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The Effectiveness of Play Therapy and Complex Task Training on Cognitive Function in Sabacute Post Stroke Patient - Comparative Study

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Abstract
[Purpose]To find out the effectiveness of play therapy and complex task training on cognitive function in post sub acute stroke patient.
[Material and methods] 30 patients (18 males and 12 females) with post subacute stroke participated in this study. 30 stroke patient was assigned into three groups by the chit method (n=10 per group). GROUP A (experimental group) was receive play therapy along with traditional training and GROUP B (experimental group) will be receive complex task training along with traditional training whereas GROUP C (control group) was receive traditional training. To evaluate the cognitive function of stroke patient we was use M.M.S.E. Two repeated measurements was taken before the intervention, after 4 weeks of intervention.
[Result] Complex task training improved cognitive abilities and complex task training subjects performance was better than play therapy and traditional training subjects performance.
[Conclusion] These finding suggest that complex task training could be as effective as play therapy and traditional training for improving cognition in subacute post stroke population.
Keyword: cognition, play therapy, complex task

I. INTRODUCTION

Stroke is the third leading cause of death world wide. A WHO study in 1990 quoted incidence mortality due to stroke in India to be 73/100,000 per year. The incidence of cereberovascular disease was found to be 2/1000 population per annum and 4/1000 population per annum in people aged 45 to 84 year [1].

Cerebrovascular disease-related mortality rates have been increasing, and 1 out of every 4 cerebrovascular disease patients dies within a month after the onset of disease. [2] Among the surviving patients, 15–30% become severely handicapped, and 40% are left with functional deficits, resulting in problems with the major components of functional independence: motor, sensory, and cognitive functions [3].

More than half of stroke patients suffer from cognitive impairment three months post-stroke [3]. Cognitive impairment is considered as one of the major long-term effects after a stroke [4].

Cognition, from the Latin term ***—cognoscere"***, means "to know", "to conceptualize" or "to recognize". Cognition includes attention, remembering, producing and understanding language, solving problems, and making decisions. Cognitive function includes how we use information, think, learn, judge, apply knowledge and change preferences. Dementia is described as an acquired cognitive impairment with affected emotional control and impaired function in daily life [68]. Cognitive disturbances are frequent after stroke, but rates regarding post-stroke dementia and cognitive impairments vary from 7.4 to 56.3 % [5].

In addition to the direct effect on the quality of life of patients and their families, [70] there are also indirect effects of this cognitive dysfunction on functional recovery, due to the inability to actively participate in functional training and the failure to follow task instructions [6].

People often struggle with memory problems following stroke and this can lead to difficulties in everyday life. The degree and kind of memory problems, mood changes, and performance of everyday activities can vary widely depending on many factors, including the location of the stroke in the brain, severity, age, and the previous health of the person experiencing a stroke.

Cognitive impairment after stroke is an important factor affecting independent function and activity participation of patients, and dementia syndrome has been known to occur in approximately 8 to 26% of stroke patients within 12 months of the onset of stroke. In cases of severe cognitive impairment, it decreases morale and motivation to participate in an intensive rehabilitation program during the acute phase. It may also affect the ability to acquire motor skills, thus becoming the main cause of poor prognosis for rehabilitation. In addition, it may affect only one area of cognitive function, but in most cases, it is accompanied by impairment of the overall area of attention, concentration, memory, spatial processing skills, language, problem-solving skills, and planning skills. Therefore, accurate assessment of cognitive function and prompt initiation of treatment in the early stage is needed for successful rehabilitation.

Cognitive impairment can influence patients' self-confidence and may cause depression, anxiety, and unwillingness to take part in daily activities [3]. Many patients with stroke experience cognitive impairment. Early identification of cognitive impairment after stroke is important for ensuring that patients receive the most appropriate level of rehabilitation after discharge from the acute care hospital. The Joint Commission has incorporated the identification of cognitive impairment into the accreditation standards for comprehensive stroke centers. Traditionally, cognitive impairment after stroke has been identified by the Mini-Mental State Exam or non-standardized methods.

Play therapy is an effective means of responding to the mental health needs of young children and is widely accepted as a valuable and developmentally appropriate intervention [4]. Play therapy represents a unique form of treatment that is not only geared toward young children, but is translated into a language children can comprehend and utilize—the language of play [5]. Games have been shown to be effective therapeutic tools for children and adults. Games can be used to increase strength and stamina, promote functional movement patterns, improve dexterity and grasp, and foster cognitive and psychosocial skills (Avedon, 1971). The complex task paradigm provides information on the automaticity, hemispheric locus, and structural independence of processes hypothesized to underlie the production of skilled performance. [6] The complex task methodology is the primary approach used to investigate interactions between cognitive] processing and motor performance [7].

