original article

Effect of Repetitive Task Training to Improve Sit to Stand Performance and Activities of Daily Living Skills in Patients with Stroke

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Abstract

Introduction: Stroke is an acute neurological dysfunction and the second leading single cause of death, with 5·8 million fatal cases per year, 40% of which are in people younger than 70 years, with problems in voluntary movement, sensation, language, emotional and intellectual functioning. Task oriented approach practice of Repetitive Task Training (RTT) is a treatment in which you repeat a series of specific movements over and over again, exercises are categorized as either blocked practice or random practice.

Aims and Objectives: To find out the effects of repetitive task training to improve sit to stand performance and Activities of Daily Living (ADL) skills in stroke patients. To evaluate sit to stand performance and ADL performance and to train Repetitive task training activities.

Materials and Methods: The raw scores of pre intervention and post intervention of Modified Ashworth Scale (MAS) and Functional Independence Measure (FIM) were added and summed up into final scores. Within experimental and control groups were analyzed using Wilcoxon Sign Ranks Test. Mann–Whitney U Test was performed for knowing the significance between the groups.

Conclusion: The results of this study suggest that sit to stand activities which is based on activity intervention is strongly grounded in repetitive task training is a promising intervention for improving sit stand activity performance of ADL in stroke patients.

Key Words: *Stroke, Repetitive Task Training, Sit to Stand Performance.*

Introduction

Stroke is an "acute neurological dysfunction of vascular origin with symptoms and signs corresponding to the involvement of focal areas of brain".[1]

Stroke is the second leading single cause of death, with 5·8 million fatal cases per year, 40% of which are in people younger than 70 years. About 15 million new acute stroke events arise every year, and about 55 million people have had a stroke at some time in the past, either with or without residual disability; the prevalence of stroke in India varies in different regions of the country and, ranges from 40 to 270 per 100000 populations. Approximately 12% of all strokes occur in the population <40 years of age.[1]

Major risk factors identified in India are hypertension (blood pressure >95 mm Hg diastolic), hyperglycemia, tobacco use, and low hemoglobin levels (<10 gm %). The National Commission on Macroeconomics and Health has projected that cases of stroke would increase from 1,081,480 in 2000 to 1,667,372 in 2015 (stroke surveillance of India 2005).[1]

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There may be disturbances of voluntary movement, sensation, language, emotional and intellectual functioning. A stroke often leaves a person with problems in using their arms and legs.

Task oriented approach is assumed that normal movements emerges as an interaction among many systems, each contributing its own aspects of control. In addition, movement organized around a behavioral goal and is constrained by the environment.[2]

Task oriented approach intervention assume that, patients learn by actively attempting to solve problem, in a functional task rather than repetitively practicing normal pattern of movement.[3]

Task-oriented approach among the physical interventions 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.[4]

Repetitive Task Training (RTT) is a treatment of repeating a series of specific movements over and over again. Repetitive practice of the action to be learned can therefore have dual benefits; enable the patient to practice the action as well as increasing muscle strength (Rutherford 1988).[5]

One way of increasing intensity is to include task repetition. Repetitive task training (RTT) therefore combines elements of both relevance to functional activity, and intensity of practice.[6]

Trials of repetitive activity were required to involve complex multi-joint movement with measurement of functional activity as an outcome. Trials were included only if the amount of practice could be quantified, either in terms of duration or number of repetitions (Beverley French 2010).[7]

Repetitive Task Training exercises are categorized as either blocked practice or random practice.

Blocked Practice is practicing one task for a block of trail then moving to on the next task you may presume that it would be easier to learn each task in a block design (Anne cook). The same movement is repeated over and over - for example, always using the same movement pattern to reach for a glass of water.[8]

Random Practice appears to be most effective when used with skills that use different patterns of coordination and thus for different underlying motor problems (Magill & Hall). In addition, characteristics of the individual, such as level of experience and intellectual abilities, may also influence the effectiveness of random practice (Rose, 1997). Any movement necessary to achieve a goal for example, using any movement that have to try to reach for a glass of water.[8]

