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# LONG TERM FOLLOW UP OF TASK SPECIFIC FUNCTIONAL TRAINING IN REHABILITATION OF STROKE PATIENTS - SOUTH INDIAN STUDY

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**ABSTRACT** **Background & Objective :** To study if home-based task-specific motor training with functional goal-directed activity is better than standard physiotherapy in improving motor function following stroke.

**Methods:** Prospective randomized single blind trial in 68 acute stroke patients with motor deficits one week after stroke were randomised to :1) Control group received standard physiotherapy care, and home advice given at discharge. 2) Experimental group received task specific functional achievable goals. Physiotherapists supervised therapy at home. NIHSS score assessed severity of impairment. Barthel Index (BI) at first contact, and at 12 months were scored for both groups.

**Results:** There were 68 patients (mean age 62.22 ± 2 yrs.) Moderately affected stroke patients (NIHSS score-5-15) were 88.2%. The Barthel Index score was significantly better (p=0.0001) in the experimental group at one year post-stroke.

**Conclusions:** The experimental group who received task-specific functional goals improved significantly better than the control group who had limited physiotherapy input .

**KEYWORDS :** Stroke ,Impairment, Task specific training, ADL.

## BACKGROUND

Stroke is one of the most important causes of motor impairment that can result in significant disability. Functional and compensatory rehabilitation training strategies results in improved motor recovery and functional independence. There are multiple physiotherapeutic approaches based on neurophysiological, motor learning and orthopaedic principles, but there is no evidence to show if one method is superior to another (Pollock, 2003)[13]. There is evidence that a mixed physiotherapy approach is superior to no treatment or placebo intervention for functional independence after stroke [13]

Intensity of therapy input alone does not account for differences between traditional treatment approaches and task-specific rehabilitation. Many of the technology assisted novel therapies in stroke rehabilitation are not cost effective in an Indian set up. Scientific evidence demonstrating the values of specific rehabilitation interventions after stroke is limited.

Repetitive functional task practice (French et al 2008 ) [10] task oriented training (Marijke Rensink et al )38,and task oriented therapy (Bayona et al 2005)[39] all help in motor functional recovery in stroke. Task specific training (Isobel J Hubbard et al, 2009)[40] is defined as therapy or training where patients practice context-specific motor tasks some form of feedback (Teasell et al 2008) [41].

Motor task specific training and functional goal directed activity in an enriched environment are promoters of neuroplasticity. These techniques could help improve motor functioning. In this study, we intend to study if these promoters of neuroplasticity can minimise impairment and improve functional recovery in stroke.

## OBJECTIVE

To observe and study a group of acute stroke patients who received standard physiotherapy care as per the hospital protocol, along with a home program and advice given at the time of discharge, as compared with an experimental group who received task specific functional training physiotherapy protocol with follow-up care in the community.

### Design

Prospective randomized single blind trial .

### Method

Acute stroke patients with ischemic infarction (n=160) were screened in an acute care medical college hospital in South India in a span of 1-2 years. Only those patients one week after stroke who were conscious and able to follow verbal commands were selected for the study. Exclusion criteria were 1) lacunar stroke 2) progressive neurological conditions 3) electrolyte imbalance 4) unstable cardiac conditions 5) ketosis 6) palliative care 7) hepatic failure, and those with 8) past medical history of limb fracture or severe arthritis.

A written informed consent was obtained from the subjects selected for the study. Institutional ethics committee approval was obtained.

A baseline initial assessment at first contact was performed and the subjects were randomized to two groups: control and experimental.

Control group received standard physiotherapy care, which was 1) passive range of movements, 2) mobility in bed, 3) high sitting, 4) retraining balance in sitting and standing gait training around the bed and veranda. Steps 3 and 4 were performed only if medically stable in the acute phase as per hospital protocol. Home advice was with only oral instructions. Frequency of physiotherapy input was 15 minutes per day for 6 days/week.

For the experimental group, after an initial assessment, task specific functional achievable goals were set depending on motor deficits. Interventions were hands-on 1) passive range of motion exercises to the affected limbs, 2) advice on positioning and handling of the stroke patients appropriately (advice and instruction to carers) 3) strength training of the affected group of muscles- active assisted – resisted , 4) functional re-education of affected muscles using repetitive task specific activity for upper limb and lower limbs 5) balance training in sitting/standing – static and dynamic, 6) postural awareness training and gait re-education - parallel bars with mirror for visual feedback, and 8) falls prevention.

