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Effectiveness Of Task-Oriented Exercise with Relaxation Techniques on Upper Limb Function and Stress Level in Stroke Patient

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ABSTRACT

Background
Stroke is a condition occurs when a blood vessel that carries oxygen and nutrients to the brain is either gets blocked by a clot or rupture. The brain doesn't get proper blood supply and oxygen it needs for normal function causes brain cells die. Task-oriented exercise refers to any movement sequence with a fun or direct objective, often taking the form of a game or challenge.

AIM: This study aims to examine the effectiveness of task-oriented exercise with relaxation technique on upper limb function and stress level in stroke patient.

Methods: Based on selection criteria, subjects were be recruited for study through the convenient sampling method.All subjects were be recruited based on the inclusion and exclusion criteria. The participants are assigned into two groups: a) Combined Approach Group: Task-oriented exercise combined with relaxation techniques. b) conventional Group: Usual care and conventional exercise. A 4 weeks intervention were given for both groups.

Results: Statistical analysis revealed a significant difference between the groups. The task-oriented group[Experimental group] shows the superior result in hemiparesis stroke patient on upper limb function , with p value less than 0.00001

Conclusion: According to this study, task-oriented exercise seems to improve upper limb function after stroke. Progressive repetitive training of task-oriented exercise with relaxation technique is effective than conventional exercise with relaxation technique and it also help to reduce stress level in stroke patient.

Key words: Task oriented exercise, stroke, Jebsen hand function test, Perceived stress scale, Jacobson relaxation technique

INTRODUCTION

Stroke is a sudden neurological event brought on by a decrease in blood flow to the brain. Physical, cognitive, and psychosocial dysfunction in stroke patients affected their quality of life and interfered with activities of daily living (ADL).The loss of hand function is one of the main causes of impairment in neuromuscular disorders and dependency in everyday life [1]. Neurodevelopmental treatment (NDT), a popular method of treatment that focuses on deficits and attempts to restore a "normal" movement pattern, has been found to be ineffective[2] .Following a stroke, anxiety and stress are prevalent, and they seem to worsen over time. Anxiety that has been clinically diagnosed affects about 24% of stroke survivors six months or longer /after the stroke. Stroke survivors may also feel anguish that does not necessarily fit the clinical definition of anxiety. There are currently few trials on psychological therapies to lessen stroke-related anxiety and/or distress. Self-help relaxation could be a practical and inexpensive intervention for post-stroke anxiety[3].

