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Comparative Effects of Vojta and Bobath Therapy on Lower Limb Spasticity and Motorcity among Hemiparetic Stroke Patients

Muhammad Zeeshan[1*], Gulnaz Zaheer[1], Ayesha Arooj[2], Ahmad Faizan[2], Muhammad Luqman Akbar[3], Maryam Ashraf[2]

[1*]Faculty of Allied Health Sciences, Superior University, Lahore, Pakistan [2]Aqsa Institute of Professional Studies, Faisalabad, Pakistan [3]Department of Physiotherapy, Abasyn University, Islamabad, Pakistan

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DECLARATIONS

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CORRESPONDING AUTHOR

Muhammad Zeeshan
Faculty of Allied Health Sciences, Superior University, Lahore, Pakistan
drzeeshan743@gmail.com

ABSTRACT

Background: Stroke is a neurological condition caused by a sudden disruption of cerebral blood flow, leading to functional impairments. Hemiplegic patients often experience motor dysfunction and spasticity, particularly in the lower limbs. Effective rehabilitation techniques are essential for improving the quality of life. **Objective:** To compare the effects of Vojta and Bobath therapies on lower limb spasticity and motorcity in hemiparetic stroke patients. **Methodology:** A single-blinded randomised clinical trial was conducted over six months at two clinical sites in Faisalabad. A total of 46 eligible participants were randomly divided into two groups: Group A received Vojta therapy, while Group B received Bobath therapy. Participants aged between 25 and 74 years, diagnosed with hemiparetic stroke within the past 1-4 months, were included in the trial. Each session involved five repetitions of pressure application to designated reflex zones, with each application lasting two minutes followed by a one-minute rest period. Group B received facilitation-based Bobath therapy, also administered three times per week. Motor function and spasticity outcomes were measured before and after the intervention period using the Fugl-Meyer assessment scale for the lower limb and the modified Ashworth scale. Descriptive statistics were used to summarise demographic data, while inferential tests were employed to compare pre- and post-intervention scores within and between the two groups. **Results:** No significant differences were observed at baseline for both the Fugl-Meyer assessment and the modified Ashworth scale. At two weeks, Bobath therapy demonstrated earlier motor gains, while Vojta therapy showed more noticeable reductions in spasticity, though not statistically significant. By week four, a significant improvement in motor function was observed in the Bobath group, while the Vojta group showed greater reduction in spasticity, though between-group differences remained statistically non-significant. Within-group comparisons showed significant improvement over time in both therapies for both motor function and spasticity. **Conclusions:** Both Vojta and Bobath therapies are effective for improving lower limb function and reducing spasticity in stroke patients. Bobath therapy offers faster motor gains, whereas Vojta therapy demonstrates greater spasticity reduction. A combined or individualized approach may enhance post-stroke rehabilitation outcomes.

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INTRODUCTION

Stroke is one of the leading causes of adult disability and the second most common cause of death globally. It results from the sudden disruption of cerebral blood flow, leading to a cascade of neurological impairments.[1] Stroke has been recognised as among the world's biggest causes of death and one of the most common causes of disability. In addition to difficulties with motor, sensory, and communication impairments, stroke patients often experience difficulties with cognition, quality of life, and mental and physical health.[2] In many developed nations, cerebrovascular illness, or stroke, is one of the main causes of both death and morbidity. Natural history of stroke epidemiologic data is crucial not only as a starting point for the assessment of rehabilitative or preventative measures, but also for planning medical care.[3]

Throughout life, the human nervous system continues to adapt, and this type of plasticity is especially significant in neurological conditions like stroke. Stroke remains the leading cause of long-term motor disability in adults globally, resulting in a significant social and economic cost.[4] Among these individuals, spasticity, a velocity-dependent increase in muscle tone due to hyper-excitability of the stretch reflex, emerges in 4-42% of cases, especially affecting the lower limbs. This impairs mobility, balance, and functional independence, significantly reducing quality of life and increasing healthcare costs.[5] Hemiparesis, the partial paralysis of one side of the body, is a common post-stroke complication, affecting more than 80% of survivors.[6]

