A Comparative Study of Proprioceptive Exercise Versus Rhythmic Stabilization Technique (Pnf) On Knee Osteoarthritis Patients

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***Abstract*—Aim: This study aims to compare the effectiveness of proprioceptive exercises versus rhythmic stabilization technique on knee osteoarthritis patient. Background: Osteoarthritis of the knee causes pain, joint issues, reduced proprioceptive accuracy which affects the quality of life. Recent studies shown that reduced proprioceptive accuracy plays role in the development and worsening of knee OA. The need of the study is to determine how effective proprioceptive exercises and rhythmic stabilization techniques for knee osteoarthritis patients in reducing pain and improving their functional abilities. Study Design: Experimental study with pre and post comparative type. Materials and Method: Once the study is approved by the Institutional Review Board, 30 patients both male and female were selected from clinical diagnosis of knee OA Grade 1, Grade 2 radiologically. The study setting was in Chennai. The source population includes person Age group between 40-70, person with Primary osteoarthritis with symptoms more than 3 months and no contraindication to exercise or significant comorbidities. The study population excludes Any history of knee, hip, ankle surgery prior to study, Peripheral vascular disease, mentally retarded patients, recent injury at knee joint. subjects were assessed by using Berg balance saleswoman and VAS SCALE. Result: The Result of the study shows that rhythmic stabilization (PNF) is effective in reducing pain and improving functional outcomes in OA knee patients.**

***Index Terms*—Osteoarthritis, Proprioceptive Neuromuscular Facilitation (PNF), WOMAC Scale, VAS Scale, Berg balance scale.**

I. INTRODUCTION

Knee Osteoarthritis is a chronic degenerative disorder prevalent in India, characterized by various structural and biochemical changes in joint tissues. [1]. This complex disorder involves several factors, including genetic traits, obesity, injuries, and repeated stress on the joint.[2][3] OA is classified into two types: Primary OA occurs due to aging and genetic factors. And Secondary OA results from factors like trauma, obesity, metabolic disorders .Knee OA is one of the most common causes of physical disability in adults and the elderly is knee OA [4].The clinical features of OA knee include Aching pain in the knee[5] , Morning stiffness [6] , Reduced range of motion and flexibility in the knee, Reduced range of motion and flexibility in the knee, A grinding or popping feeling in the knee, swelling or fluid around the joint, and knees that appear to bend inward or outward.

Management of knee osteoarthritis encompasses Weight reduction, physical activity, and rehabilitation therapies [7], Pain relievers, NSAID, and corticosteroid injections direct [6], Techniques like acupuncture, massage may offer further pain relief [8] and Procedures such as arthroplasty or osteotomy could be required for advanced OA [9]

Individuals with knee osteoarthritis can enhance their functional capabilities and experience reduced discomfort by engaging in proprioceptive exercises and the rhythmic stabilization technique referred to as PNF.Research indicates that proprioceptive exercises can boost functional ability, decrease pain, and enhance mobility, balance, and neuromuscular control [10]. On the other hand, the PNF rhythmic stabilization technique employs specific movement patterns to enhance neuromuscular control and joint stability. Studies have demonstrated that it can improve proprioception, joint stability, and reduce stiffness and pain [11]. The aim of the study is to compare the effectiveness of proprioceptive exercises versus rhythmic stabilization technique on knee osteoarthritis patient.

II. MATERIALS AND METHODS

Once the study is approved by the Institutional Review Board, 30 patients both male and female were selected from clinical diagnosis of osteoarthritis of knee Grade 1, Grade 2 radiologically. The study setting was in chennai. The source population includes person Age group between 40-70, person with Primary osteoarthritis with symptoms more than 3 months and no contraindication to exercise or significant comorbidities. The study population excludes Any history of knee, hip, ankle surgery prior to study, Peripheral vascular disease, mentally retarded patients, Any recent injury at knee joint. All the subjects were assessed by using Berg balance scale,WOMAC and VAS SCALE.

Group - A

The participants were given the proprioceptive exercise along with hot moist pack.

Group -B

The participants were given rhythmic stabilization technique along with hot moist pack.

The intervention included the proprioceptive exercise and rhythmic stabilzation technique for whole lower limbs in Group A and Group B participants, respectively.

Prorioceptive Exercise

Exercises included i) One leg balance - It involve standing on affected foot with relaxed, upright posture and other leg flexed at knee, hip and ankle.ii) Blind advanced on leg balance - it was same like one leg balance , except eye closed while performing.iii) Toe walking – here the participants was made to walk for 20 m distance up on the toe pointing straight ahead , then walk with toes pointing out ward.iv) Heel walking – walking for 20 min, on heels, first with the toes pointing out, and then inward.

Duration

1 minute with 10 to 20 second rest. Carried out daily on three days each week for a total of 12 weeks.

Rhythmic Stabilization Technique (PNF)

Two sets of five hold-relax technique repetitions are provided. Participants were placed in a supine position with their hips flexed 90 degrees, and the therapist guided their knee extension until they reached a mild stretch. Then it will be followed by isometric contraction of hamstring and quadriceps which includes:wall squat, Quadriceps set

Duration

Gentle stretching held for 30 seconds. Carried out daily on three days each week for a total of 12 weeks.

