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Restoring Mobility at Home: Impact of Task-Oriented Training on Functional Performance After Stroke

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ABSTRACT

Background: Impaired balance, reduced lower limb control, and difficulty in performing transitional movements such as sit-to-stand and stepping frequently limit functional mobility in individuals with chronic stroke, increasing their risk of falls during daily activities. Task-oriented training emphasizes repetitive practice of functional tasks and has been shown to improve mobility and motor performance. However, regular attendance at clinic-based rehabilitation programs is not always feasible for many stroke survivors, highlighting the need for effective home-based rehabilitation strategies.

Objective: To evaluate the effect of Home-based Task-oriented training on Functional mobility in chronic stroke survivors.

Methods: A Prospective follow up study was conducted among chronic stroke survivors. Functional mobility was assessed using the Timed Up and Go Test before and after a four-week Home-based Task-oriented training program. Participants performed functional exercises including sit-to-stand and step-up activities for 30 minutes per session, five days per week for four weeks. Exercise intensity was maintained at a rating of perceived exertion of 4 (somewhat hard).

Results: Participants demonstrated improvement in functional mobility ($p \leq 0.05$) following the intervention as indicated by reduced Timed Up and Go test duration.

Conclusion: The findings suggest that a Structured Home-based Task-oriented training program can improve functional mobility in individuals with chronic stroke. Incorporating simple functional exercises such as sit-to-stand and step-up activities in a home environment may provide a practical and accessible rehabilitation approach to enhance mobility and support independence in daily activities among stroke survivors.

Keywords: Chronic Stroke, Functional Performance, Home Based Rehabilitation, Mobility, Task Oriented Training, Time Up and Go Test

INTRODUCTION

Stroke is a neurological condition caused by interruption of cerebral blood flow due to ischemic or hemorrhagic events, resulting in neuronal injury and loss of neurological function.[1]

Motor impairments following stroke commonly include muscle weakness, impaired coordination, abnormal muscle tone, and deficits in postural control, which significantly affect an individual's

functional performance.[2] These impairments particularly limit functional mobility activities such as standing, walking, and transitional movements including sit-to-stand and stepping tasks, thereby restricting independence in activities of daily living.[3]

Deficits in balance and gait performance following stroke also increase the risk of falls and contribute to reduced participation in community activities among stroke survivors.[4] Therefore, improving functional mobility has become one of the primary goals of stroke rehabilitation as it directly influences independence and quality of life.[2]

Recent advances in neurorehabilitation emphasize repetitive, task-specific practice of functional activities to promote motor relearning and neuroplasticity.[5]

Task-oriented training (TOT) is a rehabilitation approach that focuses on practicing meaningful functional tasks such as standing, stepping, and walking in order to improve motor performance and functional mobility.[6] Evidence from systematic reviews suggests that task-oriented training can significantly improve gait performance, balance, and functional mobility in individuals with stroke.[7]

Despite the benefits of clinic-based rehabilitation programs, many stroke survivors face barriers such as transportation difficulties, financial constraints, and limited accessibility to rehabilitation services.[8] Home-based rehabilitation programs have therefore gained increasing attention as an alternative strategy to provide continuous rehabilitation and improve adherence to therapeutic exercises.[9]

Developing structured home-based task-oriented training programs may provide a feasible and accessible approach to enhance functional mobility while allowing stroke survivors to practice functional tasks within their daily living environment.[7]

Therefore, the present study aims to evaluate the effect of home-based task-oriented training on functional mobility in individuals with chronic stroke.

METHODOLOGY & MATERIALS:

Study Design: A prospective follow-up study using purposive sampling was conducted to evaluate the effect of home-based task-oriented training on functional mobility in individuals with chronic stroke.

Ethical Approval: Ethic's approval was obtained for study by Institutional Review Board with proposal number – PTC/IEC/45/2020-21.

Participants: n=15 individuals with chronic stroke were recruited from various Neuro-Rehabilitation Department, Ahmedabad and other Private clinics, and Communities of Ahemdabad. Inclusion criteria included a confirmed diagnosis of stroke with age between 40-65 years, Duration of Stroke ≥ 6 months, Mini-Mental State Examination score ≥ 24, Berg Balance Scale with Low fall risk and who is able to do household walking independently or with assistive device. Patients with Unstable Medical condition, History of >1 fall in past 1 month, patients with other neurological conditions, Auditory or Visual perceptual deficit, Patient with fixed contracture of any lower limb muscle were excluded.

Materials: The materials used in the study included a Chair, Cones, Stepper, Stopwatch, Recording sheets, Pen, and Pencil. Functional mobility was assessed using the Time Up and Go Test.

Procedure: After obtaining ethical approval, individuals with chronic stroke attending the Neuro-Rehabilitation outpatient department were screened according to the inclusion and exclusion criteria. The purpose and procedures of the study were explained to the participants, and written informed consent was obtained prior to participation.

