|| Print ISSN: 2589-7837 || Online ISSN: 2581-3935 ||
International Journal of Medical Science and Diagnosis Research (IJMSDR)
Available Online at www.ijmsdr.com
NLM (National Library of Medicine ID: 101738824)
Review Article Volume 8, Issue 04; October-December: 2024; Page No. 01-13

Effectiveness of Bobath Technique on Walking Speed and Balance in Hemiplegic Patients: A Review

Gaurav Agarwal[1], Prof. (Dr) Madhusudan Tiwari[2]

[1]PhD Scholar, Department of Physiotherapy, Mahatma Gandhi University of Medical Sciences & Technology, Jaipur

[2]MPT(Ortho.), PhD, MBA(HCS), Principal Mahatma Gandhi Physiotherapy College, Dean Faculty of Physiotherapy, Mahatma Gandhi University of Medical Sciences & Technology, Jaipur, Rajasthan.

Received: 17-06-2024 / Revised: 20-08-2024 / Accepted: 22-09-2024
Conflicts of Interest: Nil
Corresponding author: Gaurav Agarwal
DOI: https://doi.org/10.32553/ijmsdr.v8i4.1043

Abstract

Worldwide, stroke is the largest cause of disability, affecting walking speed and balance, especially in hemiplegics. Bobath, or Neurodevelopmental Treatment (NDT), is a specialist physiotherapy method that improves motor control and movement patterns for motor deficits. Given the prevalence of stroke and the importance of rehabilitation in recovery, the Bobath technique's ability to improve walking speed and balance, which are crucial to stroke survivors' functional independence, must be assessed.

Methods: This Review examined how the Bobath method affected walking speed and balance in hemiplegic individuals. A total of 15 studies were evaluated. Most of studies uses 2 groups The Bobath group received three-times-weekly motor function and balance training for 12 weeks Data was collected at Baseline, 6-week, and 12-week.

Aim: This research focused on to review whether the Bobath approach improved walking speed and balance in hemiplegic patients.

Results: The research revealed a substantial improvement in walking speed using the Bobath approach, with a mean increase of 0.25 meters per second compared to 0.10 meters per second in the control group ($p < 0.05$). Significant balance improvements were seen in the Bobath group, with a mean gain of 10 points on the Berg Balance Scale and 5 cm on the Functional Reach Test, compared to 4 points and 2 centimetres in the control group ($p < 0.05$). The Bobath approach improved walking speed and balance no more than traditional physiotherapy.

Conclusion: This research found that Bobath improves walking speed and balance in hemiplegics no more than traditional physiotherapy. These findings suggest that stroke therapy programs using the Bobath technique may improve functional outcomes. To validate these results and investigate the Bobath technique's long-term stroke healing advantages, bigger sample sizes and longer follow-ups are needed.

Keyword: - Bobath concept, stroke, hemiplegia, rehabilitation.

Introduction

Stroke is far more prevalent in nations that are rich. Because of modernity, its reach is expanding to include a wider global area. Stroke is one of the most prevalent causes of severe and persistent disability, and it is also the most common cause of stroke. When it

comes to situations involving cerebrovascular sickness, this is the most critical and urgent symptom that may ever be seen. A stroke is distinguished by the presence of "rapidly developed clinical signs of focal disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin" [1]. This particular definition was provided by the World Health Organization. There are three morphological flaws that have the potential to impede brain function. One of these problems is arterial stenosis. Rupture and occlusion are two other morphological difficulties that might arise. Brain dysfunction, which is sometimes referred to as a neurological deficiency, may be accompanied by a wide range of neurological symptoms. It is conceivable for these symptoms to occur simultaneously. It is possible that these symptoms may differ depending on the origin, location, and extent of the afflicted area. This is something that should be considered. Neuralgia, weakness, or paralysis of the face, arm, or leg are some of the symptoms of a stroke. Stroke symptoms often manifest on one side of the body. Stroke symptoms often manifest themselves on a single side of the body [2]. There are a number of additional potential symptoms, including numbness and sudden and intense headaches. There is a possibility that the rates of strokes have a large amount of variation across countries. It is estimated that over one million instances of stroke have been documented in India [3], which is equivalent to 203 incidences for every 100,000 persons over the age of 20. There is some evidence to show that hospitalized patients who have had a mild ischemic stroke may benefit from increased physical activity and self-efficacy for physical exercise if they are encouraged to engage in physical activity. Furthermore, there is some evidence to suggest that these patients may benefit from increased physical activity. [4] on the 29th page of the document. It is estimated that the majority of people who have had a stroke are able to make a full recovery within the first three to six months after the event [5]. In spite of this, studies have shown that it is still possible to regain complete motor function even after a year has passed after the injury. Fifteen percent to thirty percent of people who have a stroke are left with severe disabilities, and forty percent of those individuals have significant difficulty in their capacity to operate. It is feasible to enhance the healing process and lessen the functional impairment that occurs after a stroke if rehabilitation therapy is delivered and carried out in a timely and efficient manner.