Steps 3 to 8 were performed as and when the patients' medical status improved.

### Mobility

was progressed from gait re-education on level ground with or without support of mobility aids to mobility on uneven ground (outdoors).

Frequency of therapy input was twice per day for 30 minutes each session. Physiotherapists supervised therapy in their home environment after discharge and followed up to 1-year post stroke.

The outcomes were measured utilizing National Institute of Health Stroke Scale (NIHSS) and Barthel Index (BI) at first contact, 1 month, 3 months, 6 months and 12 months follow-up for both groups. NIHSS scoring was used for assessing impairment and severity of stroke. NIHSS score of 1-4 was defined as mild stroke, score of 5-15 was

defined as moderate stroke, score of 16-20 was defined as moderate-severe stroke, and a score of 21-42 was defined as severe stroke. The Barthel index score was scored to analyse the effects of task specific motor activity and functional activities. As the setting was a home setting, no special equipment was used for therapy. Adaptive devices like splints or mobility aids were used.

## RESULTS

Sixty-eight stroke patients completed the study. There were 44 males (64.7%) and 24 females (35.3%). Of the selected stroke patients, left-sided strokes were seen in 32 patients (47%), and right-sided strokes were in 36 patients (53%). Majority of patients had stroke for the first time (97%), while 3% had recurrent stroke. Mild stroke (NIHSS 1-4) was seen in 6 patients (8.8%), moderate stroke (NIHSS 5-14) in 60 (88.2%) patients, moderate severe (NIHSS 16-20) in 1 (1.5%) and severe (NIHSS 21-42) in 1 (1.5%). Table 1 gives the patient demographics.

Descriptive statistics of Barthel index showed an association between control and experimental group at 1month , 3month, 6 month and at 1 year. A significant value p=.0001 (P<0.05 ) at 95% confidence interval was observed in the Barthel Index outcome measure at one year post-stroke .( (Table 2,3.)

The experimental group showed an increased improvement in functional assessment score at one month ,3 month, 6 month and at 1 year than the control group. Maximum functional improvement occurred between 0-3 months.(Table 4)

**Table 1: Patient demographics**

| Sex | | Side of stroke | | NIHSS | | | |
|---|---|---|---|---|---|---|---|
| Male | Female | Right | Left | Mild (1-4) | Moderate (5-14) | Moderately-severe (15-20) | Severe (21-42) |
| 44 (64.7%) | 24 (35.3%) | 36 (53%) | 32 (47%) | 6 (8.8%) | 60 (88.2%) | 1 (1.5%) | 1 (1.5%) |

**Table 2 .**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Age | 68 | 30 | 88 | 62.22 | 14.109 |
| BarthelIndex1 | 68 | 0 | 70 | 18.60 | 17.785 |
| BarthelIndex1month | 68 | 0 | 90 | 30.29 | 19.507 |
| BarthelIndex3months | 68 | 0 | 95 | 47.28 | 21.274 |
| BarthelIndex6months | 68 | 0 | 100 | 57.50 | 21.931 |
| BarthelIndex1year | 68 | .0 | 100.0 | 65.147 | 23.6418 |
| Valid N (listwise) | 68 | | | | |

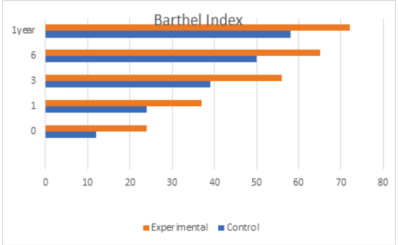
**Descriptive statistics showed an association for Barthel index score between two groups at 1month, 3 month , 6 months and at the end of one year.**

**Pairwise comparison: Table -3.**

Measure: MEASURE_1

| (I) groups | (J) groups | Mean Difference (I-J) | Std. Error | Sig.[b] | 95% Confidence Interval for Difference[b] | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| CONTROL | EXPERIMENTAL | -14.471* | 4.625 | .004 | -23.880 | -5.061 |
| EXPERIMENTAL | CONTROL | 14.471* | 4.625 | .004 | 5.061 | 23.880 |

A significant value p=.0001 (P<0.05 ) at 95% confidence interval was observed in the Barthel Index outcome measure at one year post-stroke. Table 4.




