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Effect of task-oriented therapy on upper limb motor functions in hemiplegic patients

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Abstract

Background: Stroke remains one of the foremost global health problems. It is a principal reason of disability in adults and ranks among the leading causes of death internationally. Upper limb motor function is critically impaired in a large proportion of stroke survivors, leading to substantial limitations in independence in daily activities.

Aims and Objectives: Compare and evaluation of the effectiveness of task-oriented therapy and mirror therapy on upper limb motor function in stroke patients.

Methodology: The 30 hemiplegic patients with upper extremity functional impairment aged between 45 – 65 years were included in study as per inclusion and exclusion criteria and divided into two groups, namely group A and group B. Both groups were treated with conventional physiotherapy along with group A treated with task oriented therapy and group B with mirror therapy for 60 minutes per session, 6 days in a week for 12 weeks. Motor assessment scale – upper limb (MAS - UL) was used as outcome measures. The data was obtained from both the groups at beginning of the study as pre-test and at the end of twelve weeks as post-test. Mean, standard deviation, paired and unpaired “t” test was used for data analysis.

Result: The mean improvement in upper limb motor functions scores of motor assessment scale – upper limb was 10.33 in group A and 6.66 in group B. Thus, it was resulted that group A treated with task oriented therapy statistically significant effect over group B treated with mirror therapy in upper limb motor functions of hemiplegic patients.

Conclusion: It was concluded that task oriented therapy had a superior effect over mirror therapy in upper limb motor functions of hemiplegic patients.

Keywords: Stroke, Hemiplegia, Upper limb, Motor functions, Task-oriented therapy, Mirror therapy, Conventional therapy

Introduction

Stroke is a significant neurological disorder defined by the abrupt appearance of functional impairments caused by an interruption of cerebral blood flow [1]. This interruption can result from vessel blockage or rupture, producing diminished oxygen delivery and subsequent neuronal damage [2]. International health agencies, including the WHO, define stroke, rapidly evolving neurological deficit of circulatory origin that endures for more than a day or leads to death due to cerebrovascular cause [3, 4].

Globally, stroke continues to exert a heavy toll on health, contributing substantially to death rates, long-term disability, and economic burdens [5].

Stroke is divided as ischemic and hemorrhagic, each with distinct pathophysiology and clinical outcomes [6].

Hemiplegia is a frequent sequela of stroke, producing profound weakness or paralysis on body's unilateral part. Upper limb involvement presents particular difficulty because of its anatomical complexity and central role in daily tasks. Activities such as feeding, dressing, grooming and object manipulation demand fine motor control, coordination, and sensory integration, which are often disrupted after stroke [7].

Persons with post-stroke hemiplegia commonly exhibit: Paresis or marked muscle weakness, especially at upper limb. Loss of dexterity, making precise or coordinated motions challenging. Spasticity, which impedes smooth, controlled movement. Sensory impairments, including reduced proprioception and tactile discrimination. Decreased voluntary motor control, notably in distal limb segments. These upper extremity deficits add dependence in

daily activities, reduced social engagement, and diminished overall life quality. Moreover, disuse of the affected limb can cause secondary problems such as shoulder pain, contractures and joint subluxation, further obstructing recovery [8].

Rehabilitation strategies that emphasize repetitive practice, task specificity, and active problem-solving and functional engagement are particularly effective at promoting neuroplastic change.

Task-Oriented Therapy is a neurorehabilitation approach that prioritizes practicing meaningful, goal-driven activities tied to everyday functioning. Instead of isolated joint or muscle movements, Task-Oriented Therapy encourages use of the affected limb within purposeful tasks to foster functional engagement. This strategy supports neuroplasticity by incorporating repetitive practice, active problem-solving, and variability in task execution, which together refine motor skills [9].

Mirror Therapy (MT) is a patient-focused treatment method which uses visual illusion to aid motor recovery [10]. As an inexpensive and non-invasive intervention, Mirror Therapy supplies visual feedback via a mirror placed in front of body's midline. When the person moves the unaffected body part, its reflection creates the sense on the impaired body part is executing similar movement. This illusion activates the neural system and motor areas linked to the affected limb, even when voluntary movement is limited [11]. Thus, this investigation addresses existing gaps in clinical evidence, seeks to optimize rehabilitation practices, and

aims to evaluate effectiveness of task-oriented therapy and mirror therapy on upper limb functions in post-stroke hemiplegic patients.