Lance was the first to identify spasticity in 1980, in which the introduce that an element of upper motor neuron syndrome is a motor disorder characterised by a velocity-dependent increase in tonic stretch reflexes/muscle tone with exaggerated tendon jerks, resulting from hyperexcitability of the stretch reflex.[7] A velocity-dependent amplification of stretch reflexes is a characteristic of spasticity, a motor disorder caused by a malfunctioning intraspinal interpretation of the primary afferent information.[8] Spasticity is just one of several elements that contribute to the syndrome of upper motor neurons (UMNs), which is characterised by excessive muscle activity and is referred to as the "positive" phenomenon. A type of hypertonia caused by hyperactive tonic stretch reflexes is called spasticity.[9] From 1954 onwards, Vojta-based neurophysiological physiotherapy has been used.

Numerous central and peripheral nervous system disorders are successfully treated using this technique, in addition to the structural issues affecting the joints and muscles. Vojta's method of treatment was first used with teenagers with cerebral palsy and youngsters with attention deficit hyperactivity disorder. Vojta therapy (VT) affects not just motor development but the entire body, including the sensory-neural and vegetative systems.[10] Vojta reflex locomotion was created by Dr. Vaclav Vojta, a therapeutic technique mostly utilised for cerebral palsy. The basic principle of Vojta reflex locomotion is to sustain postures through isometric contraction of muscles during stimulation of the spot (breast zone).[11] It stimulates reflex crawling and rolling to elicit postural control and coordinated muscle activation.

Vojta therapy is known to influence the entire neuromuscular system, including sensory, motor, and autonomic components, and is increasingly applied in neurological rehabilitation beyond pediatric populations.[12] Pavel Kolar extended the concepts and techniques of VT, adding the active component, loading placement, and naming it DNS. The DNS method is a practical technique that combines education, postural awareness, breath training, mobilisation, and manipulation with brain stimulation.[13] Bertha and Karl Bobath last released the Bobath Concept in 1990. Bobath therapy (BT), also known as the neurodevelopmental treatment (NDT) approach, emphasises normal movement patterns and postural control through guided facilitation and inhibition. It is based on the principle of utilising key points of control and reflex-inhibiting postures to reduce abnormal muscle tone and improve voluntary movements.[14]

One of the most popular approaches is BT, used to treat developmental disorders, was initially employed to treat children with cerebral palsy (CP) and several subsequent developmental problems, including DS. The goals of Bobath therapy are to help muscles that are hypertonic or hypotonic return to normal, develop balanced reactions, and facilitate movements.[15] Two established neurophysiological approaches used in clinical rehabilitation are VT and BT. Both methods aim to facilitate neuroplasticity and functional recovery, yet differ in mechanisms and application.[16]