Baseline assessment of functional mobility was performed using the Timed Up and Go Test (ICC=0.99)[10], which measures the time required for a participant to stand up from a chair, walk three meters, turn around, walk back to the chair, and sit down.[11]

Participants then underwent Home-based Task-oriented training for 30 minutes per session, five days per week for four weeks (total 20 sessions). Before initiating the intervention, the therapist demonstrated the exercises and familiarized both the participant and caregiver with the training protocol. Exercise intensity was maintained at a Rating of Perceived Exertion (RPE) level of 4, corresponding to "somewhat hard".

Exercise Protocol

Sit-to-Stand : Each patient in the study was asked to stand from a sitting position as many times as possible with clasp hands, during 1 minute. (Affected foot remains behind the Unaffected foot)

Afterwards there was rest for 1 minute.

Forward Step Up: The therapist was asked the patient to perform the step-up exercise in forward direction for each leg during 1 minute. (both legs one after the other, beginning with the affected leg)

Afterwards there was rest for 1 minute.

Side Step Up: The therapist was asked the patient to perform the step-up exercise in sideward direction for each leg during 1 minute. (both legs one after the other, beginning with the affected leg).

Afterwards there was rest for 1 minute.

Three sessions of 1 minute each for every exercise.

Fifteen minutes of exercise followed by fifteen minutes of rest. This simple set of exercises had been chosen based on the knowledge that using fewer exercises, will improve compliance for people participating in motor training programmes. The data of the subjects with 80% compliance to the protocol was considered for statistical analysis.

Statistical Analysis: Statistical analysis was performed using SPSS version 20 and Microsoft Excel 2007**.** Descriptive statistics were calculated for all variables. Pre- and post-intervention scores of the Timed Up and Go Test were compared to determine the effectiveness of the intervention. A significance level of $p < 0.05$ was considered statistically significant.

RESULTS

The distribution of data was evaluated using Shapiro-Wilk test. Since the data was not normally distributed for all outcome measures, non-parametric test (Wilcoxon Signed Ranked test) was was applied for analysis.

Level of significance was kept at 5% with confidence interval (CI) at 95%.

TABLE 1: DEMOGRAPHIC DETAILS

	Variables	**Mean ± SD**
1)	Mean Age (Years)	55 ± 9
2)	Post Stroke Duration (Months)	31 ± 34
3)	Gender (Male/Female)	14/1
4)	Side of Stroke (Left/Right)	9/6
5)	Type of Stroke (Ischemic/Hemorrhagic)	11/4

TABLE 2: MEDIAN AND INTERQUARTILE RANGE FOR TUG

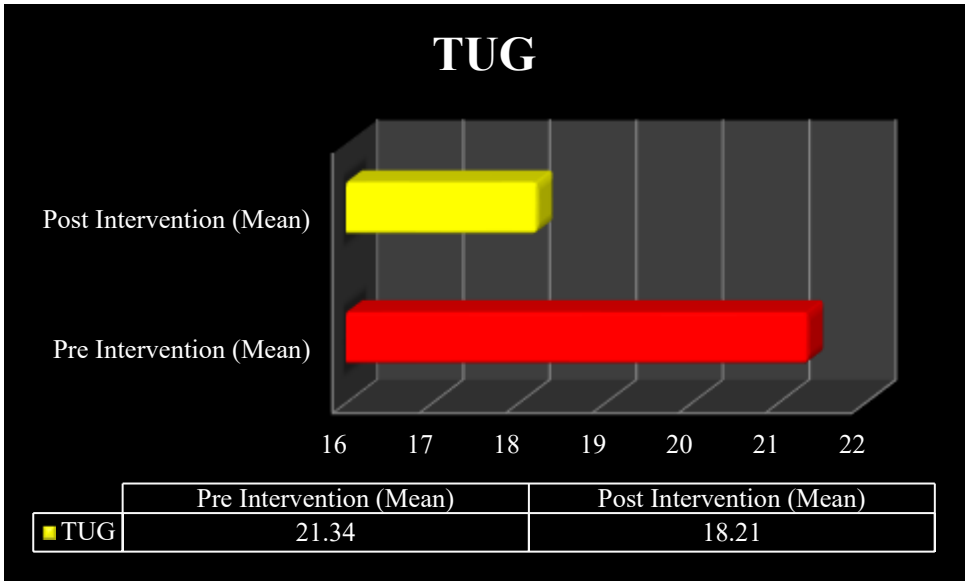
Variables	Pre Intervention		Post Intervention	
	Median	Inter quartile Range	Median	Inter quartile Range
TUG	19	14.06 – 22.77	16.67	10.73 – 19.83

- Median values and Interquartile Range are calculated as Data of all outcome Measures are not normally distributed.