III. DATA ANALYSIS

The gathered data were organized and analyzed using descriptive and inferential statistics. All parameters were evaluated using the statistical package for social science (SPSS) version 24, with a significance threshold of a p value less than 0.05 and a 95% confidence interval applied to all analyses. The data's normality was evaluated using the Shapiro-Wilk test.In this research, the Shapiro-Wilk test indicated that the data were normally distributed for the dependent variables at $P > 0.05$. Therefore, a parametric test was employed. A paired t-test was used to determine the statistical differences within the groups, while an independent t-test (Student's t-Test) was utilized to identify statistical differences between the groups.

Table 1: Comparison of VAS Score between Group - A and Group - B in pre and post test

Test	Group - A		Group - B		T - Test	Df	Significance
	MEAN	S. D	MEAN	S. D			
Pre Test	6.86	.743	6.93	.703	-.252	28	.803*
Post Test	4.40	.736	3.20	.676	4.64	28	.001**

(*- P > 0.05 - Not Significant) & (**- P ≤ 0.05 - Significant).

Table 2: Comparison of BBS Score between Group - A and Group - B in pre and post test

Test	Group - A		Group - B		T - Test	Df	Significance
	Mean	S. D	Mean	S. D			
Pre Test	36.13	3.54	35.93	3.57	.154	28	.879*
Post Test	43.33	3.51	47.60	3.35	-3.39	28	001**

(*- P > 0.05 - Not Significant) & (**- P ≤ 0.05 - Significant).

Table 3: Comparison of WOMAC Score between Group – A and Group - B in pre and post test

Test	Group - A		Group - B		T - Test	Df	Significance
	MEAN	S. D	MEAN	S. D			
Pre Test	45.93	7.39	44.73	3.45	.570	28	.573*
Post Test	29.00	2.36	24.40	4.23	3.67	28	.001**

(*- P > 0.05 - Not Significant) & (**- P ≤ 0.05 - Significant).

Table 4: Comparison of VAS Score within Group - A and Group - B between pre and post test

Groups	Pre Test		Post Test		T - Test	Significance
	Mean	S. D	Mean	S. D		
Group- A	6.86	.743	4.40	.736	18.50	.001**
Group- B	6.93	703	3.20	.676	31.58	001**

(**- P ≤ 0.05 - Significant).

Table 5: Comparison of BBS Scale within Group - A and Group - B between pretest and post test

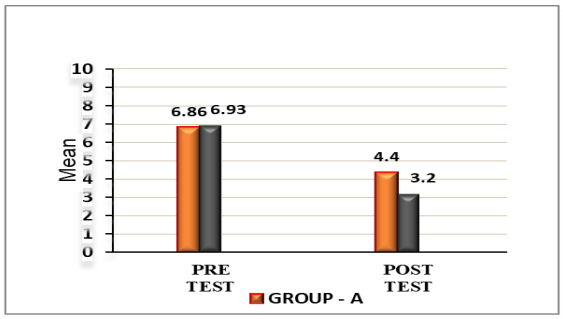
Groups	Pre Test		Post Test		T - Test	Significance
	Mean	S. D	Mean	S. D		
Group- A	36.13	3.54	43.33	3.51	-21.12	.001**
Group- B	35.93	3.57	47.60	3.35	-16.02	.001**

(**- P ≤ 0.05 - Significant).

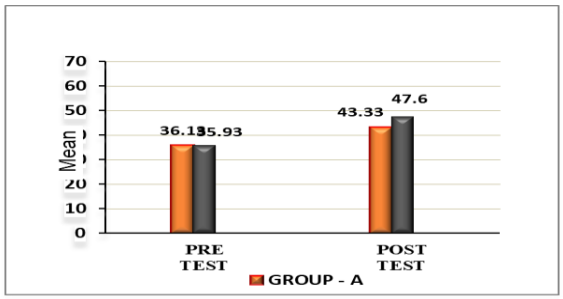
Table 6: Comparison of WOMAC Score within Group - A and Group - B bwtween pretest and post test

Groups	Pre Test		Post Test		T - Test	Significance
	Mean	S. D	Mean	S. D		
Group- A	45.93	7.39	29.00	2.36	11.12	.001**
Group- B	44.73	3.45	24.40	4.23	18.08	.001**

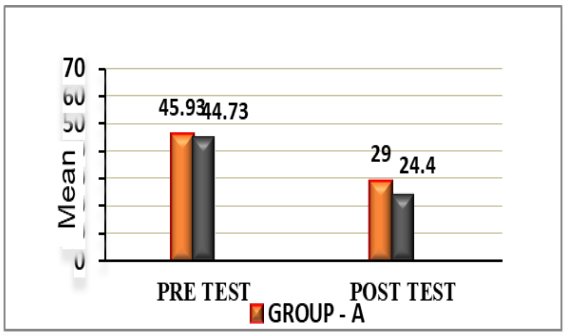
(**- P ≤ 0.05 - Significant).



