Original Research Paper

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Physiotherapy

EFFECT OF PHYSICAL PRACTICE AND MENTAL PRACTICE VERSUS PHYSICAL PRACTICE ON DORSIFLEXORS IN IMPROVING BALANCE IN SUB-ACUTE STROKE PATIENTS: A COMPARATIVE STUDY

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ABSTRACT Balance is a common impairment in individuals with stroke. Impaired balance can lead to falls.Hence an intervention is needed to accelerate improvement in balance.

Aim: of this study was to compare the combined effect of mental practice along with physical practice and only that of physical practice in stroke patients. In this study 32 stroke patients divided into two groups i.e. conventional and experimental. Subjects were screened for balance using modified dynamic gait index, voluntary control and functional reach test. Outcome measures were evaluated prior to the interventions and after 20 sessions. The conventional group was given treatment in the form of exercise only. The experimental group was given mental practice in the form of Mentamove therapy along with exercises. The intervention was given for 20 sessions and at the end of intervention, outcome measures were evaluated again.

Results: There was significant improvement seen after intervention in both the groups on all the outcomes. There was no significant difference in the balance improvement in both the groups on all the outcomes.

Conclusion: It was concluded that physical practice and the combination of physical and mental practice both groups showed improve in balance in stroke patients.

KEYWORDS : balance, m DGI, Mental Practice, Forward reach test

INTRODUCTION

"Stroke" is a functional activity limiting disorder. The brain damage caused by a stroke may result in the loss of cerebral function.[1]

Majority of stroke survivors continue to live with disabilities and the costs of ongoing rehabilitation and long term-care are largely undertaken by family members which impoverish their families. The incidence rate is 119-145 per 100,000 based on the recent population based studies..[2]

In stroke, along with other focal deficits, there are balance abnormalities which lead to increased risk of fall.[3]

As in stroke patients because of spasticity&/ tightness of tendo achilles ,dorsiflexor weakness affect ankle strategy. Gait deficits include reduced propulsion at push-off, decreased hip and knee flexion during the swing phase, and reduced stability during the stance phase. This leads to impaired balance in stroke patients and increases high risk of falls.

It has been established that, stroke patients present with more postural sway, asymmetric weight distribution, impaired weight-shifting ability and decreased stability capability.[4] This will increase more dependency on care takers. Correcting these factors may help us to enhance balance and prevent falls in hemiplegic individuals.

Thus, the area needs more attention and exploration from physical therapists.

The term "Plasticity" refers to the capacity of the CNS to adapt to functional demands and therefore to the system's capacity to reorganize. Results suggest that specific training to induce motor learning can shape subsequent reorganization in the undamaged motor cortex and that this may play an important part in functional recovery.[5] Learning new motor skills with an intact Central Nervous System (CNS) and regaining skill after a lesion of the CNS are similar in many aspects. Many repetitions are required for an individual to become skilled in a complex motor task. Repetition of movements that are too easy or of a non-meaningful task is insufficient to produce long-term neural reorganization.[6]

Mental practice (MP), also known as "Mental Imagery," is a technique by which physical skills can be cognitively rehearsed in a safe, repetitive manner.[7] It has been effective in enhancing motor performance, specifically in sport, dance and music.[8]

Even a case study conducted on post stroke patient showed that there is increase in gait speed and knee range of motion.

Mentamove is the device, which is highly sensitive electromyography initiated muscle stimulator Mentamove uses mental practice of motor skills,.[19] It is an extension of mental imagery, in that; it combines the psychological aspect of generating the mental image with feedback from the performance of the physical skill.[9]

In order to accelerate balance improvement, this study was designed to compare effect of physical practice with mental practice and physical practice on dorsiflexors to improve balance in sub-acute stroke patients.

EXPERIMENTAL HYPOTHESIS

There will be difference between the effect of only physical practice and combination of physical & mental practice in improving balance.

AIM

To compare the effect of physical and mental practice versus only physical practice on dorsiflexors to improve balance

OBJECTIVES

1. To assess the effect of physical practice on dorsiflexors to improve balance.
2. To assess the effect of physical and mental practice on dorsiflexors to improve balance.
3. To compare the effect of physical and mental practice and only physical practice in improving balance.

