

Comparison of Task Oriented Approach Versus Proprioceptive Neuromuscular Facilitation Technique on Functional Ambulation in Stroke Patients

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ABSTRACT

INTRODUCTION: Stroke rehabilitation is an organized endeavour to help patients to maximize all opportunities for returning to an active lifestyle. Early intervention in acute stroke rehabilitation plays a major role in restoration of function and reducing the degree of disability and dependence for ADL's and ambulation. Neuro-rehabilitation is a method for relearning a previously learned task in a different way, either by compensatory strategies or by adaptively recruiting alternative pathway. Selection of appropriate and best neuro rehabilitation is critical.

OBJECTIVE: To compare whether task oriented approach is better than proprioceptive neuromuscular facilitation on functional ambulation of stroke patients.

DESIGN: Single centre randomized control trial.

SETTING: Occupational Therapy department, Swami Vivekananda National Institute of Rehabilitation Training and Research, Olatpur, Odisha, 754010

PARTICIPANTS: All participants who fulfill the inclusion criteria randomly assigned to two groups. Following this a baseline assessment of Functional gait assessment scale was done at the beginning of the study.

INTERVENTION: All participants continued to receive conventional occupational therapy throughout the entire duration of study. Participants received an additional specific intervention (one group task oriented approach and the second group PNF approach). Subjects of both the group were provided therapy sessions 45minutes per session 5 days a week for two months.

OUTCOME MEASURE: Functional Gait Assessment Scale

RESULT: From the statistical result of this study, it is seen that there is no significance difference in FGA scale between two groups. This data suggests that TOA and PNF approaches are equally efficacious in treating functional ambulation in stroke patients and there is a significant improvement within the two experimental group.

CONCLUSION: There has been considerable debate regarding the comparative effectiveness of various treatment approaches with stroke patients. This study is not able to identify any differences between the groups that received Task oriented approach and the group that received Proprioceptive neuromuscular facilitation treatment. On the basis of the findings of this study occupational therapist can consider using either approach in planning treatment for functional ambulation in stroke patients.

KEYWORD: stroke, Functional ambulation, PNF approach, Task oriented approach, neurorehabilitation, maximal independence

INTRODUCTION

Stroke is the sudden loss of neurological function caused by an interruption of the blood flow to the brain (Susan B. O' Sullivan). It is the leading cause of adult disability and second leading cause of mortality worldwide (WHO, 2007). It's a global

health problem with an annual incidence of 0.2 to 2.5 per 1000 population. Sudden onset of stroke leads to the paralysis of one side of body causing difficulty in mobility, ambulation and dependence in activities of daily living.

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Functional ambulation is defined as the ability of a person to walk with maximal independence and in the least time under various environmental circumstances. Post stroke individuals may have difficulty adapting to environmental demands such as rising from a chair, stepping over an obstacle, ascending stairs and walking along inclines and uneven surfaces as they may have compromised the ability to regain balance, control movement or adjust energy expenditure. Turnbull et al. had also suggested that gait deficiencies observed in post stroke individuals are likely limitations for their ability to respond to environmental demands.

Ottenbacher and Janel (1943) found that improvement in performances appears to be related to early initiation of treatment, age and study design but not to duration of intervention. Early intervention in acute stroke rehabilitation plays a major role in restoration of function and reducing the degree of disability and dependence for ADL's and ambulation.(Edzard,1990).

Stroke rehabilitation is an organized endeavour to help patients to maximize all opportunities for returning to an active lifestyle (Gresham et al. 1997, Aichner et al. 2002). Neuro-rehabilitation is a method for relearning a previously learned task in a different way, either by compensatory strategies or by adaptively recruiting alternative pathway (Matthews et al. 2004). Selection of appropriate and best neurorehabilitation is critical.

