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Comparative Effect of Modified Constraint Induced Movement Therapy, Proprioceptive Training and Task-Oriented Training on Functions of Upper Extremity among Stroke Patients

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ABSTRACT

Background: Stroke causes a variety of impairments that compromise the quality of life. Constraint Induced Movement Therapy (CIMT) is a technique used in rehabilitation medicine to treat individuals with decreased upper extremity functions. The study compares the effectiveness of modified constraint-induced movement therapy (mCIMT), proprioceptive training, and task-oriented training on upper extremity functions among stroke patients.

Methods: This study was an experimental study of pre and post-type. The study was carried out in ACS Medical College and Hospital, Chennai. Sixty male and female samples from the stroke population were selected and allocated to three groups by random sampling method. Group A, B & C were allocated with twenty samples in each group. The study duration was six months with an intervention duration of 30 minutes per day/alternate days of a week for four weeks. The FMA-UE and Motor Activity Log assessed upper extremity function and pain as the main outcome measures. Dependent t-tests were used to find out the effects within the group. ANOVA was used to compare the effectiveness between the groups.

Results: Comparative study between Groups A, Group B, Group C showed a significant difference in the effectiveness of Motor Function, Sensory Function, ROM, Joint Pain, Muscle use, and Quality of Movement with a P value of 0.0001 on functions of upper extremity among stroke patients.

Conclusion: The study concluded that modified constraint-induced movement therapy got more improvement than proprioceptive and task-oriented training on upper extremity functions among stroke patients.

Keywords: Stroke; Modified Constraint induced Movement therapy (mCIMT); Task oriented training; Proprioceptive training.

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INTRODUCTION

Stroke causes a diversity of handicap that compromises the prosperity of a person. Muscular and mental perceptual handicaps could find in patients who have experienced brain stroke, which could decrease their ability to carry out everyday exercises. The debilitation of muscle capability comprises one of the significant reasons for handicaps after a stroke. Over 69% of cerebrovascular injury invigorates the weakness of muscle capability to the upper appendage, other than around 56% of subjects experience severe hemi paresis even after five years from stroke [1, 2].

Late investigations have shown that intercessions like Constraint Induced Movement Therapy (CIMT), reflect treatment, preparing with computer-generated reality, or monotonous assignment preparation is viable to work on the upper appendage after stroke. Due to unconstrained recuperation and restoration, upper appendage shortcoming tenderly develops in numerous patients. Yet, the genuine utilization of the arm for capability is habitually not exactly the potential utilization [4-5].

This was depicted by the scholarly non-use hypothesis, which rehashed disappointment in trying the impacted arm during the intense stroke period, prompting negative authorization of paretic arm use. CIMT is a sensibly new strategy utilized in recovery medication to treat people with lessened furthest point capability. CIMT centers massed practice with the impacted upper appendage. The first CIMT dispenses at least six hours for treatment and compelling of the safe arm for 90% of waking hours out of every day and over a time of about fourteen days. Specialists have perceived that such a plan of CIMT is thorough and presumably results in non-compliance [6-8].

Afterward, altered forms of CIMT, which is Modified CIMT, have been created to conquer such limits. The span of treatment differs from 2 to 10 weeks, and the mediation time additionally fluctuates from as short as 30 minutes to three hours out of each day evaluated by different investigations [9-11].

The proprioceptive put-together preparation approach experts with respect to the likelihood to be applied since the intense early stage after CVA, when a few restorative mediations (e.g., CIMT) can't be granted due to the absence of remaining intentional strong initiation. Plus, as expressed by Whitall et al., the contribution of unaffected appendage in reciprocal preparation addresses a principal part for preparing, in light of the reasoning of the bury appendage coupling hypothesis, where upgrades from appendages agree to make a Neuro functional unit [12, 13].

The proprioceptive-based training (PBT) is intended to invigorate the rise of intentional constriction and rely upon muscle learning standards, like the reiterations of assignments with simultaneous utilization of criticisms. Proprioception is the capacity of the CNS to recognize where body sections are all situated at some random time. Proprioceptors arranged in delicate tissues can detect changes and send afferent motivations to the mind. PBT can develop proprioception through basic development achieved in one plane where compensatory developments are denied [14, 15].

A review has suggested task situated preparing as an intercession strategy to support weakened coordinated movements of stroke patients and their capacity to complete everyday exercises, and different practical exercises appropriately applied to patients can assist with working on their genuine coordinated abilities and capacity to perform day-to-day activities [16, 17].