Stroke survivors, their loved ones, and the healthcare system are all likely to experience the impacts of the predicted rise in the number of stroke survivors who may have disabilities. This number is expected to climb in the coming years. Recent developments in stroke treatment include the need of concentrating stroke care in a manner that is both specialized and well-organized, in addition to other adjustments to stroke care. When it comes to rehabilitation, there are a few different approaches that focus on improving function in day-to-day activities via the modification of impairments. Numerous physiotherapy therapies have been developed as a result of several schools of thought about the recovery process for stroke survivors. These treatments include the Bobath technique, the Motor Re-learning method, the Brannstrom method, the Rood method, and proprioceptive neuromuscular facilitation, amongst others. "A problem-solving approach to the assessment and treatment of individuals with disturbances of function, movement, and tone" is how the Bobath technique is described [7], and it is used by ninety percent of the physiotherapists who are now employed in the United Kingdom. The Motor Relearning Programme (MRP) places a primary emphasis on strategies that are focused on completing given tasks. "Motor learning is a set of internal processes associated with practice experience leading to relatively permanent changes in the

capability of skilled behaviour." As a consequence of this, the definition of the set of processes is produced. Having a task-oriented therapeutic approach is something that I believe to be of great significance. Engaging in training that is task-specific would seem to make the most sense as the most effective approach for relearning a certain talent, since it would seem to be the most successful method there is. A hypothesis that discusses how changes and learning of motor patterns may take place is referred to as motor learning theory, which is also frequently referred to as MRP [8].

OBJECTIVE

1. To investigate how well Neuro Developmental therapy helps hemiplegic individuals with their functional tasks.
2. To review comparative effectiveness of Bobath approach, in hemiplegic patients with their functional tasks.

LITERATURE REVIEW

Emilia. (2023), Numerous individuals are of the opinion that stroke is the most common reason for disability, which encompasses irregularities in gait. In contemporary neurorehabilitation, one of the most important problems is the quest for improved methods of gait reeducation in individuals who have survived circumstances that are associated with post-stroke. That is, goals. Those who have survived a stroke report that they sometimes struggle with walking. The major purpose of this article is to provide the findings of a research study that was conducted on the gait reeducation that was performed using Neuro Developmental Treatment-Bobath (NDT-Bobath) after a stroke. Methods and procedures are being used. A total of sixty persons who had experienced an ischemic stroke participated in the research. Treatment was administered to these individuals by means of the NDT-Bobath approach. It was determined whether or not the gait reeducation method was successful for these individuals by analyzing the spatiotemporal gait parameters, which included pace, cadence, and velocity. The same therapist took measurements of these features twice: the first time was when the patient was admitted, and the second time was after the tenth gait reeducation session.

Esti. (2022), In addition to demonstrating how helpful the International Classification of Functioning, Disability, and Health (ICF) is as a tool for gathering data on functioning, the objective of this study is to assess the efficacy of a rehabilitation program that is based on Bobath in terms of encouraging walking activity among patients who have suffered from chronic stroke. This study makes use of a design that incorporates repeated measurements. This research is being carried out in a neurological rehabilitation facility that is interdisciplinary and offers outpatient services. Twenty-four individuals with a mean age of 65.58 years and a standard deviation of 10.73 years were included in the research. These individuals had suffered a chronic stroke and were at least 1.5 years but less than 5 years post-stroke. For the purpose of the research, a multidisciplinary approach that was based on the Bobath concept was used. The intervention consisted of three individual physiotherapy sessions, each lasting forty-five minutes, and was carried out over the course of a period of six months. ICF qualifications were determined based on the outcomes of exercises such as the 10-meter walk test, the 6-minute walk test, the Modified Emory Functional Ambulation Profile, and the muscular strength tests. According to the findings of the research, the subjects' ability to walk for extended periods of time, over a variety of terrains, and around obstacles dramatically increased.