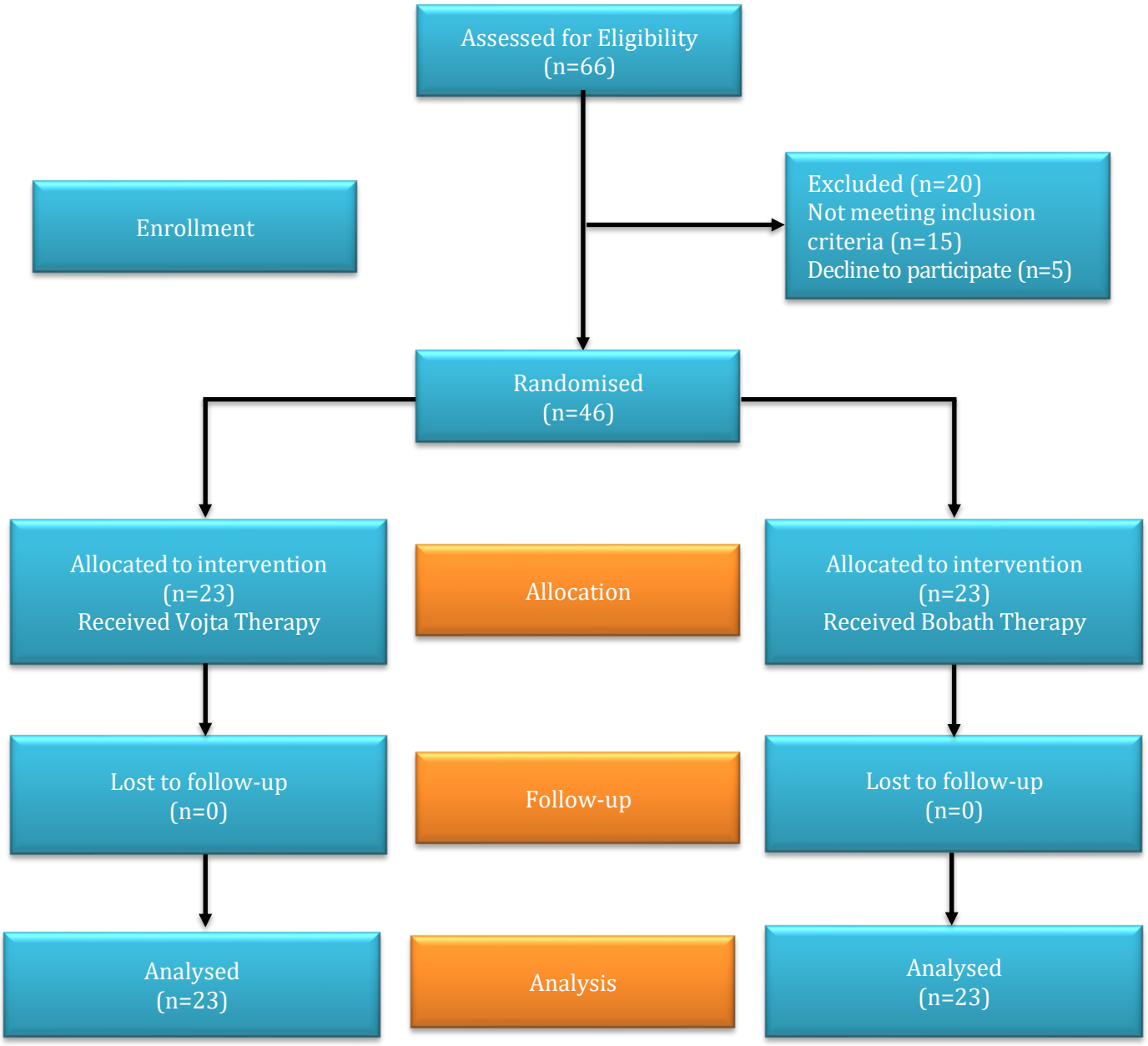
Although both therapies are clinically accepted and studied extensively in pediatric populations, limited comparative evidence exists for their effectiveness in adult hemiparetic stroke patients, especially for lower limb spasticity and motor function recovery.[17] This study was therefore designed to assess and compare the effectiveness of both therapies in improving lower limb motor function and reducing spasticity in adult hemiparetic stroke patients. By understanding which therapy offers greater clinical benefit, this research aims to contribute to evidence-based practices for functional recovery post-stroke.

METHODOLOGY

A single-blinded randomised clinical trial was conducted over six months to compare the effects of VT and BT on lower limb spasticity and motor function in hemiparetic stroke patients. The study was carried out at two clinical sites in Faisalabad: Aqsa Physiotherapy Clinic and Falah-e-Millet Hospital. A total of 66 stroke patients were initially screened for eligibility. Of these, 20 patients were excluded, 15 due to not meeting the inclusion criteria (history of brain surgery, pregnancy, cognitive limitations such as aphasia or dementia, and unstable cardiovascular conditions), and 5 who declined to participate.

The remaining 46 eligible participants were randomly divided into two equal groups: Group A received VT, and Group B received BT. The inclusion criteria required participants to be adults aged between 25 and 74 years, diagnosed with hemiparetic stroke within the past 1-4 months, and

Figure 1: CONSORT Flowchart



capable of following instructions and completing study-related assessments. The participants were enrolled using purposive sampling and then randomised into groups. Before the intervention, all participants received a standard baseline therapy consisting of a hot pack applied at 55°C for 10 minutes on the affected limb.

Group A underwent VT three times per week on alternate days. Each session involved five repetitions of pressure application to designated reflex zones, with each application lasting two minutes followed by a one-minute rest period. Group B received facilitation-based Bobath therapy, also administered three times per week. Each Bobath session lasted 15 minutes and was divided into three intervals of five minutes each, with a one-minute rest in between. All therapeutic interventions were performed by trained physiotherapists. Motor function and spasticity outcomes were measured before and after the intervention period using the Fugl-Meyer assessment scale (FMA) for the lower limb and the modified Ashworth scale (MAS). A blinded research assistant who was unaware of group allocations conducted all post-intervention assessments to reduce bias. Participants were also blinded to the specific objectives of the study to minimize placebo effects.

