



Effect of PNF Stretching and Yin Yoga on selected physical and psychological Variables of research scholars

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Abstract

PNF stretching and Yin Yoga are effective mind–body practices that help improve flexibility, relaxation, and mental well-being. Research scholars often experience academic stress and sedentary lifestyles. Therefore, this study aims to examine the effect of PNF stretching and Yin Yoga on selected physical and psychological variables among research scholars. (Bompa & Buzzichelli, 2015). The present study aimed to examine the effects of PNF stretching and Yin Yoga on selected physical and psychological variables, specifically flexibility and anxiety among women research scholars. Participants were selected from colleges affiliated with Bharathiar University, and a total of sixty women research scholars aged between 22 and 35 years voluntarily participated in the study. The subjects were randomly assigned into two groups: an experimental group that underwent a twelve-week training programme consisting of PNF stretching and Yin Yoga. Control group that did not participate in any structured physical training during the experimental period. The training intervention was conducted five days per week and included various movement patterns emphasizing rapid direction changes, jumping, and landing control. Flexibility and Anxiety were assessed before and after the training period using standardized testing protocols. Statistical analyses were employed to determine the significance of differences between the pre- and post-test scores of the two groups. The results revealed that the experimental group showed significant improvements in Flexibility and Anxiety when compared with the control group. These findings suggest that the integration of PNF stretching and Yin Yoga is an effective approach for enhancing key physical fitness and psychological components essential for women research scholars. Overall, the study supports the inclusion of PNF stretching and Yin Yoga programmes as valuable conditioning strategies for improving flexibility and anxiety among women research scholars.

Keywords: PNF Stretching, Yin Yoga, Flexibility, Anxiety, Physical, Psychology, Women Research Scholars, Bharathiar University.

Introduction

Physical and psychological well-being plays a vital role in maintaining the overall health and productivity of individuals engaged in higher education and research activities. Research scholars often experience demanding academic workloads, prolonged sitting, irregular physical activity, and high levels of mental stress due to deadlines, research pressure, and academic responsibilities. Such conditions may negatively influence physical fitness, flexibility, and psychological variables such as stress, anxiety, and mental fatigue. Therefore, adopting appropriate physical and mind–body practices is essential to maintain both physical health and psychological balance among research scholars. According to the World Health Organization (2020) [5], regular physical activity and relaxation-based practices significantly contribute to improved physical health, stress reduction, and enhanced quality of life.

Among the various exercise and therapeutic techniques, Proprioceptive Neuromuscular Facilitation (PNF) stretching has gained recognition as an effective method to improve flexibility, muscular strength, and neuromuscular coordination. PNF stretching was originally developed by Herman Kabat and later expanded by Margaret Knott and Dorothy Voss in the field of physical therapy and rehabilitation. This technique involves a sequence of muscle contraction and relaxation that enhances the range of motion and improves muscular efficiency. Studies have indicated that PNF stretching is highly effective in increasing flexibility and improving physical performance compared to

traditional stretching methods. Research conducted by David G. Behm and Chaouachi (2011) reported that PNF stretching improves neuromuscular function and contributes to better muscular performance and flexibility.

In addition to physical training methods, yoga-based practices have been widely recognized for their ability to improve both physical and psychological health. Yin Yoga is a slow-paced and meditative style of yoga that focuses on holding postures for extended periods to target deep connective tissues such as ligaments, fascia, and joints. The practice encourages relaxation, mindfulness, and improved circulation, which may lead to reduced stress and enhanced mental clarity. Yin Yoga was popularized by Paul Grilley and has been increasingly practiced as a complementary approach to physical and mental health. Research studies have suggested that yoga practices significantly improve flexibility, balance, and mental relaxation while reducing stress and anxiety levels. According to research by Shirley Telles and colleagues (2012), regular yoga practice positively influences psychological well-being and helps regulate physiological responses related to stress.

For research scholars, maintaining both physical fitness and psychological stability is particularly important to support sustained academic performance and overall well-being. Mind–body interventions such as PNF stretching and Yin Yoga may offer a practical and effective approach to counteracting the effects of sedentary behavior and academic stress. Despite the growing interest in these practices, limited studies have examined their combined or comparative effects on research scholars. Therefore, the

present study aims to investigate the effect of PNF stretching and Yin Yoga on selected physical and psychological variables among research scholars, which may contribute to the promotion of healthier lifestyles and improved well-being in academic environments.