## DISCUSSION

We have described a cohort of patients with acute middle cerebral ischemic stroke who either underwent standard physiotherapy or goal-directed, task specific physiotherapy who were followed up to one year after stroke. We measured stroke severity at onset, and functional outcomes during follow-up at predetermined intervals. Measuring stroke severity objectively is important to quantify the effects of physiotherapeutic interventions. Heinemann et al [34] found that the NIHSS scale measured stroke severity effectively. We chose NIHSS scoring scale to assess the severity of stroke. Over 88% of our stroke patients were moderately impaired in our study. The impairment score reduced in both groups equally for the first 3 months and thereafter the experimental group showed a significant reduction in the impairment score .We postulate that this beneficial effect could have been because of the continuous supervision by skilled therapists which motivated the stroke patients to actively participate in the rehabilitation.

Kaste et al (1973) [24] studied the prognosis of stroke patients with middle cerebral artery occlusion, and found that 72% of stroke survivors regained independence with their activities of daily living and the young were able to return to work. Our study showed that the elderly stroke patients also showed significant improvement in their activities of daily living and that recovery depended on the severity of impairment, motivation and active participation in the rehabilitation program.

Although motor recovery following stroke is fastest during early weeks and tend to plateau after eight to twelve weeks (Nair and Taly, 2002) [4], significant recovery can occur up to six months and exceptionally up to two years or more after stroke . In our study, we found that there is evidence for continued improvement in functional status as measured by Barthel Index even at 12 months post-stroke.

Earlier studies with task-specific, low-intensity regimens designed to improve use and function of affected limb have reported significant improvements (Smith et al. 1999; Whit all et al. 2000; Winstein and Rose 2001)[42] Systematic review of treatment interventions for the paretic upper limb suggest that participants benefit from exercise programmes in which functional tasks are directly trained (Van Peeppen 2004)[30]

Salter et al (2006)[43] in their retrospective study of 435 stroke cases who started rehabilitation 30 days post stroke showed significant increase in functional independence measure (FIM) scores at follow-up. In the Copenhagen Stroke study (1995)[44] , 95% of functional recovery in stroke patients were complete by the 13th week and varied with the initial severity of stroke. The highest ADL score was achieved at around 2 months . The duration of recovery varied with the severity of stroke. Only 30 -60% of stroke survivors regain independence in ADL. Cochrane reviews (2016)[23] of systematic studies on repetitive task training for functional ability after stroke results showed significant improvement in patients , the experimental group showed a significant improvement in global motor functioning than in the control group.

In our study, stroke patients in both control and the experimental group showed improvement in motor function and thereby in their activities of daily living (ADL) scores, but the experimental group showed significant improvement in Barthel index score at 1 month, 3 months, 6 months and at one year. Maximum improvement in function was observed between 1-3 months.

Repeated measures of ANOVA variance had a positive outcome for task specific functional training therapy in our study. The experimental group showed significant improvement in the Barthel index score at 1 year.

A meta-analysis study has shown that more intensive therapy may at least improve the rate of ADL recovery (Kwakkel 2004)[25], particularly if a direct functional approach is adopted (Kwakkel 1999; Van der Lee 2001) [30] Recent review of the evidence for physical therapy post stroke showed a strong evidence for high intensity practice (additional 17hrs over 10 weeks) with a high number of repetitions within a single-treatment session and a functional goal (Verbeek 2014) [31]. In our study protocol, therapy input timing for the experimental group was only for half an hour twice per day . No special equipment was used. Perhaps the results could have shown more significant improvement in motor function , thereby minimising the impairment and enhancing participation of the patient in the activities of daily living , if other technology assisted physical therapy devices (where the repetition can be increased ) such as functional electrical stimulation (FES) ,robotic

technology, wireless technology, visual reality, and non-invasive brain stimulation were used.

One limitation of the study is the small sample size of only 68 subjects, which may not be enough to represent the large population. Hence if study was repeated with larger numbers, it may give us a different perspective. The stroke patients studied presented with middle cerebral artery infarcts only. The results may differ for different types of stroke and recovery may depend on the frequency and duration of therapy input they received . The motivation factor plays an important role too. These are some of the implications for further research.

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