Mindfulness and relaxation exercises have been proven to be effective self-administered approaches to reduce stress and anxiety after stroke, making them one of the few psychological interventions that have been investigated in persons who have experienced a stroke[4.] Mindfulness and relaxation exercises have been proven to be effective self-administered approaches to reduce stress and anxiety after stroke, making them one of the few psychological interventions that have been investigated in persons who have experienced a stroke[5]. Rumination is supposed to be reduced by mindfulness, which also enhances attentional control. Instead of focusing on concerns from the past or the future, it refocuses attention on the present. According to some theories, relaxation counteracts the stress reaction by causing a psychophysiological state of decreased arousal. Through consistent practice, one can obtain and strengthen the benefits of mindfulness and relaxation[6]. Following a stroke, anxiety has been demonstrated to have a negative impact on relationships, quality of life, everyday functioning, and functional outcome. These concomitant issues may be improved with good post-stroke anxiety therapy. Medication (buspirone and paroxetine) has been proven to be useful in reducing anxiety in post-stroke patients; however, this is only true for those who have mixed anxiety and depression[7]. In general, upper-limb dysfunction makes it very difficult to perform tasks requiring gross motor skills (such as balancing, walking, and self-protective reflexes), in addition to problems with fine motor tasks (such as daily activities like eating, dressing, and handwriting). Lowering quality of life (QoL) for stroke patients is upper-limb dysfunction. Many recent research on stroke patients have found that task-oriented training is beneficial in enhancing the functional motor abilities needed to complete ADLs[8]. A task-oriented rehabilitation program may not always include a patient-customized training load, even if resistance training may be a useful training strategy to enhance and sustain muscular strength over the long run and in the immediate term after a stroke. Numerous investigations utilizing TOT protocols have been carried out without explicitly incorporating strength training[9]. Stroke patients may claim that their ADLs are significantly impacted. Due to their condition, they could become agitated and emotionally disturbed, and they might even experience panic episodes occasionally[10]. Most patients had moderate upper limb impairment and weakness, as evidenced by a Jebsen hand function test [11].Task-oriented training (TOT) is one of these therapeutic approaches. It entails the active training of motor tasks carried out in a distinct functional context, which may include intricate complete task or pre task movements involving the entire limb[12]. The PSS is a self-reported tool used to assess how stressful a person feels about several situations in their life. It was first created as a 14-item scale with a five-point Likert scale to gauge how stressful events during the preceding month were perceived. Subsequently, the authors said that compared to the 14-item scale, the 10-item version (PSS-10) shown stronger psychometric qualities[13]. The Jebsen-Taylor test was performed to assess how non-dysfunctional subjects' hands functioned with and without an encumbrance in each of the four types of wrist extensor orthoses. Three sessions of the Jebsen-Taylor test were utilized to collect data in order to account for potential changes that might arise as patients grew accustomed to their orthoses. An analysis of variance was used to answer the study's main question, which revealed that there were significant differences in the speeds of the five orthotic conditions in each of the seven subtests as well as in the overall mean test scores[14] .Promoting independence and a return to productive activities outside of the hospital, clinic, or is the ultimate aim of stroke rehabilitation. Regaining adequate sensorimotor control over the affected limb is often the aim for people with upper extremity paresis following a stroke, allowing them to resume their desired level of participation in both home and communal life. Determining the potential relationship between measurements taken during a clinical evaluation and "real world" activity is a current concern for rehabilitation specialists[15].There is strong evidence that stress is associated with a number of health outcomes. The PSS is a self-reported tool used to assess how stressful a person feels about several situations in their life. It was first created as a 14-item scale with a five-point Likert scale to gauge how stressful events during the preceding month were perceived. A key component of the task-oriented rehabilitation program for chronic stroke patients with mild disability may include muscle strength training [16]. The data was collected in three stages using a questionnaire, observations, and interviews (within one week after admission: within one week before discharge: within one month following discharge). ANOVA repeated measurements of ANOVA, post hoc paired t-test, Bonferroni correction, and t-test were used to evaluate the data. Data were analyzed using t-test, ANOVA repeated measures of ANOVA, and post hoc paired t-test, Bonferroni correction[17] . The ability to carry out activities of daily living will be impacted, and the sufferer's years of good health and functional wellbeing will be reduced[18]. The analysis highlights the necessity for QOL to be the primary outcome measure in upper limb intervention research, in addition to the functional outcomes that are currently

employed[19].Training in mindfulness has two main objectives. The first is to enter a profoundly peaceful state. The second is to direct attention and awareness on what is occurring in the present moment, that is, in one's own body and mind. Thus, mindfulness modifies people's connection with time by encouraging them to live in the present and focusing their attention[20]. This study aims to find the effectiveness of task-oriented exercise with relaxation technique to improve upper limb function and stress level in stroke patient.

METHODS

This experimental study involved 20 participants were recruited from private hospital at Chennai, diagnosed with stroke who met the inclusion criteria. Participants were recruited through convenient sampling and randomly allocated to two groups: the combined approach group (n=10) and the conventional group (n=10). The inclusion criteria were Stroke patient who have experienced hemiparesis within 3-6 months in post stroke, both male and female, Age group - 40-60years, Modified Ashworth Scale Grade 2 and exclusion criteria includes Hemodynamically unstable, History of fracture in affected upper extremity like complex regional syndrome ,History of pain in upper extremity more than 6 in NPRS and Respiratory condition like COPD, asthma, Pneumonia.

Following informed consent, individuals meeting the inclusion criteria were recruited and assigned to either the Combined Approach group or the conventional group. The study addressed the impact of two distinct exercise regimens on people with stroke. Both groups received treatment for four days per week over a total of 4 weeks. Each exercise will be given for 2mins and total of 16 minutes.

