



“Comparison Of Pelvic PNF And Lower Limb Strengthening Protocol For Prevention Of Fall In Post Menopausal Women”

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Abstract:

Background

One of the most well-known physiological effects of menopause is hormonal changes. Women's hormone levels decrease year by year during menopause, following which they are more likely to experience many changes as a result of this hormonal imbalance. Estrogen reacts directly and indirectly over muscle and results in condition leading to muscle loss, that brings about which in turn results in restrictions in physical abilities, muscle strength, and balance accelerating their risk of falling. Therefore this study compared fall prevention techniques in postmenopausal women by incorporating proprioceptive neuromuscular facilitation (PNF) and exercises utilizing elastic bands.

OBJECTIVES - To find out effect of pelvic PNF and lower limb strengthening to improve balance and strength for fall prevention.

METHOD- It is a control group experimental study with a pre-test and post-test design. total no. of 24 postmenopausal women of age 45 to 65 were included in the study, Pelvic PNF along with lower limb PNF was administered to Experimental Group whereas lower limb strengthening was given to Control group. Along with the above intervention, home based exercises was also provided. All the subjects in the study underwent a basic assessment and then they were randomly assigned into one of two groups, the 4-week treatment plan of 3 sessions per week for 30-35 minutes was given.

RESULT

After the 4 week PNF and elastic band exercise, both the experimental group and control groups showed statistically significant differences within the groups, except for POMA in the control group that showed no significant results. FTSTS in experimental group with p value (0.008*) and in control group with p-value (0.000*). POMA with p value (0.02*) within experimental group showed

<p>CC License CC-BY-NC-SA 4.0</p>	<p>significant results and POMA with p value (0.152) within control group showed no significant results. EFST with p value (0.005*) and (0.005*) showed significant result with in experimental and control group respectively. There was no significant difference between the two groups in the scores of EFST, POMA and FTSTS ($p > 0.05$).</p> <p>CONCLUSION Given the findings of the present study, Pelvic PNF and elastic band exercise should be recommended as a practical approach in order to improve strength, balance and reduce fall in postmenopausal women.</p>
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INTRODUCTION

Hormonal changes are one of the most well-known physiological effects of menopause. Typically occurring between the ages of 45 and 55, natural menopause is characterized by a decrease in ovarian follicle activity. During this time, women experience a gradual decline in hormone levels, leading to various changes caused by hormonal imbalances. One direct consequence of these imbalances is the impact on muscles, particularly due to the decrease in estrogen. This can result in muscle loss, changes in basal metabolic rate (BMR), body mass, and distribution, ultimately leading to limitations in physical abilities. As a result, muscle strength and balance decline, increasing the risk of falling.

While there are multiple factors that can predict falls, reduced balance and strength, along with impaired mobility, have consistently been identified as the primary risk factors. To address this, a study compared fall prevention techniques in postmenopausal women by incorporating proprioceptive neuromuscular facilitation (PNF) and exercises utilizing elastic bands.

METHODS

This study employed a control group experimental design with a pre-test and post-test approach. The participant pool consisted of 24 postmenopausal women aged between 45 and 65, who had been diagnosed with a high risk of falling and had a body mass index (BMI) ranging from 25 to 30 kg/m².

The study began with a baseline assessment of all the subjects. Subsequently, the participants were randomly assigned to one of two groups:

1. Group A - Experimental Group (n=12): This group received pelvic proprioceptive neuromuscular facilitation (PNF) exercises in addition to lower limb PNF diagonal patterns.
2. Group B - Control Group (n=12): This group underwent lower limb strengthening exercises using elastic bands (specifically yellow and blue bands). The exercises included lower extremity flexion and extension, adduction and abduction of the hips, mini squat knee extension, leg press, and ankle dorsiflexion and plantarflexion.

The study duration was 4 weeks, during which the participants attended three sessions per week, each lasting 30-35 minutes. In addition to the supervised sessions, the participants were also provided with home-based exercises as part of a comprehensive fall prevention strategy.

OUTCOME MEASURES

The study assessed the treatment responses by conducting evaluations before and after the 4-week study period. At the beginning of the treatment, the demographic and clinical characteristics of the patients were recorded. The fall risk of the patients was evaluated using the Elderly Fall Screening Test (EFST) parameter. The participants' balance status was assessed using the Performance-Oriented Measurement Scale (POMA), and their lower limb strength was measured using the Five Times Sit-to-Stand (FTSTS) test. These assessments provided valuable information on the patients' fall risk, balance abilities, and lower limb strength, allowing for the evaluation of the treatment's impact on these parameters.

