EFFECTIVENESS OF BILATERAL TASK ORIENTED TRAINING VERSUS UNILATERAL TASK ORIENTED TRAINING TO IMPROVE THE MOTOR FUNCTIONS OF UPPER LIMB IN STROKE PATIENTS

DISSERTATION

Submitted for the partial fulfillment of the requirement for the degree of

MASTER OF PHYSIOTHERAPY (MPT)

ELECTIVE: ADVANCED PHSIOTHERAPY IN NEUROLOGY

M. VASANTH

By

Bearing the **Registration No. 271620266**

Submitted to

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY

CHENNAI- 600 032

APRIL – 2018

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Seal & Signature of Principal

..……….………………………………………………….

Prof. R.RADHAKRISHNAN, M.P.T., PGDHM.,

Place: Chennai

Date:

MOHAMED SATHAK A.J. COLLEGE OF PHYSIOTHERAPY

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Signature of guide

…..…….……………………………………..

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M.S.A.J. College of Physiotherapy, Chennai.

Place: Chennai

Date:

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Nungambakkam, Chennai – 600 034.

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INTERNAL EXAMINER | **EXTERNAL EXAMINER**

.... | ....

Place: Chennai

Date:

DECLARATION BY THE CANDIDATE

I hereby declare that the dissertation entitled **"EFFECTIVENESS OF BILATERAL TASK ORIENTED TRAINING VERSUS UNILATERAL TASK ORIENTED TRAINING TO IMPROVE THE MOTOR FUNCTIONS OF UPPER LIMB IN STROKE PATIENTS"** was done by me for the partial fulfillment of the requirement of Master of Physiotherapy degree. The dissertation had been done under the direct supervision and guidance of my guide **Professor K.PREMANAND, MPT., at Mohamed Sathak A.J. College of Physiotherapy,** Chennai and submitted the same during the year April 2018 to The Tamilnadu Dr. M.G.R Medical university.

Signature of the Candidate

……………………….

M.VASANTH

Place: Chennai

Date:

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INDEX

ABSTRACT

1. ABSTRACT:

Title:

Effectiveness of bilateral task oriented training versus unilateral task oriented training to improve the motor functions of upper limb in stroke patients.

Background and Purpose:

Upper extremity paresis in post stroke is an important contributor to disability and task oriented rehabilitation aims at compensating loss of function in the affected upper extremity. The purpose of this study was to investigate the effectiveness of bilateral task oriented training versus unilateral task oriented training to improve the motor functions of upper limb in stroke patients.

Methods:

20 hemiplegic subjects have divided into two groups, the bilateral task oriented training group (10) and the unilateral task oriented training group (10). Duration of session is 60 minutes and 5 sessions per week over 12 weeks. Fugl – meyer assessment scale for upper extremity (FMA-UE), Chedoke arm and hand activity inventory (CAHAI) have used to quantify the treatment outcome.

Results:

The inferential statistical results of Independent 't' test for between the group comparison of post treatment 't' value is 1.9 (p value 0.03) in fugl - meyer motor assessment for upper extremity and 2.53 (p value 0.01) in chedoke arm and hand activity inventory.

Conclusion:

Bilateral task oriented training improved motor functions of upper limb better than unilateral task oriented training in stroke patients.

Keywords:

Bilateral task oriented training, unilateral task oriented training, Fugl – meyer assessment scale for upper extremity (FMA-UE), Chedoke arm and hand activity inventory (CAHAI), stroke.

INTRODUCTION

2. INTRODUCTION:

The World Health Organization (WHO) definition of stroke is: “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”.

Impaired upper extremity function is a common and often devastating problem for stroke survivors. In the population-based Copenhagen Stroke Study (Nakayama et al., 1994), 32% of stroke patients had severe arm paresis at admission and 37% had mild paresis. In 64 out of 491 (13%) stroke survivors, the arm remained entirely non-functional despite comprehensive rehabilitation efforts. Barecca et al., (2001) noted that “Rehabilitation of the hemiplegic upper limb remains difficult to achieve, with only 5% of stroke survivors who have complete paralysis regaining functional use of their impaired arm and hand (Kwakkel et al., 2000). Those showing some synergistic movement in UL within 4 weeks after stroke have 90% chance of improving (Kwakkel et al., 2003).

Therapies to restore upper limb function following stroke have been in practice for over 60 years. Many of these are traditional treatments which have focused on regaining control over reflexive movement patterns using muscle activation techniques. However, these efforts have not resulted in favourable outcomes for regaining arm function. It has found that 50% of survivors experience hemiparesis six months post stroke (American Heart Association, 2008).

Recent innovations in technology have allowed non-invasive examination of brain physiology leading to new theories on recovery of movement control and new ways to measure the effects of therapeutic interventions. Rehabilitation scientists are revisiting old models of movement control as new understanding of human motor performance become available.

There is much evidence to support upper limb training using functional task practice (Higgins et al., 2006) potentially bringing new treatment interventions to clinical practice.

The Task Oriented Approach is based on the systems theory of motor control which considers normal movements to result from the interaction between the individual's abilities, the demands of the task, and the context in which the task has performed. Abnormal movements have said to result from impairment in one or more factors within this system. Furthermore, therapeutic interventions using this approach promote the use of goal directed task practice in training. This approach also assumes that motor learning can be achieved through active participation and problem-solving of the participant through repetitive attempts at accomplishing a functional task (Shumway-Cook & Woollacott, 2001). These training principles highlight the use of functional activities as a primary tool for training which can be used to create a comprehensive approach to restoring motor control.