Task-oriented training refers to treatment programs that are objective on unique, useful assignments that join the solid skeletal framework and sensory system and treatment that console dynamic investment and spotlight on practical errands instead of basic, tedious preparation of ordinary movement designs. Subsequently, the target of the review was to think about the adequacy of Modified CIMT, Proprioceptive preparation, and Task-Oriented Training in improving the upper extremity function of stroke patients regarding muscle recuperation and practical results [18, 19].

The study compared the effectiveness of modified constraint-induced movement therapy, proprioceptive training, and task-oriented training on upper extremity functions among stroke patients. This study also focused on the effects of modified constraint-induced movement therapy, proprioceptive training, and task-oriented training on upper extremity functions among stroke patients.

Need of the study: Stroke causes a variety of impairments that compromise the quality of life. Paretic upper limb in stroke patients significantly impacts the quality of life. Improving upper limb function is a core element of stroke rehabilitation needed to maximize patient outcomes and reduce disability. However, UE recovery after a stroke is unlikely to be this easy. Understanding how capacity and performance change over the years after stroke might help to identify which patients to target and when during their recovery.

METHODOLOGY

This study was an Experimental study of pre and post-type. The study was carried out in ACS Medical College and Hospital, Chennai. Sixty male and female samples from the stroke population were selected, and a simple random sampling method was used to allocate them into three groups, A, B & C, with twenty samples in each group. The study duration was six months with an intervention duration of 30 minutes per day/ alternate days of a week for four weeks. The main outcome measures of upper extremity functions, ROM, and pain were assessed using FMA-UE and Motor Activity Log. Dependent t-tests were used to find out the effects within the group. Paired t-tests and ANOVA were used to compare the effectiveness between the groups.

Treatment Procedure: Samples are categorized into 3 Groups- Group A, Group B, and Group C- using the lottery method. Group A received modified constraint-induced movement therapy. 30-minute therapy session emphasizing the affected arm in use for general functional tasks like; Reaching forward to hold a glass and drinking from it, Picking up a comb and combing hair, Turning on and off a light switch, Writing with a pen, Moving the pegs.

For four days a week (alternate days) for four weeks. Constraint session of an unaffected limb is given for 5 hours per day for five days a week. The patient's unaffected hand and wrist were covered with a mitt during frequent arm use and the therapy session of MCIMT.

Figure 1: Reaching Forward To Hold the Glass and Drinking (A & B)

Figure 2: Picking Up a Comb and Combing the Hair

Figure 3: On & Off the Light Switch

Figure 4: Writing with the Pen

Figure 5: Moving the Pegs

Figure 6: Proprioceptive Training (A, B)

Group B received proprioceptive training for 30 minutes per day, alternate days for four weeks. The patient was supine with the upper limbs in a symmetric posture. The subject was asked to move both limbs with the same frequency performing bilateral flexion-extension of one of the upper limb districts according to the available free ROM of the targeted joint. The movement execution of the affected arm was supported by the therapist performing the passive movement at the same rhythm as the one executed with the unaffected side.

During the therapeutic session, the patient was asked to focus their attention on the movement performed against gravity, which was reinforced by a verbal command. Afterward, the therapist fully supported movement execution coherently with the patient's initialization. The active movements performed voluntarily by the patient with unaffected limbs were considered the reference movement, which the therapist has to emulate passively by synchronizing passive movement executed in phase with the affected side. The treatment lasted 30 minutes, the proprioceptive training session 3 minutes, with a rest of 2 minutes between sessions.

Figure 7: Throwing Ball into the Basket (A &B)

Group C received task-oriented training. The tasks included in task-oriented training were changing clothes, throwing a ball into a basket, stacking cones, moving pegs, wiping the table with a towel, and passing rings along curved rods. The training has been provided to each patient for 30 minutes daily, alternate days a week for four weeks.

Figure 8: Stacking Cones

Figure 9: Moving the pegs

Data Analysis

Descriptive Data Analysis:

Sixty participants between the age group of 30 to 50 years, 34 male and 26 female patients, were included in the study based on specific selection criteria.

Paired test within the Group A

Group A: Effectiveness of modified constraint-induced movement therapy on upper extremity functions among stroke patients.

