Effect of task specific training with proprioceptive neuromuscular facilitation on stroke survivors

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ABSTRACT

Introduction and Aim: Stroke is a neurological injury, which occurs due to interruption of blood supply to the brain, it is the 3rd most common cause of death in India. Stroke results in multiple disabilities in human and the most common disabilities are in the hand and leg. Rehabilitation and exercises are playing a major role in stroke recovery. Though there are various exercises pertaining to the management of stroke, one of the common exercises usually prescribed is task specific training, PNF is also one of the common techniques, which is used in stroke management. This study aims to identify the effect of task specific training and PNF on various functions in stroke survivors.

Materials and Methods: True experimental study with 50 MCA stroke survivors is included in the study after due consideration of the selection criteria, they all randomly divided into two groups. First group of participants were named as TST group (Task specific training) who received therapy for 10 weeks, second group of participants named as PNG group (Proprioceptive neuromuscular facilitation), who received therapy for 10 weeks. Written consent was obtained from each of the participants. Outcomes selected in the study were Modified Ashworth scale, Action reach arm scale, Berg balance scale, and Dynamic gait index. All the components were assessed before and after the study. All the analyses were done using SPSS 20.0.

Results: The results of this study show that modified Ashworth scale was 6.16, action reach arm test was 10.2, Berg balance scale was 18.9 and dynamic gait index was 10.3 at the level of p value 0.0001.

Conclusion: This study concluded that task specific training group shows better improvement than the PNF group in chronic stroke survivors.

Keywords: Task specific training; proprioceptive neuromuscular facilitation training; modified Ashworth scale; Berg balance scale; action reach arm test; dynamic gait index and stroke.

INTRODUCTION

Stroke has become one of the global health problems. It is one of the leading causes of death and disability in India (1), along with a huge number of mortality and disability (2). Studies show that the estimated prevalence of stroke range from 84-262/ 100,000 in rural and 334-424/100,000 in urban areas in India. The incidence rate is 119-145/100,000 based on the recent population studies (3).

Stroke is caused due to deficiency of blood supply to the brain which lowers the supply of oxygen and nutrients to the tissues that leads to damage to the brain. Majority of the stroke survivors continue to live with disabilities. The common symptoms were sudden weakness or numbness of the face, arm and leg on the one side of the body which makes difficulty in upper limb activities, walking, balance disturbances and coordination. Hemiplegia reduces the ability to actively perform functional movements in upper as well as lower limb and difficulty to do activities of daily living (4).

Stroke imposes direct and indirect expenses to the patient, which causes a lot of economic stress to the patient as well as family members. The cost of ongoing rehabilitation and long-term care are largely undertaken by families (5). It was estimated about 8.7 billion USD loss in India due to Coronary artery disease, Stroke and Diabetes (6). Early mobilization and early intervention for these patients are mandatory.

Stroke management is done by multidisciplinary team compromising on medical, nursing, physiotherapy, occupational therapy, speech therapy and social worker. This team plays a major role on rehabilitation on stroke (7). However, widely applicable rehabilitation strategies are crucial. Developing a crucial strategy is a major challenge for the current system of medicine (8).

Exercises and physical activities have shown an evidence on improvement in stroke rehabilitation. The interface between the condition and the physical activity is challenging (9). Rehabilitation of the

stroke survivors is quite challenging. There are many therapeutic approaches currently available in the rehabilitation. Most common approaches are Roods approach, sensory motor approach, Brunnstroms movement therapy, Bobath technique, neurodevelopmental therapy and PNF. PNF is the commonly used technique in the rehabilitation of the stroke survivors (10).

Proprioceptive Neuromuscular facilitation (PNF) works on neurophysiological substrate. It enhances the proper neuromuscular stimulation through the use of neurophysiological ways, which results in controlling of stimulation of sensory-motor conductions and proprioceptive stimuli (11).

Task specific training (TST) improves general motor performances and has long evidences provided, based on small clinical studies and case studies. Task specific training is one of the new therapeutic approaches which focusses on function that evolved out on the movement science and motor learning. The basic premise is goal directed practice of functional tasks instead of focusing on impairment reduction exercises. Task specific training involves assessment and training given with multiple tasks related to activities of daily living (12). Task specific training is effective which depends on the amount of practice necessarily given to improve motor performances, it enhances the daily activities whereby improves the performances in stroke survivors (11).

Although various evidences show that both therapies are equally effective, there was no much detailed study on comparing the therapies. PNF techniques provide a treatment solution to the mobility problems, whereas the TST shows significant improvement in the functional recovery in the stroke patients (13). There is paucity of literatures comparing the TST techniques and the PNF in the stroke patient on various variables. This is the first kind of study which compares the two techniques on multiple variables in chronic stroke survivors.