Many more interventions have used by physiotherapist to improve upper limb function they are Bilateral Arm Training, Mirror Therapy, Strength Training, Repetitive Task- Specific Training, Sensorimotor Training and Somatosensory Stimulation, Mental Practice, Neurodevelopment Techniques (Bobath), Hand Splinting, Constraint-Induced Movement Therapy, Biofeedback, Robotic Therapy, Electrical Stimulation etc.

Bilateral Arm Training (BAT) is an evidence-based intervention that can facilitate neuroplastic change and drive motor recovery after stroke. It incorporates task-oriented and motor relearning strategies including intense practice, intrinsic feedback, bimanual coordination, and goal-focused movements that improve upper extremity function. Bilateral arm training comprises repetitive practice of bilateral arm movements in symmetrical in-phase, symmetrical anti-phase and asymmetrical patterns. Traditionally, bilateral arm training was performed by linking both hands together so that the less-affected limb facilitated passive movement of the affected limb. Variations of bilateral arm training include bilateral isokinematic training (spatiotemporally identical active movements performed during functional tasks), use of mechanical or robotic devices to drive passive or active movement of the affected limb, or bilateral arm training with rhythmic auditory cueing or EMG stimulation.

The use of bilateral arm training in stroke rehabilitation is based on the assumption that symmetrical bilateral movements activate similar neural networks in both hemispheres, promoting neural plasticity and cortical repair those results in improved motor control in the affected limb. Bilateral arm training is suitable for use as an adjunct to other upper limb interventions and should involve repetitive movement during performance of novel, functional tasks.

Thus, this study aimed to demonstrate the effectiveness of bilateral task oriented training versus unilateral task oriented training to improve the motor functions of upper limb in stroke patients.

NEED FOR THE STUDY

3. NEED FOR THE STUDY:

Impaired upper extremity function is a common and often devastating problem for stroke survivors. Statistics have sparked over the last 15 years an interest in empirically testing a variety of treatment strategies some old, some novel, with the hopes of achieving improved outcomes in patients with upper extremity paresis.

One such approach that has been studied is bilateral task oriented training. In a recent meta-analysis of bilateral task oriented training, outcomes were positive overall during sub acute and chronic phases of recovery. A primary reason to perform bilateral task oriented training is that much of what we do everyday involves the use of both arms and therefore, bilateral re-training is necessary. For example, both arms and hands have used for basic self care skills such as bathing, dressing, feeding, toileting, as well as, many other mobility functions such as carrying objects, getting up from bed or chairs, and in driving.

Even though numbers of interventions are used to improve upper limb functions after stroke still now no attainment of significantly improvement because of practical issues such as economical burden, time consuming, lack of interest, lack of understanding the treatment. But bilateral task oriented training is not in this category because of low cost, interesting and easily understandable activities.

Hence my study would propose that effectiveness of bilateral task oriented training versus unilateral task oriented training to improve the motor functions of upper limb in stroke patients.

AIM AND OBJECTIVE OF THE STUDY

4.1 AIM OF THE STUDY:

This study aimed to demonstrate the effectiveness of bilateral task oriented training versus unilateral task oriented training to improve the motor functions of upper limb in stroke patients.

4.2 OBJECTIVE OF THE STUDY:

To improve the motor functions of Upper Limb.

HYPOTHESIS

5. HYPOTHESIS:

5.1 NULL HYPOTHESIS:

There is no significant difference in both the bilateral task oriented training group and unilateral task oriented training group to improve the motor function of upper limb in stroke patients.

5.2 ALTERNATE HYPOTHESIS:

There is significant difference in subjects who have received bilateral task oriented training than the unilateral task oriented training to improve the motor function of upper limb in stroke patients.

REVIEW OF LITERATURE

6. REVIEW OF LITERATURE:

1. Sunhwa Shim, Jinhwa Jung et.al.., Concluded that, the Bilateral Arm Training has significant effect on improving the motor function, amount of activity and activity intensity measured with functional independence measure, manual function test and accelerometer of patients with stroke in compared with unilateral arm training.

2. Cecille Corsilles et.al.., Concluded that, the Bilateral Task Oriented Training program showed positive treatment effects on improving functional performance of the affected arm in activities requiring unilateral and bilateral limb coordination in chronic stroke individuals with mild to moderate upper limb impairment.

3. Gui Bin Song et.al.., Concluded that, bilateral upper extremity exercises applied with functional tasks are more effective in improving upper extremity functions and daily living activities in stroke patients compared to simple, repetitive bilateral upper extremity exercises. Therefore, performing symmetrical bilateral upper extremity exercises which utilize treatment tools of different sizes and weights and movements involved in daily living activities can be used as an effective therapeutic intervention method in the recovery of upper extremity functions and daily living in stroke patients.

4. Kyoung Ju Han, Jin Young Kim et.al.., Concluded that, bilateral task exercises increase upper limb functions compared to unilateral-task exercises. Therefore, the results of this study can be utilized to elucidate the effects of bilateral exercises and to systemize more efficient rehabilitation methods.

5. Nafeez Syed, Abhisek Biswas et.al.., Concluded that, both bilateral and unilateral trainings to be efficacious for moderately impaired sub-acute and chronic stroke survivors, bilateral training weighed more advantageous for proximal arm function. Through this study, authors conclude that bilateral training is better than unilateral training in chronic stroke survivors.

6. David Arthur Cunningham et.al.., Founded that, bilateral therapy increases contralesional and ipsilesional hemisphere excitability when compared to unilateral therapy. Further, bilateral therapy resulted in a greater reduction of inhibition upon the ipsilesional hemisphere, where the effect was more pronounced in the more impaired patients. Results of this study suggest that mechanisms of bilateral therapy may be a better alternative for patients with greater motor impairments.

