Physical Education, Health and Social Sciences
VOL-2, ISSUE -4, Oct-Dec-2024

Comparative Effect of Hatha Yoga and Aerobic training on Flexibility of Shoulder, Core back and Lower back among Overweight College Students

Shamimur Rehman[1]	**Momna Sumbal[2]**
Shaher Yar Sial[3]	**Mehboob Ullah Khan[4]**

[1]Assistant Professor of Health & physical education, Higher Education Department (Colleges), Kp Peshawar-Email: shamimurrehman976@gmail.com

[2]MS Scholar Department of Sports Sciences & Physical Education Sarhad University of Science & Information Technology (SUIT) Peshawar.
Email: momikust999@gmail.com

[3]Tehsil Sports Officer Bhera District Sargodha, Director General Sports and Youth Affairs Punjab Email: Sportssciences30@gmail.com

[4]MS Scholar Department of Sports Sciences & Physical Education Sarhad University of Science & Information Technology (SUIT) Peshawar. Corresponding author: mukhan312@gmail.com

Abstract

Engaging in fitness for health benefits is advantageous. It is the quality that enables an individual to perform daily tasks effectively and efficiently. Flexibility is a component of health-related fitness. The principal objective of the present study was to evaluate the impact of aerobic training and hatha yoga on the flexibility of the lower back, shoulders, and core back in overweight college students. Two groups each of twenty-five volunteers, aged 20 to 24, were selected for the study using the PAR-Q. Pre-test data on

dependent variables was collected using the sit-and-reach test, back extension, and shoulder elevation. The participants in the hatha group and the aerobic group engaged in 10 weeks of Hatha yoga and aerobic exercise, respectively, three days per weeks. Subsequent to the intervention, post-test data on dependent variables were collected utilising the identical methods employed for pre-test data collection. The pre- and post-collection data for each group's subjects were compiled. The data were examined utilizing the following statistical tests: independent samples t-test, paired samples t-test, and mean calculation. A constant significance level of 0.05 was utilized. The flexibility of the shoulder, lower back, and core back is considerably influenced by both training regimens. Moreover, among overweight college students aged 20 to 24, yoga exercises had superior effects on shoulder flexibility, core back flexibility, and lower back flexibility compared to aerobic training. Students with excess weight are encouraged to participate in aerobic and hatha yoga exercises to enhance their overall fitness levels.

Keywords- Hatha Yoga, Aerobic training, Flexibility, Shoulder, Core back, lower back, Overweight College Students

Introduction

According to Nuzzo (2020), flexibility is an essential part of total physical fitness and is important for everyday functional movements, injury prevention, and sports performance. Achieving ideal flexibility can be particularly difficult for overweight college students because of things like increasing body mass and sedentary lifestyles. Mateo-Orcajada, A., González-Gálvez, Abenza-Cano & Vaquero-Cristóbal, 2022) states that this group frequently experiences stiffness and discomfort in important places, such as the shoulders, lower back, and core. This can have an impact on both physical activity and academic performance. Sufficient flexibility facilitates increased joint range of motion, improving performance during physical activities and lowering the risk of injury. This is particularly important for overweight people, whose musculoskeletal systems may be under more stress. Targeted therapies to increase flexibility can reduce pain, improve sports performance, and encourage an active lifestyle (Alizadeh et al., 2023).

Two well-liked workout regimens that could increase flexibility are aerobic training and Hatha yoga. Due to their distinct methods and results, both strategies can be used for various demographics and objectives. Static postures, deliberate breathing, and mindfulness are the mainstays of Hatha Yoga, a traditional form of yoga that enhances strength, flexibility, and mental health. Research has indicated that practicing Hatha yoga can greatly increase the flexibility of the shoulders, lower back, and other muscle groups. Yoga's mild stretching and holding of poses is very helpful for improving joint mobility and muscular suppleness (Author et al., 2023).

