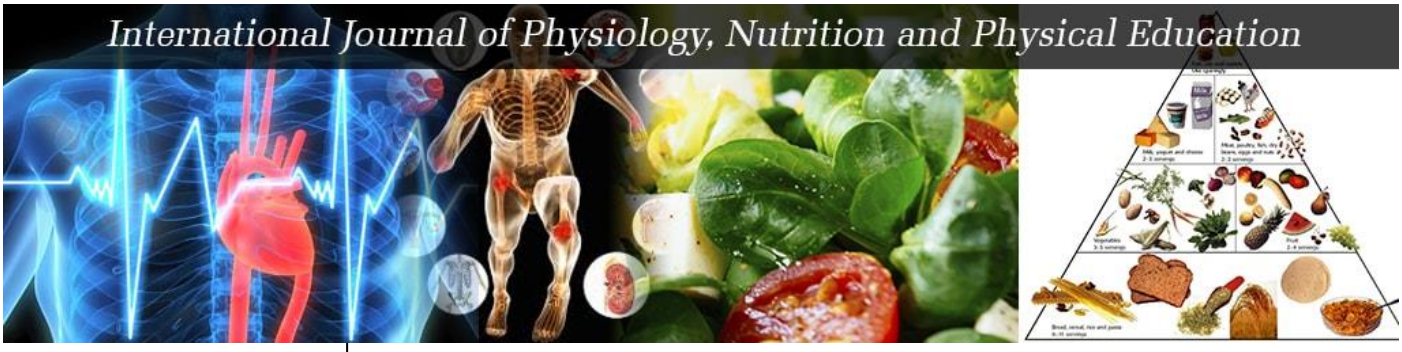

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A Gajalakshmi
Research Scholar, Department of Yoga, School of Ancient Indian Studies, Vel Institute of Science, Technology & Advanced Studies, Chennai, Tamil Nadu, India

Dr. CV Jayanthy
Assistant Professor, Department of Yoga, School of Ancient Indian Studies, Vels Institute of Science, Technology & Advanced Studies, Chennai, Tamil Nadu, India

Dr. S Natarajan
Associate Professor, Department of Yoga, School of Ancient Indian Studies, Vels Institute of Science, Technology & Advanced Studies, Chennai, Tamil Nadu, India

Corresponding Author:
A Gajalakshmi
Research Scholar, Department of Yoga, School of Ancient Indian Studies, Vel Institute of Science, Technology & Advanced Studies, Chennai, Tamil Nadu, India

Effect of adapted yogic practices on physical variables among middle aged men with mechanical low back pain

A Gajalakshmi, Dr. CV Jayanthy and Dr. S Natarajan

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Abstract
The aim of this study was to investigate the influence of adapted Yogic practices on abdominal muscular endurance and flexibility levels concerning low back pain. To achieve this objective, thirty middle-aged male school teachers from the Pondicherry Region, aged between 35 to 40 years, were selected by the investigator. The participants were divided into two groups: An Experimental group and a Control Group. The Experimental group underwent yogic practices, whereas the Control group did not engage in any specific practices. Pre-tests and post-tests were conducted for both groups. The Experimental group participated in one-hour sessions of adapted Yogic Practices, including Asanas and Pranayama, five days per week for eight weeks. Post-tests were administered after the completion of the eight-week training program.
The data collected were analyzed using Repeated Measures ANCOVA, and the F ratio was found to be significant. The results indicated a significant difference between the pre-test and post-test outcomes. After the experimental group completed the training, all subjects were tested for abdominal muscle endurance and flexibility levels, with a significance level set at 0.05 to test the hypothesis.
Further analysis using analysis of variance (ANCOVA) revealed significant differences among the adjusted post-test means. The findings suggest that post-test results indicate increased abdominal muscular endurance and flexibility levels among the participants.

Keywords: Yoga, low back pain, muscular endurance and flexibility

Introduction
Yoga, originating in ancient India with a history spanning over, 4000 years, encompasses various components, including physical postures (asana), controlled breathing techniques (pranayama), relaxation, and meditation (Dhyana). It is a holistic discipline emphasizing overall health, incorporating a series of positions or Asanas, breathing exercises, meditation, and regulated body movements.
The Gheranda Samhita (Chapter 2, Verses 16-17) suggests that regular asana practice can render the body lighter and slimmer, potentially extending life and aiding in blood cleansing. The Hatha Ratnavalli claims that a dedicated yoga practitioner may fend off illness and slow down the aging process.
Low backache or lumbago is a prevalent musculoskeletal disorder affecting 80% of people at some point in their lives. In India, the occurrence of low back pain is alarming, with nearly 60% of people experiencing significant back pain at some point. Mechanical low back pain is a general term referring to back pain caused by the strain of muscles on the vertebral column and abnormal stress levels. Chronic in nature, low backache is characterized by persistent dull or sharp pain in the lower back, often accompanied by burning, stiffness, numbness, or tingling, with pain radiating down the buttocks and legs.
Mechanical low back pain, also known as "activity-related spinal pain," is a prevalent musculoskeletal disorder that primarily manifests as back pain in the lower thoracic and lumbar regions. It can present either acutely or chronically in clinical settings.
Muscles are a potential source of low back pain. Some authors have suggested that the failure of muscles to adequately protect passive structures from excessive loading may lead to damage to pain-sensitive structures in the back, resulting in pain.