Group A	Number of Pairs	Mean Difference	SD SEM	95% Cl	Df	t	p-value	Sig. different (P < 0.05)
Motor Function	20	24.40	1.729 0.3866	23.59 to 25.21	19	63.11	<0.0001	****
Sensory Function	20	2.350	0.6708 0.1500	2.036 to 2.664	19	15.7	<0.0001	****
ROM	20	3.900	0.9119 0.2039	3.473 to 4.327	19	19.13	<0.0001	****
JOINT PAIN	20	1.4	0.7539 0.1686	1.047 to 1.753	19	8.30	<0.0001	****
Muscle Use	20	34.9	3.291 0.7359	33.36 to 36.44	19	47.42	<0.0001	****
Quality of Movement	20	38.05	1.959 0.4381	37.13 to 38.97	19	86.84	<0.0001	****

Table 1: Paired t Test for Motor Function, Sensory Function, ROM, Joint Pain, Muscle use, and Quality of Movement within the Group A

The above table 1 shows significant differences in Motor Function, Sensory Function, ROM, Joint Pain, Muscle use, and Quality of Movement within Group A with P<0.001

Paired test within the Group B

Group B: Effectiveness of Proprioceptive Training on Functions of Upper Extremity among Stroke Patients.

Group B	Number of Pairs	Mean Difference	SD SEM	95% Cl	Df	T	p-value	Sig. different (P < 0.05)
Motor Function	20	21.30	0.923 0.207	20.87 to 21.73	19	103.0	<0.0001	****
Sensory Function	20	1.700	0.571 0.128	1.433 to 1.967	19	13.31	<0.0001	****
ROM	20	1.800	0.615 60.14	1.512 to 2.088	19	13.08	<0.0001	****
JOINT PAIN	20	1.25	0.440 0.099	1.042 to 1.458	19	12.58	<0.0001	****
Muscle Use	20	31.25	0.428 1.916	30.35 to 32.15	19	72.94	<0.0001	****
Quality of Movement	20	28.8	2.628 0.588	27.57 to 30.03	19	49.01	<0.0001	****

Table 2: Paired t Test Motor Function, Sensory Function, ROM, Joint Pain, Muscle use, and Quality of Movement within the Group B

The above table 2 shows significant differences in Motor Function, Sensory Function, ROM, Joint Pain, Muscle use, and Quality of Movement within Group A with P<0.0001

Paired test within the Group C

Group C: Effectiveness of Task-Oriented Training On upper extremity functions among stroke patients**.**

Group C	Number of Pairs	Mean Difference	SD SEM	95% Cl	df	t	p-value	Sig. different (P < 0.05)
Motor Function	20	25.80	1.0560. 236	25.31 to 26.29	19	109.2	<0.0001	****
Sensory Function	20	1.95	0.686 0.154	1.629 to 2.271	19	12.71	<0.0001	****
ROM	20	2.40	0.754 0.169	2.047 to 2.753	19	14.24	<0.0001	****
Joint Pain	20	3.45	1.099 0.246	2.936 to 3.964	19	14.04	<0.0001	****
Muscle Use	20	31.95	1.701 0.380	31.15 to 32.75	19	84.02	<0.0001	****
Quality of Movement	20	31.05	1.605 0.35	30.30 to 31.80	19	86.51	<0.0001	****

Table 3: Paired t Test Motor Function, Sensory Function, ROM, Joint Pain, Muscle use, and Quality of Movement within the Group C

The above table 3 shows significant differences in Motor Function, Sensory Function, ROM, Joint Pain, Muscle use, and Quality of Movement within Group A with P<0.0001

Compare the Effectiveness of Modified Constraint Induced Movement Therapy, Proprioceptive Training and Task-Oriented Training on Functions of the Upper Extremity among Stroke Patients

Variables	Test	Sum square	DF	Mean Square	F value	P Value	Sig. different (P < 0.05)
Motor Function	Pre test	25.43	2	12.72	3.130	0.0513	NS
	Post Test	282.2	2	141.1	32.86	0.0001	****
Sensory Function	Pre test	6.700	2	3.350	2.324	0.1070	NS
	Post Test	17.10	2	8.550	7.412	0.0014	****
ROM	Pre test	3.633	2	1.817	1.075	0.3480	NS
	Post Test	75.03	2	37.52	25.37	0.0001	****
Joint Pain	Pre test	12.70	2	6.350	2.464	0.0941	NS
	Post Test	55.90	2	27.95	17.22	0.0001	****
Muscle Use	Pre test	4.633	2	2.317	0.804	0.4528	NS
	Post Test	126.5	2	63.27	8.504	0.0006	****
Quality of Movement	Pre test	4.633	2	2.317	0.813	0.4484	NS
	Post Test	979.3	2	489.7	79.27	0.0001	****

Table 4: ANOVA Test for Motor Function, Sensory Function, ROM, Joint Pain, Muscle Use, and Quality of Movement between Groups A, B & C.