Task oriented exercise:

- Clothes pin activity – Attach clothespins to a line or string at varying heights. Use your affected hand to open and close the clothespins and move them along the line. This exercise helps with grip strength, coordination, and dexterity. (5 reps, 3sets)
- Stacking cups- Place a set of cups in front of you and use your affected hand to stack them one by one, creating a tower. This activity enhances fine motor skills, hand-eye coordination, and reaching movements. (5 reps, 3 sets)
- Cutting paper – Hold a pair of safety scissors and practice cutting paper into simple shapes or patterns. This exercise targets hand strength, precision, and the use of bilateral hand movements. (5 reps, 3 sets)
- Card sorting - Shuffle a deck of cards and use your affected hand to sort them by suit or color into different piles. This exercise engages visual perception, grasp, and controlled movements. (5 reps, 3 sets)
- Buttoning and un buttoning – Practice buttoning and unbuttoning buttons on a shirt or a piece of fabric. Start with larger buttons and gradually move to smaller ones as your coordination improves (5 reps, 3 sets)
- Bilateral reaching – Sit or stand in front of a table and use both hands together to reach for objects placed at varying distances. This exercise helps integrate both arms for functional tasks. (5 reps, 3 sets)
- Food preparation: peeling vegetables or fruit, spreading butter or jam on bread, pouring liquid from one container to another –(5 reps, 3 sets)
- Therapeutic exercise: squeezing, rolling, shaping activities – (5 reps, 3sets)

Relaxation technique: Jacobson's relaxation technique is a type of therapy that focuses on tightening and relaxing specific muscle groups in sequence. It's also known as progressive relaxation therapy. The relaxation technique will be given for 5 minutes after the exercise.

Conventional exercise:

- Active or passive range of motion exercise – These exercises will keep your muscles strong and mobile, and your joint flexible. (5 reps ,3 sets (3minutes)
- Active or passive stretching – Arm across chest, Triceps stretch, side stretch, arch stretch, mid back stretch, backward arm stretch - 4 reps ,3 sets (5 minutes)

- Strengthening – Biceps curls, single arm row, bent over rows, single weight biceps curls-3 reps, 3 sets (4 minutes)
- Isometric exercise – isometric shoulder abduction ,isometric elbow flexion, resisted shoulder internal and external rotation-3 reps, 2 sets (2mins)
- Weight bearing exercise-with palms resting comfortably on table slowly move body over hands until gentle stretch is felt in forearm,
- With feet and hands shoulder width apart, lean into wall then push away from the wall -2 reps, 2 sets (2 minutes)

STATISTICAL ANALYSIS & RESULTS:

Paired-T and Unpaired-T test were used for statistical analysis. A p-value <0.05 was considered statistically significant.

The study compared the pre-test and post-test values of an experimental group and a conventional group using the Jebsen hand function test and the Perceived Stress Scale.

For the Jebsen hand function test, the experimental group showed significant improvements in all seven subtests, with the t-values ranging from 6.2044 for writing to 25.6154 for simulated feeding (all $p<0.0001$). In contrast, the conventional group had smaller improvements, with t-values ranging from 6.5320 for writing to 9.000 for lifting small objects (all $p<0.0001$).

Comparing the post-test values between the two groups, the experimental group performed significantly better than the conventional group across all seven subtests of the Jebsen hand function test. The post-test values for the experimental group were: writing 51.8, page turning 31.0, lifting small objects 22.9, simulated feeding 43.8, stacking checkers 36.2, lifting large light objects 21.8, and lifting large heavy objects 34.8. The corresponding post-test values for the conventional group were: writing 62.7, page turning 36.5, lifting small objects 26.5, simulated feeding 51.4, stacking checkers 45.6, lifting large light objects 25.8, and lifting large heavy objects 47.8.

For the Perceived Stress Scale, the experimental group showed a larger improvement, with a pre-test value of 33.70 and a post-test value of 20.4 ($t=12.8710$, $p<0.0001$), compared to the conventional group which had a pre-test value of 32.8 and a post-test value of 27.4 ($t=7.6882$, $p<0.0001$). The post-test values for the experimental and conventional groups were 20.4 and 27.4, respectively.