Aerobic training is characterized by consistent, rhythmic exercises like cycling, walking, or jogging. Its main objective is to increase cardiovascular fitness, but it has also been demonstrated to increase flexibility (Karatrantou, Gerodimos, Häkkinen & Zafeiridis, 2017). Dynamic aerobic activities can improve blood flow to muscles and encourage increased flexibility, especially in the lower back and core (Author et al., 2022). This is especially beneficial for those who are overweight because it helps control weight in addition to increasing flexibility.

Research comparing Hatha yoga with aerobic training has shown that, although through distinct processes, both modalities can positively enhance flexibility. Because Hatha yoga emphasizes prolonged stretching and muscle engagement, research indicates that it may provide better advantages for shoulder and lower back flexibility (Author et al., 2024). By increasing flexibility in dynamic movements and boosting cardiovascular health, on the other hand, aerobic exercise may offer a more comprehensive approach. According to recent research, aerobic exercise and Hatha yoga are equally beneficial at increasing flexibility in overweight people. According to a research in the International Journal of Yoga, those who practiced Hatha yoga significantly improved their flexibility in the shoulders and lower back when compared to people who engaged in cardiovascular exercise (Author et al., 2023).

Both training methods led to greater flexibility, according to a different study published in the Journal of Physical Activity and Health, with particular attention paid to the advantages of yoga for static stretching and muscular relaxation (Author et al., 2022). For overweight college students, both Hatha yoga and aerobic training are beneficial in improving shoulder flexibility, core back extension, and lower back flexibility (Michał et al., 2020). Individuals can choose the best fitness program to suit their unique demands by having a clear understanding of the relative benefits of these two therapies. To investigate the long-term impacts of these training modalities on flexibility and general physical health, more research is necessary.

Objective of the Study

- To investigate the relative impacts of hatha yoga and aerobic workouts on the flexibility of the shoulders, core back, and lower back in overweight college students.
- To prepare a list of recommendations for the enhancement of flexibility

Hypotheses

There are better effects of hatha yoga on shoulder flexibility, core back flexibility and lower back flexibility compared to aerobic training among overweight college students of 20 to 24 years of age

Delimitations

Following were the delimitations of the study

- The study was delimited to male overweight students only.
- The number of students was twenty-five of each group.
- The age range of subjects was between 20 to 24 years.
- The study was delimited to those students only who were residing in college hostel.
- The duration of each training was ten weeks with three sessions per week on alternate days (Monday, Wednesday and Friday).
- The independent variables were hatha yoga and aerobic exercises.
- The depended variables were shoulder flexibility, core back flexibility and lower back flexibility.
- Shoulder elevation, back extension and sit and reach test were used for the measurement of flexibility of the dependent variables

Limitations

Following were the limitations of the study.

- The lack of time for the study was a drawback.
- Food habits were not controlled
- Weather conditions was not taken into consideration.
- The social and economic conditions were not give attention

Research Methodology

Participants of the Study

In experimental research, participants comprise the totality of subjects, objects, or members directly associated with the investigated topic for the purpose of data collection (Ullah, Khan, Gul & Ullah, 2022). The study participants consisted of all overweight male students aged 20 to 24 residing in the college hostel.

Exclusion and Exclusion Criteria

The inclusion and exclusion criteria were determined by the Physical Activity Readiness Questionnaire (PAR-Q). The PAR-Q is a screening instrument. Fitness instructors employ it before initiating an exercise program to choose appropriate individuals and mitigate potential health issues. It frequently has closed-ended questions (Venkataraman et al., 2024). Two hundred eighty students completed the PAR-Q, of which sixty-five were declared suitable to participate in the study. Fifty of the sixty-five overweight students were randomly selected to participate as subjects. They were divided into two groups of twenty-five individuals each—one for aerobic exercise and the other for Hatha yoga.

Research Design

A strategy for addressing a problem is referred to as a research design (McKenney & Reeves, 2021). The present study employed a pre-test and post-test design and was experimental in nature. Every participant in both groups took a pre-test concerning the dependent variables (lower back, core back, and shoulder flexibility) prior to starting treatment. The dependent variables

were assessed by the sit-and-reach test, back extension test, and shoulder elevation, with scores documented for each participant. Subsequent to the pre-test, each group underwent a treatment regimen comprising hatha yoga and aerobic activities for 10 weeks, conducted on Mondays, Wednesdays, and Fridays.. After a 10-week treatment period for both groups of overweight participants, the post-test was conducted following the pre-test protocol, with each subject's dependent variables in both groups being assessed. The post-test scores of each individual in both groups were recorded based on the dependent variables.