RESULT

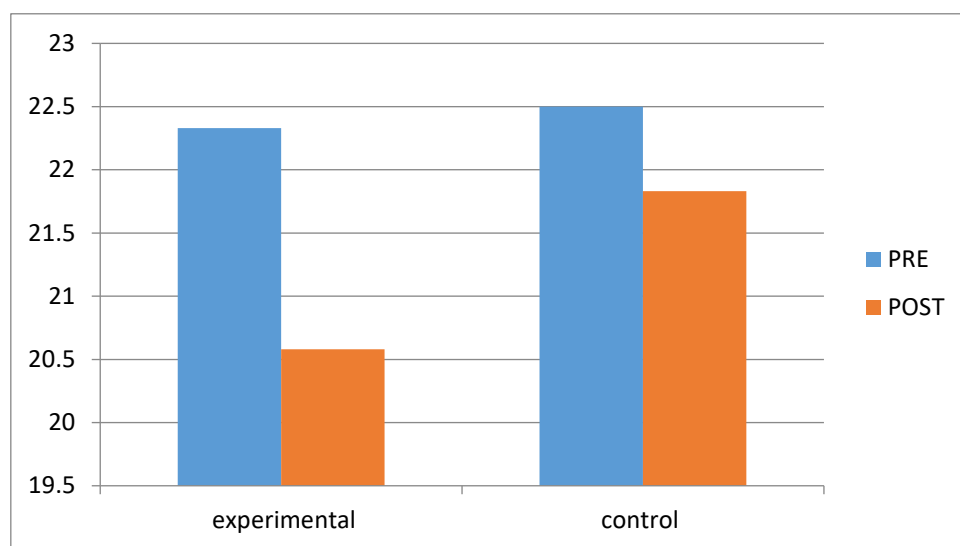
This study was done on 24 subjects who were equally divided into two groups, with 12 subjects in each group. The mean value for age in experimental and control group was 56 and 57.33 respectively. The mean value for BMI in experimental and control group was 5.46 and 5.86 respectively.

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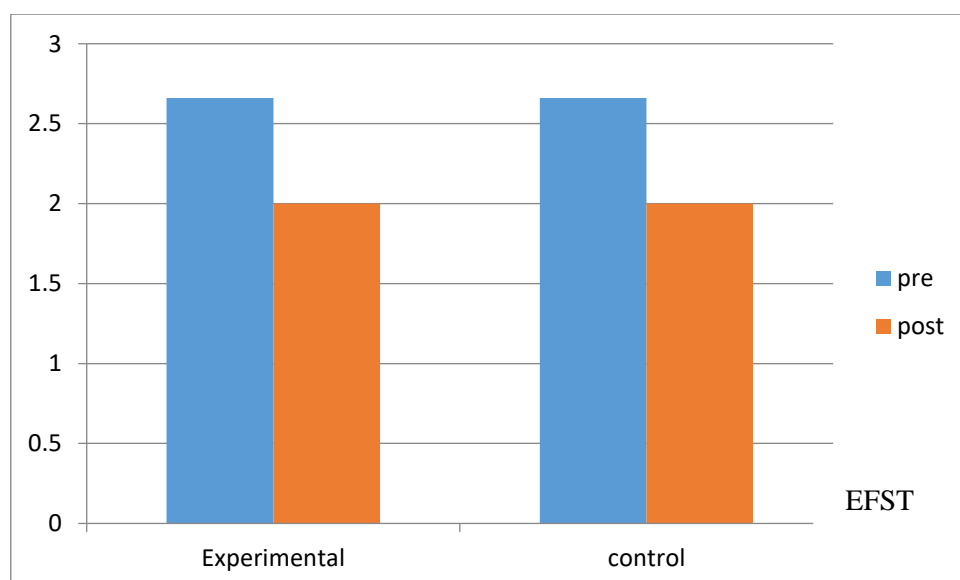
comparison was done using Paired t test to analyse FTSTS within experimental and control group and showed significant differences with p-value (0.008*) and (0.000*) in experimental and control group respectively. Independent T-test were utilized to analyze the FTSTS between the groups. At baseline it showed no significant results in FTSTS with p-value (0.896) and (0.897) and after 4th week of intervention it showed no significant differences in experimental and control group with p-value (0.372) and (0.375) respectively (graph-1)

Wilcoxon signed ranked test was used to analyse POMA and EFST within experimental and control group. and showed significant differences with p-value (0.02*) and (0.005*) in experimental group, and in control group it showed no significant difference within POMA with p-value (0.152) and showed significant differences within EFST with p-value (0.005*).