DISCUSSION

A stroke is an abrupt neurological occurrence caused by a reduction in blood supply to the brain. A stroke is defined by the World Health Organization as "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin." Stroke patients experienced physical, cognitive, and psychosocial impairment that impacted their quality of life and complicated activities of daily living (ADL).

There are currently few trials on psychological therapies to lessen stroke-related anxiety and/or distress. According to recent research, weakness is one of the most important basic deficits in stroke survivors. It has been shown that weakness significantly reduces many significant daily tasks, involvement, and quality of life for those with hemiparesis. In several studies, task-oriented training (TOT) an effective neurological therapeutic approach has been shown through demonstration

The affected hand and arm are still very tough to rehabilitate. Improvements in motor function may not necessarily transfer into increased performance because daily tasks are more complex than those involving the lower limbs, even if data suggests that the arm's motor recovery is comparable to that of the lower extremities. Many different rehabilitation modalities have been used in clinical settings to help the wounded arm regain function.

Mindfulness and relaxation exercises have been proven to be effective self-administered approaches to reduce stress and anxiety after stroke, making them one of the few psychological interventions that have been investigated in persons who have experienced a stroke. Rumination is supposed to be reduced by mindfulness, which also enhances attentional control. Instead of focusing on concerns from the past or the future, it refocuses attention on the present. According to some theories, relaxation counteracts the stress reaction by causing a psychophysiological state of decreased arousal. Through consistent practice, one can obtain and strengthen the benefits of mindfulness and relaxation.

According to Marijke Rensink and her colleagues, the overall findings suggest that rehabilitation focused on specific tasks tends to be more successful. Various interventions are viable for nurses and can be implemented either within a healthcare facility or in a home setting. It is emphasized that nurses have the capacity and responsibility to contribute significantly to the facilitation of opportunities for individuals to engage in meaningful functional activities beyond formal therapy sessions.

Chang-Yong et.al that strokes often result in upper extremity (UE) motor deficits, adversely affecting daily living activities. A substantial proportion, ranging from 30% to 66%, continues to grapple with UE motor dysfunction for over six months post-stroke. The participants in this study were specifically recruited beyond the six-month mark to assess the recovery of UE motor dysfunction. This research represents a pioneering exploration into the clinical advantages of crossed-education.Notably, this study stands as the first to examine and compare distinct crossed-education protocols on a tilt table within the context of stroke rehabilitation. Additionally, it is the inaugural effort to contrast task-oriented protocols with those who do not engage in task-oriented training for the upper extremities.

According to the research led by Wanees Badawy et.alhighlighted the potential benefits of integrating task-oriented exercises alongside conventional physical therapy programs to enhance hand function in stroke rehabilitation. Their findings strongly suggest that incorporating these specific exercises positively impacts the development of hand function among individuals recovering from strokes. These task-oriented exercises involve engaging the affected hand and arm in purposeful and functional activities resembling real-life tasks. By simulating actions like gripping, reaching, or manipulating objects, these exercises help retrain motor skills and coordination, contributing to the recovery of hand function post-stroke.

According to the research by Ian Kneebone, three primary issues were addressed. Firstly, the study aimed to assess the potential of relaxation training in diminishing anxiety among stroke patients. Secondly, it sought to determine the viability of establishing a relaxation group within an in-patient post-acute rehabilitation ward. Lastly, the study aimed to identify a suitable measure for capturing any changes brought about by relaxation training.

It's crucial to emphasize that the study didn't define particular anxiety thresholds for inclusion in the relaxation group. Hence, for a more robust assessment of relaxation training's effectiveness in anxiety management post-stroke, forthcoming studies should examine its effects on individuals diagnosed with post-stroke anxiety.

