

Original Article

An 8 Week Feasibility Study of Tele Based Supervision for Task Oriented Exercises on Upper Limb Motor Performance and Functional Ability Among Patients with Stroke

Neha Thakur, Subhasish Chatterjee.

Abstract

Background

Telerehabilitation, which makes rehabilitation more accessible for patients in remote areas and with transportation challenges, has been implemented extensively for stroke recovery. With the advancement of communication technologies, telerehabilitation is becoming a more feasible option. It is still unknown, nevertheless, how successful this delivery strategy is in the rehabilitation of stroke patients.

Materials and Methods

In this prospective, single-group, therapeutic feasibility trial, 12 patients were recruited on the basis of selection criteria. After getting signed informed consent from patients physical assessment was taken at baseline and familiarization was given to patients. Patients have received tele-based supervision for task-oriented exercises for 30 minutes on 3 days a week for 8 weeks through live sessions. Before switching tasks, there was a 30-second break. Outcome measures, FMA UE and MESUPES were taken at baseline, 4th weeks, and 8th weeks of intervention, respectively. Descriptive statistics were computed for demographic information and outcome measures at baseline. To assess the normality of the data, the Shapiro-Wilk test was employed. As the data was found to be normally distributed, Repeated Measure ANOVA and post hoc analysis were done to evaluate the data at baseline, 4th week, and 8th week within the group. The Bonferroni Correction was applied to address multiple comparisons. A p-value of less than 0.05 was considered to indicate statistically significant differences.

Results

Every outcome measure indicated a considerable improvement ($p < 0.05$). Noticeable distinctions were observed in FMA UE and MESUPES ($p < 0.001$) according to within-group analysis.

Conclusions

Tele-based supervision for task-oriented exercises is effective to improve upper limb motor performance and functional ability in stroke patients.

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Introduction

Stroke is a prevalent non-communicable disease (NCD) in India that carries a substantial risk of death and disability [1]. Impairment following a stroke is the loss of function due to motor, cognitive, or sensory problems operating independently or in combination. The most common kind of damage suffered by stroke patients is anomalies in the motor system, which affects over 80% of them. The other patients have chronic impairments in their arms, which are linked to a lower quality of life, limitations on their ability to participate in activities, a reduction in their general well-being, and so on. [2,3]. In response to the COVID-19 pandemic, physicians have been using telemedicine a practice in which

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Keywords

Stroke, Tele-rehabilitation, task-oriented
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patients get medical information electronically from one location to another more frequently. The World Confederation for Physical Therapy released a position statement on the use of telerehabilitation, in response to this new medical practice environment. Larger scale delivery of rehabilitation interactions might be possible with telerehabilitation[4].

Telerehabilitation has been made possible by the significant advancement of technology in the previous ten years, which allows for remote rehabilitation assessment and intervention. The technologies that can be used to give telerehabilitation range from inexpensive internet-based solutions, virtual reality, and robotic systems to more expensive telephones and mobile phones, which are present in most homes. [5]Craig et al. showed that telemedicine may be used to manage neurological examinations with the same level of reliability as in-person assessments.

Telerehabilitation could be just as successful for ADLs, in dependence, motor function, and overall pleasure and quality of life as standard care. This encouraging discovery might also apply to the viewpoint of the patient as shown by patient satisfaction. Despite these encouraging results, methodological issues and the variability of interventions and results preclude the formulation of a clear conclusion in favor of telerehabilitation [6]. Furthermore, even though these encouraging results were primarily restricted to within-group improvements (and were not consistently maintained for between-group changes), they do point to the possibility that, in contrast to standard care, telerehabilitation could be an alternative model of care. The task-oriented exercise entails the active practice of motor tasks carried out in a well-defined functional context, encompassing intricate whole task or pretask movements involving the entire limb or a portion of it. One of the main characteristics of this training is the large number of repetitions done in one session. The evidence indicates that Task oriented exercise improves motor and functional recovery and causes neuroplastic alterations [7,8].

However, research on numerous chronic health disorders demonstrates that telerehabilitation strategies can be effective in enhancing results. The aim of this study was to find the effectiveness of tele based supervision for task oriented exercises among stroke patients

We hypothesized that there may be significant effect of tele based supervision for task oriented exercises on upper limb motor performance and functional ability among stroke patients.

Material and Methods: A single-group, therapeutic feasibility trial was done. 12 patients recruited on the

basis of selection criteria from the reputed hospital OPD. Data was collected from February 2023 to December 2023.

The study has been approved by the Institutional Research Ethics Committee (IEC-2317). The trial has also been registered under Clinical Trials Registry-India (CTRI/2023/02/050093).

Selection criteria: Male and female patients between the ages of 45 and 75 who had experienced their first stroke within the previous two to six months, moderate to mild motor impairment (FMA-UE scores 26–56), mild to moderate spasticity (MAS scores <2), >24 on the MMSE, stage II and III on the Brunnstrom score, and willingness to participate were all included. [9,10] .Patients with progressive stroke, visual impairments, excessive joint contracture, or other neurological disorders were not accepted.

Outcome measures: The Fugl-Meyer Assessment Scale for Upper Extremity (FMA-UE) and the Motor Evaluation Scale for Upper Extremity in Stroke Patients (MESUPES) have been used to assess upper limb motor recovery and functional abilities. Sensation, balance, and voluntary movement of the upper and lower limbs are the three separate impairment parts of the Fugl-Meyer Assessment, a performance-based evaluation tailored to a particular condition. Passive range of motion and pain are also measured. Strong interclass reliability was indicated by the intraclass correlation coefficients and the total intraclass correlation coefficient of 0.96[9,10].

