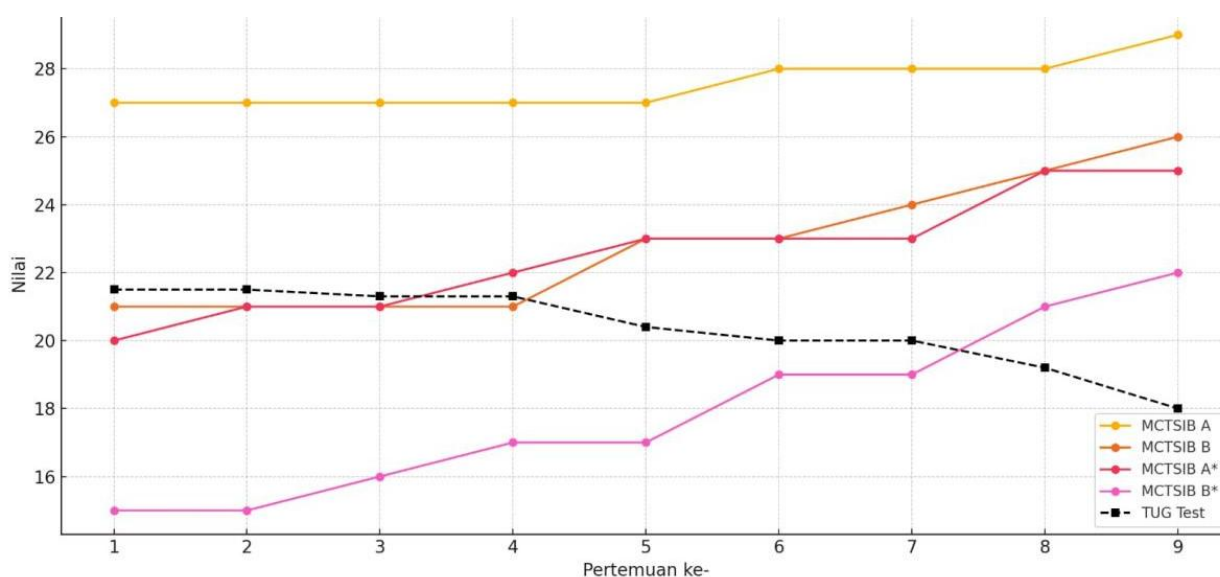
Brandt Daroff exercises and hydrotherapy for patients with increasing frequency over six weeks as a clinical intervention method. The method focuses on early identification through the Dix-Hallpike maneuver, with routine assessment of the patient's balance using standard instruments such as the MCTSIB and TUG-T. The use of both methods is crucial in combination as they provide a comprehensive picture of their effectiveness in restoring vestibular function and improving body balance, particularly in conditions with closed eyes and on unstable surfaces. This understanding supports the concept of evidence-based rehabilitation and is beneficial for patients with BPPV.

The intervention method began with a diagnosis of BPPV in patients using the Dix Hallpike maneuver in accordance with the measurement procedures performed previously. After

identification was complete, patients underwent body balance measurements, both static and dynamic, in accordance with the previous protocol. Additionally, during each session, Brandt Daroff exercises and hydrotherapy were administered at an increased frequency in accordance with the dosage table and intervention protocol. These activities are conducted once a week for 3 weeks and twice a week for the next 3 weeks. After the intervention, the patient undergoes tests to reassess their body balance. During the final session, the Dix Hallpike maneuver is repeated to confirm the results of the Brandt Daroff exercises. This is done to evaluate changes in the patient's performance and quality of life moving forward.

Figure and Table

Figure 1. Results of MCTSIB and TUG-T Component Score Development and Total Score for Each Meeting



The results of the intervention showed that the TUG-T score decreased from 21.5 to 18. A low TUG-T score reflects higher mobility and faster reaction times, and this decrease indicates an improvement in performance. Performance in condition A—which shows open eyes and a stable surface—remained consistent at a score of 27–29, indicating that participants did not encounter any difficulties in this situation. Meanwhile, condition B (eyes closed, stable surface) showed an increase in scores from 21 to 26, reflecting good adaptation to balance without visual support. Conditions A* and B* also showed progress, with B* experiencing a significant increase from 15 to 22. This indicates that the ability to maintain balance in the most challenging situations is greatly influenced by training or intervention. Overall, these findings indicate a steady improvement in participants' balance and mobility from one week to the next. The greatest performance improvements occurred in more complex situations, further confirming the success of the training program and interventions implemented during the study period.

This study has several limitations, including its case report design involving only a single subject, which limits the generalizability of the findings. Furthermore, there was no comparison with a control group or alternative interventions. Therefore, future

studies are recommended to use larger sample sizes, apply controlled study designs, and include long-term follow-ups to obtain more accurate and clinically applicable results.

Conclusion

Rehabilitation intervention for patients with BPPV involving a combination of the Dix Hallpike maneuver, Brandt Daroff exercises, hydrotherapy, and regular balance measurements over six weeks showed significant improvement in patients' balance function and mobility. This can be seen from the decrease in the total TUG-T score and the increase in the MCTSIB score, especially in the most difficult balance conditions (eyes closed and unstable surface). This systematic and progressive approach has proven successful in supporting vestibular system adaptation and improving overall postural control. Therefore, this intervention model is worthy of consideration as one of the therapeutic options for patients experiencing balance disorders due to BPPV.

Patient management for BPPV should begin with the integration of diagnostic maneuvers, such as the Dix-Hallpike test, with structured exercises, such as the Brandt-Daroff exercise and hydrotherapy, to accelerate vestibular function during the

recovery process. Regular measurements of the patient's balance function should be objectively assessed using validated tools such as the MCTSIB and TUG-T to monitor progress. The exercises provided should be progressive and administered for at least six weeks, including challenging static and dynamic balance exercises for the patient's vestibular system. Additionally, interventions should be tailored to the patient's characteristics, particularly in older adults or those with mobility disabilities, to enhance the effectiveness of the procedure; exercise acceptance; and thereby reduce the risk of complications. These exercises should be guided by a physical therapist or rehabilitation specialist and integrated into the daily protocol of patients with vertigo or chronic functional balance disorders.

Conflict of interest

The authors declare that there are no conflicts of interest in this study.

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