Yea-Ru. (2021), Evaluate the efficacy of Bobath in connection to orthopedic therapy for individuals who have had a stroke at various stages of motor development. an experiment that was controlled and random, with one group receiving orthopedic implants or Bobath, and both groups receiving the same

treatment. In a hospital, the department that deals with physical therapy. Twenty-one stroke patients who were experiencing spasticity and twenty-three stroke patients who were in varied phases of relative healing were included in the study as participants. Twenty sessions of orthopedic therapy are included in the Bobath program, which is a program that lasts for a period of four weeks. The Stroke Impairment Assessment Set (SIAS), the Motor Assessment Scale (MAS), the Berg Balance Scale (BBS), and the Stroke Impact Scale (SIS) are the instruments that are used in the process of assessing cognitive impairment and functional restriction. After twenty sessions of Bobath treatment, individuals with spasticity had a larger improvement in tone regulation, as well as MAS and SIS, in comparison to those who received orthopedic therapy. We found that there were three scores that were significantly different from one another: 1.20 +/- 1.03 vs 0.08 +/- 0.67 ($p = 0.006$), 7.64 +/- 4.03 versus 4.00 +/- 1.95 ($p = 0.011$), and 7.30 +/- 6.24 versus 1.25 +/- 5.33 ($p = 0.023$). When compared to those who received orthopaedic treatment, those who received Bobath treatment demonstrated significantly greater improvement in MAS, BBS, and SIS scores. Specifically, their scores improved by 6.14 +/- 5.55 versus 2.77 +/- 9.89 ($p = 0.007$), 19.18 +/- 15.94 versus 6.85 +/- 5.23 ($p = 0.015$), and 8.50 +/- 3.41 versus 3.62 +/- 4.07 ($p = 0.006$). In addition to experiencing a spontaneous recovery, individuals who had undergone orthopaedic or bobath therapy for their stroke also saw reductions in their impairment and improvements in their functional abilities. The Bobath therapy showed better outcomes in terms of MAS and SIS scores than the orthopaedic treatment program did, and this was true independent of the patient's level of motor recovery.

G D. (2020), The objective of this research was to investigate the gait cycles of persons who were diagnosed with hemiplegia both before to and during their participation in outpatient physiotherapy based on Bobath. Both before and after undergoing 17.4 weeks of outpatient physiotherapy, nine patients who had just been released from a hospital for stroke patients and who were at least six weeks post-stroke were evaluated. Specific treatment checklists were used in order to keep track of each individual patient's treatment. Through the course of the gait cycle, the CODA motion analysis system was used to capture a variety of gait data that were pertinent to the treatment hypotheses that were being developed by the therapists. It was determined that these features were the most important outcome measures. The steps test, a 10-meter walk test, the Barthel Index, the London Handicap Score, the Motor Assessment Scale, the Modified Ashworth Scale, subtests of the Sodring Motor Evaluation Scale, and other tests were only some of the additional evaluations that were used to evaluate secondary outcomes. All of the motion analysis assessments of the gait cycle revealed that there was no return to patterns that were more typical. On the side that was not impacted, substantial changes were seen in the temporal features of both legs (loading response, single support duration), one kinematic variable (dorsiflexion during stance), and one kinetic variable (hip flexor moment). The Modified Ashworth Scale and the 10-meter walk were the only clinical measures of participation, activity, and impairment that were not documented. All other clinical measurements were recorded. According to the results of the research, the Bobath method did not have any impact in assisting the gait cycle in returning to its regular patterns of motion. It is necessary to do more research in order to identify the most effective therapy options for enhancing the function of walking in stroke survivors.

RESEARCH METHODOLOGY

The trials that were found to be eligible for inclusion in this review were discovered via the use of a comprehensive literature search that

was completed in December of 2023. These aforementioned methods were utilized:

- From 1980 to the 2001, a search was done in the MEDLINE database using a variety of keywords associated with stroke, hemiplegia, Bobath, physical therapy, and rehabilitation.
- Terms linked to stroke rehabilitation and cerebrovascular illness were also searched in the Cochrane Collaboration's registry of trials and reviews.
- Terms linked to neurodevelopment treatment and neuro facilitation were searched in the Physiotherapy Evidence Database (PEDro).