An ordinal scale is employed in the MESUPES assessment tool. The MESUPES has eight arm tasks with six response categories and nine hand items with three answer categories (scores 0-5). (points 0–2). The maximum score for the MESUPES is 58. The results of the intraclass correlation coefficients (ICC = 0.98 and the standard error of measurement (SEM = 2.68) indicate that the total score of MESUPES (maximum of 58) exhibited both strong relative and absolute dependability. [11]

Intervention: 12 patients recruited on the basis of selection criteria. After getting signed informed consent from patients physical assessment was taken at baseline and familiarization was given to patients. Patients have received Tele based supervision for task-oriented exercises for 30 minutes on 3 days a week for 8 weeks through live sessions. Before switching tasks, there was a 30 second break [12]. Task oriented exercises[13] included sets of task to stimulate shoulder movements (flexion, abduction, extension), stimulate supination, Stimulate wrist extension and radial deviation, stimulate palmar abduction and rotation of thumb (opposition),

train opposition of radial and ulnar sides of hand (cupping of the hand), train control over the manipulation of objects. Each task was repeated for 5 times (supplementary file). Data was collected by means of FMA UE, MESUPES [9,10,14]. Three readings were taken one before the treatment, 2nd after 4th week and 3rd after 8th weeks.

Statistical Analysis: Normality testing was done according to Shapiro-wilk test (Sample size < 50). All the outcome measures were normally distributed as p-value is greater than 0.05. String variables are represented in ratio. Descriptive statistics were computed for demographic information and outcome measures at baseline. As the data was found to be normally distributed Repeated Measure ANOVA and post hoc analysis was done to evaluate the data at baseline, 4th week, and 8th week within the group. The Bonferroni Correction was applied to address multiple comparisons. A p-value of less than 0.05 was considered to indicate statistically significant differences.

Results

Out of the 28 stroke patients who underwent the initial screening, 16 were not included. Ultimately, the analytic sample consisted of 12 people. Table 1 lists the clinical and demographic features of the participants and shows how normal the demographic characteristics are. Given that the p value was more than 0.05, all of the outcome measures had a normal distribution.

None of the study's participants withdrew, and all of them demonstrated excellent compliance with the given tele based supervision for task-oriented exercises. Furthermore, over the course of the research, no falls or negative effects were noticed.

Table 2 presents the comparing mean values of baseline, 4th week and 8th week for outcome measures. Difference between timeline reach significance in all outcomes (all P < 0.05).

Variables	Mean ±SD	Significance level (p value)
Age	55.16±5.57	0.505
Gender (Male: Female)	3:1	-
Height	166.42± 11.56	0.271
Weight	70.30± 9.14	0.848
BMI	25.30± 4.51	0.840
Duration since first ever stroke	4.70± 0.94	0.720
MMSE	28.08± 1.24	0.086
Affected side (Right: Left)	1:2	-
Type of stroke (Ischemic: Hemorrhagic)	3:1	-

Table 1: Normality of the Demographic characteristics of the total recruited participants (n=12)

Outcome measure	Time line	Mean± SD	SEM (95% of CI)	Test value (F) (pvalue*)	Effect size(Partial eta square)	Obser power
FMA- UE	Baseline	35.16±0.937	0.271 (34.5-35.7)	35.286** (0.000)*	0.762	1.00
	4 th Week	35.41±1.08	0.313 (34.7-36.1)			
	8 th week	36.58±0.996	0.288 (35.9-37.2)			
MESUPES	Baseline	34.0±2.62	0.759 (32.33-35.37)	35.543** (0.000)*	0.764	1.00
	4 th Week	34.83±2.28	0.661 (33.37-36.28)			
	8 th week	36.25±2.05	0.592 (34.94-37.55)			

Table 2: Comparing mean values of Baseline, 4th week and 8th week for outcome measures.

The findings showed that the group had a significant impact on all outcome measures ($P < 0.05$). The baseline data from the fourth week was analyzed using post hoc analysis, which was not significant. However 4th weeks-8th weeks and baseline-8th weeks was found significant. On the other hand, baseline-8th weeks were determined to be more important.

Discussion

As a result of the current study's findings, stroke patients' motor function and upper limb function can be enhanced through task-oriented exercise under tele based supervision. The eighth week's FMA-UE and MESPUES scores increased with participation in thirty-minute interactive, task-oriented, tele based supervision sessions.

Better motor performance and more independence are indicated by higher FMA UE and MESPUES scale scores. Additionally, the study's observations of patient safety and compliance raised questions about the viability of interactive, supervised telerehabilitation for stroke victims.

The current exergaming system is easy to use, much like a home-based system that previously reported by Dodakian et al. Following a stroke, increased patient motivation is associated with improved rehabilitation therapy outcomes [15]. Though rates of non-adherence to rehabilitation can reach 70%, it might be difficult to stay motivated during treatment, particularly when it comes to unsupervised typical home rehabilitation activities. The current participants enjoyed therapy and had a high level of dedication to treatment goals [16].

Therapeutic training in rehabilitation is to assist patients in attempting to use the affected side and perform motor skills freely. Various physical intervention techniques are employed to achieve this goal. Among such, task-oriented training has been shown in multiple recent studies involving stroke patients to be beneficial in enhancing the functional motor abilities needed to execute ADLs [17]. While there is evidence supporting the beneficial effects of various physiotherapy techniques, primarily task-oriented exercises, recent research indicates that priming stimuli may help promote functional improvements in motor and cognitive (memory, attention, and concentration) function by preparing the brain for a more plastic response. It is important to emphasize the significance of a more thorough understanding of functional gains in the context of neurorehabilitation [18].

Conclusion

The authors describe Tele based supervision for task oriented exercises, which are cost effective and can be used effectively for the stroke rehabilitation.

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