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The Effectiveness of the Bobath Technique in Improving Balance Levels among Post-Stroke Patients

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Abstract

Balance disorders are linked to difficulties in regulating weight transfer and reduced muscle movement, leading to impaired body balance and functional activity disturbances in post-stroke patients. This study evaluated the effectiveness of the Bobath technique in improving balance among post-stroke patients using a one-group pretest-posttest design. The study included 96 post-stroke patients, aged 40-79, selected through purposive sampling. Balance levels were assessed using the Berg Balance Scale (BBS) both before and after the intervention. Data analysis with the Wilcoxon rank test at a=0.05 showed a significant improvement in balance (p=0.000), confirming the Bobath technique's effectiveness in enhancing balance in post-stroke patients.

Keywords: *Post-Stroke, Bobath Technique, Balances Level*

INTRODUCTION

Stroke is one of the leading causes of mortality and morbidity in adults in most countries (Kuo and Hu, 2018). Stroke as a disease neurovascular is still a serious problem, not only in Indonesia but in the world (Hipertensi Mas *et al.*, 2024). Disease Stroke is the second leading cause of death and the third leading cause of disability in the world (Desmonika, Yulendasari, and Yudha Chrisanto, 2023). Stroke according to the World Health Organization (WHO) is a condition where clinical indications are found that develop rapidly in the form of deficits Neurology focal and global, which can be severe and lasting for 24 hours or more and or can cause death, in the absence of any other apparent cause other than Vascular (Artha, 2020). A stroke occurs when the blood vessels of the brain are blocked or ruptured, resulting in part of the brain not receiving the blood supply that carries the expected oxygen, resulting in cell/tissue death (Ministry of Health of Indonesia, 2019).

In patients with Stroke there is a disorder of the central nervous system, due to the disorder of the central nervous system (CNS) will cause abnormal postural tone, from the abnormal postural tone then has an impact on the decrease in the quality of movement which causes abnormalities in sensory feedback which has an impact on balance disorders in the patient Stroke (Yosefi, 2023). Good balance in stroke patients is an important component to be able to perform movement and function (Artha, 2020). There are many methods that can be done to be able to increase the speed of the patient's recovery process post-stroke (Ludiana and Supardi, 2020). Some commonly used methods to speed up patient healing post-stroke among other approaches Bobath (Artha, 2020). The Bobath method is a post-stroke therapy approach based on the premise that stroke survivors revert

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to an infant-like state, requiring retraining of growth and development similar to that of a baby (Agustina et al., 2023). Consequently, patients are initially trained to start from lying positions, progressing through lying on their sides, lying on their stomachs, crawling, sitting, standing, and eventually walking (LiwaMarliando & Sudaryanto, 2022; Pathak1 et al., 2021). Given the negative consequences of balance impairments in stroke patients, it is critical to assess the effectiveness of non-pharmacologic techniques, such as the Bobath method, in improving balance levels among these patients.

Research Objectives

General Objectives

To determine the effectiveness of the Bobath Technique in Improving Balance Levels among Post-Stroke Patients.

Specific objectives:

1. To determine the characteristics of the patients based on age, gender, and hypertension type
2. To assess balance levels in post-stroke patients before administering the Bobath technique
3. To assess balance levels in post-stroke patients after the administration of the Bobath technique.
4. To determine the effectiveness of the Bobath technique in improving balance levels among post-stroke patients

Theoretical Framework

The components of the balance framework BN Klatt, *et al.* (2015) were utilized in this study. Balance exercise can reduce falls, and comprehensive assessment is recommended for identifying impairments in postural control and informing the design of optimal balance exercise programs for fall prevention. Components of balance operational definitions include:

1. Biomechanical constraints: degrees of freedom, strength, limits of stability. Functional stability limits: Ability to move the center of mass as far as possible in the anteroposterior or mediolateral directions within the base of support, underlying motor systems: eg, strength and coordination, static stability: the ability to maintain the position of the center of mass in unsupported stance when the base of the support does not change (may include wide stance, narrow, 1-legged stance, tandem any standing condition)
2. Orientation in space: perception of gravity, verticality. Verticality: Ability to orient appropriately with respect to gravity (eg, evaluation of lean).
3. Movement strategies: reactive, anticipatory, voluntary. Reactive postural control: Ability to recover stability after an external perturbation to bring the center of mass within the base of support through corrective movements (eg, ankle, hip, and stepping strategies). Anticipatory postural control: Ability to shift the center of mass before a discrete voluntary movement (eg, stepping-lifting leg, arm raise, head turn).
4. Control of dynamics: gait, proactive. Dynamic stability: Ability to exert ongoing control of center of mass when the base of the support is changing (eg, during gait and postural transitions).
5. Sensory strategies: integration, reweighting. Sensory integration: Ability to reweight sensory information (vision, vestibular, somatosensory) when input is altered.
6. Cognitive processing: attention, learning. Cognitive influences: Ability to maintain stability while responding to commands during the task or attending to additional tasks (eg, dual-tasking).

Significance of the Study:

This research aims to evaluate the effectiveness of the Bobath technique in enhancing balance among post-stroke patients. The study's results indicate that proper implementation of this intervention can significantly improve the quality of life for post-stroke patients and, consequently, benefit the broader community.

The findings will be valuable in assisting post-stroke patients in maintaining balance and in the application of the Bobath technique. This requires the support of caregivers or family members in daily life.

Ultimately, the implementation of the Bobath technique offers positive hope for patients and their families, thereby contributing to the overall well-being and quality of life for post-stroke patients.

Related Literature & Studies

Epidemiology of Post-Stroke

Multiple reports have been issued thus far on the prevalence of balance impairments post-stroke, with values ranging from 16.7% to as high as 83% (Khan & Chevidikunnan, 2021). Difference in these values are most probably caused by differences between the date of onset and the date of assessment, assuming acute patients have worse balance than chronic patients (Vincent-Onabajo, Musa, & Joseph, 2018). The mean age of participants in each study is also another probable cause, as balance function has been shown to diminish with age (Tyson *et al.*, 2006). Gender, handedness, location and side of lesion are all factors affecting balance, which are explored in the literature along with stroke severity (Iwasaki and Yamasoba, 2015). Assessment of balance at admission could explain the motor response to the rehabilitation programs in subacute patients, and could also act as a predictor for balance during the discharge (Gath *et al.*, 2021). Similarly, balance confidence has been reported to predict perceived physical function, mobility and recovery at 12 months in patients with stroke (Torkia *et al.*, 2016). Good balance is also important for stepping patterns, gait velocity, and initial training of gait in subjects with stroke (Pollock *et al.*, 2021). Moreover, cognitive function also affects balance, and it has been reported that patients with cognitive dysfunction have balance impairments and a higher risk of falls (Moon, Lee, & Yoon, 2017).

Data on stroke in Indonesia, including each province, were collected from the Global Burden of Disease study (GBD) 2019, the age-standardized incidence rates and age-standardized prevalence rates per 100,000 individuals with 95% Uncertainty Intervals (UIs) were used to estimate the incidence and prevalence characteristics. The cause of stroke was classified into three types: intracerebral hemorrhage, ischemic stroke, and subarachnoid hemorrhage. In 2019, the national incidence and prevalence of stroke in Indonesia were 293.33 (262.2 – 331.6 95% UIs) and 2,097.22 (1878.2 – 2351.8 95% UIs) per 100,000 individuals, respectively. West Java holds the highest rank in the incidence rate of stroke and ischemic stroke as well as the prevalence rate for almost all types of strokes, except for subarachnoid hemorrhage. Females and over 70 years of age had a higher incidence and prevalence of stroke than other groups (Widyasari, Rahman and Ningrum, 2023).

With the importance of establishing the prevalence of balance impairments and the factors associated, it is accordingly necessary to provide such a study for the region. Thus, the aim for this study was to find the prevalence of balance impairment and the factors associated with it in patients with post-stroke.

Balance Impairment

Risk Factors for Balance Impairment

Post-stroke balance impairment appears to be significantly influenced by stroke survivors' age, gender, and post-stroke duration (Phan *et al.*, 2019). Furthermore, there is evidence that more profound negative outcomes are linked to the socio-economic status of people with stroke (Li *et al.*, 2018). Given the negative consequences of impaired balance after stroke, identifying the gravity of the post-stroke balance impairment, especially its prevalence, is critical (Yeh *et al.*, 2017). Similarly, information on associations between stroke survivors' socio-demographic and clinical attributes such as balance impairments may assist in identifying those at risk and subsequently in providing appropriate and targeted interventions (Kossi *et al.*, 2019).