Methodology

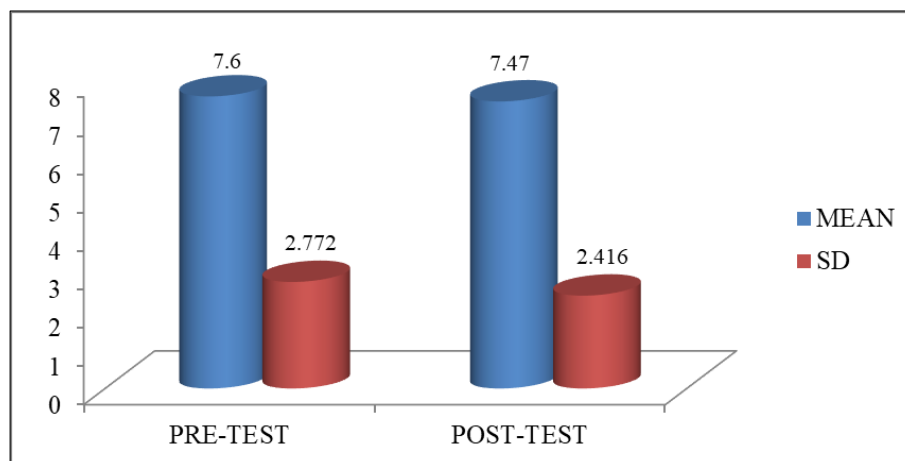
The 30 hemiplegic patients with upper extremity functional impairment aged between 45 – 65 years were included in study as per inclusion and exclusion criteria and divided into two groups, namely group A and group B. Both groups were treated with conventional physiotherapy along with group A treated with task oriented therapy and group B with mirror therapy for 60 minutes per session, 6 days in a week for 12 weeks. Motor assessment scale – upper limb (MAS-UL)¹² was used as outcome measures. The data was obtained from both the groups at beginning of the study as pre-test and at the end of twelve weeks as post-test. Mean, standard deviation, paired and unpaired “t” test was used for data analysis.

Results

1. Between Groups: Pre-Test: Motor Assessment Scale – Upper Limb (MAS-UL)

Table 1: Between-Group Comparison of Pre-Test Motor Assessment Scale–Upper Limb (MAS-UL) Scores

Group	Mean	N	SD	SEM	Mean Diff	SD Diff	T	P
A	7.60	15	2.772	0.72	0.13	0.356	0.1404	0.8893
B	7.47	15	2.416	0.62				



Graph: 1 Comparison of Pre-Test MAS-UL Scores Between Group A and Group B

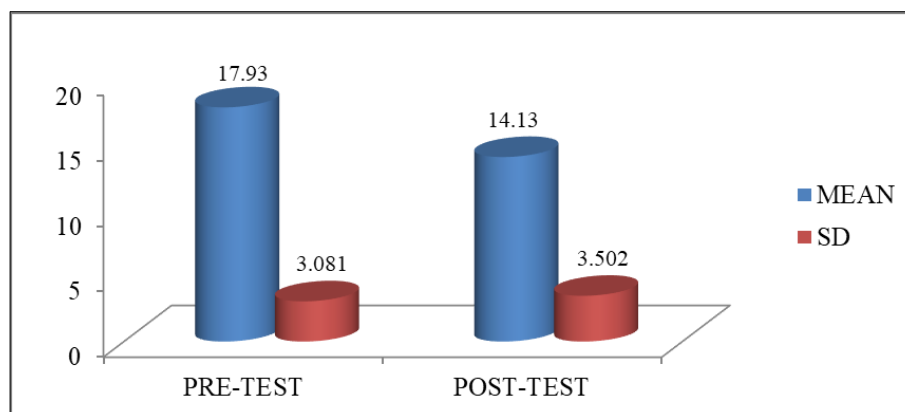
Interpretation

Pre-test MAS-UL means were 7.60 (Group A) and 7.47 (Group B), mean difference 0.13. The ‘t’ value was 0.1404 and P=0.8893, which is non-significant, indicating groups were comparable at baseline.