Insufficient endurance of trunk muscles has been identified as a predictor of the initial occurrence of low back issues.

Yoga therapy encompasses patient education and a variety of asana stretching and strengthening practices. While the abdominal muscles often receive attention for their protective role in the low back, the extensors are more crucial. Decreased trunk extensor endurance has been found to correlate with low back issues. Therefore, trunk extension exercise training is an essential preventive approach for individuals with low back pain. Certain muscles, in particular, have been shown to stabilize the low back in various situations.

During a fatiguing isometric trunk extension effort of torque, spinal loading forces increased. Despite the constant torque output, as the erector spinae fatigued, secondary extensors such as the internal oblique and latissimus dorsi muscles compensated. Abnormal motor control has been associated with low back problems, including poor control of the axis of rotation of the trunk during sagittal plane movements, asymmetric muscle activation during spinal extension or gait, reduced activity of the transverse abdominis, poor endurance of the spinal extensors, and atrophy of the multifidus.

Endurance is mechanically defined as either the point of isometric fatigue, where the contraction can no longer be maintained at a certain level, or as the point of dynamic fatigue, where repetitive work can no longer be sustained at a certain force level.

Studies indicate that practicing yogasana also can reduce anxiety, enhance self-efficacy, and improve pain acceptance. Given that chronic low back pain is influenced by biological, psychological, and social factors, the emotional support provided by yoga practice can boost patients' confidence in managing the condition. Yoga's mechanism of action is linked to contextual factors, a combination of personal, disease-related, and environmental elements. In musculoskeletal disorder-associated pain, redirecting attention away from pain during physiotherapy has shown effectiveness in alleviating pain.

Yogic practices often involve gentle stretching and flexibility exercises, which can enhance overall flexibility and increase the range of motion in the spine and surrounding muscles. Improved flexibility may lead to better posture and reduced strain on the lower back. Yogic postures, particularly those focused on the core and back muscles, can help build strength and endurance.

Increased muscle strength may provide better support for the spine and contribute to a reduction in back pain. Yogic practices often incorporate mindfulness, meditation, and relaxation techniques, which can help reduce stress levels.

Lower stress levels may positively impact physical well-being and contribute to a more relaxed state of the musculoskeletal system. Yogic practices emphasize awareness of body alignment and posture. Middle-aged individuals with low back pain may experience improvements in posture, leading to reduced strain on the spine and surrounding muscles Reduction in pain, improved physical function, and better mental well-being can collectively contribute to an enhanced overall quality of life. The effectiveness of adapted yogic practices may vary among individuals, and it's important to tailor interventions to the specific needs and abilities of participants.

Materials and Methods

The subject selection, variable selection, training processes, and statistical techniques used in the study are described in this section.

To achieve this aim, thirty middle-aged male school teachers from the Pondicherry Region, aged between 35 to 40 years, were selected by the investigator. The participants were divided into two groups: An Experimental group and a Control Group. The Experimental group underwent Adapted Yogic practices like Asana modified UttanaPadasana with Chair, Ardha Padahastasana, with chir, Parasava utanasana, Dandasana with Props, savasana, Abdominal Breathing and Brahmari pranayama, whereas the Control group did not engage in any specific practices. Pre-tests and post-tests were conducted for both groups. The Experimental group underwent one-hour sessions of adapted Yogic Practices five days per week for a duration of eight weeks. Post-tests were conducted upon completion of the eight-week training program.

Based on considerations such as tool accessibility, subject suitability, and testing time constraints, the variables for the inquiry were chosen. Two physical variables-abdominal muscle endurance, and flexibility of the trunk were selected as the study's criterion bearing these factors in mind. Both before and right away after the training session, all subjects were tested (to measure the pain level using a visual analog scale), and abdominal muscular endurance using by Sit-Ups and to measure flexibility using the sit-and-reach test on these chosen dependent variables. To analysis the data Analysis of Covariance (ANCOVA) was used to statistically analyze the obtained data to find any significant differences in the specified dependent variables between the groups before and after the training session. In all situations, a significance threshold of.05 was chosen for testing.

