



EFFECT OF MENTAL IMAGERY ALONG WITH CONVENTIONAL PHYSIOTHERAPY ON DYNAMIC BALANCE IN INSTITUTIONALISED ELDERLY INDIVIDUALS : AN EXPERIMENTAL STUDY.

Physiotherapy

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ABSTRACT

Background -The incidence of falls & falls related injuries is high among institutionalized elderly as compared to community dwelling elderly population. The most common problem in elderly population is reduced balance and lack of postural control which is leading to increased risk of falls & instability during walking. This population needs to be both physically and mentally healthy for a better quality of life. Studies have shown that ageing leads to neurological changes so that it is affecting person's physical and mental abilities.

Objectives – To compare the effect of mental imagery and conventional treatment on dynamic balance in institutionalised elderly individuals.

Material and method – The present study was conducted in Pune, India. 100 subjects from institutionalised elderly were assessed as per inclusion, exclusion criteria and randomly allocated in two groups. Subjects in Group-A (n=50) received conventional physiotherapy. Subjects in Group B (n=50) received mental imagery along with conventional physiotherapy. Both the group received 12 sessions of intervention (3sessions/week) in 4 weeks. Dynamic balance was assessed by using TUG, FSST. The data was analysed by using Mann-Whitney rank sum test.

Results - All outcome measures were homogenous at baseline ($p>0.05$). Intragroup & intergroup analysis revealed significant changes in outcome parameters ($p<0.05$), and experimental group was better than control group.

Conclusion - This study concluded that that mental imagery along with conventional physiotherapy has a better effect in improving dynamic balance than conventional physiotherapy alone in institutionalized elderly individuals.

KEYWORDS

Mental imagery, Dynamic balance, Institutionalised elderly individuals

INTRODUCTION:

Elderly population is increasing constantly over the years in India. Elderly population is suffering and facing number of health problems in which falls are most common which leads to injury, trauma, dependency & sometimes death in considerable population^{1,2}. The incidence of falls & falls related injuries is high among institutionalized elderly as compared to community dwelling elderly population.^{3,4} A cross sectional study among adult men and women aged 60 and above in northern India reported that 52% of subjects fell in the past years suggesting a high burden. The prevalence of falls in hospitalized or institutionalized Indian women was also very high, 45 to 64%.⁵

Maintenance of balance function is essential to stay physically active in life.⁶ Balance is required for maintaining a position for remaining stable while moving from one position to another. While performing acts of daily living & moving freely in community⁷

Balance is a complex motor task involving the detection and integration of sensory information to access the position and motion of the body in space and the execution of appropriate musculoskeletal responses to control body position within the context of the environment and task. Thus, balance control requires the interaction of the nervous and musculoskeletal systems & contextual effects.⁸

Elderly population needs to be both physically and mentally healthy for a better quality of life. Studies have shown that ageing leads to neurological changes so that it is affecting person's physical and mental abilities. There are various strategies used by the physiotherapist to promote healthy ageing. Elderly populations are frequently referred to physiotherapy treatment to improve balance control and decrease risk of falls. Mental imagery is one of these strategies used in rehabilitation as it has been found to have benefits when combined with physical practice.⁹

Mental imagery (MI) is defined as “the mental representation of movement without any movement”¹⁰. In simple concept it is visualizing an action without performing the movement. The subject in turn uses his memory to save strategies of the action. An age related deterioration of the peripheral sensory systems combined with poorer central integrative mechanisms could explain this increased amount of attention required to perform postural tasks (Teasdale et al., 1991, 1993)^{11,12}.

At present as per census of 2014, 14% of the elderly are living alone or

institutionalised. Studies have proved that there is increase in risk of fall and fall related injuries more in institutionalised elderly as compare to elder population staying at home. Dynamic balance tasks have shown a greater sensitivity to the age-related increase in the attentional cost of balance (Boisgontier et al., 2013)¹³. In addition, more and more balance training programs administered to seniors include dynamic postural exercise. Thus, investigating postural control in such dynamic context may be more relevant to falls.

MATERIAL AND METHODS:

- 1. Study design :** Experimental Study.
- 2. Study population :** Institutionalised elderly individuals.
- 3. Study area :** old age homes in Pune, India .
- 4. Sampling method :** convenient sampling
- 5. Allocation method :** Computerised randomisation.

6. Sample size : 100 (50 in each group) Sample size was determined based on prior estimates (prior study) of mean scores average time for TUG for the elderly, considering type I error (α) = 0.05 type II error (β) = 10%. i.e power of the test = 90% , confidence interval = 95, formula used : $n = (Z)^2(SD)^2 / d^2$. Prior written informed consent was taken by the participants.

7. Materials required: consent form, Stationary, Audiotape, stopwatch, chair, balance pad, 4 canes, measuring tape.

4. Selection of subjects:

Inclusion Criteria- Both males and females, MMSE score ≥ 24 , GDS score ≤ 9 Age 60-75 years old, Able to walk with or without assistive devices, Berg balance score more than 21, Manual TUG score more than 10 sec, Betts Questionnaire upon mental imagery min score 4 in all questions.

Exclusion criteria: - Individuals having any neuromuscular, cardiovascular conditions. Individuals having uncorrected visual, auditory and cognitive problems that would interfere with understanding instructions and/or execution of the task.

5. Tools of the study: Mini mental scale, GDS & Betts Questionnaire was used while recruiting the subjects in the study. Timed up and go test & four square step test was used to access dynamic balance in institutionalised elderly.

6. Ethical Consideration: Ethical approval was obtained from the Institutional ethical committee. Prior written consent was taken from the subjects who volunteered to participate in the study.

Procedure:

Subjects were screened and consent was taken and divided into 2 groups.