Methodology

The study adopted a randomized experimental design to evaluate the impact PNF Stretching and Yin Yoga on selected physical and psychological variables among women research scholars. Participants were selected from Bharathiar University, and a total of sixty women research scholars volunteered to take part in the research. Prior to data collection, all subjects were briefed about the objectives and procedures of the study, and informed consent was obtained. The selected participants were then randomly divided into two groups: an experimental group and a control group. The experimental group underwent an 8-week structured training programme, conducted five days a week, which included PNF Stretching and Yin Yoga towards lead to the flexibility, was measured by sit and reach test in centimeters, anxiety was measured by standardized questionnaires test in points for the efficiency. The control group did not participate in any organized physical training during the study period and maintained their routine daily activities.

Training programme

A 12-week training programme of PNF stretching and Yin Yoga was implemented for women research scholars to improve selected physical and psychological variables. The

training was conducted five days per week for 45–60 minutes per session. Each session included a warm-up (5–10 minutes), main exercises (35–40 minutes), and relaxation (5–10 minutes). PNF stretching exercises such as hamstring stretch, quadriceps stretch, calf stretch, hip flexor stretch, and shoulder stretch were performed using the contract–relax technique, with contractions of 10–20 seconds followed by relaxation of 20–30 seconds, repeated 3–4 times. Yin Yoga postures including Butterfly pose, Caterpillar pose, Child’s pose, Sphinx pose, Dragon pose, and Saddle pose were practiced with 30–90 seconds holding time. The intensity was maintained at a moderate to moderately high level, and the duration and depth of stretches were gradually increased throughout the 12 weeks to improve flexibility, relaxation, and psychological well-being.

Statistical analysis

Descriptive statistics such as mean and standard deviation are found in order to get the basic idea of the data distribution “t” test was done for finding whether there is any statistically significant pre-test to post-test mean differences in their respective variables of each groups. ANCOVA tests the significance of “adjusted post test mean” differences between the experimental and control groups for each variable. Whenever the “F” ratio for adjusted post test was found to be significant, Scheffé’s post hoc test was applied to test the significant difference between the paired adjusted means. 0.05 level of confidence was fixed for vo21 max and breath holding time parameters to test the level of significance.

Table 1: Computation of ‘t’ ratio on flexibility of experimental and control groups (Scores in Centimeters)

Groups	Pre – test mean	Pre – test S. D (±)	Post - test mean	Post – test S. D (±)	‘t’ ratio
PNF Stretching Group (PNFSG)	22.79	1.38	26.59	1.29	8.99*
Yin Yoga Group (YYG)	22.85	1.32	25.43	1.61	9.35*
Control Group (CG)	22.56	1.06	22.58	1.01	0.37*

* Significant at 0.05 level for the degrees of freedom 1 and 19, (2.09)

Table I shows that the ‘t’ ratios on flexibility of PNFSG and YYG were 8.99 and 9.35 respectively. Since, these values were higher than the required table value of 2.09, it was found to be statistically significant at 0.05 level of confidence for degrees of freedom 1 and 19. Further, the

obtained ‘t’ ratio between pre and post test of the control group 0.37 was lesser than the required table value of 2.09, and it was found to be not statistically significant. From the results it was inferred that, PNFSG and YYG produced a significant improvement in flexibility of Research Scholars.

Table 2: Analysis of covariance on pre, post and adjusted post test means on flexibility of experimental and control groups (scores in centimeters)

Test	PNF Stretching Group (PNFSG)	Yin Yoga Group (YYG)	Control Group (CG)	Source Of variance	df	Sum of square	Mean square	F-ratio
Pre-test mean	22.79	22.85	22.56	B/S	2	0.17	0.08	0.04
				W/S	57	108.28	1.90	
Post-test mean	26.59	25.43	22.58	B/S	2	43.29	21.64	12.41*
				W/S	57	99.37	1.74	
Adjusted post-test mean	26.58	25.43	22.57	B/S	2	40.11	20.05	18.63*
				W/S	56	60.28	1.07	

* Significant at 0.05 level for the degrees of freedom (2, 57) and (2, 56), 3.16

Table II reveals the computation of ‘F’ ratios on pre test, post test and adjusted post test means of PNFSG, YYG and CG on flexibility.

The obtained ‘F’ ratio for the pre test means of PNFSG, YYG and CG on flexibility was 0.04. Since, the ‘F’ value was less than the required table value of 3.16 for the degrees of freedom 2 and 57, it was found to be not significant at

0.05 level of confidence.

Further, the ‘F’ ratio for post test means of PNFSG, YYG and CG on flexibility was 12.41. Since, the ‘F’ value was higher than the required table value of 3.16 for the degrees of freedom 2 and 57, hence it was found to be statistically significant at 0.05 level of confidence.

