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Research Paper

Effect of Mental Imagery Training for subjects with Stroke

Medical Science

KEYWORDS : Stroke, Mental imagery training, Conventional physiotherapy

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ABSTRACT

Objective: In stroke, upper limb hemi paresis is commonly seen impairment which is particularly affecting activities of daily living (ADL). It is believed that motor recovery occurs only in first 6-12 months after stroke. One of the major goals in rehabilitation for survivors of stroke is return to independence in ADL. The success of achieving plastic changes in the central nervous system after skill training appears to be dependent on the amount of practice from the particular skills. Purpose of this study is to analyze the effectiveness of mental imagery training in promoting relearning in post stroke subjects.
Method: A randomized design group was used to examine the differences in mental imagery training and functional retaining training for 3 weeks for five sessions per week. The training was carried out in outpatient department of a teaching institute. Thirty subjects of both genders were included up to 60 years of age who were medically stable, able to communicate, diagnosed with unilateral cerebral infarction. The subjects were divided into 2 groups 15 in each group study group and control group. The outcome measures used were Fugal Meyer motor assessment scale and 7 point Likert scale.
Results: P value shows significant difference between the pre and posttest means of both groups under both outcome measures. There was statistically significant difference in both outcome measures after intervention in mental imagery training group.
Conclusion: This study concludes that cortical reorganization and functional improvement were seen following mental practice with mental imagery training along with conventional physiotherapy.

Introduction

Stroke is defined as sudden loss of brain function due to the interruption of flow of the blood to the brain or the rupture of the blood vessels in the brain. Hence it is commonly called as Cerebro-Vascular Accident[1] and involving disruption in the motor, somatosensory, visual, speech, perceptual, cognitive, bowel and bladder dysfunction. It leads to altered muscle tone, muscle weakness and abnormal movement pattern which consequently limit the ability to perform functional activities such as walking, climbing stairs & self-care. Strokes are classified by etiological categories (thrombosis or hemorrhage), specific vascular territory (anterior cerebral artery syndrome, middle cerebral artery syndrome etc.,) and management categories (transient ischemic attack, minor stroke, major stroke, deteriorating stroke).[2]

Stroke or Cerebro Vascular Accident (CVA) is the 3rd largest cause of death after heart disease and all cancers worldwide and the most important single cause of severe disability in people living in the community making it an important concern not only for the physiotherapist but for the entire rehabilitation team. The incidence of stroke increases dramatically with age doubling every decade after 55 years of age and the mortality rate increases in individuals of the age 65 and older.[3]

The major cause of the stroke is hypertension, heart disease, diabetes and the stroke risk is increased by 4-6 times in patients with high blood pressure (elevated above 160/95 mm of hg), cardiovascular risk increased with high elevated total blood cholestral and low density lipoprotein cardiac diseases such as Rheumatic heart vascular disease, Endocardities and cardiac surgery.[4]

Most stroke recovery occurs in the first 2 to 3 months, but recovery can continue for many years. Recovery is most rapid in the first 3 months following stroke, but continued improvement at a slower pace often is seen beyond the first year. Motor recovery tends to reach plateau more quickly than functional recovery. Over 50% of patients with upper limb paresis resulting from stroke face long -term impaired arm function and ensuring disability in daily life. Different approaches are used in this field of rehabilitation. One of them takes the form of neurologic facilitation intervention, which is designed to bring about changes in the underlying neural structure affected by stroke, such as neuro-developmental treatment, motor relearning approach and more recently, constraint induced movement therapy.[5]

This study aims to evaluate a new therapy for improving arm function in acute stroke patients based on mental practice theories and functional task oriented training and to study the predictors for a positive treatment results. Movement imagery has emerged, targeting the cognitive processes associated with enhanced motor performance and specific skilled movement in healthy persons[5]. Human have the ability to generate mental correlates of perceptual and motor events without external stimuli. This cognitive operation can be performed in different modalities such as visual, auditory, tactile, kinesthetic, olfactory, and gustatory or any combination of these senses. For instance mental rotation is a form of movement imagery in which subjects have to rotate a geometric figure mentally in order to identify its shape.[6]

The process of imagining a movement and the act repeating the imagined movements several times with the intention of learning a new ability or perfecting a known skill. Thus mental imagery will refer to a specific cognitive operation, whereas mental practice will designates a training method that can use various cognitive processes including motor imagery.[6] The purpose of the study is to find out the effect of mental imagery training in improving motor functions and daily activity performances in post stroke patients.