The historical perspective of neurorehabilitation approaches evolved from reflex theory of motor control. Approaches based on this concept are sensory motor approach (Roods 1940), movement therapy approach (Brunstrom, 1950), Bobath approach (1960_70s), proprioceptive neuromuscular facilitation (PNF) approach (knotandvoss, 1960_70s).

According to the theories of motor control system theory of motor control ,dynamic theory of motor control, and biomechanics and new approaches developed .Based on dynamic theory of motor control concepts different task specific training approaches are developed such as Motor Relearning Program for Stroke , sensory integration and CIMT to advance concepts of robotic therapy, mental imagery, virtual reality and locomotors trainings with body weight supported treadmill training and strength training.

But still Roods approach; PNF, Brun strtom approach and Bobath are commonly practiced and taught in India (Davidson et al 2000). While stroke is an important cause of disability, there is no generally accepted method for rehabilitating stroke survivors. Commonly-used treatment approaches that focus on impairments and seek to regain a 'normal' movement pattern, such as neurodevelopmental treatment (NDT), have proved ineffective (Pomero & Tallis 2000, Paci 2003, Hafsteinsdottir et al. 2005, Kollen et al. 2006, Lennon et al. 2006).

The **PNF approach** emphasizes the patient's abilities and potential so that strengths assist weaker components. Strengths and deficiencies are assessed and addressed in treatment within total patterns of movement and posture. A battery of techniques is superimposed on these total patterns to enhance motor response and facilitate motor learning (PEDRETTI 5th EDITION).

Task oriented approach: Unfortunately, no conclusive definition of a task-oriented Approach exists in the literature. In the task-oriented approach, movement emerges as an interaction between many systems in the brain and is organized around a goal and constrained by the environment (Shumway Cook & Woollacott 2001).Task-oriented approach for stroke patients is based on the recognition that the goal of motor control is the control of the movement required to approach a particular task, and this includes the acquisition of motor skills as a consequence of repetitive practice (Shepherd RB).

The purpose of this study was to investigate both task oriented approach and PNF technique was beneficial for functional ambulation of stroke patients, wheather feasible and satisfied by the stroke survivors or not. Had its clinical implication on treating the stroke patients..

AIMS AND OBJECTIVES

Aim of the study is to compare whether task oriented approach is better than proprioceptive neuromuscular facilitation on functional ambulation of stroke patients.

HYPOTHESIS:

Task oriented approach is more effective on functional ambulation as compared to proprioceptive neuromuscular facilitation within stroke population.

NULL HYPOTHESIS:

Task oriented approach has no difference in effect on functional ambulation as compared to PNF within stroke population.

METHODOLOGY

SETTINGS: Department of Occupational Therapy, SV NIRTAR

PARTICIPANTS: A total of 30 stroke patient fulfilling the inclusion criteria were selected for the study purpose. The selection of subjects was done by convenient sampling. The patients have been explained about the purpose of study. Consent of participation in written form has been obtained from the patient prior to study.

INCLUSION CRIETERIA

- Population-All stroke survivors: Male and female both.
- Types of event-Ischemic or hemorrhagic.
- No more than one stroke episode.
- Can walk at least one minute without support.
- No incidence of any other significant neurological disorder.
- Ability to communicate verbally.

EXCLUSION CRITERIA

- Seizure disorder.
- Primary hearing impairment
- Severe visual impairment
- An orthopedic condition affecting their natural gait.
- Any other significant neurological or orthopedic disorders of gait including amputation.

WITHDRAWL CRITERIA:

- Any subsequent episode of stroke.
- Any other medical condition that would prevent regular participation in the study

OUTCOME MEASURES

FUNCTIONAL GAIT ASSESSMENT SCALE

The FGA is a 10-item clinical gait test during which participants are asked to perform the following gait activities: walk at a normal speed at fast and slow speeds, with vertical and horizontal head turns, with eyes closed, over obstacles, in tandem, backward, and while ascending and descending stairs. The FGA is scored on a 4-level (0 – 3) ordinal scale; scores range from 0-30, with lower scores indicating greater impairment.