The obtained ‘F’ ratio for the adjusted post test means of PNFSG, YYG and CG on flexibility was 18.63. Since, the

'F' value was higher than the required table value of 3.16 for the degrees of freedom 2 and 56, it was found to be statistically significant at 0.05 level of confidence. The

results revealed that there was a significant difference in post-test means among PNFSG, YYG and CG in flexibility of Research Scholars.

Table 3: Scheffe's post hoc test for the differences between the paired adjusted post-test means of flexibility

PNF Stretching Group (PNFSG)	Yin Yoga Group (YYG)	Control Group (CG)	Mean difference	Confidence Interval
26.58	25.43		1.15*	0.89
26.58		22.57	4.01*	
	25.43	22.57	2.86*	

* Significant at 0.05 level

Table III reveals the mean differences between the paired adjusted post test means of all groups.

The mean difference between PNFSG and YYG, PNFSG and CG, YYG and CG was 1.15, 4.01 and 2.86 respectively. The value of mean difference of adjusted post means was higher than the required confidence interval value of 0.89

and it was found to be significant at 0.05 level of confidence.

From these results, it was inferred that twelve weeks of PNFSG produced significant improvement in flexibility of Research Scholars than YYG and CG group.

Mean values of pre, post and adjusted posttest of PNFSG, YYG and CG on flexibility are presented in Figure I

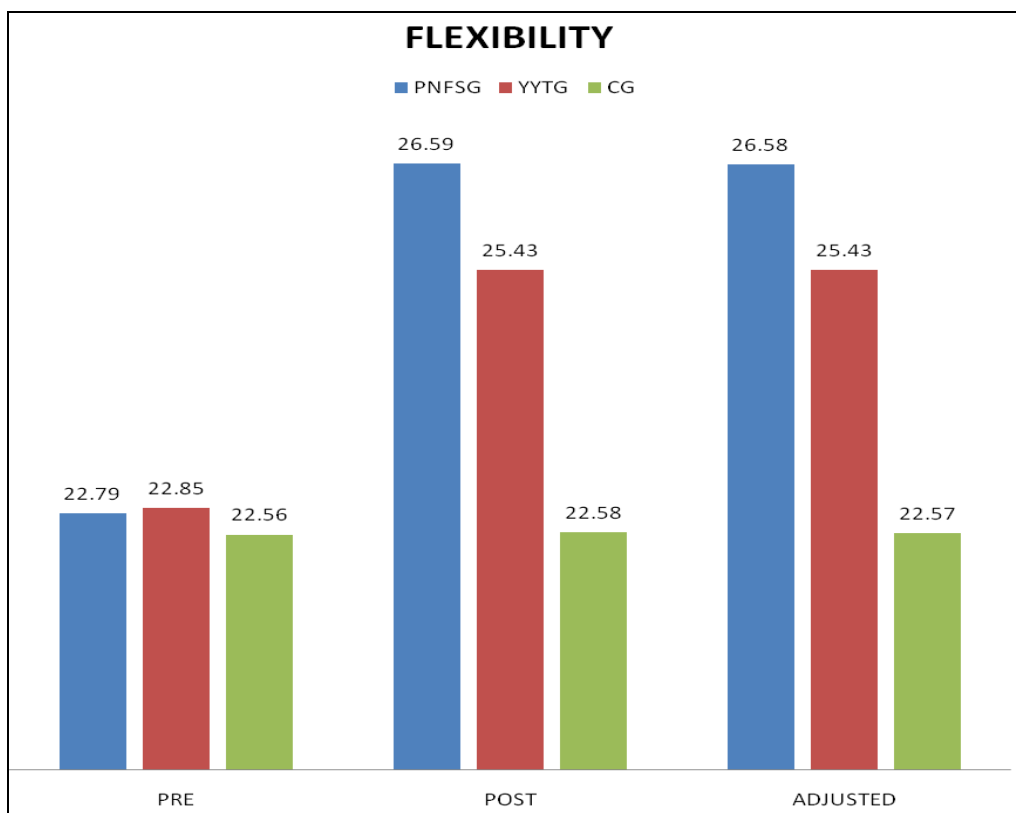


Fig 1: Bar diagram showing pre, post and control group test means on pnf stretching group yin yoga group and control group of flexibility (Scores in Centimeters)

Table 4: Computation of 't' ratio on anxiety of experimental and control groups (scores in points)