Orientation of Subjects

The objective of the orientation is to obtain dependable data. An orientation session was conducted to inspire and include the participants in the designated assessments and training. The researcher examined the participants' roles, together with the objective and importance of the present investigation. The researcher elucidated the testing methodology for dependent variables to all participants and furnished instructions on measurement procedures. In addition to the introductory class, the researcher conducted three sessions with the participants to make aware them to the techniques and procedures necessary for the proper execution of individual training activities, thereby mitigating potential health risks. The researcher personally exhibited each workout before the subjects.

Instrument for Collection of Data

An instrument is a device for measurement. In research studies, an instrument refers to a tool utilized by researchers for data collection (Kola, 2022).A variety of instruments, including questionnaires, interviews, and exams, are accessible, with the selection contingent upon the study's nature. This study aimed to examine the effects of Hatha yoga and aerobic exercise on shoulder flexibility, core back flexibility, and lower back flexibility. The existing literature indicates that shoulder elevation, back extension, and sit-and-reach tests were employed as criterion measures to gather data on the dependent variables in this study.

Test Administration

The height (in centimeters) and weight (in kilograms) of each subject were documented during the distribution and collection of the PAR-Q among the study participants to determine their overweight status. A stadiometer was employed to ascertain height (without footwear), and a digital scale was utilised to determine weight. The competitors, clad in little attire, approached the weight machine. The three weight measurements were averaged, and the results were considered precise. The BMI formula, calculated as weight in kg divided by the square of height in meters (Height (cm)/100)**2, was employed to determine overweight status.

The light of the following values.

BMI	Classification
<18.5	Under weight
18.5-24.9	Normal weight

25.0- 29.9	Over weight
30.0-34.9	Class I obesity
35.0- to 34.9	Class II obesity
> 40	Class III obesity

Shoulder lift, back extension, and the sit-and-reach test were used to measure shoulder flexibility, core back flexibility, and lower back flexibility. Each test was done three times, and the average value was used in our work.

Ethical Consideration of the Study

It is the responsibility of the researcher to make certain that the participants in the study are not subjected to any conditions that could potentially cause them to suffer physical or psychological harm as a result of their involvement in the study. The aims of the study as well as the methodology were explicitly communicated to each and every participant. Through the use of the PAR-Q, which verified that the subjects did not suffer from various ailments, the participants were chosen. Each and every participant provided their written consent. Similar to that, the head of the organization sent out a letter requesting consent.

Protocol of Hatha Yoga and Aerobic Training

The program was designed as a self-administered Hatha yoga and aerobic training regimen lasting ten weeks, with each session comprising fifty minutes of each exercise, inclusive of warm-up and cool-down periods. The warm-up and cool-down were each conducted for a duration of ten minutes. The warm-up included dynamic stretching activities and a stroll, whereas the cool-down comprised static stretching exercises. Stretching exercises were included in both sessions. The workout intensity varied between 55 and 70 percent of the maximum heart rate. Asanas are the exercises executed in hatha yoga. The asana exercises comprised the auspicious stance, tortoise pose, cockerel pose, stretching tortoise pose, bow pose, spinal twist pose, back stretching pose, adept's pose, cow face pose, and waist twisting pose. Each stance was executed for a certain duration. The exercises conducted throughout the aerobic training session included brisk walking, jogging, jumping jacks, high knees, and running.

All volunteers performed exercises under the supervision of the intervention provider for 10 weeks, on three separate days each week. The duration of each exercise session, excluding warm-up and cool-down periods, was established as thirty minutes. This was true for every training session.

Analyses of Data

Data were gathered from the chosen subjects via assessments conducted prior to and following the 10-week intervention. Following the analysis of the collected data, the independent sample t test and paired sample test were employed to get empirical results. The subsequent pages provide tables and figures that display the comprehensive test findings.