Assessment of Balance Impairment

The Berg balance scale (BBS) helps determine the ability to balance safely. This scale consists of 14 tasks that are scored by healthcare providers on a scale of 0 to 4. The higher the score, the better of balance.

Originally, the Berg balance scale was designed to assess people over 65 years of age or those who had suffered a stroke. People in this group are more likely to experience balance problems that can make it difficult for them to move safely. Today, healthcare providers – including occupational therapists, clinical exercise physiologists, and physical therapists – use these tests to measure balance abilities in several different populations.

This is an easy and reliable test that test providers use to assess functional balance (ability to balance so that move safely and effectively in everyday life). "Reliability" means can trust the test results because they remain consistent. Research shows that even though different health care providers perform tests on the same person, the results are the same.

Health workers will ask patients to perform a series of tasks that involve sitting, standing, or doing simple movements. They will rate ability to perform each task on a scale from 0 to 4 and then add the numbers. The highest possible score is 56. The Berg balance scale test takes approximately 15 to 20 minutes to complete. Perform 14 specific movements in a Berg balance test includes: move from a sitting to a standing position, standing up unsupported, sitting unsupported, moving from a standing to a sitting position, transferring from one chair to another, standing up with eyes closed, stand with feet together, reach forward with an outstretched arm, pick an object up off the floor, turn and look behind therapist, turn around in a complete circle, place each foot alternately on a stool in front of therapist, stand unsupported with one foot directly in front of the other, stand on one leg for as long as therapist can.

Evaluation of Balance Impairment

Berg balance scale scores range from 0 to 56. The lower the score, the more at risk of losing balance. The higher the score, the better functional mobility (ability to move effectively and safely). Depending on the task, higher scores depend on the ability to:

Complete a task unassisted. This includes not having to rely on an additional body part (like hands) to steady or needing extra support from the provider giving the test to maintain balance during a task.

Hold a position for the specified length of time. The maximum amount of time all need to hold a position depends on the task, but most are under a minute.

Maintain steady movements. The provider will assess how to maintain posture and balance weight as they complete various tasks.

Healthcare provider will interpret results of the Berg balance test based on where score falls within a range: 0 to 20: poor balance ability (A person with a score in this range will likely need the assistance of a wheelchair to move around safely). 21 to 40: fair balance ability (A person with a score in this range will need some type of walking assistance, like a cane or a walker). 41 to 56: good balance ability (A person with a score in this range is considered independent and should be able to move around safely without assistance).

Treatment for Balance Impairment

Balance impairment is one of the common impairments in patients after stroke, which is related to worse physical impairments, disability and low quality of life. Moreover, balance impairment often leads to high fall rates, which brings a great burden to patients who had a stroke, their families and the society. In addition, good balance is a prerequisite for regaining the ability to walk independently and activities of daily living (Li *et al.*, 2019).

Currently, rehabilitation therapies including whole body vibration (WBV), virtual reality (VR), exercise, mirror therapy (MT), ankle-foot orthosis (AFO), traditional Chinese medicine (TCM), traditional Chinese exercise (TCE) have been used to improve balance in patients who had a stroke. Several meta-analyses of head-to-head comparisons have investigated the comparative efficacy and safety of these rehabilitation therapies (Broderick *et al.*, 2018).

Many methods can be done to be able to increase the speed of the patient's recovery process post-stroke (Agustina *et al.*, 2023). Some commonly used methods to speed up patient healing post-stroke among other approaches Bobath. Method Bobath is a method of therapy in post-stroke that assumes that the sufferer post-stroke returns to being a baby so that his growth and development Sync with the growth of the baby (LiwaMarliando and Sudaryanto, 2022). Therefore, patients are trained starting from lying positions, on their sides, on their stomachs, crawling, sitting, standing, and walking (Pathak1 *et al.*, 2021).