MATERIALS AND METHODOLOGY

TYPE OF STUDY: Experimental design

STUDY POPULATION: Individuals with stroke

INCLUSION CRITERIA:

1. Subacute stroke (>1month,<2 year)
2. Patient should be able to complete 6.1meters walk distance. Walking with or without assistive device
3. Voluntary control for ankle joint 2 to 4
4. Functional reach test distance covered should be less than 15cm

EXCLUSION CRITERIA:

1. Affection in cognition, perceptual and psychiatric disorders
2. Recurrent stroke
3. Visually challenged individuals
4. Any neurological disorder other than stroke
5. Sever TA contracture
6. Vestibular dysfunction
7. Symptomatic lower limb disorder

MATERIALS

- Outcome measures

1. Modified dynamic gait scale
2. Functional reach test

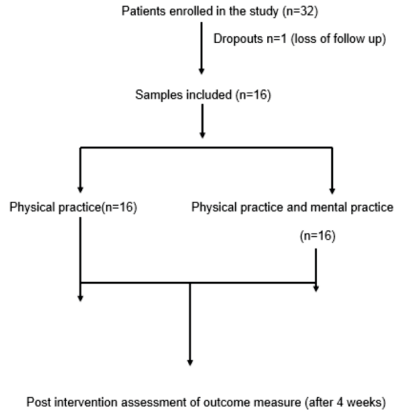
- Patient's record sheets
- Goniometer
- Measuring tape
- Stop watch
- Mentamove machine with electrodes
- Foot rest
- Chair with back support

Mentamove with electrodes

Stop watch

STUDY SETTINGS: Physiotherapy OPD, Patient's home
SAMPLING TECHNIQUE: Simple random sampling
SAMPLE SIZE: 32 subjects

FLOW CHART OF OUTCOME ASSESSMENT AND INTERVENTION



METHODOLOGY

The clearance from the ethical committee was taken. The subjects were screened according to the inclusion, exclusion criteria. An informed written consent was taken from the subject. The entire procedure was explained to the subject. The subjects were randomly allocated to any one group amongst the two groups.

Before the initiation of intervention outcome measures i.e. Functional Reach Test, Modified Dynamic Gait Index, and Voluntary control were assessed. After 4weeks patients were reassessment on same outcome measures were taken.

The subjects allocated in the experimental group i.e. group A performed physical practice and mental practice the subjects .They performed physical activity like, reaching forward, laterally, standing on one leg (affected leg), standing with eyes open then with eyes closed, forward lunges, perturbations with eyes open; then with eye closed, tandem standing, TA stretching, gait training, active movements of hip and knee muscles. The subjects performed 10 -15 repetitions, 5 days per week for 4 week. Mental practice in the form of Mentamove was given to participant for 20 minutes to dorsiflexors (tibialis anterior muscle), with 9 contractions for each muscle per session. It was given for 5 days per week for 4 weeks.[10]
Position of the patient sitting in chair with feet supported.

Regular verbal cues were given to the subject in the form of "please relax", "imagine that you are taking the foot upwards". While the verbal cues were given when the participant reached the mental threshold (offset value), participant perceived current along with a movement of the muscle. 9 contractions were given in each session.

After 4weeks of intervention were evaluated again by using functional reach test, Modified dynamic gait index, Voluntary control of ankle joint.

Data was then analyzed using appropriate statistical test. SPSS version 19 was used for analysis.

Graph No. I Comparison of age in years

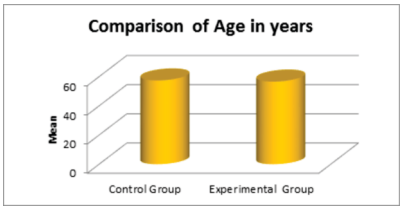


Table No. I Comparison of Gender

	Control group	Experimental group
Female	6	5
Male	10	11

Table No.II Comparison of Voluntary control before intervention

	Control Group	Experimental Group	Mann-Whitney Z test	P value
Mean	3.06	2.94	0.526	0.599 NS
Standard deviation	0.680	0.680		

Table No. III Intra & intergroup Comparison of Voluntary control

Voluntary control	Control Group		Experimental Group		Mann-Whitney Z test	P value
	Mean	SD	Mean	SD		
Pre	3.06	0.680	2.94	0.680	0.526	0.599 NS
Post	3.88	1.025	4.13	0.885	0.735	0.463 NS

Table No. IVTotal score of Modified Dynamic Gait Index scale before intervention

Total mDGI	Control group	Experimental group	Mann-Whitney Z test	P value
Mean	3.06	2.94	1.627	0.104NS
Standard Deviation	0.680	0.680		

Table No. V Total score of Modified Dynamic Gait index scale

Total mDGI	Control Group		Experimental Group		Mann-Whitney Z	P
	Mean	SD	Mean	SD		
Pre	3.06	0.680	2.94	0.680	1.627	0.104 NS
Post	3.88	1.025	4.13	0.885	1.231	0.218 NS