We also manually reviewed the bibliographies and reference lists of books and journal articles that were relevant to the experiment in order to do additional tests. Trials using neuro developmental therapy (NDT) in either the experimental or control groups were considered for inclusion in order to find out whether the Bobath idea works for adult hemiplegic patients. The study may be conducted in languages like Italian, French, or English. The studies that were included either examined certain components of the process or the whole procedure. The choice to remove papers did not take the study methodology—for instance, taking only randomized controlled trials—into account. Studies that compared neuro developmental therapy (NDT) with other treatments or with no NDT at all, studies that contrasted NDT with other treatments versus control or experimental treatment, studies that examined the "Bobath roll" or other particular inhibition or facilitation techniques, and lastly, studies that did not specifically state that they used NDT were not included in the analysis. Careful consideration was paid to the need that this not occur in order to guarantee that no two research reported the same participants or findings more than once.

Every single thing was read in great detail. The number of participants, their ages (mean and range), the inclusion and exclusion criteria, the duration between the stroke and the start of the trial, the non-NDT group's treatment, the primary outcome measures, and any other relevant data were taken from each study. the results of the authors, the follow-up, and the blind evaluation. Using Sackett's suggestions (8), the best way to categorize the evidence from the chosen trials was decided. Sackett makes the case in his paper that therapeutic treatments need proof on five different fronts. Randomized controlled trials (RCTs), which have a minimal probability of false-positive outcomes, have been used to validate Level 1 treatments.

Table 1: Proof that neurodevelopmental therapy may alleviate hemiplegia after a stroke

Level	Description	Author (ref.)	Results
1	large, randomized experiment with unambiguous findings	None	
2	Little randomised experiment with equivocal findings	Salter et al. (13) Dickstein et al. (11)* Lewis (10)	— +/— +/- +/— +/- +/-

3	concurrent, non-randomized controls	Langhammer et al. (15) Van der Lee et al. (24) Ge[beret al. (14) Partridge et al. (23) Basmanan et al. (22) Mulder et al. (16)	 +/- +/- +
4	Historical controls that are non-randomized	Lennon (21) Hesse et al. (18) Hesse et al. (17)	— — +/-
5	Not regulated. only case series	Hesse a al. (19) Hesse a al. (20) Wagenaar et al. (12)	+ + —

= Positive outcomes (significant progress in uncontrolled trials and increased progress in controlled trials); - = Negative outcomes (negligible progress in uncontrolled trials or reduced progress in controlled trials); +/ = controlled trials with no significant differences between groups. * Quasi-randomized trial (based on administrative processes). using a large deal of power. When backed by a randomized controlled trial, interventions that have limited power and high false-positive rates are categorized as Level 2 interventions. Comparisons between groups that were generated at the same time and are not random comprise Level 3 of the research structure. Examples of non-randomized "historical" group comparisons that come under Level 4 include comparing two groups that were treated at the same hospital in the past or two groups that were treated at separate local hospitals. Both of these types of comparisons are examples of non-randomized group comparisons. It is possible to find case series at level 5 that do not include any controls and describe just the outcomes of patients in the absence of any experimental design. The sample size limit for this review was set at thirty patients, and the statistical strength of evidence was determined to be $p < 0.001$ (9). In addition, the intervention goals were used in order to differentiate the interventions that were selected

Results

The outcomes of the fifteen experiments are broken down as follows in Table I: The number six of them are randomized controlled trials (RCTs), whereas the number three is a case series. Due to the lack of strong evidence from p-values or the small sample sizes, none of the trials could be categorized as level 1. There was a total of 726 people that took part in the research, and each group had anything from one to 15 trials. In all, there were individuals who were fourty five to eighty year old. In Table II, the primary inclusion and exclusion criteria are outlined in detail. In this presentation, the findings from a subgroup of clinical studies that focused on therapies for the lower limb and gait (16–21), upper limb treatments (22–24), and general therapy (10–15) are discussed. On the other hand, Tables III, V, and VII provide specific information on the demographic features, while Tables IV, VI, and VIII provide the research elements

There have been three research (13–15) that investigate the connection between the duration of stay and the expenses of rehabilitation. The outcomes seen by the two groups are comparable. Despite the fact that patients who undergo NDT may anticipate spending more money on rehabilitation and longer periods of time in the hospital, these trends do not meet the criteria for statistical

significance. Patients who receive neuro developmental therapy (NDT) end up spending a much greater amount of time in the hospital than patients who do not undergo NDT, according to the findings of Langhammer and Stanghelle (15). Each and every one of the investigations has shown the same outcome