STUDY DESIGN:

Single centre randomized control trial.

SAMPLING:

Convenient sampling with random assignment.

PROCEDURE:

All participants who fulfill the inclusion criteria enrolled into the study after getting prior informed consent. Participant randomly assigned to two groups. Following this a baseline assessment of Functional gait assessment scale was done at the beginning of the study. All participants continued to receive conventional occupational therapy throughout the entire duration of study. Participants received an additional specific intervention (one group task oriented approach and the second group PNF approach).

PROTOCOLS:

PNF: Lower extremity:

- Flexion-abduction-external rotation (knee flexed and knee extended)
- Extension-adduction-internal rotation (knee flexed and knee extended)
- Flexion-adduction-internal rotation (knee flexed and knee extended)
- Extension-abduction-external rotation (knee flexed and knee extended).
- Upper extremity:
- Flexion-abduction-external rotation (elbow flexed and elbow extended)
- Extension-adduction-internal rotation (elbow flexed and elbow extended)
- Flexion-adduction-internal rotation (elbow flexed and elbow extended)
- Extension-abduction-external rotation (elbow flexed and elbow extended)

TASK ORIENTED APPROACH

- Reaching towards objects across table while standing with symmetrical weight distribution over both legs.
- Walking over the balance beam.
- Forward walking
- Backward walking.
- Sideway walking.
- Obstacle Crossing
- Bending and picking up objects from the floor.
- Walking in real life situation like uneven surfaces and narrow spaces.
- Stair climbing.
- Walking in a ramp.

Each protocol given 45minutes per session 5 days a week for two months.



Figure 1 Patient performing functional gait assessment



Figure 2 Patient performing TOA (walking over a balance beam)



Figure 3 Performing PNF diagonal pattern (lower extremity flexion-abduction-external rotation , knee flexed)

DATA ANALYSIS

The test measurements were compared before and after therapy. Statistical calculation were performed with SPSS version 23. Statistical test were carried with level of significance set at $p < 0.05$

The raw score of pre intervention and post intervention of outcome measure (Functional Gait Assessment) were taken. As this was 2-tailed, non-parametric study, the changes in outcome measure within 2 experimental groups were analyzed using Wilcoxon Sign Rank Test. Mann-Whitney U Test was performed for knowing the difference in improvement between two groups.

RESULTS

The Master chart showing The detail individual score of outcome measure for both the experimental groups is shown in the appendix. The analysis of data gives the following tables the Descriptive Characteristics and test results.

Table-1

Sl No.	Baseline characteristics	Group A (Experimental)	Group B (Experimental)
1	No. of Subjects	15	15
2	Age Range(years)	29-59	28-61
3	Mean Age	42.8	44
4	Gender(M/F)	8/7	9/6

This table shows mean age of all participants in the study. Mean age of all subjects in Experimental group A is 42.8 and mean age of 15 subjects in experimental group B is 44 with minimum age of 29 yrs and maximum age 59 yrs in experimental group A and minimum age of 28yrs and maximum age 61 yrs in experimental group B.

Table-2: Showing results of WILCOXON SIGN RANKED TEST FOR FGA within the experimental group of TOA.

Ranks

		N	Mean Rank	Sum of Ranks
FGApost - FGApre	Negative Ranks	0 ^a	.00	.00
	Positive Ranks	15 ^b	8.00	120.00
	Ties	0 ^c		
	Total	15		