METHODOLOGY

The study was approved by institutional ethical committee and was conducted in multiple neurological centers in and around Erode. Participants in the study were selected based on selection criteria which includes, Age group of 45-69 years, both genders, MCA stroke with hemiplegia on dominant side at least 6 months, Brunnstrom recovery stage of 4, Grade 2 on Modified Ashworth Scale, Participants without any perceptual or cognitive deficits, no other associated problems, no fixed deformities in the limbs and medically stable. Willing participants were selected by a separate evaluator and those who fulfill the criteria were selected for the study. 74 participants were selected, and they were all randomly allocated into each group. This study is a true experimental study and the samples were selected based on systematic sampling method. Computer assisted lottery method is used to divide the participants into the groups equally. First group includes 37 participants, who underwent TST for a duration of 10weeks. This group is called as TST Group and the other group 37 participants underwent PNF therapy for a duration of 10 weeks and it is called as PNF Group. Treatment duration for each group consists of 60 minutes of exercises. Prior to the study a detailed explanation was given to all the participants and written consent was obtained from each of the participants. The initial values were evaluated by the separate assessor and the outcomes selected were Modified Ashworth scale, Action reach arm scale, Berg balance scale, and Dynamic gait index. All the components were assessed before and after the study. After 4 weeks there was decline in the participants noted in both the groups. There were about 30 participants in each group. After 8 weeks of treatment the withdrawal of patients is further noted and it reduced to 25 in each group. So, this study finally analyzed and completed with 25 participants in each group. All the analyses were done using SPSS 20.0.

RESULTS

Data collected were homogenous in distribution, while comparing the data for the pre interventions there was no statistical significance. Table 1 shows the demographic data. The mean age group of the participants in this study is 56.44 ±7.05. There are 25 male participants and 25 female participants with mean age of 57.8 and 55.1 respectively.

Table 1: Demographic data of participants

	TST	PNF	p value
Age	55.88 ± 6.831	57 ±7.37	P=0.77
Gender	Male (13): 56.42 ± 7.0	Male (12): 59.17 ± 5.44	P=0.75
	Female (12): 55.25 ± 6.89	Female (13): 55 ± 8.5	P=0.77

The table 2 shows the interventions and their impacts on the various outcome variables between the groups and within the groups. The interventions applied over the participants show significant improvement in the various outcome parameters. Both groups produced difference in the values on comparing their pre vs post data. On the contrary, when the groups are compared, they show differences. The group underwent Task specific training produces slightly higher improvement than the PNF group.

Table 2: Interventions and their impacts on the various outcome variables between the groups and within the groups

Outcome	N	Group I TST (Mean / SD)		Group II PNF (Mean / SD)		p value	Unpaired 't' value
		Pre	Post	Pre	Post		
Modified Ashworth Scale	25	2.16 ±0.47	0.52 ±0.51	2.20±0.47	1.40±0.50	0.0001	6.16
Action reach arm test	25	17.88±1.30	37.32±3.42	17.68±1.07	28.04±3.71	0.0001	10.2
Berg Balance Scale	25	35.84±2.37	51.4±2.66	35.72±1.95	40.28±1.24	0.0001	18.9
Dynamic Gait Index	25	10.72±2.58	23.48±1.81	10.64±1.08	18.24±1.81	0.0001	10.3

DISCUSSION

The purpose of the study is to identify the effect of task specific training versus proprioceptive neuromuscular facilitation therapy in chronic stroke survivors. Stroke is one of the major causes of disability in adults and elders. The ability to be a fit physically and mentally is the most challenging in stroke survivors (14). Stroke survivors live with affected motor function, mobility, cognitive functions which lead to restriction in the basic living activities (15).

There are numerous rehabilitation approaches shown beneficial in the promotion of recovery of stroke, long term improvement is still questionable. Although multiple studies conducted by various researchers on comparing various modalities on stroke and they identified that PNF is one of the best modalities in stroke rehabilitation (15). Approaches like Brunnstrom, PNF, Motor relearning and functional training can be used as a standard protocol for the stroke rehabilitation (16).

Task oriented approach is to improve motor control in the brain, it focuses on the relearning of daily activities. It works based on theories of kinesiology which emphasizes the motor control model (17). Task specific training helps to learn motor control and the pattern of movement for each specific activity and not only learning the non-task specific movements (18).

Active participation and self-reliance help to improve the motor learning pattern of the movement in a given context and task. Successful performance of functional activities requires interaction between person's abilities and environmental demands (19). Multiple studies also showed that task specific training produces a greater benefit in the improvement of functional tasks, gait as well as upper limb functions (20).

The PNF approach to treatment uses the principle that control of motion proceeds from proximal to distal body regions. Facilitation of trunk control, therefore, is used to influence the extremities. PNF uses the body's proprioceptive impulses and facilitates or inhibits the muscle contractions and produce a greater motor response (21, 22). PNF would facilitate motor control by application of stretch with the use of particular movement patterns and resistance patterns to reduce irradiations (23). PNF treatment has become an integral part of the exercise prescriptions. It should be incorporated in any functional training in stroke survivors (11, 24, 25).

Statistical analysis made for this study shows that there was a significant difference on the variables between the groups. Furthermore, the differences were profoundly found in the task specific training group than the proprioceptive neuromuscular facilitation group.

CONCLUSION

This study concludes that there is a significant difference in the modified Ashworth scale, Berg balance scale, Action reach arm test and Dynamic gait index among the groups. When compared within the groups, both show significant changes. While comparing between the groups, the TST Group shows more significant difference in the improvement than the PNF Group. So, this study concludes that TST is much more effective in chronic stroke survivors than PNF therapy.

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CONFLICT OF INTEREST

Authors declare no conflict of interest.

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