METHODOLOGY

This type of research is quantitative research with a pre-experimental design, one group, and pre-test and post-test. This design is useful for initial assessments of interventions but has limitations in establishing causal relationships due to potential confounding variables and the absence of a control group for comparison. The researchers conducted preliminary assessments of the Bobath technique intervention before investing in more rigorous experimental designs. Further, this design is used to explore the potential effects of the intervention, providing data that can justify more controlled experimental studies in the future.

Study Population and Sampling Technique

The study focused on post-stroke patients with balance impairments, utilizing purposive sampling to select 96 participants. The inclusion criteria were post-stroke patients willing to participate in the study and having a history of hypertension. Exclusion criteria included balance impairments not caused by stroke, such as those resulting from Parkinson's disease, cerebral palsy, knee surgery, or other conditions.

Ethical Considerations

The research proposal has been reviewed and approved by the Research Ethics Committee of Wijaya Husada Institute for research involving human subjects. Participation in this study is entirely voluntary, and respondents will not receive any monetary compensation. Participants have the right to refuse or withdraw from the study at any time without affecting their compensation or employment. To safeguard participant privacy, all data is stored securely in a cloud-based Gmail account and is accessible only to the researchers involved. Confidentiality and anonymity were upheld throughout the research process, with participant information coded to protect privacy. Additionally, no personal names or identifiable data were included in the final research report.

Site of the Study

This research was conducted in the working area of Pasir Mulya Health Center, Bogor City, West Java, Indonesia. This area was chosen as a research location because it has the highest rates of hypertension and stroke in Bogor City and it was accessible to researchers.

Research Instrument

The instruments in this study used the Bobath Technique SOP and the Berg Balance Scale (BBS) assessment sheet to assess the post-balance (Hayashi *et al.*, 2022). Through the Bobath technique, it will be seen that the post-stroke balance before the Bobath technique and after being given the Bobath technique to respondents are divided into several categories as follows:(Kudlac *et al.*, 2019)

1. Low balance, if the score is 0-20
2. Medium balance, if the score is 21-40
3. Balance high, 41-56.

Validation of Instrument

The BBS was found to have excellent reliability and validity (Viveiro *et al.*, 2019). The score is a prediction of factors that contribute to the patient's function and performance. The risk of falling cannot be predicted with certainty through scores. The BBS is a reliable and valid tool for assessing balance and functional mobility in

the post-stroke population. However, this tool should not be used as a strong predictor of fall risk in the stroke population (Kudlac *et al.*, 2019).

The test-retest reliability for the BBS was excellent Intraclass Correlation Coefficients (ICC = 0.994). The BBS is a reliable and valid scale to be utilized in the balance assessment of elderly adults (Lee and Choo, 2019).

Data Collection Process

The Berg Balance Scale (BBS) was assessed twice by the same assessor. During the initial meeting, patients reviewed and agreed to the informed consent, and the researcher adhered to the confidentiality statements included within it, ensuring the anonymity of the patients. Subsequently, the researcher assessed the patients" post-stroke balance and administered the Bobath Technique for approximately 15-20 minutes per patient. This process was repeated in each session until the final session. A post-test was conducted on the third day using the BBS observation sheet to evaluate balance impairment.

Data Analysis

Descriptive statistics, including frequency and percentage, were utilized to outline sample characteristics based on age, gender, and hypertension type. The mean consciousness levels before and after the Bobath technique intervention were assessed. To determine the difference between pre-test and post-test consciousness levels, a Wilcoxon rank test was employed, with a significance level set at $p < 0.05$ and a confidence level of 95%.

RESULTS

Table 1 presents patient characteristics by age: 6 patients were aged 40-49 years, representing 6.25%; 48 respondents were aged 50-59 years, making up 50%; 30 patients were aged 60-69 years, representing 31.25% and 12 patients were aged 70-79 years, accounting for 12.5%. Regarding gender, there were more women than men, with 54 female patients (56.2%) and 42 male patients (43.8%). In terms of hypertension type, 42 patients (43.8%) had pre-hypertension, 48 patients (50%) had first-grade hypertension grade and 6 patients (6.2%) had hypertension second grade.

Table 1. Distribution of Patients Characteristics.