The research studies conflict as to whether Repetitive Task Training of the legs and trunk can improve walking and trunk stability following a stroke. Repetitive activity alone is not enough to produce increased motor cortical representations (Nudo et al. 2003). Instead, an element of skilled motor learning is required in addition to repetition for cortical reorganization / plasticity to occur.[9]

There is growing evidence that the cortex adjacent to the stroke-damaged region is important to recovery but only if stimulated and trained in the lost function (Hallet et al. 2001). Directed, task-specific therapy appears important to maximize recovery of lost function.[10]

The Proponents of task-specific training site that intense training is not always necessary for positive outcomes in stroke patients, but instead suggest that therapy designed to be more task-specific within normal contact time (30 to 45 minutes per session) could be more efficacious (Page 2003).[11]

Hoses et al. (2003) notes that, "Task-specific therapy can enable hemiplegic patients to practice walking repetitively, in contrast to conventional treatment in which tone-inhibiting maneuvers and gait-preparatory tasks during sitting and standing dominate".[12]

Clinically, repetition plays a major role in inducing and maintaining changes within the cortex. However, repetition of a task in the absence of new, meaningful skill learning is unlikely to induce cortical changes of significance. Less intense task-specific training regimens, of 30 to 45 minutes in length, with the more affected limb can produce cortical reorganization and associated meaningful functional improvements. This correlates well with clinical experience and the maximal "use it or lose it".[13]

Sit to stand (STS) is one of the most mechanically demanding of everyday tasks and crucial to independence (Colleen G canning et al 2003).[14]

Standing up is one of the most mechanically demanding daily activities, requiring greater range of the motion at the knee and higher moments of the force at hip and knee then gait or stair climbing.[15]

STS can be practiced repetitively from lower seat heights, and at increasing speed. If done repetitively with sufficient load, such training provides a means of strengthening the lower limb muscles and increasing endurance, as well as control over the dynamics (Carr & Shepherd 1987).[13]

Rationale of the study:

The task-related training has not traditionally been a significant part of therapy after stroke, which has been dominated by the Bobath approach. This specifically minimizes repetitive active movement, and relies on therapist-guided restoration of "normal movement" patterns, rather than the purposeful, but possibly unnatural, movement that could occur as a result of a more pragmatic approach within RTT, which has the potential to be a resource efficient component of stroke rehabilitation.

Aims and Objectives:

Aims:

To find out the effects of repetitive task training to improve sit to stand performance and ADL skills in stroke patients.

Objectives:

To evaluate sit to stand performance and ADL performance.

Hypothesis:

Null hypothesis:

- There is no significant change in sit to stand ability
- There is no significant improvement in ADL performance

Alternative hypothesis:

- There is significant change in sit to stand ability
- There is significant improvement in ADL performance

Data Analysis

The raw scores of pre and post intervention of all the outcome measures (MAS and FIM) were added and summed up into final scores.

As this was 2- tailed, non-parametric study, the changes in outcome measures (MAS and FIM) within experimental and control groups were analyzed using Wilcoxon Sign Ranks Test.

Mann–Whitney U Test performed for knowing the significance between groups.

Results

Table – 1: Descriptive characteristics

S. No.	Baselines Characteristics	Group A (Control)	Group B (Experimental)
1.	No of subjects	15	15
2.	Age range (years)	34-65	34-65
3.	Mean age (±Std Dev.)	55.8 (±8.351)	55.8 (±8.351)

Table 2: Descriptive statistics of STS outcome measures

Outcome Measure	Mean test score (Group A) Control (N=15)		Mean test score (Group B) Experiment (N=15)	
	Pre test	Post test	Pre test	Post test
MAS	4.13	8.38	4.25	10.13
FIM	83.20	95.73	85.33	102.93

Table 3: Results of Wilcoxon Sign Rank Test for MAS STS within the groups.