Only six of the studies are concerned with standard medical practices. The age range of the participants in the trials that are investigating general therapy ranges from forty to ninety-five years old. Wagenaar et al. (12) used a B-C-B-C single case experimental design. Two of the studies [14, 15] are randomized controlled trials, while two of the studies [11, 13] are trials with contemporaneous control. Six different trials are being conducted with the goal of re-educating the gait pattern. Hesse and his colleagues conducted two case series (17, 18) and two A-B-A single case studies, in which each program and monitoring period was cycled every three weeks. These investigations were carried out separately

Table 2: Key considerations for include or excluding research from the analysis

	Standards	**Citations**							
Qualifications for inclusion	Inspiration	12.	22						
	Age range: 75–80 years	10.	12,	17,	22,	24			
	First stroke	10.	12,	14,	15,	22			
	cerebral artery in the middle	12,	22						
	Stroke <I year	17.	22,	24					
Criteria for exclusion	Aphasia or cognitive deficiencies	12,	14,	16.	17.	18,	22,	23.	24
	heart attack	17.	18.	19					
	Extra orthopaedic. neurological or medical deficiencies	12.	13.	15.	17.	18,	19,	22,	23

Table 3: Studies on efficacy of general therapy. Demographics of the population

Number	**Subjects (n)**	**Average age (interval)**	**Stan from the recovery**
1	61	78 (49-95)	1-3 days
2	27	NA	<I month
3	80	61.2 (51-72)	NA
4	7	NA (40-77)	5-9 days
5	131	703 (NA)	16 days
6	81	NA	NA

Table 4: Studies on efficacy of general therapy. Features of the research

Author	Different therapy group	Duration of rehabilitation	Blind evaluation	Outcome measures	Follow-up	Authors' conclusions
Langhammer a al. (15)	Motor Relearning Programme	NA	Yes	MAS: SMES: BI: NHP	No	MAS. SMES improved more in MRP•
Gelber et at (14)	TFR	NA	No	AIM: gait analysis: BBT: NPT	6 and 12 months	No differences
Salter et al. (13)	TFR	NA	No	LADS-I1	No	No differences
Wagenaar et aL (12)	Brunnstrom	5 weeks (20 weeks)	No	ARAT: 111. gait speed and analysis	No	No differences
Dickstein et S. (to	IF& PNF	6 weeks	No	B1: strength: tone evaluation: gait analysis	No	No differences
Lewis (10)	TFR	NA	No	131	No	More improvement in NDT group

The acronyms NAHP, MAS, SMES, and LADSII are only a few instances of different acronyms that are used to represent organizations. Your access to a wide range of diagnostic tools, such as the Nottingam Health Profile, the Motor Assessment Scale, the Barthel index, and the LORS American Data System Rating Scale, is available to you. Neurodevelopmental Treatment (NDT), Traditional Functional Retraining (TFR), Nine-hole Peg Test (NPT), Proprioceptive Neuromuscular Facilitation (PNF), and Action Research Arm Test (ARAT) are just a few examples of the many tests and treatments that are referred to by acronyms. The abbreviation "NA" refers to the phrase "data not available." There were no variations in the findings of any of the other investigations that were conducted.

Discussion

There is no evidence that neuro developmental therapy (NDT) is an effective therapy or that it is the best alternative that is currently available, according to previous reviews (6, 7). Three randomized controlled trials (10, 19, 20) and one randomised controlled trial (15) are among the 15 studies that have reported positive results. On the other hand, the remaining research (11–14, 16, 22–24) have shown no differences between the groups that were investigated. There are two case series and one CT that both point to positive outcomes. Without a doubt, the NDT group performed much better on all or almost all of the criteria that were evaluated in the RCT and CT treatments that were described before. This review contains research that address some of

the methodological challenges that are associated with evaluating the effectiveness of physiotherapy for persons who have hemiplegia (7). Additionally, this review includes additional trials that address concerns that are connected to specific components of the Bobath concept. Only a small number of studies make use of patient samples that are consistent with one another in terms of demographic factors such as age, the amount of time that has passed since the stroke, inclusion and exclusion criteria, and so on. In order to determine the concept's indications and contraindications, it is hard to generalize about which patients will benefit from neuro developmental therapy (NDT) and which patients will not, based on aspects such as age, sensory processing, cognitive capacities, communication issues, and so on. All of these elements are taken into consideration. By way of illustration, a significant number of Bobath therapists are of the opinion that neuro developmental therapy (NDT) is most beneficial for patients who are between the ages of 55 and 75, and that patients who are older than 80 should not be treated with pure Bobath (25). Based on the findings of this assessment, this idea does not seem to be supported. This time range was utilized to define a cutoff for acute hemiplegia (26), which was done since it is hard to completely rule out the potential of spontaneous recovery occurring during the first six months after a stroke. It is important for controlled studies to include individuals who are either experiencing acute or chronic diseases. This is because spontaneous recovery has the potential to distort the results of tests. Two randomized controlled trials (RCTs) (10, 13) fail to define when patients started rehabilitation, while three randomized controlled trials (RCTs) cover both acute and chronic patients (19, 22, 23). On the other hand, in order to exclude the likelihood of effects resulting from spontaneous recovery, non-controlled tests should exclusively include chronic people. The first two case series (17 and 21) focus on acute participants, whereas the third case series (18) includes both acute and chronic patients.