Methodology

Thirty subjects of both genders were included in the age up to 60 years who were medically stable, able to communicate properly, and diagnosed with unilateral cerebral infarction. Subjects with severe additional impairments prior to stroke, causing persistent disability and patients with cognitive and perceptual impairments were excluded. The study was cleared by institutional review board and all participants signed an informed consent prior to participation. The subjects were randomly divided into 2 groups 15 in each (experimental group and control group).

The subjects in the experimental group were provided training in the mental imagery program and the functional retraining. The difficult level of each set of task was organized in ascending order. The training for the easiest task set was covered in the first week. The training for the most difficult set was covered in the third week. Patients received one hour conventional physiotherapy sessions for training in walking and for general muscle strengthening 5 days a week at a different time of a day to minimize the fatigue.

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In the mental imagery program, patients were trained in the technique of mental imagery to practice specific tasks. In the first week, the focus was on analyzing task sequence to facilitate the motor planning and problem identification process using computer generated pictures and movies. In the second week, patient identified their own problems for rectification through the use of mental imagery picture cards depicting the task sequence were used if the patients needed help in recalling the steps. In the third week, the focus was on the practicing the rectified task performance using mental imagery and actual practice.

The subjects in the control group were given one hour routine physiotherapy which includes stretching of the affected limb muscles, walking, general strengthening exercise and active assisted and active exercises. Both groups received training for one hour per day for 5 days/week. Fugal Meyer motor assessment (FMS) scale and 7-point Likert scale were used as outcome measures for both groups before intervention and after intervention.

Data Analysis

There were 30 subjects with the mean age of 55.7 years. 12 subjects were right side affected and 20 were males. The data analysis was computed with SPSS-17. Wilcoxon signed ranks test was used to test the significant difference within the groups and Mann Whitney U test was used to test the significant difference between groups. The level of significance is fixed at 0.05 for all analysis.

Table-1: With in group analysis of score for both outcome

Outcome	Intervention		Mean	z Value	p Value
FMS Scores	Conventional Physiotherapy	Before	43.46	52.209	.000
		After	62.66		
	Mental Imagery Training	Before	43.33	101.69	.000
		After	82.86		
7-Point Likert Scale	Conventional Physiotherapy	Before	22.06	63.721	.000
		After	42.13		
	Mental Imagery Training	Before	22.93	10.205	.000
		After	73.46		

Table-1 shows within group analysis of both outcome measures by Wilcoxon signed ranks test. There is statistically significant difference in both groups after intervention in both outcome measures. The post intervention values of both groups were analyzed by Mann Whitney U test for significant difference between groups. Table-2 shows the analysis of post intervention values. There is significant difference between groups after intervention with more improvement in both outcome measures in the Mental imagery group compared to conventional group.

Table-2: With in group analysis of score for both outcome

Outcome	Intervention	Mean	Z Value	P Value
FMS Scores	Mental Imagery Training	82.86	37.99	.000
	Conventional Physiotherapy	62.66		
7-Point Likert Scale	Mental Imagery Training	73.46	3.871	.000
	Conventional Physiotherapy	42.13		

Discussion

The results of our study suggest that mental imagery training is more effective with conventional therapy than conventional therapy alone. This study does not include a true control group which may prove the effect of time and natural plasticity mechanisms of central nervous system.

Use of mental practice in physical rehabilitation may be a cost efficient means to promote recovery after damage to the central nervous system which needs further research. Regularly applying this technique in training and completion is called mental practice combining mental practice training principles with active movement training appears more beneficial than mental practice training alone[7].

Brain activity during mental imagery task could result from motor simulation. Somatotopic organization provides one means to distinguish between the two high-level representations of plans for actions or targets of movement do not have to be somatotopically organized. Thus if a Mental imagery task leads to motor simulation activity during that task should be somatotopically organized. Indirect evidence comes from electroencephalographic studies, which have measured the surface electrical activity during imagined left and right hand movements, and found evidence for lateral organization[8,9].

Conclusion

This study concludes that cortical reorganization and functional improvement were seen following mental practice with Mental imagery training along with conventional physiotherapy.

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