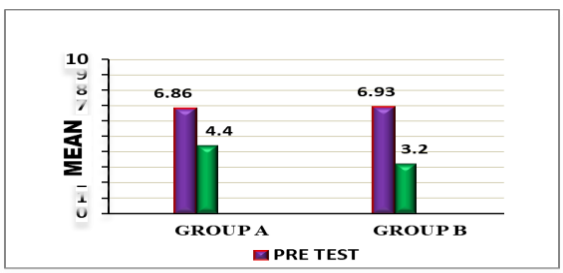
Graph 1: Comparison of VAS Score between Group - A and Group - B in pre and post test



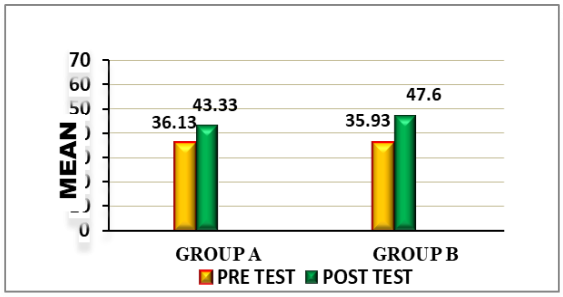
Graph 2: Comparison of BBS Score between Group - A and Group - B in pre and post test



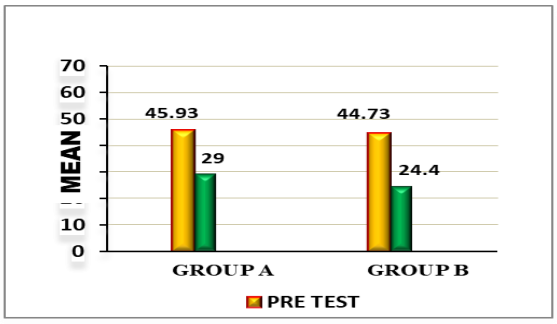
Graph 3: Comparison of WOMAC Score between Group – A and Group - B in pre and post test



Graph 4: Comparison of VAS Score within Group - A and Group - B between pre and post test



Graph 5: Comparison of BBS Scale within Group - A and Group - B between pretest and post test



Graph 6: Comparison of WOMAC Score within Group - A and Group - B between pretest and post test

IV. RESULTS

A comparison of Group A and Group B's VAS score mean values shows a significant drop in both groups' post-test mean values; however, Group B's 47.60 ± 3.35 mean value is more effective than Group A's 43.33 ± 3.51 mean value at $P \leq 0.05$. The null hypothesis has been rejected.

When Group A and Group B's mean scores on the Berg Balance Scale are compared, it is visible that both groups' post-test mean scores have significantly increased. However, Group B's higher mean score of 47.60 ± 3.35 is more effective than Group A's 43.33 ± 3.51 at $P \leq 0.05$. The null hypothesis is thus rejected.

Comparing Group A and Group B's WOMAC Score Mean Values reveals a significant drop in both groups' post-test mean values; however, Group B's lower mean value of 24.40 ± 4.23 is more effective than Group A's 29.00 ± 2.36 at $P \leq 0.05$. The null hypothesis is thus rejected. When the VAS, Berg Balance Scale, and WOMAC scores of Groups A and B are compared before and after the test, there is a significant difference in the mean values at $P \leq 0.05$.

V. DISCUSSION

This study compared proprioceptive exercises and rhythmic stabilization (PNF) techniques in patients with knee osteoarthritis (OA), assessing pain (VAS), balance (BBS), and function (WOMAC). Both interventions led to significant improvements, with rhythmic stabilization showing greater benefits across all outcomes.

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In OA patients, proprioceptive training enhances joint position sense and mobility [12], but our results demonstrated that rhythmic stabilization had a stronger effect. This method reduces knee stress and increases dynamic stability by improving proprioception and joint alignment through alternating isometric contractions [13].

In line with Kim and Lee (2019) [14], who discovered that rhythmic stabilization enhanced sensory feedback and joint alignment, Group B demonstrated superior pain reduction. According to Hamed et al. (2019) [15], it also improves coordination by activating multiple balancing strategies, which is supported by our BBS results.

According to Kavlak et al. (2021) [16] and Shakoor et al. (2018) [17], who reported improved gait and decreased stiffness, Group B functionally showed larger WOMAC improvements. This approach likely helps build the deeper muscles that support the joints

and makes the body more flexible and responsive to different positions or movements.

Elangovan et al. (2017) [18] emphasized cortical reorganization after neuromuscular training, suggesting that neuroplastic effects may also play a role. Dynamic variability improves motor outcomes, according to Ribeiro and Oliveira (2020) [19]. Additionally, psychological factors might be involved [20]. Therefore, in OA rehabilitation, rhythmic stabilization is more beneficial and ought to be given priority.

VI. CONCLUSION

The study's conclusion shows that both proprioceptive exercises and rhythmic stabilization (PNF) effectively reduced pain, improved functional outcomes, and increased balance in OA knee patients. The Rhythmic Stabilization Technique (Group B) was more effective overall across all measures: pain (VAS), balance (BBS), and function (WOMAC).

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