7. Ching-Yi Wu, Yu-Wei Hsieh et.al.., This preliminary study revealed that might induce neural plasticity changes and produce motor and functional gains in stroke patients. This study showed that increased activation in the bilateral cerebral hemispheres, especially in the ipsilesional hemisphere, during affected hand movement and in the contralesional hemisphere during unaffected hand movement. Cerebellar activation increased in the Bilateral arm training group, but decreased in the Distributed Constraint-induced Therapy.

8. Li-ling Chuang, Pei-kwei Tsay et.al.., Concluded that, Bilateral arm training group showed a better improvement of force generation, functional ability and use of the affected arm in daily life than in unilateral training.

9. Andreas, Richard Macko et.al.., These preliminary findings suggest that, Bilateral arm training with rhythmic auditory cueing induces reorganization in contralesional motor networks and provide biological plausibility for repetitive bilateral training as a potential therapy for upper extremity rehabilitation in hemiparetic stroke.

10. Ming-de Chen, Wan-chien Huang et.al.., Concluded that, compared with Control group and Therapist based bilateral arm training, the Robot assisted bilateral arm training exhibited differential effects on outcome measures. Therapist-based bilateral arm training improves temporal efficiency, smoothness, trunk control, and motor impairment of the distal upper limb.

11. Cauraugh, Kim et.al.., Concluded that, patients in the bilateral training group moved more blocks on the Box and Block test compared to the other two groups, unilateral training group and control group.

12. Summers, Kagerer et.al.., Concluded that, individuals receiving bilateral training showed a reduction in movement time of the impaired limb and increased upper limb functional ability compared to individuals receiving unilateral training.

13. Stinear, Barber et.al.., Concluded that, immediately after the intervention, motor function of the affected upper limb improved in both, Active-Passive Bilateral Therapy and control group groups. One month after the intervention, the Active-Passive Bilateral Therapy group had better upper limb motor function than control patients.

14. Stewart, Summers et.al.., Reported that, bilateral movements alone or in combination with auxiliary sensory feedback are effective stroke rehabilitation protocols during the sub-acute and chronic phases of recovery. The overall effect size was relatively large.

15. Naik, Cauraugh et.al.., Conducted a meta-analysis, including the results from 25 studies, the majority of which were RCTs. The overall bilateral arm training effect was a standardized mean difference of 0.734, representing a large treatment effect. The effect size was influenced by the type of treatment (pure bilateral, BATRAC, coupled bilateral and EMG-triggered FES and active/passive movement using robotics). BATRAC and EMG-triggered FES studies were associated with the largest Standard Mean Difference.

16. James, Neha Lodha et.al.., The current meta-analysis provide strong evidence supporting bilateral arm training on motor capabilities in post stroke patients. As stroke patients attempt to overcome motor dysfunctions in activities of daily living, practicing bilateral arm training activates both central and peripheral input, and improvements are found.

17. Barreca, Gowland et.al.., From the literature, survivors of stroke, and their caregivers, 751 items were generated. Using factor analyses stem leaf plots, clinical judgment, and pilot testing on individuals with stroke, the list was reduced to 13 bilateral, real life items. Research continues to provide evidence of the Chedoke arm and hand activity inventory (CAHAI) test retest and inter rater reliability as well as construct, concurrent, and longitudinal validity.

18. Barreca, Stratford et.al.., Concluded that, High inter rater reliability and convergent and discriminant cross-sectional validity were established for the CAHAI. The CAHAI is more sensitive to clinically important change than the ARAT.

19. Barreca, Lambert et.al.., Concluded that, Our findings support the validity of scores on both CAHAI versions. Moreover, our results indicate there is a minimal reduction in validity when the CAHAI-9 is used in place of the CAHAI-13 at the group level; Both CAHAI versions demonstrated more sensitivity to change than the ARAT.

20. Rowland, Turpin et.al.., Investigated the clinical utility of CAHAI within 14 days of stroke from the perspective of therapists. All therapists agreed CAHAI was suited for the stroke population and assisted identification of client ability or difficulty within functional context. The findings indicate that CAHAI shows promise as an upper limb ability assessment for clients within 14 days of stroke.

21. Griffiths, McBay et.al.., Concluded that, All shortened versions maintained the same high degree of reliability and construct and longitudinal validity as the original CAHAI-13. Therapists and researchers may select from three valid, shorter versions of a new upper limb functional measure to facilitate effective standardized assessment within limited time and resources.

22. Berglund K, Fugl-Meyer AR.et.al.., Says that, fugl - meyer method appear to be externally valid, have good inter - rater reliability and as the time needed for assessing the arm function of a hemiplegic or hemiparetic patient rarely exceeds 10 min.

23. Heesoo kim, Jingang et.al.., The result indicate that, the FMA is a reasonable assessment of function of upper and lower extremities of patient with stroke.

24. Pamela W Duncan, Martha Propst et.al.., Study concluded that, intra tester and inter tester reliability coefficients were high and statistically significant. Establishing the reliability of the Fugl-Meyer method of assessing recovery of function following cerebrovascular accident has increased the usefulness of this method for clinical assessment and as a tool for the comparative analysis of the effectiveness of various therapeutic interventions.

25. Julie Sanford, Juiie Moreiand et.al.., – Says that, the fugl - meyer assessment is designed to assess motor recovery following stroke the overall reliability for this instrument was high.

26. Jaasko L, Leyman I et.al.., Concluded that, the reliability coefficient for the upper extremity was higher than that for the lower extremity.

27. Gladstone D. J, Danells et.al.., Concluded that, the fugl - meyer Assessment is a disease-specific impairment index designed to assess motor function, balance, sensation qualities and joint function in hemiplegic post-stroke patients.

28. Folstein, McHugh et.al.., concluded that, the Mini Mental State Examination was developed as a brief screening tool to provide a quantitative assessment of cognitive impairment and to record cognitive changes over time.