TABLE 3: PRE AND POST COMPARISON OF BALANCE (TUG)

Variables	Pre-Intervention Mean ± SD	Post-Intervention Mean ± SD	Z Value	p Value Interpretation	Effect Size Interpretation
TUG (sec)	21.34 ± 10.31	18.21 ± 9.18	**3.296**	**p=0.001 SIGNIFICANT**	**0.3 Small Effect Size**

GRAPH 1: PRE AND POST COMPARISON OF TUG SCORE



- Pre and Post comparison of TUG was done using Wilcoxon Signed Rank Test that shows significant difference with Z value of 3.296 (p=0.001) with small Effect size.

DISCUSSION

The mean age was 55 Years and mean post stroke duration was 31 months. 15 subjects with Chronic hemiparesis were studied for the effect of Home Based Task Oriented Training, which was given for 30 minutes / day, 5 times a week for 4 weeks. Subjects were evaluated for Functional Performance in terms of Mobility using TUG.

In the present study, a statistically significant improvement was observed in functional mobility as measured by the Timed Up and Go Test following four weeks of Home-based Task-oriented training in

individuals with chronic stroke. The mean TUG score improved from 21.34 ± 10.31 seconds at baseline to 18.21 ± 9.18 seconds post-intervention (p = 0.001) (Table 3, Graph 1). This improvement indicates enhanced functional mobility and transitional movement ability, particularly during activities such as sit-to-stand, turning, and walking.

The improvement observed in the present study can be attributed to the principles of task-oriented training**,** which emphasize repetitive practice of functional tasks in a context-specific manner. During repeated performance of functional activities such as sit-to-stand and step-up tasks, participants implicitly learned to coordinate multiple motor components including postural control, anticipatory weight shifting, and limb loading. Through repeated exposure to these tasks, the central nervous system likely reorganized motor strategies to improve movement efficiency and balance control. These adaptations may occur through experience-dependent neuro-plasticity**,** allowing stroke survivors to develop compensatory or restorative motor patterns that enhance functional mobility.

Biomechanically, the exercises used in the intervention required bilateral weight bearing with progressive loading of the affected limb**,** which likely improved symmetry of weight distribution and postural alignment. Sit-to-stand activities challenge the anterior–posterior displacement of the center of gravity (COG) and require coordinated activation of the hip and knee extensors, while step-up activities demand mediolateral stability and dynamic balance control**.** Repeated practice of these movements may enhance anticipatory postural adjustments, lower limb muscle activation, and proprioceptive feedback**,** thereby improving the ability to perform functional transitions such as standing and turning, which are critical components of the TUG task.

The findings of the present study are consistent with earlier research. **Jeon SN et al. (2015)**[12] reported significant improvement in TUG scores from **15.62 ± 4.89 to 9.93 ± 3.93 seconds** following task-oriented balance training in stroke survivors. Similarly, **Wright RL et al. (2017)** [13] demonstrated improvement in TUG performance from **20.0 [16.0, 39.9] seconds to 16.3 [13.3, 35.1] seconds** after functional task practice. **Traxler K (2024)**[14] reported that specific task-oriented training significantly improved balance and functional mobility in individuals with stroke, with notable improvements observed in mobility assessments including the Timed Up and Go Test.

Although the present study demonstrated statistically significant improvement, the effect size was relatively small. Because participants were in the chronic stage of stroke**,** where spontaneous neurological recovery is limited and functional improvements typically occur at a slower rate. Also Baseline variability in mobility levels among participants (as reflected by the relatively large standard deviation in TUG scores) could have influenced the magnitude of the observed effect.

Despite the modest effect size, the statistically significant improvement in TUG performance suggests that home-based task-oriented training may be an effective and feasible strategy for improving functional mobility in individuals with chronic stroke**.**

CONCLUSION

The present study demonstrated that a four-week home-based task-oriented training program resulted in a statistically significant improvement in functional mobility among individuals with chronic stroke, as evidenced by improved performance in the Timed Up and Go Test. The intervention, which incorporated repetitive functional tasks such as sit-to-stand and step-up exercises, facilitated improvements in dynamic balance, transitional movements, and mobility performance. These findings suggest that structured task-oriented exercises performed in a home environment may promote functional recovery

and enhance mobility in chronic stroke survivors. Therefore, home-based task-oriented training may serve as a feasible and effective rehabilitation strategy, particularly for individuals who face barriers in accessing regular clinic-based rehabilitation services.

CLINICAL IMPLICATION

The findings of the present study have several important clinical implications for stroke rehabilitation. Home-based task-oriented training provides a practical and accessible rehabilitation approach that can be implemented outside clinical settings. This is particularly beneficial for chronic stroke survivors who may have limited access to frequent physiotherapy sessions due to transportation barriers, financial constraints, or geographical limitations. Incorporating functional activities such as sit-to-stand and step-up exercises into home programs may help improve dynamic balance, mobility, and independence in activities of daily living. Furthermore, caregiver involvement and structured exercise diaries may enhance adherence and continuity of rehabilitation. Thus, physiotherapists may consider prescribing simple, functional, task-oriented exercises as part of home rehabilitation programs to support long-term functional recovery after stroke.

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