2. Between Groups: Motor Assessment Scale – Upper Limb (MAS-UL)

Table 2: Between-Group Comparison of Post-Test Motor Assessment Scale–Upper Limb (MAS-UL) Scores

Group	Mean	N	SD	SEM	Mean Diff	SD Diff	T	P
A	17.93	15	3.081	0.79	3.80	0.421	3.155	0.0038
B	14.13	15	3.502	0.90				



Graph: 2 Comparison of Post-Test MAS-UL Scores Between Group A and Group B

Interpretation

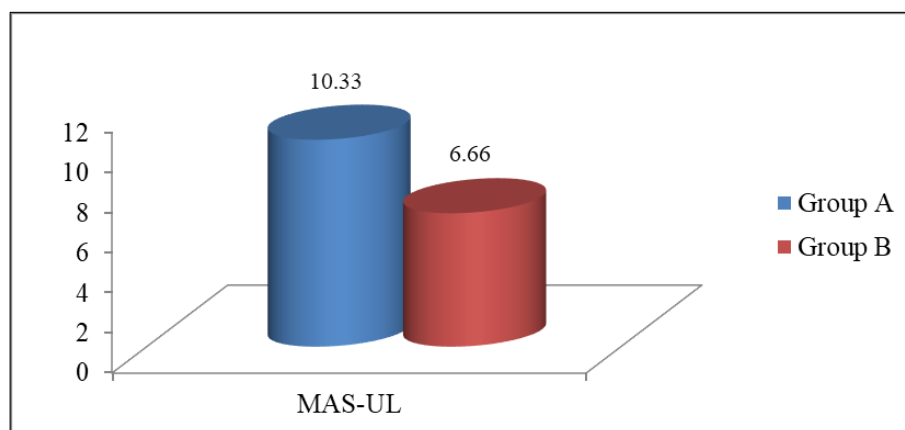
Post-test MAS-UL means were 17.93 (Group A) and 14.13 (Group B), with a mean difference of 3.80, $t=3.155$ and $p=0.0038$ between groups. As $p<0.05$, this is significant, showing both interventions improved upper limb assessment

scores but task-oriented therapy had superior effects compared to mirror therapy.

3. Mean Improvement

Table: 3 Mean Improvement in Upper Limb Motor Function Scores

	Group	N	Mean		Group	N	Mean
FMA-UE	A	15	29.94	MAS-UL	A	15	10.33
	B	15	24.33		B	15	06.66



Graph: 3 Comparison of Mean Improvement in MAS-UL Scores Between Group A and Group B

Interpretation

Mean MAS-UL improvement was 10.33 in Group A while 6.66 seen in Group B, likewise showing superior effect of task-oriented therapy. Overall, Group A (task-oriented therapy) demonstrated greater improvements in upper limb motor functions than Group B (mirror therapy) in hemiplegic patients.

Discussion

Hemiplegia frequently leads to long-term disability with profound impacts on patients' lives. Upper extremity motor impairments following stroke are common and closely linked to the capacity to perform everyday tasks, as well as to social and recreational participation. Rehabilitation for stroke survivors should include functional activities and effective therapeutic methods focused on improving upper-limb function to address emotional, psychological, social and interpersonal challenges affecting quality of life [13].

Group A showed improvements in MAS-UL values (mean gains 10.33), demonstrated that task-oriented therapy is enhancing the upper limb functions as well as independence.

These results align with prior research reporting that repetitive, purposeful, functional practice promotes motor control and independence. Studies by Bosch *et al.* (2014) [14], Almhawi *et al.* (2016) [15], similarly reported that task-oriented approaches improve motor performance, functional strength and normal life after hemiplegia, supporting the clinical relevance of TOT.

Group B, which received mirror therapy, also showed significant within-group improvements (mean gains of 6.66 in MAS-UL), indicating MT is effective for motor recovery. These findings agree with previous reports of MT's benefits for motor performance, functional recovery and neuroplasticity (Ramachandran and Altschuler, 2010; Michielsen *et al.*, 2011;) [16-17].

When directly comparing both approaches, Group A achieved greater mean improvements in MAS-UL (10.33 vs 6.66) than Group B. The superiority of task-oriented therapy may be due to its focus on repetitive practice of meaningful, goal-directed tasks that drive neuroplastic changes, motor learning, and functional carryover. Mirror therapy, although beneficial, primarily relies on visual feedback and motor

image, that may explain its relatively smaller effect compared to task-oriented practice.

Conclusion

The study demonstrate that task-oriented therapy produced the greatest improvements in upper limb motor functions, and Mirror therapy also yielded meaningful improvements in upper limb function. Overall, task-oriented therapy was efficiently enhancing upper limb motor functions than mirror therapy among hemiplegic individuals.

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