29. Lenore Kurlowicz, Meredith Wallace et.al.., - Says that, the Mini Mental State Examination is effective as a screening tool for cognitive impairment with older, community dwelling, hospitalized and institutionalized adults.

METHODOLOGY

7. METHODOLOGY:

7.1 STUDY DESIGN:

- Quasi Experimental design

7.2 SAMPLING DESIGN:

- Convenient sampling

7.3 SAMPLE SIZE:

The total samples (N) = 20. Samples are selected as per the inclusion and exclusion criteria. They are divided into two groups

- Group A - 10 subjects
- Group B - 10 subjects

7.4 CRITERIA:

7.4.1 INCLUSION CRITERIA:

- Age : 40 – 60 years
- Both gender
- Had stroke on 1st time
- Hemiplegic stroke
- MCA territory occlusion or hemorrhage
- 3 - 6 months of stroke occurrence

- Brunnstrom stages of recovery III-IV
- Spasticity less than 3 in Modified ashworth scale
- Minimal mental state examination >24

7.4.2 EXCLUSION CRITERIA:

- Multiple stroke
- Cognitive impairments
- Orthopedic conditions of upper limb
- Visual impairments
- MMSE <23 (cognitive dysfunction)
- Other neurological and neuromuscular problems.

7.5 STUDY SETTING:

- Clinical based setting

7.6 STUDY DURATION:

- 3 months

7.7 VARIABLES:

7.7.1 INDEPENDENT VARIABLE:

- Bilateral task oriented training
- Unilateral task oriented training

7.7.2 DEPENDENT VARIABLE:

- Motor functions of upper limb

7.8 OUTCOME MEASUREMENT TOOL:

- Fugl - Meyer motor assessment for upper extremity
- Chedoke Arm and Hand Activity Inventory (CAHAI)

7.9 MATERIALS USED:

- Table
- Chair
- blanket
- Plastic cups - 2
- Peg boards – 2
- Books - 2
- Sponge balls – 2
- Towel
- Drawer
- 200g jar of coffee
- push-button telephone
- 30cm ruler
- 8.5” x 11” paper
- pencil
- 2.3L plastic pitcher with lid

- 250 ml plastic cup
- wash cloth
- wash basin (24.5 cm. in diameter, height 8 cm.)
- Pull-on vest with 5 buttons
- bath towel (65cm X 100cm)
- 75ml toothpaste with screw lid, >50% full
- Toothbrush
- dinner plate (Melamine or heavy plastic, 25 cm. in diameter)
- medium resistance putty
- knife and fork
- built up handles the length of the utensil handle
- Metal zipper in polar fleece poncho
- Eyeglasses
- Handkerchief
- Container (50 x 37 x 27cm)
- 4 standard size steps with rail
- a plastic grocery bag holding 2kg weight
- Reflex hammer

PROCEDURE

8. PROCEDURE:

Consent is obtained from the individual by explaining the procedure. A total of 20 patients have selected based on inclusion criteria. All the patients underwent pre test assessment for motor functions of upper limb using Fugl - Meyer scale and Chedoke Arm and Hand Activity Inventory (CAHAI) . The subjects were conveniently assigned into two groups. Group A received bilateral task oriented training. Group B received unilateral task oriented training. The duration of each session is 1 hour per day. Both groups received five sessions per week and continued this for twelve weeks. Then end of twelfth week again all patients underwent post test assessment for upper limb motor function using Fugl - Meyer scale and Chedoke Arm and Hand Activity Inventory (CAHAI) .

GROUP A:

BILATERAL TASK ORIENTED TRAINING:

During bilateral task oriented training, exercises are done on both paralytic and non paralytic upper limb. Repetition of each exercise is about 10 times.

- Lift cups forward
- Pick up pegs in front and put it in hole on sides (vise versa)
- Turns the pages in book
- Grasp and release towel
- Squeezing the sponge ball
- Towel folding
- Open a drawer and pick a pen

UNILATERAL TASK ORIENTED TRAINING:

Group B received unilateral task oriented exercise, and they performed above tasks with only by the affected upper limb.

BILATERAL TASK ORIENTED TRAINING

Towel folding

Grasp and release towel

UNILATERAL TASK ORIENTED TRAINING

Grasp and release towel

Squeezing the sponge ball

DATA ANALYSIS

9. DATA ANALYSIS:

PAIRED "t" TEST:

$$t = \frac{(\sum \mathrm{D})/\mathrm{N}}{\sqrt{\frac{\sum \mathrm{D}^2 - \left(\frac{(\sum \mathrm{D})^2}{\mathrm{N}}\right)}{(\mathrm{N}-1)(\mathrm{N})}}}$$

$\sum D$ - Difference between matched scores

N - Number of samples

INDEPENDENT "t" TEST:

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\left(\frac{(N_1 - 1){S_1}^2 + (N_2 - 1){S_2}^2}{N_1 + N_2 - 2}\right)\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$$

$\overline{X_1}$ - Mean of group A

$\overline{X_2}$ - Mean of group B

N_1 - Number of samples in group A

N_2 - Number of samples in group B

Level of significance is 5%

DATA ANALYSIS FOR WITHIN THE GROUP:

FUGL MEYER ASSESSMENT SCALE FOR UPPER EXTREMITY:

	PRE TEST MEAN VALUE ± SD	POST TEST MEAN VALUE ± SD	"p" VALUE
GROUP A	36.8 ± 3.82	45.9 ± 4.65	0.0001***
GROUP B	35.6 ± 4.50	42 ± 4.55	0.0001***

Note: *** - EXTREMELY SIGNIFICANT

CHEDOKE ARM AND HAND ACTIVITY INVENTORY:

	PRE TEST MEAN VALUE ± SD	POST TEST MEAN VALUE ± SD	"p" VALUE
GROUP A	31.5 ± 3.95	41.8 ± 7	0.0001***
GROUP B	30.5 ± 2.84	35.5 ± 3.57	0.0002***

Note: *** - EXTREMELY SIGNIFICANT

DATA ANALYSIS FOR BETWEEN THE GROUP:

FUGL MEYER ASSESSMENT SCALE FOR UPPER EXTREMITY:

	GROUP A MEAN VALUE ± SD	GROUP B MEAN VALUE ± SD	"p" VALUE
PRE TEST	36.8 ± 3.82	35.6 ± 4.50	0.264^{NS}
POST TEST	45.9 ± 4.65	42 ± 4.55	0.03^{*}

Note: NS – NOT SIGNIFICANT, * - SIGNIFICANT

CHEDOKE ARM AND HAND ACTIVITY INVENTORY:

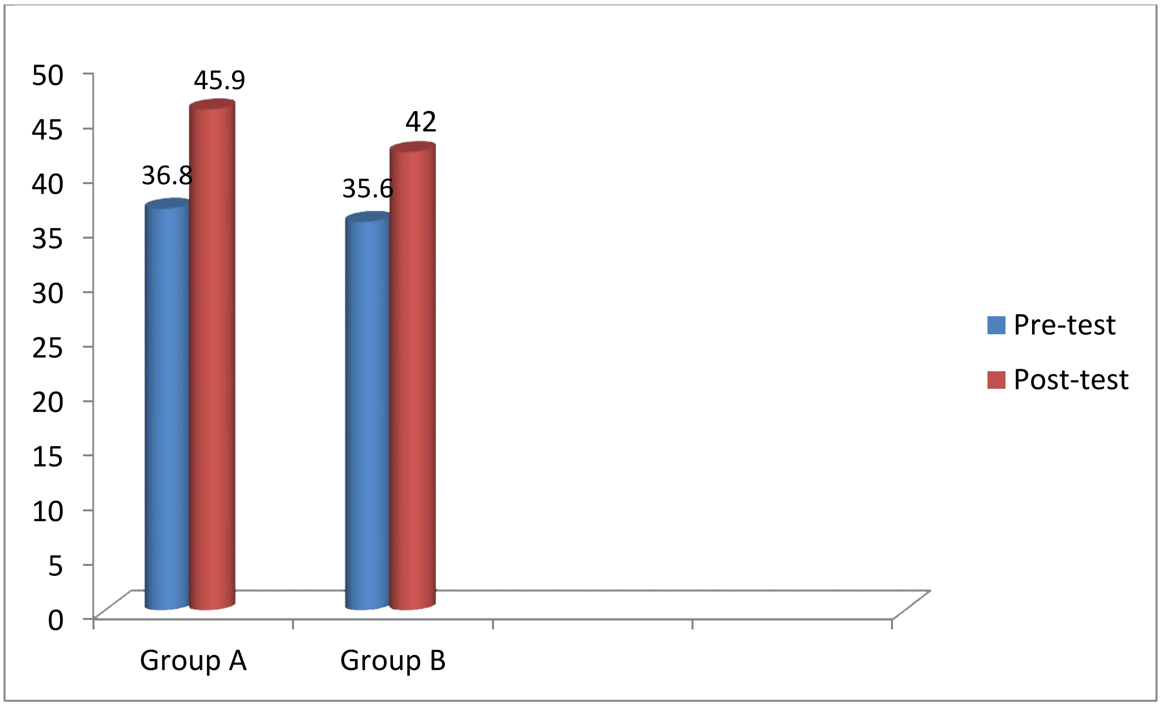
	GROUP A MEAN VALUE ± SD	GROUP B MEAN VALUE ± SD	"p" VALUE
PRE TEST	31.5 ± 3.95	30.5 ± 2.84	0.261^{NS}
POST TEST	41.8 ± 7	35.5 ± 3.57	0.01^{*}

Note: NS - NOT SIGNIFICANT, * - SIGNIFICANT

BAR DIAGRAM

COMPARISON BETWEEN THE MEAN DIFFERENCE OF GROUP A AND GROUP B

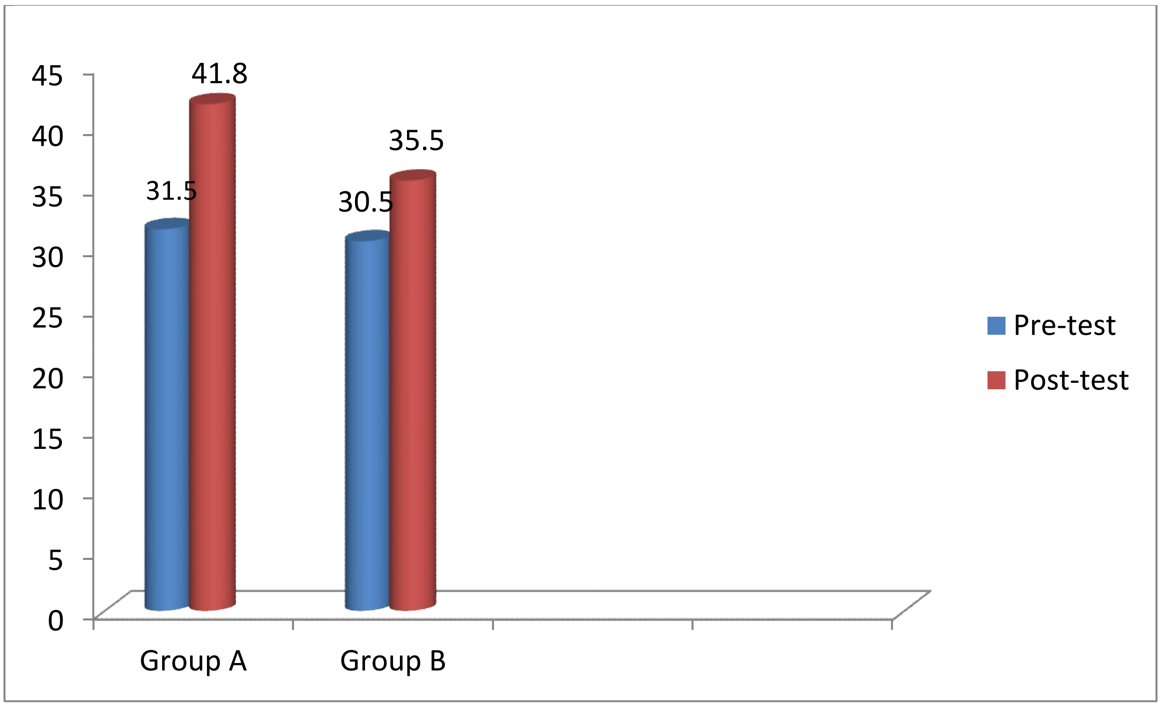
FUGL-MEYER MOTOR ASSESSMENT UPPER EXTREMITY