II. REVIEW OF LITERATURE

Surinder Pal Singh et.al (2011) shows that the addition of play therapy along with conventional therapy shown greater improvement as compared to conventional therapy alone. So Play therapy can be efficiently added in clinical practice for treating stroke patients [77].

Gye Yeop Kim (2014 Jan;26) shows that Dual-task training improved cognitive and walking abilities, and dual-task training subjects' performance was better than single-task training subjects' performance. In addition, these training benefits were maintained for 2 weeks. Dual task training improves cognitive and walking abilities of patients with stroke [78].

Jun Hwan Choi et al (2012) found that dual task training could be as effective as conventional balance training for improving balance and cognition in sub acute post stroke patient [79].

Sameniene J et. al(2008) found that at the beginning of early rehabilitation period and after rehabilitation applied, there was a significant moderate correlation between mental state and reaction time in stroke patients [80].

Goethals I Audenaert K.(2004) This finding was associated with activation effects in posterior (mainly parietal) brain areas in addition with activation of previously observed anterior (mainly anterior cingulate) brain regions [81].

Mercier L[1], Audet T et.al(2001) The factors that make the greatest contribution in explaining the variance in functional autonomy are, in order of importance, the motor factor, the perceptual factor, and the cognitive factor [82].

OzdemirF[1], BirtaneMet.al(2001)Cognition evaluation should be taken as a whole to predict functional outcome in patients with post acute stroke, except for the baseline orientation score that seemed more predictive for ambulation [83].

III. HYPOTHESIS

A. NULL Hypothesis

There will be no significant effect of play therapy and complex task training on cognitive function in post sub acute stroke patient.

B. Alternate Hypothesis

There will be a significant effect of play therapy and complex task training on cognitive function in post sub acute stroke patient.

C. Aims And Obectives

1) AIMS

a) To find out the effectiveness of play therapy and complex task training on cognitive function in post sub acute stroke patient.

2) Objectives

a) To identify the effectiveness of play therapy and complex task training on cognitive function.

b) To improve the cognitive function.

IV. MATERIAL AND METHODS

Many studies have reported that a complex task or dual task training affects on cognitive function. However, most of studies have focused on the effect of a cognitive task on gait or locomotion and balance. Only few studies have reported that a complex task/dual task intervention improved cognition ability in subjects with sub acute stroke patient.

Some studies have reported that a play therapy along with conventional therapy shown greater improvement on functional reach in stroke case. No studies have reported that play therapy intervention on cognitive function in post stroke patient.

The purpose of this study was determine the effectiveness of play therapy and complex task training on cognitive function in sabacute post stroke patient. However no such studies are available on the comparison between play therapy and complex task training in patients with sub acute stroke population.

1) Sensory impairment in involved limb.

2) Any other medical condition which affect the participation in the therapy.

A. Variables

1) Dependent Variables

a) Cognition

2) Independent Variables

a) Play therapy

b) Complex task training

B. Instruments And Tools

1) Design of The Study: Comparative study

2) Place of Study: The study was conducted in S.M Hospital and Heart Canter and Ujala Nursing Home.

3) Study Population: Study was conducted in patients with post sub acute stroke patient.

C. Selection Criteria

1) Inclusion Criteria

a) Inch tape

b) Marker

c) Ball

d) Basket

e) Large box

f) Stop watch

g) Modified Ashworth Scale (Bohannon RW and Smith MD,1987).

2) Procedure

a) Post subacute stroke patient
b) Gender: Both males and females was taken into consideration.
c) Patient's Age Range : 30 year-50 year
d) Right or left sided hemiplegia.
e) Subjects must be medically stable.
f) Spasticity 1 to 1+ on Modified Ashworth Scale.

3) Exclusion Criteria

a) Individuals of age less than 30 years or more than 50 years.
b) Acute stroke patient and chronic stroke patient.
c) Unable to maintain standing for at least 10 minutes.
d) Unable to sit unsupported for at least 10 minutes.
e) Concurrent cerebellar and brainstem lesion.
f) Visual spatial hemineglect or apraxia.

30 patients (18 males and 12 females) with subacute stroke were participated in this study. Their diagnosis were confirm clinically through computed tomography scans or magnetic resonance imaging. 30 stroke patient were assigned into three groups (group A, B, C) by the chit method(n=10 per group).The patient were recruited following attendance at the department of physiotherapy in S.M Hospital And Herat Centre Lucknow and Ujala Medical centre Lucknow between September 2016 and January 2017 for a first ever cerebral stroke involving the cortical or subcortical area as recruit as per the inclusion and exclusion criteria and informed consent was obtain from all the subjects after the procedure was explain to them.