The above table 4shows significant differences in Motor Function, Sensory Function, ROM, Joint Pain, Muscle use, and Quality of Movement between Groups A, B & C with P<0.0001

RESULT

In Group A, Motor Function, Sensory Function, ROM, Joint Pain, Muscle use, and Quality of Movement it was increased with a mean difference of 24.40, 2.350, 3.900, 1.4, 34.9, 38.05, respectively, by modified constraint-induced movement therapy with P value >0.0001, on Functions upper extremity among stroke patients**.** Hence, the study has accepted the alternate hypothesis and rejected the null hypothesis.

In Group B, Motor Function, Sensory Function, ROM, Joint Pain, Muscle use, and Quality of Movement it was increased with a mean difference of 21.30,1.700, 1.800, 1.25, 31.25, 28.8, respectively by with p-value >0.0001, among Proprioceptive Training on Functions upper extremity among stroke patients.

In Group C, Motor Function, Sensory Function, ROM, Joint Pain, Muscle use, and Quality of Movement it was increased with a mean difference of 25.80, 1.95, 2.40, 3.45, 31.95, 31.05, respectively, by Task-Oriented Training with P value >0.0001, on functions of upper extremity among stroke patients.

A comparative study between Groups A, B, and C showed significant differences in the effectiveness of Motor Function, Sensory Function, ROM, Joint Pain, Muscle use, and Quality of Movement with a p-value of 0.0001 on upper extremity functions among stroke patients. Group A was more effective with higher mean values than Group B and Group C.

DISCUSSION

The present study was conducted to determine the effect of modified constraint-induced movement therapy, proprioceptive training, and task-oriented training on upper extremity functions among stroke patients. The study uses FMA-UE and Motor Activity Log as parameters to demonstrate the effect of exercise programs on upper extremity function among stroke patients.

Totally 60 patients were included in this study, and they were randomly allocated into three groups – Group A (mCIMT), Group B (Proprioceptive Training), and Group C (Task-Oriented Training). This present study showed a significant difference regarding upper extremity functions in all three groups. But when comparing the improvement between the groups, Group A, with a mean difference of 24.40, 2.350, 3.900, 1.4, 34.9, and 38.05, respectively showed better improvement than Group B and Group C.

Previous studies in other contexts and populations support our results that mCIMT has improved motor functional recovery in the upper extremity among the stroke population. mCIMT is one of the most developed training methods for motor recovery. It is based on a theory that brain plasticity and cortical functional use of the more affected arm may be increased, and learned non-use might be overcome.

The patients endeavor to move the impacted side outcomes in better execution in exercises of everyday living and actual capability. In Gathering A (mCIMT), patients endeavor the activities and draw in with monotonous undertakings with the impacted arm, bringing about the progress of the useful movement in the impacted furthest point [20, 21].

The adequacy of the changed requirement prompted the development of treatment on the furthest point capability and word-related execution of stroke patients. The mCIMT bunch showed better upgrades in the word-related execution and the furthest point capability than the regular restoration treatment group [22, 23].

A review to assess the remedial impacts of altered imperative has prompted the development of treatment in patients with intense sub-cortical localized necrosis. It explores the potential components hidden in the impact. The treatment essentially worked on the development in the altered limitation actuated development treatment bunch contrasted and the benchmark group. They presumed that the altered limitation actuated development treatment and quickly brought about huge practical changes in coordinated development following treatment in patients with intense subcortical infarction [24, 25].

The adequacy of altered imperative has prompted the development of treatment in administering furthest point shortcoming in hemiparetic patients because of stroke. They presumed that a month of mCIMT is powerful in working on the engine capability in the paretic upper appendage of stroke patients [26].

The degree of proof on adjusted requirement prompted the development of treatment in advancing UE recuperation post-stroke. They inferred that the mCIMT convention effectively mediates UE recovery after stroke. Future examination, including enormous RCTs, might expand the degree of rate for mCIMT [27, 28].

The strength for genuinely that modified CIMT could diminish the capacity to utilize the paretic furthest point and improve immediacy during movement. A study to assess the altered requirement actuated development treatment on furthest point capabilities in stroke subjects. The review results showed that mCIMT helps work on the capability of the impacted furthest point in stroke subjects [29-31].

CONCLUSION

The study concluded that there is a difference in effect between the groups. Modified Constraint Induced Movement Therapy found more improvement in upper extremity functions than proprioceptive and task-oriented training.

The study found improved upper extremity functions by Modified Constraint Induced Movement Therapy and proprioceptive and task-oriented training.

Ethical clearance: Ethical clearance was obtained from the ethical Institutional Review Board of the Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Chennai, with reference no: MPT (Neurology)-04/PHYSIO/IRB/2020—2021 approval letter dated 11/03/2021.

Conflicts of Interest: There is no conflict of interest in conducting this study.

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