Results

The results of the analysis of covariance on the pre and post-tests were collated and are shown in Tables.

Table 1: Analysis of co-variance of the pre-test and test means of the yoga practices and control group in pain

Group	Yoga	Control	Source of variance	Sum of squares	DF	Mean square	'F' Ratio
Pre-test Mean	6.81	6.11	Between	6.685	1	6.685	2.78 NS
SD	1.33	1.73	Within	124.741	52	2.399	
Post-test Mean	4.15	7.22	Between	127.574	1	127.574	10.40*
SD	1.32	0.89	Within	66.074	52	1.271	
Adjusted post-test mean	5.69	6.46	Between	132.046	1	132.046	9.508*
			Within	68.520	52	2.036	

From the above Table results reveals that the pre-test mean score on Yoga practices is 6.81 and control group is 6.11. Therefore, it is inferred that the obtained calculated 'F' value is 2.78 for Pre-Test mean score. Therefore the framed research hypothesis is rejected. It is inferred that there is no significant difference between the pre-test means of the pain. However, the Post-test mean score on yoga group is 4.15 and control group is 7.22. Therefore, it is evident that the obtained 'F' value 10.40 for Post-Test mean score. Therefore the framed research hypothesis is accepted. Further, the above

Table taking into consideration of the adjusted Post-test mean score on yoga practice is 5.69, control group is 6.46. Therefore, it is evident that the calculated 'F' value is 9.508. Therefore the framed research hypothesis is accepted. It is inferred that there is a significant difference between the adjusted post-test means of the pain.

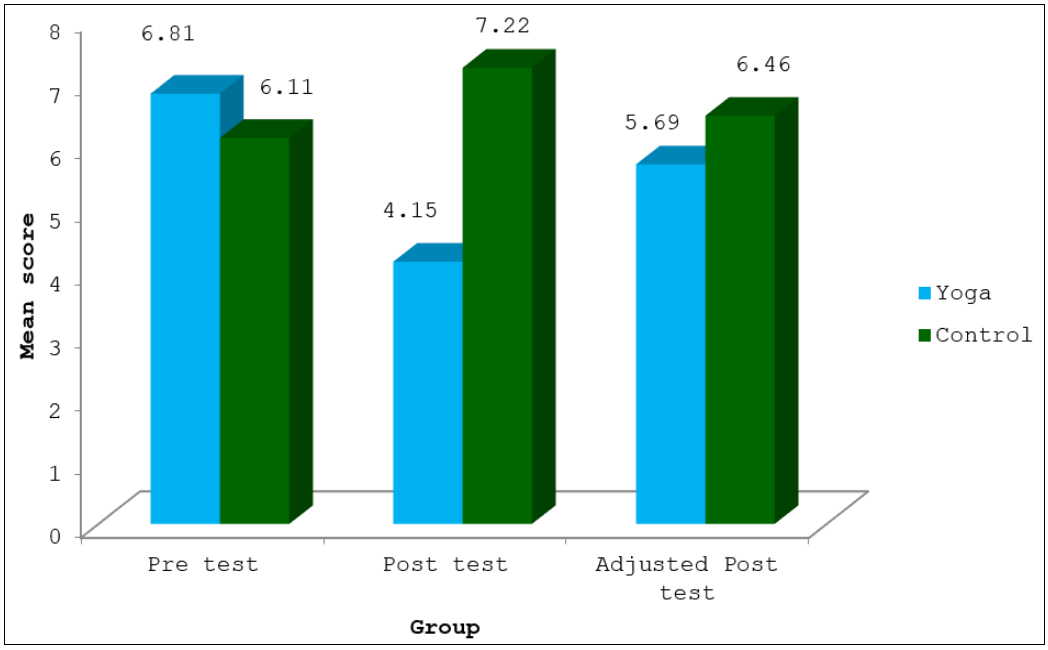

Fig 1: Show yoga practices and control group in pain

Table 2: Analysis of co-variance of the pre-test and test means of the yoga practices and control group in abdominal muscle endurance test

Group	Yoga	Control	Source of variance	Sum of squares	DF	Mean square	'F' Ratio
Pre-test Mean	16.60	15.20	Between	19.600	1	19.600	0.866 NS
SD	5.61	3.70	Within	860.000	38	22.632	
Post-test Mean	20.40	15.40	Between	250.000	1	250.000	10.19*
SD	5.50	4.32	Within	931.600	38	24.516	
Adjusted Post-test mean	17.90	15.90	Between	263.021	1	263.021	7.408*
			Within	748.856	38	23.716	