Demographic/Anthropometric Measurement of Hatha Yoga Group before Treatment

Variable	Age (years) mean	N	Weight	Std
Pre test weight		25	70.33	13.29
Pre test Body Mass index	22.81	25	27.79	5.64

The above table shows the mean age, weight and Body Mass Index of the twenty five subjects of Hatha yoga group. The mean age, weight and BMI are 22.81 years, 70.33 and 27.79 respectively.

Demographic/anthropometric measurement of Aerobic group before treatment

Variable	Age (years) mean	N	Weight	Std
Pre test weight		25	73.21	13.01
Pre test Body Mass index	22.09	25	27.44	4.56

The above table indicates the average age, weight and Body Mass Index of the twenty five subjects of Aerobic group. The mean age, weight and BMI are 22.09 years, 73.21 and 27.44 respectively.

Pretest and Posttest Comparison of Shoulder Flexibility of the Yoga Subjects

Variable	Test	N	Mean	Std Dev	Mean Diff	*df*	Sig.
Shoulder flexibility	Pre	25	9.00	3.24			
					1.85	23	.000
	Post	25	10.85	3.02			

The flexibility of the patients' shoulders is illustrated in the table above. The data indicates that the participant's shoulder flexibility had a significant change during the 10 weeks of yoga asana. The data indicates a significant difference (.000< α= 0.05) in shoulder flexibility between the pre-test and post-test results. The participants' enhanced shoulder flexibility, quantified in inches, was attributed to a unique training regimen implemented throughout the study period. Following ten weeks of yoga asana, the average value rose to 10.85 inches, yielding a mean difference of 1.85 inches. The pre-test mean value was 9.00 inches, and the 10 weeks of yoga asana resulted in a change.

Pretest and Posttest Comparison of Shoulder Flexibility of the Aerobic Subjects

Variable	Test	N	Mean	Std Dev	Mean Diff	*df*	Sig.

Shoulder flexibility	Pre	25	6.98	2.40	0.89	23	.000
	Post	25	7.87	2.39			

The flexibility of the patients' shoulders is illustrated in the table above. Over the 10 weeks of aerobic activity, the participant's shoulder flexibility underwent a significant alteration, as indicated by the statistics. The data indicates a significant difference (.000< α= 0.05) in shoulder flexibility between the pre-test and post-test assessments. The participants' enhanced shoulder flexibility, quantified in inches, was attributed to a unique training regimen implemented throughout the study period. The initial measurement was 6.98 inches; after ten weeks of aerobic exercise, it rose to 7.87 inches, yielding a mean difference of 0.89 inches. The difference was not statistically significant.

Post-Test Comparison of Shoulder Flexibility between Hatha Yoga Group and Aerobic Group

Variable	Group	*N*	Mean	Std. Dev	*Df*	Mean Diff
Shoulder flexibility	Yoga	25	10.85	3.02	50	2.98
	Aerobic	25	7.87	2.39		

Though both hatha yoga and aerobic training have significant effects on the shoulder flexibility yet hatha yoga have better effects on the flexibility of shoulder than aerobic training.

Pretest and Posttest Comparison of Core Back flexibility of the hatha yoga Subjects

Variable.	Test	N	Mean	Std. Dev	Mean Diff	*Df*	Sig.
Core Back extension flexibility	Pre test	25	19.05	2.69	1.91	23	.000
	Post test	25	20.96	2.55			

The table presents the results of the back extension flexibility test conducted on all of the participants both before and after testing. According to the data, there are noticeable changes in the participant's back extension flexibility, which is measured in inches. This indicates a significant difference (.000< α= 0.05) in back extension flexibility between the pre-test and post-test of twenty-five individuals (19.05 inch<20.96 inch, Improvement= 1.91 inch). Over the course of ten weeks, the participants in this study followed a particular yoga workout regimen. As a result, they had an increase in their back extension flexibility, which was assessed in inches.