Ethical approval was obtained from the relevant institutional review board. Before data collection, permission letters were obtained from the clinic administrations, and informed consent was signed by each participant. Data were analyzed using SPSS version 23. Descriptive statistics were used to summarise demographic data, while inferential tests were employed to compare pre- and post-intervention scores within and between the two groups.

RESULTS

A total of 46 participants were included in the study, 29 were male and 17 were female. 23 individuals assigned to each group. The overall age distribution ranged from 26 to 70 years, with a mean age of 48.67±10.24 years. The mean and standard deviation for gender coding were 1.37±0.48, indicating a male-dominant sample. Group A (VT) had a minimum age of 26 and a maximum of 64, with a mean of 45.87±9.17 years, while Group B (Bobath therapy) had a minimum age of 32 and a maximum of 70, with a mean of 51.48±10.67 years. Table 1 shows the results of the Friedman test, which was used to assess changes in spasticity across three timepoints (pre-, mid-, and post-intervention) within each group. In Group A (Vojta therapy), the MAS scores significantly decreased from a mean of 3.30±0.87 (pre) to 2.39±0.94 (mid) and 1.39±0.99 (post). The mean ranks were 2.96, 2.00, and 1.04, respectively, and the change was statistically significant (p=0.00). In Group B (Bobath therapy), MAS scores also showed significant within-group improvement, reducing from 3.39±0.66 to 2.61±0.78 and 1.83±0.78 at the same intervals. The mean ranks were 2.89, 2.00, and 1.11, respectively, with a significant p-value (p=0.00). The Fugl-Meyer Assessment was used to measure motor function improvement. In Group A, FMA scores increased from a baseline mean of 20.57±4.83 to 22.74±4.99 (mid), and 24.74±5.16 (post), with mean ranks of 1.00, 2.00, and 3.00, respectively (p=0.00) (Table 1). In Group B, FMA scores improved from 22.17±4.87 to 24.74±5.01, and 27.26±4.72 at the same intervals, also showing a statistically significant increase (p=0.00) as shown in Table 1.

For spasticity, no statistically significant differences were observed between the two groups at any time point. Group A (VT) had a lower mean MAS score at four weeks, but the p-value was 0.14, indicating a non-significant difference (Table 2). Between-group comparisons using the Mann-Whitney U test showed no significant difference in FMA scores at baseline and after two weeks (p=0.14 and 0.09, respectively). However, at four weeks, a significant difference emerged (p=0.03), with Group B (BT) showing superior motor function gains (Table 2). Both therapies significantly improved motor function and reduced spasticity over time. However, BT demonstrated superior motor gains by the 4th week, while VT showed relatively better spasticity reduction, although this was not statistically significant. These results suggest that both techniques are effective, but may have different strengths depending on the desired rehabilitation outcome.

DISCUSSION

This study was designed to compare the effectiveness of Vojta therapy and Bobath therapy on lower limb spasticity and motor function among adult patients with hemiparetic stroke. Stroke remains one of the most disabling neurological conditions worldwide, particularly in low- and middle-income countries like Pakistan. Despite the extensive use of the Vojta and Bobath approaches

Table 1: MAS and FMA Scores for Friedman test

	Groups	Endpoints	Mean	S.D	Mean Rank	p-value
MAS	Group A (Vojta Therapy)	Baseline	3.30	0.87	2.96	0.00
		2nd week	2.39	0.94	2.00	
		4th week	1.39	0.98	1.04	
	Group B (Bobath Therapy)	Baseline	3.39	0.65	2.89	0.00
		2nd week	2.61	0.78	2.00	
		4th week	1.83	0.77	1.11	
FMA	Group A (Vojta Therapy)	Baseline	20.57	4.83	1.00	0.00
		2nd week	22.74	4.99	2.00	
		4th week	24.74	5.16	3.00	
	Group B (Bobath Therapy)	Baseline	22.17	4.87	1.00	0.00
		2nd week	24.74	5.01	2.00	
		4th week	27.26	4.72	3.00	