The Table 2 result proved that the pre-test mean score on yoga group is 16.60, control group is 15.20. Therefore, it is observed that the obtained 'F' value 0.866 for Pre-Test mean score. Therefore the framed research hypothesis is rejected. It is inferred that there is no significant difference between the pre-test means of the abdominal muscle endurance test. Also, the Post-test mean score on yoga practices is 20.40, control group is 15.40. Therefore, it is evident that the obtained 'F' value 10.19 for Post-Test mean score. Therefore the framed research hypothesis is accepted. Further, the above Table taking into consideration of the adjusted Post-test mean score on yoga practices is 17.90, control group is 15.90. Therefore, it is evident that the obtained 'F' value is 7.408. Therefore the framed research hypothesis is accepted. It is inferred that there is a significant difference between the adjusted post-test means of the abdominal muscle endurance test.

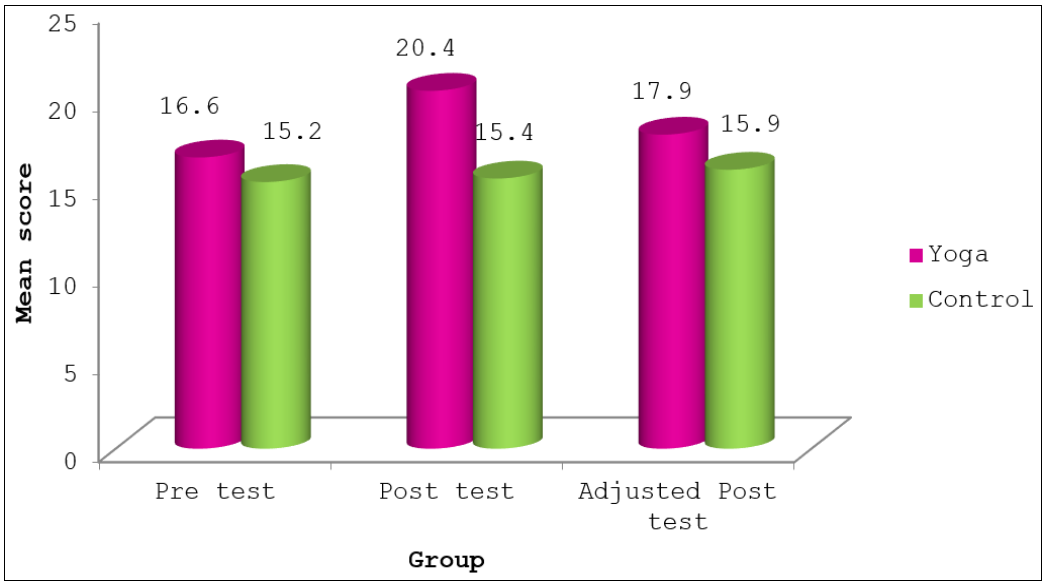

Fig 2: Show adjusted post-test means of the abdominal muscle endurance test

Table 3: Showing the mean, standard deviation and t-value of the range of motion test for (F)

Group	N	Mean	Std. Deviation	T-Value	P-Value
Pre-test	16	63.12	7.50	4.22	0.001*
Post-test	16	73.43	6.25		

From the above Table it is seen that in the pre-test, respondents scored of means value (63.12) than the post-test respondents are higher mean value (73.43).

This mean difference is statistically proved by the obtained t-value (4.22), which is significant at 0.001 level. Therefore the framed research hypothesis that there is a significant difference in range of motion for (F) level among the respondents between pre and Post-test is accepted.

Conclusion

The study concluded that Adapted Yogic practices had a significant impact on reducing pain levels and improving abdominal muscular endurance and trunk flexibility among middle-aged men affected by Mechanical low Backache.

The findings indicated that individuals who participated in the Adapted Yogic practices experienced notable reductions in pain compared to those in the control group. This suggests that the specific yoga exercises and techniques tailored for addressing low back pain were effective in alleviating discomfort and improving overall well-being.

Furthermore, the study highlighted improvements in abdominal muscular endurance and trunk flexibility among participants engaged in the Adapted Yogic practices.

This suggests that the yoga routines targeting core strength and flexibility contributed positively to the physical health and resilience of the individuals involved.

Overall, the results underscored the beneficial effects of incorporating Adapted Yogic practices as a therapeutic intervention for managing Mechanical low Backache in middle-aged men. By emphasizing pain reduction and enhancing physical fitness components such as muscular endurance and flexibility, yoga emerged as a promising approach for addressing the challenges associated with low back pain in this population group.

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