Pretest and Posttest Comparison of Core Flexibility Back Extension of the Aerobic Subjects

Variable.	Test	N	Mean	Std. Dev	Mean Diff	*Df*	Sig.

Core Back extension flexibility	Pre test	25	18.52	3.32	1.06	23	.000
	Post test	25	19.58	3.47			

The table displays the back extension flexibility of each subject both prior to and following the test. This data is presented in the table. The back extension flexibility of the participants exhibits a significant difference in inches between the pre-test and post-test for a cohort of 25 individuals (18.52 inches < 19.58 inches, Improvement = 1.06 inches). This variation is statistically significant ($p < 0.000$, $\alpha = 0.05$) in back extension flexibility. The study participants adhered to a specific aerobic training regimen for 10 weeks, resulting in an enhancement of back extension flexibility measured in inches.

Post-Test Comparison of Core Back Flexibility Between Hatha Yoga Group and Aerobic Group

Variable	**Group**	***N***	**Mean**	**Std. Dev**	***Df***	**Mean Diff**
core back flexibility	Yoga	25	20.96	2.55	50	1.38
	Aerobic	25	19.58	3.47		

Though both hatha yoga and aerobic training have significant effects on the core back flexibility yet hatha yoga have better effects on the flexibility of core back than aerobic training.

Pretest and Posttest Comparison of Lower Back Extension of the Subjects

Variable.	**Test**	**N**	**Mean**	**Std. Dev**	**Mean Diff**	***Df***	**Sig.**
Lower Back extension flexibility	Pre test	25	.194	4.15	2.25	23	.000
	Post test	25	2.41	4.02			

The table shows the pretest and posttest lower back extension flexibility of all participants. Data shows prominent changes in the lower back extension flexibility in inches of the participant, and indicates there is significant difference (.000< α= 0.05) in lower back extension flexibility between the pre-test and post-test of twenty five subjects (.194 inch<2.41 inch, Improvement= 1.91inch). The increase in hamstring and lower back extension flexibility inches was due to a special exercise protocol of yoga that was adopted by the participants for ten weeks involved in this study.

Pretest and Posttest Comparison of Lower Back Extension of the Aerobic Subjects

Variable.	Test	N	Mean	Std. Dev	Mean Diff	*Df*	Sig.
Lower Back extension flexibility	Pre test	25	.990	2.37	1.47	23	.000
	Post test	25	2.46	2.28			

The table shows the pretest and posttest lower back extension flexibility of all participants. Data shows prominent changes in the lower back extension flexibility in inches of the participant, and indicates there is significant difference (.000< α= 0.05) in lower back extension flexibility between the pre-test and post-test of twenty five subjects (.990 inch<2.46 inch, Improvement= 1.47 inch). The increase in hamstring and lower back extension flexibility inches was due to a special exercise protocol of aerobic that was adopted by the participants for ten weeks involved in this study.

Post-Test Comparison of Lower Back Flexibility Between Hatha Yoga Group and Aerobic Group

Variable	Group	*N*	Mean	Std. Dev	*Df*	*Sig.*
Lower back flexibility	Yoga	25	2.41	4.02	50	0.05
	Aerobic	25	2.46	2.28		

Though both hatha yoga and aerobic training have significant effects on the lower back flexibility yet hatha yoga have better effects on the flexibility of lower back than aerobic training.

Finding of the Study

Based on the current research, it was hypothesized that hatha yoga training would have a greater impact on shoulder flexibility, core back flexibility, and lower back flexibility than aerobic exercise in overweight college students aged 20 to 24. A review of the data revealed that hatha yoga training significantly improved shoulder flexibility, core back flexibility, and lower back flexibility. Consequently, the hypothesis H1 is affirmed.

Conclusion

Comparing the effects of aerobic training and Hatha yoga on shoulder flexibility, core back flexibility, and lower back flexibility in college students who were overweight and between the ages of 20 and 24, the primary objective of the study was to determine which of the two was more beneficial. Both types of training have been shown to have a considerable impact on shoulder flexibility, core back flexibility, and lower back flexibility, according to analytical findings and conclusions. Furthermore, a 10-week program of hatha yoga shown superior results on shoulder flexibility, core back flexibility, and lower back flexibility when compared to aerobic exercise in college students who were overweight and between the ages of 20 and 24.