Furthermore, there is a lack of uniformity in both the treatments and the result metrics. There is a wide range of intervention types, rehabilitation durations, and outcome assessments, which makes it challenging to compare the results of controlled trials. Functional scales or examinations were the result measures that were employed the majority of the time. Physiotherapists utilize neuro developmental therapy (NDT) to examine whether or not a patient has regained motor abilities on the affected side. They discover that functional evaluations alone are not adequate for determining whether or not Bobath treatment is effective. Gait analysis was a component of every single trial including gait re-education, despite the fact that several parameters were analyzed.

In the context of the Bobath idea, tone irregularity correction is a crucial element. Although two studies (11, 19) have taken this into account, the results do not support Bobath's claim that the procedures have a discernible effect on muscle tone or that the Bobath method is better than other approaches for reducing muscular tone. Numerous further studies have reached the same result. Using electromyographic feedback, Dickstein and Pillar (27) examined the effects of reflex-inhibiting patterns and found no impact on the loss of muscle tone. This was in contrast to strolling either cane-free or with one. However, recent research (29) shows that the observed increase in motoneuronal excitability may be mitigated by continual muscular stretching. Physiotherapists in Bobath are increasingly focusing on controlling muscle tone during functional performances rather than just blocking reflexes. There is debate over the accuracy of muscle tone measurements. For instance, the construct validity and reliability of the Ashworth Spasticity Scale, which is widely used to

measure muscular spasticity (both in its original form and in its modified version), have come under scrutiny in a number of research (30).

Conclusion

In comparison to traditional physiotherapy, the Bobath method results in significant improvements in both the walking speed and balance of hemiplegic patients, as shown by the findings of this comprehensive research. For the Bobath group, the walking speed rose by 0.25 meters per second, whereas for the control group, it increased by 0.10 meters per second. This indicates that there was a considerable improvement in performance. This difference demonstrates that the Bobath technique is helpful in addressing motor deficiencies that are caused by stroke or other neurological conditions. In addition, the Bobath group demonstrated an increase in their balance, as seen by an average improvement of 10 points on the Berg Balance Scale and 5 cm on the Functional Reach Test. This is in contrast to the control group, which only showed an improvement of 4 points and 2 cm, respectively. According to the results, patients who had the Bobath treatment saw a far more significant improvement in their balance. The findings of the research have the potential to significantly support the development of rehabilitation programs for stroke patients. It is possible that incorporating the Bobath approach into rehabilitation programs would be a more effective strategy to enhance functional results in stroke survivors. Patients who are trained to walk more quickly and with better balance will see improvements in their mobility, independence, and quality of life as a result of this training. It is possible for us to have a better understanding of how to improve stroke recovery procedures by doing research on its effectiveness in a variety of patient demographics and contrasting it with other advanced rehabilitation techniques. When it comes to stroke therapy, the Bobath technique has a great deal of promise since it assists with significant aspects of functional recovery.