Groups	z (2 tailed)	P (2 -tailed)
Experimental	-3.573	.001
Control	-3.342	.001

Graph 1: Bar Graph showing Mean score changes in STS of both groups

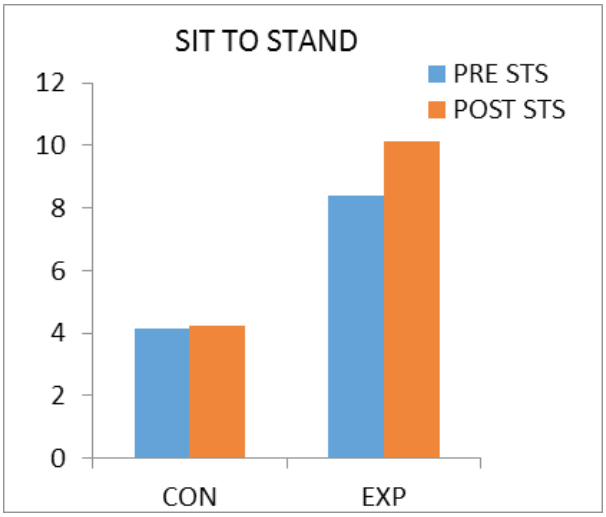

Table – 4: Mann-Whitney U Test result for STS between the groups

Outcome Measure	Z (2 tailed)	P (2 tailed)
SIT TO STAND	-2.513	.019

Table –5: Showing results of Wilcoxon Sign Rank Test for ADL within the groups

Groups	z (2 tailed)	P (2 -tailed)
Experimental	-3.414	.001
Control	-3.423	.001

Graph 2: Bar graph showing mean score changes in ADL of both groups

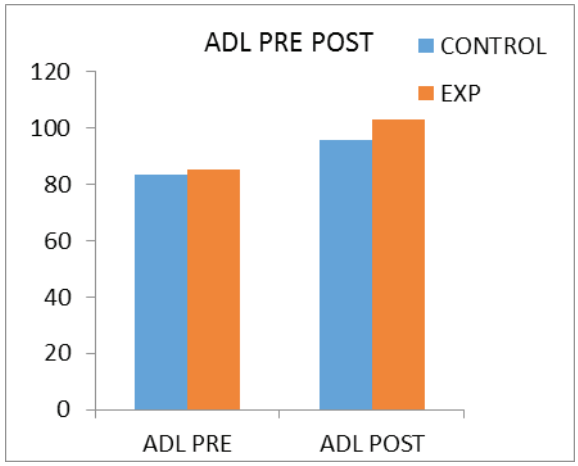

Table – 6: Mann-Whitney U test result for ADL between the groups

Outcome measure	z (2 tailed)	p (2 -tailed)
ADL	-4.456	.000

Discussion

The purpose of the study was determining effect of repetitive task training on sit to stand performance and ADL in stroke patients.

The results within group Wilcoxon test shows improvement in the sit to stand performance on MAS scale for both the group, but there is more significant difference in experimental group in comparison with control group.

As shown in the table 2, 3, 4 shows the repetitive task training on sit to stand performance enhancing the sit to stand performance between evidence

There is also significant improvement in ADL within the group as shown in table 5,6. There is significantly more improvement in ADL performance in experimental group in comparison to control group.

The present study provides evidence that repetitive task training program can be beneficial in improving sit to stand performance and activity daily living when it is incorporated into conventional occupational therapy treatment approach without having any detrimental change in daily routines.

However, the experimental group, but not the control group, improved significantly on sit to stand & activity of daily living. More intensive therapy may improve ADL (Kwakkel 2004).[16,17]

The exercise effect transferred into improved walking speed which was not itself specifically trained. There is evidence in the motor learning literature that transfer of training can occur in able – bodied subjects across actions which share similar dynamics (Magil RA 1998).[18]

Sit to stand and step-ups are both weight bearing actions which involve the production of lower limb extensor forces across three lower limb joints with the feet flexed. Stance phase of walking also involves the lower limb kinetic chain and increased strength in extensor muscles has been linked to increase in speed of walking (SharpSA1997).[19]

Conclusion

The results of this study suggest that effect of sit to stand activities which is based on activity intervention is strongly grounded in repetitive task training is a promising intervention for improving sit stand performance and ADL in stroke.

These activities intervention also tolerable and convenient for most of the stroke patients and is also safe and practical.

This study concludes that repetitive task training program can be included along with conventional occupational therapy treatment approach to improve sit to stand performance and activity daily living.

Limitations:

- Sample size was small.
- There was no control over the extraneous factors such as natural recovery.
- Follow-up could not be done on the subjects in both the groups.
- The study duration was also short.