Table 2: MAS and FMA comparison between groups A and B

	Timepoint	Group A Mean Rank	Group B Mean Rank	z-score	p-value
MAS	Baseline	22.78	24.22	-0.39	0.69
	2nd week	21.96	25.04	-0.82	0.40
	4th week	20.74	26.26	-1.46	0.14
FMA	Baseline	20.63	26.37	-1.45	0.14
	2nd week	20.24	26.76	-1.65	0.09
	4th week	19.41	27.59	-2.08	0.03

in pediatric populations and neurological rehabilitation, there is limited comparative evidence on their efficacy in adult stroke rehabilitation, especially regarding motor recovery and spasticity reduction of the lower limbs.

The results of our study demonstrated that both therapies led to statistically significant improvements in motor function and reductions in spasticity over time within each group. However, a between-group analysis revealed that Bobath therapy was significantly more effective in improving motor function by the fourth week ($p=0.03$), whereas no significant difference was found between the groups in reducing spasticity ($p>0.05$) at any time point. These findings suggest that BT may facilitate earlier improvements in motor performance, while both therapies remain equally effective in managing muscle tone.

Our findings align with previous research by Huseyinsinoglu et al., who compared the Bobath Concept with constraint-induced movement therapy in stroke patients. Their results showed that while both therapies improved upper limb function, the Bobath approach demonstrated slightly superior outcomes in enhancing movement quality and speed, particularly in patients with higher baseline functionality.[18] Similarly, Kılınç et al. conducted a study assessing the impact of Bobath-based trunk exercises on post-stroke patients and reported improved trunk control, functional capacity, and gait compared to traditional physiotherapy, reinforcing the benefits of Bobath-based interventions in stroke rehabilitation.[19]

On the other hand, studies investigating Vojta therapy, primarily in pediatric populations, have highlighted its role in improving neuromotor control. Sun-Young Ha et al. evaluated the effect of Vojta therapy on diaphragm movement in children with spastic cerebral palsy and found significant improvements in gross motor function and respiratory mechanics, demonstrating that its systemic neuromuscular benefits occurred.[20] Ungureanu et al. (2022) compared Vojta and Bobath therapies in children with cerebral palsy and reported no statistically significant differences between the two approaches in balance rehabilitation.[21] In contrast, our study in adult stroke patients found that Bobath therapy led to superior motor gains by week 4, suggesting that the adult population may respond differently, with faster observable benefits from facilitation-based methods like Bobath.[21]

Similarly, Menendez-Pardinas et al. (2023) observed notable gross motor improvements following Vojta therapy in children with neuromotor disorders when compared to conventional physiotherapy. Their results suggested that Vojta therapy plays a key role in activating foundational movement patterns essential for daily functional tasks.[22] However, our study results suggest that although Vojta therapy does improve motor function in adult stroke patients, it may not yield the same early gains as Bobath therapy in the same population.

CONCLUSION

The present study concludes that both Vojta and Bobath therapies are effective in improving lower limb motor function and reducing spasticity among hemiparetic stroke patients. While both groups showed significant within-group improvements, Bobath therapy demonstrated faster motor gains by the fourth week of treatment. On the other hand, Vojta therapy showed a comparatively greater reduction in spasticity, although the difference between groups was not statistically significant. These findings suggest that both therapies have unique benefits, and a tailored or combined rehabilitation strategy may enhance post-stroke functional recovery in clinical practice. Future research should consider long-term follow-up evaluations to assess the sustained effects of Vojta and Bobath therapies.

It is also recommended to expand the study across multiple cities or regions to improve generalizability. Further investigations into the effectiveness of these therapies in late childhood populations (ages 6 to 12 years) may also provide useful insights. Finally, larger, multicenter randomised controlled trials are encouraged to validate and expand upon the findings of this study.

DECLARATIONS

Consent to participate: Written consent had been obtained from patients. All methods were performed following the relevant guidelines and regulations.
Availability of Data and Materials: Data will be made available upon request. The corresponding author will submit all dataset files.
Competing interests: None
Funding: No funding source involved.
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CONSORT Guidelines: All methods were performed following the relevant guidelines and regulations.

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