BAR DIAGRAM

COMPARISON BETWEEN THE MEAN DIFFERENCE OF GROUP A AND GROUP B

CHEDOKE ARM AND HAND ACTIVITY INVENTORY



RESULTS

10. RESULTS:

The results of study have obtained by outcome tool Fugl - Meyer assessment for upper extremity and Chedoke Arm and Hand Activity Inventory. Results from pre and post treatment scores of fugl-meyer motor assessment upper extremity and chedoke arm and hand activity inventory from both the groups have analyzed using paired 't' test for within the group analysis and independent 't' test for between the group analysis.

The statistical results of paired 't' test for fugl-meyer motor assessment upper extremity score have shown the mean difference of 9.1 (pre mean 36.8 and post mean 45.9) in group A and 6.4 (pre mean 35.6 and post mean 42) in group B.

The statistical results of paired 't' test for chedoke arm and hand activity inventory score have shown the mean difference of 10.3 (pre mean 31.5 and post mean 41.8) in group A and 5 (pre mean 30.5 and post mean 35.5) in group B.

The inferential statistical results of Independent 't' test for between the group comparison of pre treatment fugl-meyer motor assessment upper extremity score had shown 't' value of 0.64 (p value 0.26).

The inferential statistical results of Independent 't' test for between the group comparison of pre treatment chedoke arm and hand activity inventory score had shown 't' value of 0.65 (p value 0.26).

The inferential statistical results of Independent 't' test for between the group comparison of post treatment fugl-meyer motor assessment upper extremity score had shown 't' value of 1.9 (p value 0.03).

The inferential statistical results of Independent ‘t’ test for between the comparison of post treatment chedoke arm and hand activity inventory score had shown ‘t’ value of 2.53 (p value 0.01).

DISCUSSION

11. DISCUSSION:

This study has conducted to examine effectiveness of bilateral task oriented training versus unilateral task oriented training to improve the motor functions of upper limb in stroke patients. According to the results, this study showed pre and post test comparison of both bilateral task oriented training group and unilateral task oriented training group shows significant effects on the recovery of upper extremity motor functions using Fugl - Meyer motor assessment for upper extremity and Chedoke Arm and Hand Activity Inventory (CAHAI). But when come to between the group analysis bilateral task oriented training group showed significant effects than unilateral task oriented training group using both Fugl - Meyer motor assessment for upper extremity and Chedoke Arm and Hand Activity Inventory (CAHAI). The results of this study suggest that bilateral task oriented training to be effective in promoting recovery of upper limb motor function in stroke patients.

Summers et.al.., conducted a repeated bilateral task in which 12 chronic patients positioned a round rod 60 times per session for six days. They observed a reduction in reaching time, increased elbow joint angles, and a change in arm function. In another study by Richards et.al.., 14 stroke patients completed eight sessions over two weeks (two hours per session, four sessions per week) of bilateral tasks that required the repeated placement of nine blocks. The result of this study showed hemiplegic patients had significant improvements in the function of the affected arm.

Most studies in bilateral arm training measure its effects on the affected limb in performing tasks requiring single limb coordination but this present study measure the contributions of the affected limb in tasks requiring bilateral coordination after intervention.

Mudie and Matyas et.al.., suggested that the neural network behind specific movements that were intact in the non-stroke hemisphere, were used as a template for cortical reorganization in the stroke hemisphere through a central control mechanism over the two hemispheres.

Interhemispheric inhibition (IHI), a process in which each hemisphere can limit communication between the two hemispheres to prevent interference on control of movements (Fling and Seidler, 2012).Unilateral task results in high IHI to prevent mirror movements in the opposite limb but bilateral movements require a higher coordination of the hemisphere resulting in a decrease in IHI. As suggested by Mudie and Matyas (2000), it may be necessary to provide more training time to achieve lasting effects for bilateral arm use in functional activities.

Several of these authors suggested the role of interlimb coupling in initiating and maintaining improvements in the affected limb. Unilateral task oriented training group used independent arm movements and they did not use coordinated movements of the two limbs to complete a common functional goal which is the primary type of repetitive bilateral movements used in the Bilateral task oriented training group protocol.

It is known that 10–20% of ipsilateral corticospinal pathways are non-crossing. Such non-crossing ipsilateral pathways are included in the recovery mechanism after a stroke, which supports the use of bilateral exercise.