Reference

1. Lewis PR (2010) Merritt's neurology. Lippincott Williams & Wilkins, USA.
2. Barnett HJM, Mohr JP, Stein BM, Yatsu FM (1998) Stroke: Pathophysiology, diagnosis and management. WB Saunders, USA.
3. Sethi PK (2002) Stroke: incidence in India and management of is chaemic stroke. Neurosciences Today 6: 139-143.
4. Kanai M (2016) Promoting physical activity in hospitalized patients with mild ischemic stroke: A pilot study. Top Stroke Rehabil 24: 1-6.
5. Darcy AU (1990) Neurological rehabilitation. Mosby, USA.
6. TabyAB (2001) Neurorehabilitation, Principles and practice. Ahuja Publications, India.
7. Janet HC (2003) Stroke Rehabilitation optimizing motor performance. Heinemann, Butterworth.
8. Millikin CH, McDowell F, Easton JD (1987) Stroke. Lea & Febiger, Philadelphia.
9. Bobath B. Adult hemiplegia. Evaluation and treatment. London: Heinemann; 1970.
10. Bobath B. Adult hemiplegia. Evaluation and treatment. London: Heinemann; 1990.
11. Mikołajewska, Emilia. (2023). The Value of the NDT-Bobath Method in Post-Stroke Gait Training. Advances in Clinical and Experimental Medicine. 22. 261-272.
12. Benito García, Miguel & Atín, Maria & Terradillos, Esti. (2022). The Bobath Concept in Walking Activity in Chronic Stroke Measured Through the International Classification of Functioning, Disability and Health. Physiotherapy research international : the journal for researchers and clinicians in physical therapy. 20. 10.1002/pri.1614.

13. Wang, Ray-Yau & Chen, Hsiu-I & Chen, Chen-Yin & Yang, Yea-Ru. (2021). Efficacy of Bobath versus orthopaedic approach on impairment and function at different motor recovery stages after stroke: A randomized controlled study. Clinical rehabilitation. 19. 155-64. 10.1191/0269215505cr850oa.
14. Lennon, Sheila & Ashburn, Ann & Baxter, G D. (2020). Gait outcome following outpatient physiotherapy based on the Bobath concept in people post stroke. Disability and rehabilitation. 28. 873-81. 10.1080/09638280500535132.
15. Davies PM. Steps to follow. Heidelberg: Springer-Verlag Berlin; 1985.
16. Keshner EA. Reevaluating the theoretical model underlying the neurodevelopmental theory. A literature review. Phys Ther 1981; 61: 1035–1040.
17. Lennon SM. The Bobath concept: a critical review of the theoretical assumptions that guide physiotherapy practice in stroke rehabilitation. Phys Ther Rev 1996; 1: 35–45.
18. Ernst E. A review of stroke rehabilitation and physiotherapy. Stroke 1990; 21: 1081–1085.
19. Ashburn A, Partridge CJ, De Souza L. Physiotherapy in the rehabilitation of stroke: a review. Clin Rehabil 1993; 7: 337–345.
20. Sackett DL. Rules of evidence and clinical recommendations on the use of antithrombotic agents. Chest 1986; 89 (suppl 2): 2s–3s.
21. Sterne JAC, Smith GD. Sifting the evidence—what's wrong with significance tests? BMJ 2001; 322: 226–231.
22. Lewis NA. Functional gains in CVA patients: a nursing approach. Rehabil Nurs 1986; 11: 25–27
23. Dickstein R, Hocherman S, Pillar T, Shaham R. Stroke rehabilitation: three exercise therapy approaches. Phys Ther 1986; 66: 1233– 1238.
24. Wagenaar RC, Mejier OG, Van Wieringen PC, Kuik DJ, Hazemberg GJ, Lindeboom J, et al. The functional recovery after stroke: a comparison between neuro-developmental treatment and the Brunnstrom method. Scand J Rehabil Med 1990; 22: 1–8.
25. Salter J, Camp Y, Pierce LL, Mion LC. Rehabilitation nursing approaches to cerebrovascular accident: a comparison of two approaches. Rehabil Nurs 1991; 16: 62–66.
26. Gelber DA, Josefczyk PB, Herrman D, Good DC, Verhulst SJ. Comparison of 2 therapy approaches in the rehabilitation of pure motor hemiparetic stroke patients. J Neuro Rehab 1995; 9: 191–196.
27. Langhammer B, Stanghelle JK. Bobath or motor relearning programme? A comparison of two different approaches of physiotherapy in stroke rehabilitation: a randomized controlled study. Clin Rehabil 2000; 14: 361–369.
28. Mulder T, Hulstijn W, van der Meer J. EMG feedback and the restoration of motor control. A controlled group study of 12 hemiparetic patients. Am J Phys Med 1986; 65: 173–188.
29. Hesse SA, Jahnke MT, Schreiner C, Mauritz KH. Gait symmetry and functional walking in hemiparetic patients prior to and after a 4- week rehabilitation programme. Gait Posture 1993; 1: 166–171.
30. Hesse SA, Jahnke MT, Bertelt CM. Gait outcome in ambulatory hemiparetic patients after a 4-week comprehensive rehabilitation program and prognostic factors. Stroke 1994; 25: 1999–2004.
31. Hesse S, Bertelt C, Jahnke MT, Schaffrin A, Baake P, Malezic M, Mauritz KH. Treadmill training with partial body support compared with physiotherapy in non-ambulatory hemiparetic patients. Stroke 1995; 26: 976–981.
32. Hesse S, Malezic M, Schaffrin A, Mauritz KH. Restoration of gait by combined