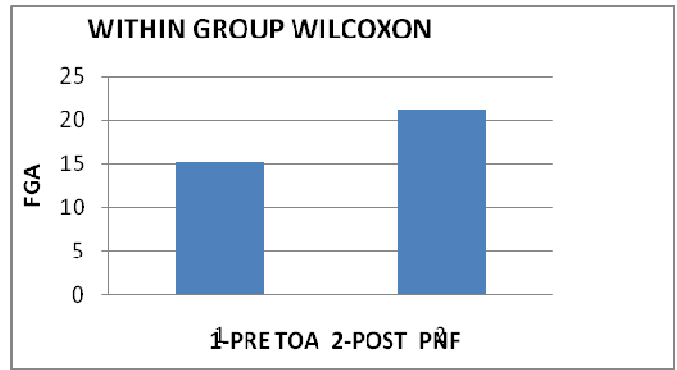
- a. FGApost < FGApre
- b. FGApost > FGApre
- c. FGApost = FGApre

Test Statistics

	FGApost - FGApre
Z	-3.422 ^b
Asymp. Sig. (2-tailed)	.001

- a. Wilcoxon Signed Ranks Test
- b. Based on negative ranks.

This table shows a significant improvement in experimental group A within the group with a p value of 0.001



Graph 1 Showing significant improvement in experimental group A within the group

Table-3: Showing results of WILCOXON SIGN RANKED TEST FOR FGA within the experimental group of PNF.

Ranks

		N	Mean Rank	Sum of Ranks
FGApo - FGApre	Negative Ranks	0 ^a	.00	.00
	Positive Ranks	15 ^b	8.00	120.00
	Ties	0 ^c		
	Total	15		

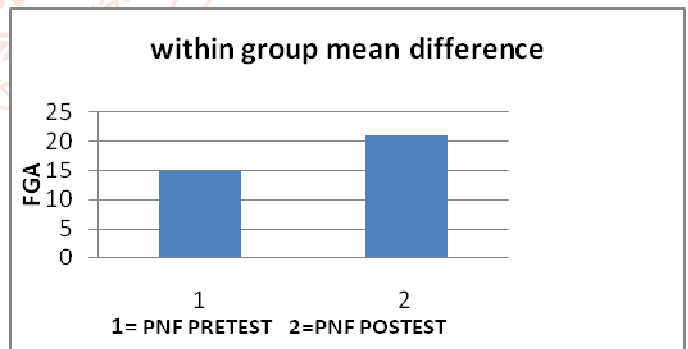
- a. FGApo < FGApre
- b. FGApo > FGApre
- c. FGApo = FGApre

Test Statistics^a

	FGApo - FGApre
Z	-3.417 ^b
Asymp. Sig. (2-tailed)	.001

- a. Wilcoxon Signed Ranks Test
- b. Based on negative ranks.

This table shows a significant improvement in experimental group B within the group with a p value 0.001



Graph 2 Significant improvement in experimental group B within the group

Table -4: MAN WHITNEY TEST FOR IMPROVEMENT SCORE OF TWO experimental groups

Ranks

	Group	N	Mean Rank	Sum of Ranks
Improvemet	Task Oriented Approach	15	15.53	233.00
	PNF	15	15.47	232.00
	Total	30		

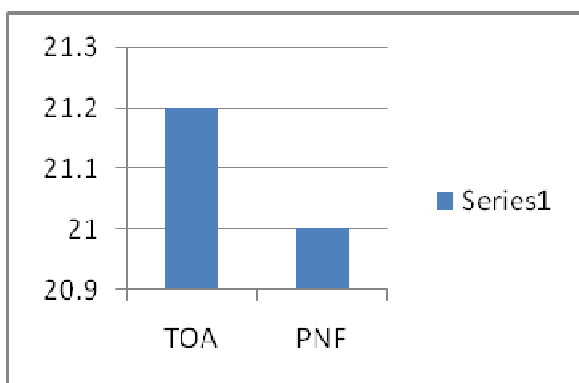
Test Statistics^a

	Improvement
Mann-Whitney U	112.000
Wilcoxon W	232.000
Z	-.021
Asymp. Sig. (2-tailed)	.983
Exact Sig. [2*(1-tailed Sig.)]	1.000 ^b