GROUP A (experimental group) was receive play therapy along with traditional training and GROUP B (experimental group) will be receive complex task training along with traditional training whereas GROUP C (control group) was receive traditional training. The protocol was received and approved by the all participants provided written informed consent before the selection procedure**.** All the subject was be select based on the inclusion and exclusion criteria subject was randomly assign into three group will 30 subject each. Prior to participant each subject was require reading and signing and inform consent form.

Experimental Group A was receive play therapy along with traditional training, protocol for experimental group B in each session=

1 Ball into basket 5 minutes 2 Balls into well 5minutes
3 Throw and catch 5 minutes 4 Hit the target 5 minutes

After completing two games there was a rest period of 10 minutes. Thus a total of 30 minutes for play therapy session.

D. Procedure For Group A

1) Ball into Basket: While sitting unsupported on a stool of appropriate height, seat depth, and width; patient threw a ball into a basket by both hands. The basket was placed at a height of 5 feet from ground and 8 feet away from patient. The number of times patient succeeded in putting the ball into basket in a period of 5 minutes was taken as score.

2) Balls into Well: While sitting unsupported on a stool, patient picked up small balls one at a time with his impaired limb, reaching forward, backward, side wards. Balls were scattered on the floor all around the patient. After picking up the ball, the patient threw it into a large box (well) 8 feet in length, 4 feet in height, 3 feet in width, placed 8 feet away from patient. In a period of 5 minutes, number of balls patient successfully threw into well was taken as score.

3) Throw and Catch: While standing, the patient threw a ball with both hands towards wall which was 8 feet away. The ball was thrown from at or above shoulder level and the patient caught the ball with both hands as it bounced back. In a period of 5 minutes the number of times patient succeeded in catching the ball after bouncing from wall was taken as score. Target was taken as score. Distance between patient and target, distance of target from ground, size of target was adjusted in order to provide just right challenge to patient.

4) Experimental Group B was recieve complex task training along with traditional training.

E. Procedure For Group B

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1) Standing on foam surface with rapid alternating hand movement while throwing and catching a ball. 2.Sitting while holding basket and naming the objects .
2) Pick the ball and keep into the same color box with music commond.
3) Watching T.V, eating fruits on verbal commond.

Control group B was recieve traditional training such as R.O.M, Bed mobility, transfer training(buttock to buttock, bed to wheelchair and wheelchair to bed) duration of each session was 30 minutes.

To evaluate the cognitive function of stroke patient we was use M.M.S.E. Two repeated measurements was taken before the intervention, after 4 weeks of intervention. The MMSE scale takes around 10 min and assesses cognitive function in the areas of orientation,memory, attention and calculation, language and visual construction. Patients score between 0 and 30 points, and cutoffs of 23/24 have typically been used to show significant cognitive impairment.

Play therapy and complex task training was given 30 min, 3 days per weeks for a total of 4 weeks.

F. Data Analysis

Thirty subjects participated in this study. The frequency and percentage was calculated for qualitative data means (+_ SD) was calculated for continuous data paired) unpaired t- test was used to compare the continuous variable between two groups, while one way ANOVA was used for more than two groups. P value less than 0.05 was taken as a criteria for rejecting null hypothesis.

1) *Hit the Target:* While standing, the patient hit a target 15 inch height at 5 feet above the ground and 8 feet away from patient by his both hands. In a period of 5 minutes the number of times the patient succeeded in hitting the

V. RESULTS

Table 1: Distribution of study subjects according to Gender

	Group A	Group B	Group C
Male	4	7	7
Female	6	3	3
Significance	Chi Square =2.5,p=0.28		

Table 1 shows the study subjects according to gender. Results show that the distribution of gender that almost same in each group (Chi Square =2.5,p=0.28) i.e the study is a gender matched study

Table 2: Age of Study Subjects

	Group A	Group B	Group C	Significance

Age	52.00± 5.16	52.70± 4.73	51.80± 8.06	F=0.05,p= 0.943

Table 2 shows the study of subjects according to age, result shows that the mean age of study subjects in group A is 52.00 years (±5.16), group B is 52.70 years (±4.73) and group C is 51.80 years (±8.06). one way ANOVA shows that the mean age of study subjects is almost same (F=0.05,p=0.943).

Table 3: Effect of Intervention on M.M.S.E.