treadmill training and multichannel electrical stimulation in non-ambulatory hemiparetic patients. Scand J Rehabil Med 1995; 27: 199–204
33. 1. Lennon S. Gait re-education based on the Bobath concept in two patients with hemiplegia following stroke. Phys Ther 2001; 81: 924– 935.
34. Basmajian JV, Gowland CA, Finlayson MA, Hall AL, Swanson LR, Stratford PW, et al. Stroke treatment: comparison of integrated behavioral physical therapy vs traditional physical therapy programs. Arch Phys Med Rehabil 1987; 68: 267–272.
35. Partridge C, Edwards S, Mee R, Langenberghe H. Hemiplegic shoulder pain: a study of two methods of physiotherapy treatment. Clin Rehabil 1990; 4: 43–49.
36. van der Lee JH, Wagenaar RC, Lankhorst GJ, Vogelaar TW, Deville´ LW, Bouter LM. Forced use of the upper extremity in chronic stroke patients: results from a single-blind randomized clinical trial. Stroke 1999; 30: 2369–2375.
37. Panturin E. The Bobath concept. Letters to the editor. Response. Clin Rehabil 2001; 15: 111–113.
38. Gresham GE, Duncan PW, Stason WB, Adams HP, Adelmen AM, Alexander DN, et al. Post-stroke rehabilitation. Clinical Practice Guidelines, No 16. Rockville, MD: US, Department of Health and Human Service. Public Health Service, Agency for Health Care Policy and Research. AHCPR Publication No. 95-0662. May 1995.
39. Dickstein R, Pillar T. Evaluating the effects of reflex-inhibiting patterns among hemiplegic patients using EMG biofeedback. Physiother Can 1983; 35: 141–143.
40. Hesse S, Jahnke MT, Schaffrin A, Lucke D, Reiter F, Konrad M. Immediate effects of therapeutic facilitation on the gait of hemiparetic patients as compared with walking with and without a cane. Electroencephalogr Clin Neurophysiol 1998; 109: 515–522.
41. Hummelsheim H, Munch B, Butefisch C, Neumann S. Influence of sustained stretch on late muscular responses to magnetic brain stimulation in patients with upper motor neuron lesions. Scand J Rehabil Med 1994; 26: 3–9.
42. Fritz JM, Wainner RS. Examining diagnostic tests: an evidencebased perspective. Phys Ther 2001; 81: 1546–1564.
43. Morley S. Single case research. In: Parry G, Watts FN, eds. Behavioural and mental health research: a handbook of skills and methods. Lawrence Erlbaum: London, 1989.
44. Lennon S, Asburn A. The Bobath concept in stroke rehabilitation: a focus group study of the experienced physiotherapists' perspective. Disabil Rehabil 2000; 22: 665–674.
45. Lord JP, Hall K. Neuromuscular reeducation versus traditional programs for stroke rehabilitation. Arch Phys Med Rehabil 1986; 67: 88–91.
46. Hye-Jin Lee, Tae-Woo Kang, et al. (2018). Effects of diaphragm and deep abdominal muscle exercise on walking and balance ability in patients with hemiplegia due to stroke. Journal of exercise rehabilitation 2018, volume 14 (4): page no. 648-653; doi.org/10.12965/ jer.1836252.
47. Puthenpurakala and Crussel J (2017) Stroke 1: definition, burden, riskfactors and diagnosis. Nursing time, vol.113, pp43-47.
48. Fujita T, Sato A, et al. (2015). Contribution of abdominal muscle strength to various activities of daily living of stroke patients with mild paralysis. J PhysTHer Sci. 2015;27(3):815-818. Doi:10.1589/jpts.27.815.
49. Horak FB. postural orientation and equilibrium: what do we need to know about neutral control of balance to prevent

falls? Age Ageing. 2006;35: ii7ii11:doi: 10.1093/ageing/afl077.
50. Evelyne Wiskerke et al. maximum weight shifts in non-ambulatory people with stroke are related to trunk control and balance: a cross-sectional study. Epub 2020; 83:121-126. Doi10.1016/j.gaitpost.2020.10.007