Recommendation for further studies:

- Further study with a large sample with long duration.
- Further study can be done with upper extremity function of motor assessment scale.
- Repetitive task training activities can be comparison with other methods.

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Declaration of patient consent:

The authors certify that we have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal the identity, but anonymity cannot be guaranteed.

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References

1. Division of Non-communicable Diseases Indian Council of Medical Research Workshop Report on Stroke Surveillance in India November 2006 New Delhi, INDIA
2. Smith GV, Silver KH, Goldberg AP, Macko RF. "Task oriented" exercise improves hamstring strength and Spastic reflexes in chronic stroke patients. Stroke. 1999; 30(10):2112–2118.
3. Elissa sitcoff, camille costa, nicol korner – bitensky Repetitive task specific training– family /patient information.Reference: http://www.strokengine.ca/
4. Salbach NM, Mayo NE, Wood-Dauphinee S, Hanley JA, Richards CL, Cote R. A task-orientated intervention enhances walking distance and speed in the first-year post stroke: a randomized controlled trial. Clinical Rehabilitation 2004; 18:509-519.
5. Butefisch C, Hummelsheim H, Denzler P, Mauritz

KH. Repetitive training of isolated movements improves the outcome of motor rehabilitation of the centrally paretic hand. J Neurol Sci. 1995; 130(1):59–68.

6. Winstein CJ, Rose DK, Tan SM, et al. A randomized controlled comparison of upper-extremity rehabilitation strategies in acute stroke: a pilot study of immediate and long-term outcomes. Arch Phys Med Rehabil. 2004; 85:620-628. 2003; 82:730-732.
7. Beverley French (2010) does reptitive task training improve functional activity after stroke? a cochrane systematic review and meta-analysis. Journal rehabilitation medicine 2010; 42;9-15.
8. Judi Edmans, Fiona Coupar and Adam Gordon Occupational Therapy and Stroke Second Edition.
9. Richards CL, Malouin F, Wood-Dauphinee S, Williams JI, Bouchard JP, Brunet D. Task-specific physical Therapy for optimization of gait recovery in acute stroke patients. Arch Phys Med Rehabil.1993; 74(6):612–620.
10. Liepert J, Graef S, Uhde I, Leidner O, Weiller C. Training-induced changes of motor cortex representations in stroke patients. Acta Neurol Scand. 2000; 101:321-326.
11. Page SJ. Intensity versus task-specificity after stroke: How important is intensity? Am J Phys Med Rehabil.2003; 82(9):730–732.
12. The role of task-specific training in rehabilitation therapies. Nestor A. Bayona, Jamie Bitensky, Katherine Salter, and Robert Teasell. Stroke Rehabilitation 2005; 12(3):58–65.
13. Carr JH, Shepherd RB. A Motor Relearning Program for Stroke, 2nd ed. Rockville, MD: Aspen Publishers; 1987.
14. Colleen G canning, Roberta B Sheppard, Janet H Carr, Jennifer A Alison. A randomized controlled trial of the effects of intensive sit-to-stand training after recent traumatic brain injury on sit-to stands performance. Clinical rehabilitation 2003; 17:355-362.
15. Monger, Carr JH, fowler V. Evaluation of a home – based exercise and training programme to improve sit to stand in patients with chronic stroke. Clinical rehabilitation 2002; 16:361-367.
16. Elizabeth Britton, Nigel Harris, Bath and Ailie Turton. An exploratory randomized controlled trail of assisted practice for improving sit-to-stand in stroke patients in the hospital setting Clinical rehabilitation 2008; 22:458-468.
17. Kenji Kosaka (1995) Effectiveness of Training of ADL walking in stroke ward, department of rehabilitation. saitama medical center, saitama medical school: journal of physical therapy science 7: 45-48, 1995.
18. Galea MP, Miller KJ, Kilbreath SL. Early task-related training enhances upper limb function following stroke [abstract]. Poster presented at the annual meeting of the Society for Neural Control of Movement; 2001; Sevilla, Spain.
19. Duncan PW, Badke MB. Stroke Rehabilitation, the Recovery of Motor Function. Chicago: Year Book; 1987.