Patients Characteristics	Frequency	Percentage (%)
Age		
40-49 years old	6	6.25
50-59 years old	48	50.0
60-69 years old	30	31.25
70-79 years old	12	12.5
Gender		
Man	42	43.8
Woman	54	56.2
Hypertension Type		
Pre-hypertension	42	43.8
Hypertension first grade	48	50.0
Hypertension second grade	6	6.2

Table 2 of distribution frequencies of balance, before being given the Bobath technique (pre-test) from 96 respondents, there were 72 (75.0%) respondents with medium balance and after being given the Bobath technique (post-test) there were 60 (62.5%) respondents with medium balance.

Table 2. Distribution of Pretests-Posttests on Balance in Post-Stroke Patients.

No	Pretest Balance Values	Frequency	Percentage (%)
1	Low *Balance*	24	25.0
2	Medium Balance	72	75.0
Total		96	100
No	Posttest Balance Score	Frequency	Percentage (%)
1	Low *Balance*	18	18.75
2	Medium Balance	60	62.50
3	High Balance	18	18.75
Total		96	100

Table 3 reveals that the average mean rank of balance was 8.50, with a sum of rank was 136. Statistical analysis yielded a p-value of 0.000 ($p<0.05$), indicating a significant improvement in the balance after the Bobath technique among post- stroke patients.

Table 2: Effectiveness of Bobath Technique in Improving Balance Levels among Post-Stroke Patients.

Pretest-Postest	N	*Mean Rank*	*Sum of Rank*	*P value*
Negative Rank	0	0.00	0.00	0.000
Positive Rank	96	8.50	136.00	
Ties	0			
Total	96			

DISCUSSION

In post-stroke patients with abnormal balance, such as the ability to stand upright with both legs for daily activities, balance management can be effectively addressed through non-pharmacological therapy, specifically the Bobath technique (Khedr et al., 2020). The Bobath technique is designed to inhibit abnormal movement patterns and facilitate normal movement patterns essential for functional activities (Daba, 2023). This technique involves exercises that activate internal trunk muscles, including the abdominal muscles, paraspinal muscles, and pelvic floor muscles (Michielsen et al., 2019). These muscles provide core stability for maintaining proper posture (Kollen et al., 2009), thereby improving balance in post-stroke patients (Haykal, Prasojo, & Isytiaroh, 2021). Maintaining body balance is crucial for daily activities, enabling the ability to keep the body's center aligned, particularly in an upright position (Brel, 2019). Therefore, non-pharmacological interventions like the Bobath technique, which focuses on activating internal trunk muscles, can significantly enhance balance in post-stroke patients (Shenoy et al., 2022).

The balance level of post-stroke patients before administering the Bobath technique (pre-test) showed that the majority of them had medium balance. After applying the Bobath technique (post-test), there were 60 respondents (62.5%) with medium balance. The hypothesis test results using the nonparametric Wilcoxon Signed Rank Test indicated a significant value (Sig.) of 0.000. Since the P value is ≤ 0.05, it means that the alternative hypothesis (Ha) is accepted, indicating a significant influence of the Bobath technique on the balance of post-stroke patients.

The findings of this study are consistent with Suharto et al.'s (2023) research titled "Differences in the Effectiveness of Pilates Exercises and Bobath Exercises on Sitting and Standing Balance in Children with Cerebral Palsy." Using a pre-experimental research design with a sample of 34 respondents, Suharto et al. found that the Wilcoxon test yielded a p-value of 0.001. This result indicates a significant effect of Bobath exercises on balance ability (Suharto et al., 2023).

The Bobath technique presents a promising approach to address balance impairments in post-stroke individuals. The positive outcomes observed in this study highlight its effectiveness in enhancing balance, making it a viable solution for post-stroke rehabilitation. The technique not only supports better balance but also contributes to the overall improvement in the quality of life for stroke survivors.

Research suggests that implementing the Bobath technique can significantly enhance balance in post-stroke patients. This study demonstrated that applying the Bobath technique positively affects post-stroke balance levels. Consequently, this intervention offers a viable solution for improving balance in individuals recovering from a stroke.

CONCLUSION

The study findings indicate that administering the Bobath technique can significantly improve balance in post-stroke patients. Consequently, these results can be utilized within the community to assist in enhancing the activity levels and balance of individuals recovering from a stroke. Additionally, this study offers an alternative approach for maintaining balance in post-stroke patients.

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