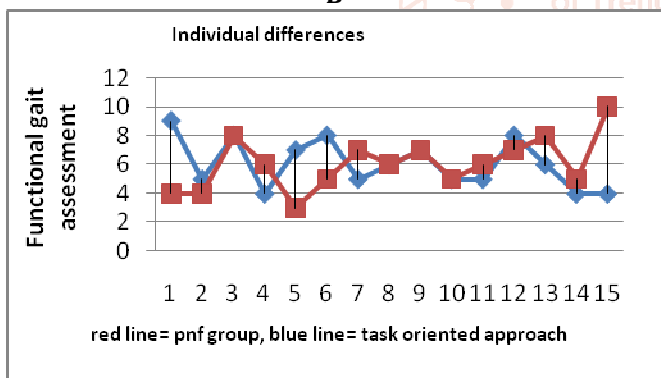
- a. Grouping Variable: group
- b. Not corrected for ties.

This table shows there is no significant difference between post score data of both experimental group with a p value 1.000.

Graph Showing difference between the improvement score in post test score of experimental groups A and B



Graph 3 Showing difference between the improvement score in post test score of experimental groups A and B



Graph 4 Line graph showing difference between individual improvement score in post test score of experimental groups A and B

DISCUSSION

This chapter discusses the finding of the study of comparison of task oriented approach versus proprioceptive neuromuscular facilitation on functional ambulation of stroke patients. TOA and PNF are two well established interventions for stroke. These two interventions exhibit a good amount of occupational performance. Therefore, the aim of the study was to determine whether task oriented approach is better than proprioceptive neuromuscular facilitation on functional ambulation of stroke patients or not.

Our experimental hypothesis is there is a significant difference between TOA group in comparison to PNF group on functional ambulation of stroke patient. Overall result of the study shows that there was no significant difference between the two groups in FGA score at the end of 2 two

months and there was significant improvement within the two experimental group. By the help of this study we infer that TOA and PNF are efficacious methods of improving functional ambulation in strokes patients.

Lee and Van Douklear, 1995, said that there is a certain period of time, in which plastic changes of the brain after stroke can be influenced by therapeutic intervention. According to Laura and Jeanne the efficacy of standard physical therapy (based on the task-oriented approach) has a significant results in balance retraining with poststroke patients.

A systemic review on task oriented training studied by **Marijke Rensink, Marieke Schuurmans** shows that Active use of task-oriented training with stroke survivors will lead to improvements in functional outcomes and overall health related quality of life.

Yea-Ru Yang ,Ray-Yau Wang studied the effectiveness of Task-oriented progressive resistance strength on cronic stroke patients and found improvement in muscle strength and functional performance. According to this evidence and our study results suggest that Task oriented approach can be used as a treatment protocol for improving functional ambulation on stroke patients.

Trueblood et al. were unable to show gait speed improvement after one session of treatment consisting of four sets of five repetitions of resisted PNF pelvic motions in 20 patients but stance stability and limb advancement of the involved lower extremity improved. Our finding is in line with that of Wang who demonstrated improvements in gait speed and cadence with twelve sessions of PNF pelvic facilitation in patients with hemiplegia of short duration and long duration. He however concluded that the cumulative effect of PNF was more beneficial than the immediate effects. Participants in this study had about 45 minutes of PNF treatment, each component repeated two times five times per weeks for 2 months; a duration that is long enough to produce the cumulative effects suggested by Wang.

In another study Kawahira et al.²⁵ were able to show that a rehabilitation programme comprising mainly the PNF technique led to improvement in voluntary movement of the hemiplegic lower limb. Increased walking speed has also been linked to an improvement in the stage of synergistic patterned movement in the paretic leg and improvement in maximal ankle power.

Remediate process are different input from PNF and TOA, where results are expected to differ. But our study result shows that there is no significance difference in FGA scale between two groups. This data suggests that TOA and PNF approaches are equally efficacious in treating functional ambulation in stroke patients.