Groups	Pre – test mean	Pre – test S. D (±)	Post - test mean	Post – test S. D (±)	't' ratio
PNF Stretching Group (PNFSG)	21.20	5.04	19.45	4.97	6.00*
Yin Yoga Group (YYG)	21.60	6.00	18.90	5.60	12.81*
Control Group (CG)	21.45	5.92	21.40	5.38	1.29

* Significant at 0.05 level for the degrees of freedom 1 and 19, (2.09)

Table IV shows that the 't' ratios on anxiety of PNFSG and YYG were 6.00 and 12.81 respectively. Since, these values were higher than the required table value of 2.09, it was found to be statistically significant at 0.05 level of confidence for degrees of freedom 1 and 19. Further, the

obtained 't' ratio between pre and post test of the control group 1.29 was lesser than the required table value of 2.09, and it was found to be not statistically significant. From the results it was inferred that, PNFSG and YYG produced a significant improvement in anxiety of Research Scholars.

Table 5: Analysis of covariance on pre, post and adjusted post test means on anxiety of experimental and control groups (scores in points)

Test	PNF Stretching Group (PNFSG)	Yin Yoga Group (YYG)	Control Group (CG)	Source Of variance	df	Sum of square	Mean square	F-ratio
Pre-test mean	21.20	21.60	21.45	B/S	2	1.40	0.46	0.14
				W/S	57	3161.04	32.92	
Post-test mean	19.45	18.90	21.40	B/S	2	868.40	289.46	9.51*
				W/S	57	2920.16	30.41	
Adjusted post-test mean	19.40	18.92	21.40	B/S	2	863.91	287.97	16.38*
				W/S	56	1669.79	17.57	

* Significant at 0.05 level for the degrees of freedom (2, 57) and (2, 56), 3.16

Table V reveals the computation of ‘F’ ratios on pre test, post test and adjusted post test means of PNFSG, YYG and CG on anxiety.

The obtained ‘F’ ratio for the pre test means of PNFSG, YYG and CG on anxiety was 0.14. Since, the ‘F’ value was less than the required table value of 3.16 for the degrees of freedom 2 and 57, it was found to be not significant at 0.05 level of confidence.

Further, the ‘F’ ratio for post test means of PNFSG, YYG and CG on anxiety was 9.51. Since, the ‘F’ value was higher than the required table value of 3.16 for the degrees of

freedom 2 and 57, hence it was found to be statistically significant at 0.05 level of confidence.

The obtained ‘F’ ratio for the adjusted post test means of PNFSG, YYG and CG on anxiety was 16.38. Since, the ‘F’ value was higher than the required table value of 3.16 for the degrees of freedom 2 and 56, it was found to be statistically significant at 0.05 level of confidence. The results revealed that there was a significant difference in post-test means among PNFSG, YYG and CG in anxiety of Research Scholars.

Table 6: Scheffé’s post hoc test for the differences between the paired adjusted post-test means of anxiety

PNF Stretching Group (PNFSG)	Yin Yoga Group (YYG)	Control Group (CG)	Mean difference	Confidence Interval
19.40	18.92		0.48*	0.10
19.40		21.40	2.00*	
	18.92	21.40	2.48*	

* Significant at 0.05 level

Table VI reveals the mean differences between the paired adjusted post test means of all groups.

The mean difference between PNFSG and YYG, PNFSG and CG, YYG and CG was 0.48, 2.00 and 2.48 respectively. The value of mean difference of adjusted post means were higher than the required confidence interval value of 0.10 and it was found to be significant at 0.05 level of confidence.

From these results, it was inferred that twelve weeks of YYG produced significant improvement in anxiety of Research Scholars than PNFSG and CG group.

Mean values of pre, post and adjusted posttest of PNFSG, YYG and CG on anxiety are presented in Figure II.

Findings

The findings of the study indicated that both PNF stretching and Yin Yoga training produced significant improvements in the selected physical and psychological variables among research scholars. With regard to the physical variable (flexibility), the PNF stretching group showed considerable improvement. This may be attributed to the contract-relax mechanism involved in PNF techniques, which enhances neuromuscular efficiency and increases the range of motion of muscles and joints. The repeated cycles of contraction and relaxation stimulate the muscle spindle and Golgi tendon organs, resulting in greater muscle extensibility and improved flexibility. Similar findings were reported by David G. Behm and Chaouachi (2011), who observed that PNF stretching significantly improves flexibility and muscular performance compared to traditional stretching methods.