According to the research conducted by Paulo Bazile de Silva et.al , the incorporation of strength training proved highly effective in enhancing the rehabilitation of the upper limbs. This effectiveness was highlighted by the notably higher values attained by the TOT_ST group across a majority of the parameters assessed. These findings suggest that integrating muscle strength training could play a crucial role as a key component within the task-oriented rehabilitation program, especially for patients with long-standing conditions experiencing less disability following a stroke. The results emphasize the potential importance of including strength training to optimize the rehabilitation process for individuals in this specific category.

In accordance with the findings presented by Shruti Mahajan, our research provided robust support for the alternative hypothesis. Both cohorts under investigation demonstrated a marked and statistically significant decrease in anxiety levels following the prescribed treatment regimen. Notably, when comparing the effectiveness of the Jacobson's

relaxation technique alone with the combination of Jacobson's relaxation technique followed by shavasana, the latter emerged as notably more impactful in reducing anxiety among post-stroke patients.

Limitations & recommendations:

Future studies should aim to recruit a larger sample size to increase the statistical power and generalizability of the findings.Future studies should include a longer intervention period to assess the long-term effects of task-oriented exercise. I highly recommend focusing on upper limb function while also incorporating lower limb function. Future studies should use a more representative sampling technique to increase the applicability of the results the . upcoming studies should include a more diverse sample of individuals with different types of stroke condition and age groups to increase the applicability of the findings.

CONCLUSION

In conclusion, task-oriented exercise seems to improve upper limb function after stroke. Progressive repetitive training of task-oriented exercise with relaxation technique is effective than conventional exercise with relaxation technique and it also help to reduce stress level in stroke patient.

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Experimental group	Pre test	Post test	T value	P value
Writing	67.3	51.8	6.2044	0.0001
Page turning	38.6	31	24.8768	
Lifting small objects	28.5	22.9	18.3303	
Simulated feeding	54.9	43.8	25.6154	
Stacking checkers	45.3	36.3	21.0000	
Lifting large, light objects	27.7	21.8	6.8432	
Lifting large, heavy objects	51.2	34.8	8.5081	

TABLES

Table 1: Comparing pre- test and post- test of Experimental group by using Jebsen hand function test

Table 2.: Comparing Pre and post- test value of conventional group by using Jebsen hand function test

Conventional group	Pre test	Post test	T value	P value
Writing	65.9	62.7	6.5320	0.00001
Page turning	39.9	36.7	7.6862	
Lifting small objects	29.8	26.5	9.000	
Simulated feeding	54.7	51.4	6.9829	
Stacking checkers	48.9	45.6	6.6569	
Lifting large ,light objects	28.5	25.8	6.8214	
Lifting large, heavy objects	50.6	47.8	7.7992	

Table 3: Comparing the post -test value of Experimental group and conventional group by using Jebsen hand function test

	Experimental group	Conventional group
Writing	51.8	62.7
Page turning	31	36.7
Lifting small objects	22.9	26.5
Simulated feeding	43.8	51.4
Stacking checkers	36.2	45.6
Lifting large, light objects	21.8	25.8
Lifting large, heavy objects	34.8	47.8

Table 4: Comparing Pre and post- test value of Experimental group by using perceived stress scale

Experimental group	Mean	SD	T value	P value
Pre test	33.70	3.40	12.8710	0.00001
Post test	20.40	2.63		

Table 5: Comparing pre and post -test value of conventional group by using perceived stress scale

Conventional group	Mean	SD	T value	P value
Pre test	32.80	27.4	7.6882	0.00001
Post test	4.37	4.33		

Table 6: Comparing the post- test values of Experimental group and conventional group by using perceived stress scale

Post test value	Mean	SD	T value	P value
Experimental group	20.4	2.63	5.3136	0.00001
Conventional group	27.4	4.33		

Human ethics statement: This study was approved by the Institutional Scientific Review Board (03/015/2023/ISRB/SR/SCPT), and all participants provided written informed consent.

Human and Animal Rights: This article does not contain any studies with human or animal subjects performed by any of the authors.

Human Participants: This study was approved bythe Institutional Scientific Review Board (03/015/2023/ISRB/SR/SCPT), and all participants provided written informed consent.

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Data availability: The data supporting the results of the study are available by contacting the corresponding author.

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