Group (A) was treated with conventional physiotherapy & Group (B) was treated with mental imagery along with conventional physiotherapy both the groups were treated for thrice in week for 4 weeks. Post 4 weeks subjects will be assessed using Time up and go test and four square step test.

Protocol: conventional exercises was composed of flexibility, strengthening and balance exercises. And progression for every individual was depending on individual performance.

Mental imagery protocol:

Mental imagery (MI) protocol was pre-recorded by investigator so that, all the instruction will be standardised for every time, with respect to volume, speed and words.

MI was implemented in subjects in the experimental group in an isolated, quiet room. The MI program was composed of guided balance training. The participants will perform the MI while they are in a comfortable condition, sitting on a comfortable seat, with an armrest and backrest¹⁴

Data Processing: The information obtained from the study was analysed using the winpepi & primer of biostatistics software with the level of significance at $p < 0.05$. WINPEPI software (version 11.65) for normality by using Shapiro Wilk test and PRIMER OF BIOSTATISTICS (Version 7.0) was used for analysis of data. software was used to perform the statistical analysis of the data obtained. Since the data did not follow the normality, pre and post -test values of all the variables in experiment as well as control group using Wilcoxon sign rank test for within group comparison. The improvement in each group was taken as difference in pre and post- test values for each group and Mann-Whitney Rank Sum Test was used for in between group comparison.

RESULT:

This was institution based experimental study involving both the genders above the age group 60-75 years. The study took place in period of 1 year. During the study period, a sample of 100 were included and 240 were screened. In this study 100 samples (81 females, 19 males).

DESCRIPTIVE STATISTICS:

| | MEAN | STANDARD DEVIATION |
|-----|-------|--------------------|
| AGE | 67.91 | 4.22 |

Table 1: Pre Post mean values of TUG test for within group analysis of control & Experimental group.

| Group | TUG | Mean ± SD' | P value |
|-------------------------|------|------------|---------|
| Control group (Group A) | Pre | 14.42±1.75 | <0.001 |
| | Post | 11.38±1.71 | |
| Experimental (Group B) | Pre | 14.25±2.03 | <0.001 |
| | Post | 10.16±1.73 | |

Table 2: Pre Post mean values of FSST for within group analysis of control & Experimental group.

| Group | FSST | Mean ± SD' | P value |
|-------------------------|------|------------|---------|
| Control group (Group A) | Pre | 13.48±1.66 | <0.001 |
| | Post | 11.07±1.48 | |
| Experimental (Group B) | Pre | 12.88±2.03 | <0.001 |
| | Post | 9.63±2.02 | |

Table 3: Mean difference values of TUG Test for in between group analysis for both the Experimental & control groups.

| Group | TUG | Mean ± SD' | P value |
|--------------------|-----------------|-------------|---------|
| Experimental group | Mean difference | 4.09 ± 1.04 | <0.001 |
| Control group | | 3.04 ± 1.02 | |

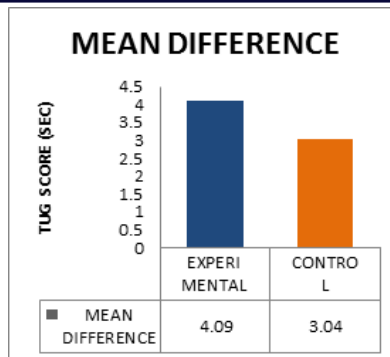
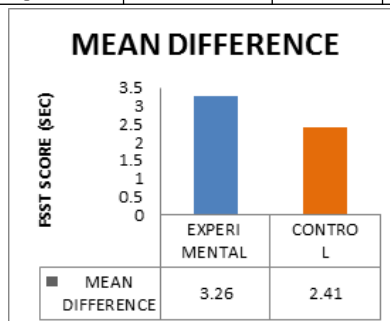


Table 4: Mean difference values of FSST for in between group analysis for both the Experimental & control groups.

| Group | TUG | Mean ± SD' | P value |
|--------------------|-----------------|------------|---------|
| Experimental group | Mean difference | 3.26± 1.01 | <0.001 |
| Control group | | 2.41± 0.70 | |



DISCUSSION:

Results in this study showed that Experimental group (received conventional PT with additional MI) produces a significant improvement which was greater than Control group (conventional PT alone) enhancing dynamic balance in institutionalised elderly individuals. This is in accordance with Young-Hyeon Bae et al.¹⁴ al conducted study on An efficacy study on improving balance and gait in subacute stroke patients by balance training with additional motor imagery: a pilot study, the results of the study showed that After completion of the 4-week intervention. Changes in the Timed Up and Go test, Functional Reach Test, and Four Square Step Test scores after intervention were significantly higher in the experimental than in the control group. Hence author concluded that Specific balance training with additional motor imagery may result in better rehabilitation outcomes of gait and balance ability than balance training alone. Possible reason could be MI recruits cerebral substrates controlling the actual preparation and execution of the movement including primary somatosensory and motor cortices (Munzert et al., 2009)¹⁵. In several experiments, subliminal muscle activations were detected during MI.

Meta-analysis on effect of motor imagery on brain structures conducted by Hetu et al. (2013)¹⁶ provided evidence that motor imagery activates motor-related brain networks including large frontoparietal and subcortical regions involved in motor execution. Several studies provided evidence that motor imagery increases excitability in corticospinal tracts which projects directly to motoneurons and their interneurons controlling the muscles.

Thus, the findings of the present study and previous studies when compiled together prove that mental imagery along with conventional physiotherapy was more effective in improving dynamic balance in institutionalized elderly individuals.

CONCLUSION:

This study concluded that that mental imagery along with conventional physiotherapy has a better effect in improving dynamic balance than conventional physiotherapy alone in institutionalized elderly individuals.

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