The Yin Yoga group also demonstrated noticeable improvement in flexibility. Yin Yoga involves holding postures for extended periods, which gently stretches the

deep connective tissues, ligaments, and fascia around the joints. This prolonged stretching helps improve joint mobility, muscular relaxation, and overall flexibility. The slow and controlled nature of Yin Yoga allows the body to gradually adapt to deeper stretches, which contributes to improved physical function. Research studies have also indicated that regular yoga practice improves flexibility and musculoskeletal health (Shirley Telles *et al.*, 2012).

In relation to the psychological variable (anxiety), both the PNF stretching and Yin Yoga groups showed a reduction in anxiety levels. PNF stretching may reduce anxiety by decreasing muscular tension and promoting better blood circulation, which contributes to physical relaxation. On the other hand, Yin Yoga practices emphasize deep breathing, mindfulness, and meditative awareness, which activate the parasympathetic nervous system and promote mental calmness. According to Catherine Woodyard (2011), yoga practices are effective in reducing stress, anxiety, and psychological tension while improving emotional well-being.

Furthermore, research scholars often experience high academic pressure and sedentary lifestyles, which may lead to physical discomfort and psychological stress. Mind-body practices such as PNF stretching and Yin Yoga provide a holistic approach that improves both physical flexibility and mental relaxation. The present findings are also supported by recommendations from the World Health Organization (2020) [5], which emphasizes the importance of regular physical activity and relaxation practices for maintaining physical and psychological health. Therefore, the results of the study suggest that both PNF stretching and Yin Yoga training can be considered effective interventions for improving flexibility and reducing anxiety among research scholars.

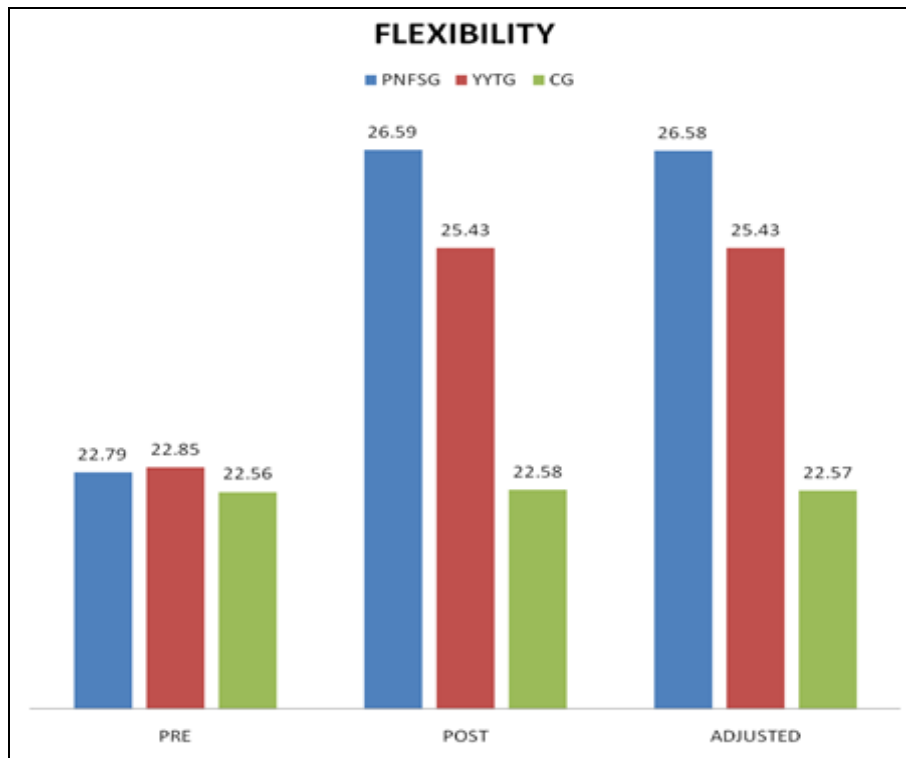


Fig 2: Bar diagram showing pre, post and control group test means on pnf stretching group yin yoga group and control group of anxiety (Scores in Points)

Conclusions

The study concludes that PNF stretching and Yin Yoga training have a positive effect on selected physical and psychological variables among research scholars. Both training methods significantly improved flexibility, as the stretching techniques enhanced muscle elasticity and joint range of motion. In addition, the practices contributed to a reduction in anxiety levels, promoting relaxation and mental calmness among the participants. PNF stretching improved neuromuscular coordination through the contract-relax technique, while Yin Yoga promoted deep relaxation through slow, sustained postures and controlled breathing. Therefore, the regular practice of PNF stretching and Yin Yoga can be considered an effective approach for improving both physical fitness and psychological well-being among research scholars.

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