	Group A	Group B	Group C	Significance
0 Week M.M.	22.30± 1.33	22.40± 1.50	20.80± 1.61	F=3.60, p=0.041
4 Week M.M.	25.90± 0.73	27.10± 0.99	24.60± 0.69	F=23.19 ,p=0.001
Significance	t=-10.59,p=0.001	t=-9.08,p=0.001	t=-9.12,p=0.001	

Post Hoc Test :At 0 week- Group A Vs Group C,Group B Vs Group C are significant
Post Hoc Test :At 4 week- Group A Vs Group C,Group B Vs Group C& Group A Vs Group B are significant
Table 3 shows the effect of intervention on M.M.S.E . The result shows that the mean M.M.S.E on 0 week in group A is 22.30 (±1.33), group B is 22.40 (±1.50) and group C is 20.80 (±1.61). The mean of M.M.S.E on 4week of group A is 25.90 (±0.73), group B is 27.10 (±0.99) and group C is 24.60 (±0.69). At 0 week,the mean MMSE score is significantly lower in group C(F=3.60,p=0.041) where as the mean MMSE score has been increased after 4th week follow up & Group B shows maximum improvements on MMSE and this is statistically significant (F=23.19,p=0.001).

VI. DISCUSSION

In this study we showed that the play therapy and complex task training may improve cognitive function in sabacute post stroke patient. The present study sought to investigate the effects of 4 weeks of play and complex task training along with traditional training on cognitive function in post sub acute stroke patient.

The evaluation of cognitive function of stroke patient is important for the identification of treatment strategies for functional recovery and their return to daily living. The Mini Mental State Examination test was used to measure cognitive function in the present study. The Mini-Mental State Exam (MMSE) has a sensitivity of45 to 60% and specificity of 65 to 90% for detecting MCI using cut-points of 27 or 28.16.

Cognitive function increased with time and difference was observed in the degree of improvement in the M.M.S.E test according to training group. Complex task training displayed greater improvement than the play therapy and control group after 4 week intervention.

Similar study reported that GyeYeop Kim et al(2014 Jan;26) effect of dual task training on cognitive and motor function of stroke patients. The result shows that the dual task training improved cognitive and walking abilities of stroke patient.

Other study reported that Vasques et al (2011) conducted a dual task training combined with aerobic training for depressed elderly subjects. Their data showed improvement in cognitive assessments, which led them to suggest that dual task training in a safe and useful approach for cognitive function training.

Same study reported that Hiyamizu et al.(2012) divided 45 elderly subjects into dual task and single task training groups and studied the effects of dual task balance training on cognition and concurrent standing postural control. Their results show that the dual task group had significantly improved performance compared to single task group .

This study reported that Surinder Pal Singh et.al(2011)shows that the addition of play therapy along with conventional therapy shown greater improvement as compared to conventional therapy alone. So Play therapy can be efficiently added in clinical practice for treating stroke patients [16]. Other study reported that Barzegary, L a et al reported that the effect of play therapy on children with ADHD results showed that there was a significant difference between control and experimental groups in hyperactivity and attention deficit variables.i.e resulted that play therapy may be effective method for treating children with ADHD. Some studies have shown when subjects participate in play sessions, they feel much desirable. And these feelings lead to much attention and preciseness about different objects and they can generate this attention to another situation. Therefore cognitive therapy is important for stroke patient to reduce fall risk, to improve attention for training time. Although patients with stroke have complex impairement involving sensory and motor function as well as cognitive function. They receive therapy focused on a single aspect at a time for example a physical therapist provides treatment for motor improvement, sensory improvement or poor balance control. Whereas many task in a community setting require for cognitive function because more than half of the stroke patient suffer from cognitive impairment. Cognitive impairment is directly affected on the quality of life patients or functional activity participates in functional training and failure to follow task instruction.

A. Limitation

There was some limitation to our study-

1) We did not observe long term follow up.
2) Variation in age may vary the improvement of cognitive function. Younger age stroke population may show faster improvement than older one.
3) Lack of availability of sub acute stroke population.
4) Fluctuation in vitals during treatment sessions.
5) Patients were not easily cooperated with treatment program.
6) Limited varieties of play therapy were used.
7) The intervention duration was short therefore we cannot comment on the long term effect of complex task training on cognition. Further research using a complex task training program with more device training components would help to identify a broader rehabilitation strategy for clinical use.

B. Future Study

Future study may based on :

1) Large sample size can be taken.
2) Long Treatment time session can be planned.
3) To find out improvement in hand function with complex task training.
4) To find out improvement in ADL with complex task training and play therapy.

5) To find out improvement in coordination with complex task training and play therapy.

C. Clinical Implimentation

After analyzing the result we concluded those 4 weeks of complex task training along with traditional training shown greater improvement as compared to play therapy along with traditional training and traditional training alone. So we strongly recommended that complex task training can be efficiently added in clinical practice for rehabilitation of stroke population.

VII. CONCLUSION

We demonstrated that 4 weeks of complex task training along with traditional training had modest effects on cognitive function compared with 4 weeks of play therapy training along with traditional training and traditional training alone in patient with subacute stroke. These finding suggest that complex task training could be as effective as play therapy and traditional training for improving cognition in subacute post stroke population.

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