Based on the results of this study, it can be seen that bilateral task oriented training are more effective in improving upper extremity functions and daily living activities in stroke patients compared to unilateral task oriented training. Therefore, performing bilateral task oriented training which utilizes treatment tools of different sizes, weights and movements involved in daily living activities, can be used as an effective therapeutic intervention method in the recovery of upper extremity motor functions and activities of daily living in stroke patients.

LIMITATION AND RECOMMENDATION

12. LIMITATIONS AND RECOMMENDATIONS:

LIMITATIONS:

- Study has limited number of patients.
- The study has done in shorter duration.
- Study has done only with patients who have sub acute stoke.
- Upper extremity has evaluated functionally, but not evaluated kinematically.

RECOMMENDATIONS:

- Study size can be increased.
- Study duration can be increased.
- Outcome should be evaluated kinematically and neurophysiologic basis.

CONCLUSION

13. Conclusion:

Based on the results of this study, bilateral task oriented training is more effective in improving the motor functions of upper limb in stroke patients compared to unilateral task oriented training.

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ANNEXURE

15. ANNEXURE:

15.1 CONSENT FORM

I, Mrs. / Ms ……………………… voluntary consent to participate in the Dissertation study named **"EFFECTIVENESS OF BILATERAL TASK ORIENTED TRAINING VERSUS UNILATERAL TASK ORIENTED TRAINING TO IMPROVE THE MOTOR FUNCTIONS OF UPPER LIMB IN STROKE PATIENTS".** The physical therapy student has explained me about the procedure in detail. Here I assure that I will adhere to the treatment programme prescribed to me and have been given the liberty to withdraw myself from programme at any time with knowledge of the physical therapy student.

Participant's signature :

Signature of witness :

Sign of physical therapy student :

Date :

Place :

15. 2 ASSESSMENT FORM

SUBJECTIVE ASSESSMENT:

DEMOGRAPHICAL DATA:

Name:

Age:

Gender:

Date of admission:

Address:

Occupation:

HISTORY:

Past medical history:

Present medical history:

Family history:

Personal history:

OBJECTIVE ASSESSMENT:

VITAL SIGNS:

Body temperature:

Blood pressure:

Heart rate:

Respiratory rate:

ON OBSERVATION:

Built:

Attitude of limb:

Posture:

Deformity:

Gait:

External appliances:

ON PALPATION:

Muscle wasting:

Contractures:

ON EXAMINATION:

Conscious level:

Higher centre examination:

Cognitive function:

- Mini Mental State Examination

Sensory examination:

- Superficial
- Deep:
- Cortical:

Motor examination:

- Range of motion:
- Muscle tone:
- Fugl – Meyer motor assessment
- chedoke arm and hand activity inventory

Reflexes:

- Superficial reflex:
- Deep reflex:

Balance:

- Static balance:
- Dynamic balance:

Co-ordination:

- Equilibrium test:
- Non-equilibrium test:

Bladder and bowel function:

Gait assessment:

Aim:

Means:

Home advice:

Do's:

Don'ts:

Follow up:

15.3 FUGL-MEYER MOTOR ASSESSMENT UPPER EXTREMITY:

A. UPPER EXTREMITY, sitting position		
I. Reflex activity	**None**	**None**
Flexors: biceps and finger flexors	0	2
Extensors: triceps	0	2
Subtotal (max4)		

II. Volitional movement within synergies, without gravitational help			**None**	**Partial**	**Full**
Flexor synergy: hand from contra lateral knee to ipsilateral ear. From extensor synergy (shoulder adduction/internal rotation, elbow extension, forearm pronation) to flexor synergy (shoulder abduction/external rotation, elbow flexion, forearm supination).	Shoulder	Retraction	0	1	2
		Elevation	0	1	2
		Abduction(90^0)	0	1	2
		External rotation	0	1	2
	Elbow	Flexion	0	1	2
	Forearm	Supination	0	1	2
Extensor synergy: Hand from ipsilateral ear to contra lateral knee	Shoulder	Adduction/internal rotation	0	1	2
	Elbow	Extension	0	1	2
	Forearm	Pronation	0	1	2
Subtotal II max (18)					

III. Volitional movement mixing synergies, without compensation		**None**	**Partial**	**Full**
Hand to lumbar spine	Cannot be performed, hand in front of SIAS	1		
	Hand behind of SIAS (without compensation)		2	
	Hand to lumbar spine (without compensation)			3
Shoulder flexion 0^0 -90^0	Immediate abduction or elbow flexion	1		
Elbow at 0^0	Abduction or elbow flexion during movement		2	
pronation – supination 0^0	Complete flexion 90^0, maintain 0^0 in elbow			3
pronation – supination	No pronation/supination starting position immposile	1		
	Limited pronation/supination, maintains position		2	
	Complete pronation/supination, maintains position			3
	Subtotal III (max 6)			

IV. Volitional movement with little or no synergy		**None**	**Partial**	**Full**
Shoulder abduction 0^0-90^0	Immediate supination or elbow flexion	1		
Elbow at 0^0	Supination or elbow flexion during movement		2	
Pronation - supination 0^0	Abduction 90^0, maintains extension and pronation			3
Shoulder flexion 90^0 – 180^0	Immediate abduction or elbow flexion	1		

Elbow at 0^0 Pronation - supination 0^0	Abduction or elbow flexion during movement Complete flexion 90^0, maintain 0^0 in elbow		2	 3
Pronation/supination Elbow at 0^0 Shoulder flexion 30^0 - 90^0	No pronation/supination starting position immposile Limited pronation/supination, maintains extension Full pronation/supination, maintains position	1	 2	 3
Subtotal IV (max 6)				

V. Normal reflex activity evaluated only if full score of 6 points achieved on part IV				
Biceps, triceps, finger flexors	0 point on part IV or 2 or 3 reflexes markedly hyperactive 1 reflex markedly hyperactive or at least 2 reflexes lively Maximum of 1 reflex lively, none hyperactive	0	 1	 2
Subtotal V (max 2)				
Total A (max 36)				