Table No. VI Comparison of time in mDGI scale

Time	Control Group		Experimental Group		Unpaired T test	P value
	Mean	Sd	Mean	Sd		
Pre	10.13	1.628	9.63	1.857	0.810	0.424 NS
Post	13.38	2.217	12.31	2.182	1.366	0.182 NS

Table No.VII Comparison of gait in mDGI scale

Gait	Control Group		Experimental Group		Mann-Whitney	P
	Mean	Sd	Mean	Sd		
Pre	14.88	2.062	13.81	1.834	1.583	0.113 NS
Post	19.06	1.948	18.19	1.974	1.282	0.200 NS

Table No. VIII Comparison of level of assistance in mDGI scale

Level of asst	Control Group		Experimental Group		Mann-Whitney Z	P
	Mean	Sd	Mean	Sd		

Pre	11.81	2.007	10.81	1.682	1.734	0.083 NS
Post	13.31	1.493	13.25	1.183	0.295	0.768 NS

Table No. IXFunctional reach test before intervention

FRT	Control group	Experimental group	Unpaired T test	P value
Mean	11.38	11.56	0.297	0.769NS
Standard deviation	1.928	1.632		

Table No. X Comparison of Functional reach test

FRT	Control Group		Experimental Group		Unpaired t test	P value
	Mean	SD	Mean	SD		
Pre	11.38	1.928	11.56	1.632	0.297	0.769 NS
Post	14.06	1.914	15.25	1.949	1.739	0.092 NS

Graph I,table II,IV & IX show that both groups were at same baseline level with repect to their age,gender,voluntary control,Mdgi score and fuctional reach test before intervention

Table no. III,V,VI,VII,VIII,Xshow comparison of voluntary control,mDGI ,components of mDGI and functional reach test pre and post intervention. There was a significant improvement in all these outcomes in both the group after the intervention. But there was not statically significant difference in the improvement after intervention between both the groups.

DISCUSSION

The main focus of the study was to compare the effect of physical and mental practice (experimental group) and only physical practice (control group) in improving balance in sub-acute stroke patients.

Improvement seen in both groups after intervention could be due to physical intervention. Improvement seen due to physical activities can be attributed to motor learning and neuroplasticity.

Another mechanism that could improve the values of outcome measure is due to neuroplasticity reorganization.[11]

Outcome measures used in this study were Modified dynamic gait index, Functional reach test and voluntary control of ankle joint, which showed that there was no statically significant difference in the improvement after the intervention in both the groups. Mental practice used in experimental group did not show any additional effect of balance in stroke patients.

Previous studies which showed positive result of mental practice on ankle dorsiflexors was conducted on healthy elderly individuals with normal muscle tone. In stroke patients plantarflexors are spastic and dorsiflexors are weak. Dorsiflexors lack in strength to overcome the spasticity of planterflexors.[12] Therefore maintenance of strength of the dorsiflexors and plantarflexors muscles as well as adequate ankle range of movement is necessary to allow efficient force generation.

Functional reach test which assess dynamic balance is in standing position which is a weight bearing position.

In this study Modified dynamic gait index scale was used to assess balance Paresis or weakness is a primary neuromuscular impairment affecting the number, type and discharge frequency of motor neurons that is essential for force production during gait.

As per previous studies, to improve balance paresis of other muscles groups like plantar flexors, quadriceps, hip flexors, hip abductors, hip extensors and, even spasticity, hip and stepping strategy should also be taken in consideration.

In this study mental imaginary was given in non-weight bearing position, transfer of training might have not occurred. practice
As patients were in sitting position they were not able to see the joint during mental practice.

Even number of sessions given in this study may not be sufficient to see significant effect of mental practice for lower limb muscles in stroke patients. Hence mental practice given in experimental group did not show additional effect on balance in stroke patients.

it was concluded that both the treatment strategies physical and combination of physical and mental practice were equally effective.

Conclusively, Both the treatment strategies physical and combination of physical and mental practice were equally effective. The mental practice used in experimental group did not show any additional effect on the balance.

Balance is major issue to tackle in stroke patients. Along with intervention in the form of physical exercise, mental training which should be task specific can be used as an adjunct to improve balance. Longer duration of mental practice may help in improving balance.

Limitations

1. Specific age group was not considered, there was wide interval of age groups
2. Mentamove was used for shorter duration.
3. Lifestyle and occupation was not considered in the study.
4. Type of personality of the subject was not considered.

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