CONCLUSION

This study shows the improvement in walking speed observed as reduced task completion time in FGA scores. These improvements in walking naturally lead to an improvement in the individual’s ability to negotiate real-world overground environments (steps, obstacle and uneven surfaces) and to walk independently and confidently.

The PNF protocol used in this study led to improvements in FGA scores and consequently overall functional ambulation. Inclusion of PNF in any treatment plan for post-stroke individuals may be of benefit, especially when improved functional ambulation is a key part of treatment goals. At the moment there was no evidence found through this experiment favorable to a specific approach. Both the approaches should be used with therapists' own experiential view but a larger study ultimately will bring about conclusive evidence.

REFERENCES

- [1] Anne shumway and Marjorie H. Woollacott: Motor Control Theory and practical application.
- [2] Am J Occup Ther: Use of the Occupational Therapy Task-Oriented Approach to optimize the motor performance of a client with cognitive limitations.
- [3] Birgitta Langhammer Johan K Stanghelle Bobath or Motor Relearning Programme? A follow-up one and four years post stroke.
- [4] Beverley French, PhD1, Lois Thomas, PhD: Does Repetitive Task Training Improve Functional Activity After Stroke? A Cochrane Systemic Review and Meta-Analysis.
- [5] Blennerhassett J. & Dite W. (2004) Additional task-related practice improves mobility and upper limb function early after stroke: a randomised controlled trial. The Australian Journal of Physiotherapy.
- [6] Cheng P.T., Wu S.H., Liaw M.Y., Wong A.M. & Tang F.T. (2001) Symmetrical body-weight distribution training in stroke patients and its effect on fall prevention. Archives of Physical Medicine and Rehabilitation.
- [7] CO AKOSILE, BOA Effects of Proprioceptive Neuromuscular Facilitation Technique on the Functional Ambulation of Stroke Survivors.
- [8] David DL, Brown DA, Pierson-Carey, CD, Buckley EL and Lew HL. Stepping over obstacles to improve walking in individuals with poststroke hemiplegia. *J Rehab Res Dev* 2004; 41(3A): 283-292.
- [9] Darsi A. Umphred: Neurological Rehabilitation, 6th edition.
- [10] Diane M Wrisley, Gregory F Marchetti, Diane K Kuharsky, and Susan L Whitney: Reliability, Internal Consistency, and Validity of Data Obtained With the Functional Gait Assessment.
- [11] Glen Gillen, Ann Burkhardt : Stroke rehabilitation-A function based approach.
- [12] HN Harsha Kumar, Babusha Kalra, and Nayna Goyal : A Study on Stroke and its Outcome in Young adults (15-45 Years) from coastal South India.
- [13] Johanna Jonsdottir, Davide Cattaneo : Task-Oriented Biofeedback to Improve Gait in Individuals With Chronic Stroke: Motor Learning Approach, NEUROREHABILITATION AND NEURAL REPAIR · JUNE 2010.
- [14] Jorgenson HS, Nakayama H, Raaschau HO and Olsen TS. Recovery of walking function in stroke patients: the Copenhagen Stroke Study. *Arch Phy Med Rehab* 1995; 76: 27-32.
- [15] Kumar, S., Kumar, A. & Kaur : Effect of PNF Technique on Gait Parameters and Functional Mobility in Hemiparetic Patients.
- [16] Kawahira K, Shimodozono M, Ogata A and Tanaka N. Addition of intensive repetition of facilitation exercise to multidisciplinary rehabilitation promotes motor functional recovery of the hemiplegic lower limb. *J Rehab Med* 2004. 36(4): 159-164.
- [17] Kwakkel G and Wagenaar RC. Effect of duration of upper- and lower- extremity rehabilitation on sessions and walking speed on recovery of interlimb coordination in hemiplegic gait. *Phys Ther* 2002; 82: 432-448.