B. WRIST Support may be provided at the elbow to take or hold the position, no support at wrist, check the passive range of motion prior testing		**None**	**Partial**	**Full**
Stability at 15 dorsi flexion Elbow at 90, forearm pronated	Less than 15° active dorsiflexion Dorsiflexion 15°, no resistance is	0	 1	

Shoulder at 0	taken Maintains position against resistance			2
Repeated dorsi flexion/volar flexion Elbow at 90, forearm pronated Shoulder at 0, slight finger flexion	Cannot perform volitionally Limited active range of motion Full active range of motion, smoothly	0	1	2
Stability at 15 dorsi flexion Elbow at 0, forearm pronated Slight shoulder flexion/abduction	Less than 15°, active dorsiflexion Dorsiflexion 15°, no resistance is taken Maintains position against resistance	0	1	2
Repeated dorsi flexion/volar flexion Elbow at 0, forearm pronated Slight shoulder flexion/abduction	Cannot perform volitionally Limited active range of motion Full active range of motion, smoothly	0	1	2
Circumduction	Cannot perform volitionally Jerky movement or incomplete Complete and smooth circumduction	0	1	2
Subtotal B (max 10)				

C.HAND support may be provided at the elbow to keep 90° flexion, no support at the wrist, compare with unaffected hand, the objects are interposed, active grasp		**None**	**Partial**	**Full**
Mass flexion From full active or passive extension		0	1	2
Mass extension From full active or passive extension		0	1	2
GRASP				
A – flexion in PIP and DIP (digits II – IV) Extension in MCP II- IV	Cannot be performed Can hold position but weak Maintains position against resistance	0	1	2
B – thumb adduction 1 - st CMC, MCP, IP at 0, scrap of paper between thumb and 2nd MCP joint	Cannot be performed Can hold paper but not against tug Can hold paper against a tug	0	1	2
C - opposition pulpa of the thumb against the pulpa of 2-nd finger, pencil, tug upward	Cannot be performed Can hold pencil but not against tug Can hold pencil against a tug	0	1	2
D – cylinder grip cylinder shaped object (small can) tug upward, opposition in digits I and II	Cannot be performed Can hold cylinder but not against tug Can hold cylinder against a tug	0	1	2

E – spherical grip fingers in abduction/flexion, thumb opposed, tennis ball	Cannot be performed Can hold ball but not against tug Can hold ball against a tug	0	1	2
	Total C (max 14)			

D. COORDINATION/SPEED after one trial with both arms, blind-folded, tip of the index finger from knee to nose, 5 times as fast as possible		**Marked**	**Slight**	**None**
Tremor		0	1	2
Dysmetria	Pronounced or unsystematic Slight and systematic No dysmetria	0	1	2
		>5s	2 – 5s	<1s
Time	More than 5 seconds slower than unaffected side 2-5 seconds slower than unaffected side Maximum difference of1 second between sides	0	1	2
	Total D (max 6)			

TOTAL A-D (max 66)	

15.4 CHEDOKE ARM AND HAND ACTIVITY INVENTORY (CAHAI):

Activity scale				
1. Total assist (weak U/L < 25%) 2. Maximal assist (weak U/L = 25-49%) 3. Moderate assist (weak U/L = 50-74%) 4. Minimal assist (weak U/L >75%)		5. Supervision 6. Modified independence (device) 7. Compete independence(timely, safely)		
		Affected limb		score
1.	Open jar of coffee	☐ Holds jar	☐ Holds lid	☐
2.	Call 911	☐ Holds receiver	☐ Holds phone	☐
3.	Draw a line with ruler	☐ Holds ruler	☐ Holds pen	☐
4.	Pour a glass of water	☐ Holds glass	☐ Holds pitcher	☐
5.	Wring out wash cloth			☐
6. .	Do up five buttons			☐

7.	Dry back with towel			☐
8.	Put tooth paste on toothbrush	☐ Holds	☐ Holds brush	☐
9.	Cut medium resistance putty	☐ Holds	☐ Holds fork	☐
10.	Zip up the zipper	☐ Holds	☐ Holds zipper pull	☐
11.	Clean a pair of eye glasses	☐ Holds	☐ Holds lenses	☐
12.	Place container on table			☐
13.	Carry a bag up the stairs			☐
Total score				

15.5 MASTER CHART:

PRE - TEST AND POST TEST VALUE OF GROUP A

FUGL-MEYER MOTOR ASSESSMENT UPPER EXTREMITY

S NO	PRE	POST
1	33	48
2	41	46
3	37	47
4	35	43
5	40	48
6	39	50
7	34	46
8	30	35
9	42	52
10	37	44

PRE - TEST AND POST TEST VALUE OF GROUP – B

FUGL-MEYER MOTOR ASSESSMENT UPPER EXTREMITY

S NO	PRE	POST
1	31	37
2	34	44
3	41	48
4	38	41
5	32	39
6	30	36
7	43	50
8	36	43
9	32	39
10	39	43

PRE - TEST AND POST TEST VALUE OF GROUP A

CHEDOKE ARM AND HAND ACTIVITY INVENTORY

S NO	PRE	POST
1	28	35
2	36	45
3	31	48
4	34	42
5	30	37
6	38	50
7	30	46
8	25	29
9	34	49
10	29	37

PRE - TEST AND POST TEST VALUE OF GROUP B

CHEDOKE ARM AND HAND ACTIVITY INVENTORY

S NO	PRE	POST
1	27	35
2	35	38
3	31	38
4	29	30
5	30	34
6	28	35
7	34	43
8	31	35
9	27	32
10	33	35