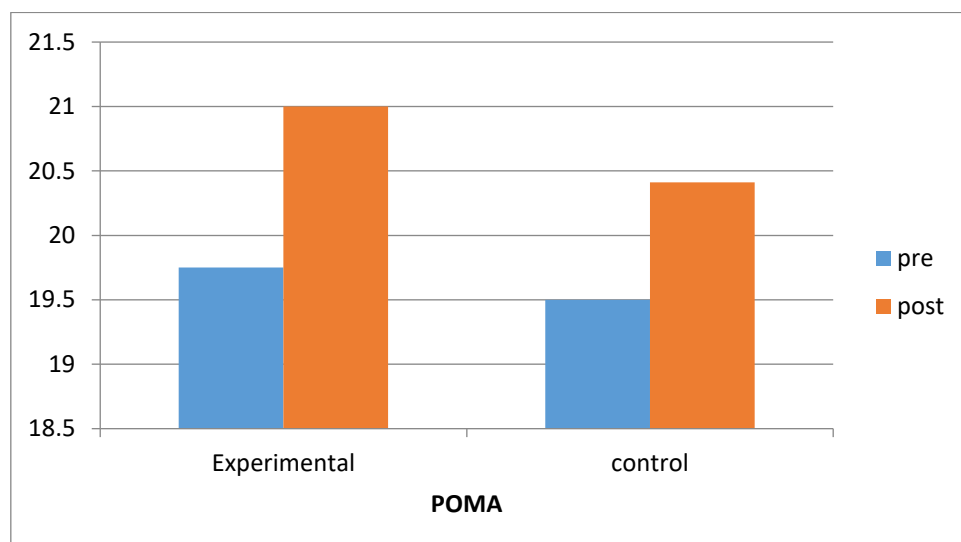
Mann whitney test was used to analyse POMA and EFST between the groups i.e. experimental and control groups at baseline and after 4th week, At baseline it showed no significant results in POMA and EFST with p-value (0.977) and (1.000) respectively and after 4th week of intervention it showed no significant differences between the groups in POMA and EFST with p-value (0.887) and (1.000) respectively. (graph 2 and graph 3)



Graph 1– Comparison of FTSTS within experimental and control group and within baseline and after 4th week



Graph 2- Comparison of EFST between experimental and control group and within baseline and after 4th week



Graph 3 - Comparison of POMA between experimental and control group and within baseline and after 4th week

DISCUSSION

The present study was primarily designed to see the effects of pelvic PNF and lower limb strengthening to improve balance and strength for fall prevention in postmenopausal women

The primary finding of the study was overall improvement in balance and strength after 4 weeks of PNF and strength training within group but no significant differences when compared between groups.

Evaluating the fall risk is crucial since falls can result in undesirable outcomes like bone damage, impairment, and limitations in daily activities. (Lord, S. R et, al 1994) This study revealed a noteworthy enhancement in the EFST parameter following treatment in both exercise groups, compared to the initial measurements. It is important to note that our study included participants with a history of fall within the past 1 year. Consequently, the improvement observed in fall risk, as measured by the EFST scale, holds significant clinical relevance. However, when comparing the groups, the difference between pre-treatment and post-treatment measurements was not statistically significant. The findings of this study demonstrate the effectiveness of both proprioceptive neuromuscular facilitation (PNF) exercises and elastic band exercises in reducing the risk of falls. The POMA (Performance-Oriented Mobility Assessment) test has been recognized as a valuable tool for evaluating balance and postural control, with high sensitivity and specificity in evaluating fall risk (Brauer et al., 2000). In other study involving females, randomization was performed to assign participants to the PNF, Pilates, and control groups. The PNF and Pilates groups underwent a 6-week treatment consisting of three sessions per week. At the conclusion of the study, significant improvements were observed in both the POMA test and FRT (Functional Reach Test) scores within the exercise groups when compared to the control group. The study proposed that PNF exercises led to a better balance between agonist and antagonist muscle activation, which subsequently resulted in enhancements in dynamic balance, stabilometric parameters, and POMA test performance (Mesquita, L. S et, al 2015) Similar to the previous studies, in our study, we also got significant improvements in EFST and POMA scale parameters in both PNF and elastic band exercise after intervention compared to baseline.

Similarly in our third outcome in Five Times Sit to Stand (FTSTS) test the result were similar to other outcomes. This is considered in a study conducted by Teixeira de Carvalho et al., the impact of Pilates and PNF (Proprioceptive Neuromuscular Facilitation) technique on muscle power enhancement was investigated. The results of the study indicated that both Pilates and PNF methods led to a significant improvement in muscle strength in the knee flexors and extensors. , the increase in strength observed in the group trained with PNF exercises can be attributed to the basic principles of the technique, which involve the utilization of neural muscle receptors. PNF exercises aim to activate and recruit a greater number of motor units in series, leading to increased muscle activation and subsequent improvements in muscle strength. By incorporating techniques that stimulate neural receptors, such as the stretch reflex and other proprioceptive feedback mechanisms, PNF exercises promote enhanced neuromuscular activation and coordination, resulting in increased muscle strength over time. Study done by Paulo et, al. have shown the importance of resistance training programs to gain strength. The findings of the study align with the notion that a 4-week intervention period is adequate to attain muscle strength gains in both PNF and strength training techniques. However, it is worth noting that the

magnitude of muscle strength gains differed between the two approaches, despite the lack of a statistical difference between the investigated groups. This suggests that while both PNF and strength training can lead to improvements in muscle strength, the extent of those improvements may vary. Other factors, such as individual differences in response to training or the specific nature of each technique, could contribute to the observed differences in muscle strength gains.

CONCLUSION

Postmenopausal women are at increased risk of falling. Therefore, non-pharmacological approaches are recommended due to low-risk and accessibility. Given the findings of the present study, Pelvic PNF and elastic band exercise should be recommended as a practical approach in order to improve strength, balance and reduce fall in postmenopausal women.

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