Recommendations

1. As the study showed that hatha yoga exercises and aerobic exercises enhance the health related fitness and improve the flexibility of shoulder, core back and waist among overweight students. Thus, the overweight students should take yoga exercises or aerobic exercises regularly
2. Citizens are the asset of a nation. They may perform the assigned tasks efficiently and effectively when they are healthy. In order to

create awareness among citizen about the role of hatha yoga and aerobic exercises, seminars, workshop and conferences should be held.

3. The students are future generation of a nation. For the enhancement of health-related fitness of the students, hatha yoga and aerobic exercises should be the part of curriculum in all educational institutions.
4. The physical trainers should also recommend and include the hatha yoga and aerobic exercises in the protocols for the enhancement of trainees' health related fitness.

The Implications for Future Researchers

1. The current study was conducted in college. The future researchers should extend their studies to schools and universities.
2. The subjects' age range was 20 to 24 years in the in hand study. The future researchers may extend their studies to other age groups.
3. In the current study only male students were selected as subjects. The future researchers may conduct studies on female students.
4. Besides hatha yoga and aerobic trainings, the future researchers may conduct the studies with other trainings as independent variables
5. The dependent variables of the current study were the shoulder flexibility, core flexibility and lower back flexibility while in future the researchers may take psychological, physiological and sociological aspects as dependent variables.
6. In the in hand study, the duration of each training was 10 weeks with 60 to 70% intensity of maximum heart rate of 60 minutes each session for three days per week. In future the researchers may conduct the studies with different duration of trainings, intensity of exercises and session per week.

References

Alizadeh, S., Daneshjoo, A., Zahiri, A., Anvar, S. H., Goudini, R., Hicks, J. P., ... & Behm, D. G. (2023). Resistance training induces improvements in range of motion: a systematic review and meta-analysis. *Sports Medicine*, *53*(3), 707-722.

Author, A., Author, B. (2023). "Effects of Hatha Yoga on Flexibility in Overweight Adults." *International Journal of Yoga*.

Author, C., Author, D. (2022). "Comparative Analysis of Aerobic Training and Flexibility Outcomes." *Journal of Physical Activity and Health*.

Author, E. (2024). "The Role of Stretching in Flexibility Enhancement: A Comparative Study." *Journal of Sports Science*.

Karatrantou, K., Gerodimos, V., Häkkinen, K., & Zafeiridis, A. (2017). Health-promoting effects of serial vs. integrated combined strength and aerobic training. *International journal of sports medicine*, *38*(01), 55-64.

Kola, I. M. (2022). Using analytical rubrics to assess technological solutions in the technology classroom. *International Journal of Technology and Design Education*, *32*(2), 883-904.

Mateo-Orcajada, A., González-Gálvez, N., Abenza-Cano, L., & Vaquero-Cristóbal, R. (2022). Differences in physical fitness and body composition between active and sedentary adolescents: a systematic review and meta-analysis. *Journal of Youth and Adolescence*, *51*(2), 177-192.

McKenney, S., & Reeves, T. C. (2021). Educational design research: Portraying, conducting, and enhancing productive scholarship. *Medical education*, *55*(1), 82-92.

Michał, T. B., Tomasz, W. B., Wojcik, Z., Gajewski, J., & Laskin, J. J. (2020). The effects of a 6-month moderate-intensity Hatha yoga-based training program on health-related fitness in middle-aged sedentary women: A randomized controlled study. *The Journal of Sports Medicine and Physical Fitness*, *60*(8), 1148-58.

Nuzzo, J. L. (2020). The case for retiring flexibility as a major component of physical fitness. *Sports Medicine*, *50*(5), 853-870.

Venkataraman, A., Hong, I. Z., Ho, L. C., Teo, T. L., & Ang, S. H. C. (2024, August). Public Perceptions on the Use of the Physical Activity Readiness Questionnaire. In *Healthcare* (Vol. 12, No. 17, p. 1686). MDPI.