RESEARCH ARTICLE

Effect of yoga therapy on selected physiological and psychological parameters of sports persons

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ABSTRACT

Background: Elevated levels of physiological and psychological stress harm the sports player's performance during competition. Practicing yoga has been shown to reduce anxiety and keep the physiological parameters within normal ranges. The present study investigates the impact of yogic practice (4 weeks) on the selected physiological parameters and pre-competition anxiety level of a sports player before a competition. *Methods*: 120 Male Inter-University players (19–26 years) from basketball, volleyball, and handball games at HNB Garhwal University, Uttarakhand, was recruited as the experimental group (n = 60), and the Control group (n = 60). Pre- and post-intervention anxiety levels and physiological parameters like VC (VC), resting heart rate (RHR), and blood pressure (SBP and DBP) were recorded. Descriptive statistics (mean and standard deviation) and dependent t-tests (paired 't' test) were applied for the statistical analysis and the significance level was set at 0.05. *Results*: Significant lower post-intervention values of VC, RHR, SBP, DBP, and anxiety scores were observed in the experimental groups of all three types of sportspersons in comparison to their pre-intervention values. However, there was no pre- and post-intervention difference in the control groups of all the recruited sportspersons. *Discussion*: Based on the findings of the study, it is concluded that a four-week yogic intervention is beneficial for controlling anxiety, and it has a positive significant effect on selected cardio-respiratory parameters of the sports persons.

Keywords: Anxiety, Pranayama, VC, Systolic blood pressure, Diastolic blood pressure, Sports persons, Relaxation therapy.

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INTRODUCTION

The fear of the unknown causes anxiety, resulting in emotional tension and disturbance due to the apprehension of danger or potential suffering. It entails perceiving an imminent threat, experiencing a sense of powerlessness, and preparing for potential hazards, culminating in an uneasy emotional state.[1]

In sports psychology, anxiety is defined as an unpleasant emotion characterized by vague but persistent feelings of apprehension and dread. Pre-competitive anxiety specifically refers to the tendency to perceive pre-competitive situations as threatening and to respond with feelings of apprehension or tension.[2] Competitive anxiety is described as an adverse emotional response to stressors associated with competition, manifested before and during athletic performances.[3,4]coupled with the risk of severe injury can induce significant levels of anxiety, which if uncontrolled, can negatively impact performance and possibly promote unsporting conduct. The present study examined competitive anxiety levels of combat sports athletes and determined whether self-reported scores were associated with mental toughness and Sportspersonship attitudes. A cross-sectional survey design was used whereby participants (N = 194 It is identified by cognitive symptoms such as negative thoughts about performance and somatic symptoms like trembling limbs.[5]Smoll, Cumming, Grossbard, 2006 While it's common for athletes to experience minor levels of competitive anxiety as a natural response to competition,[3]coupled with the risk of severe injury can induce significant levels of anxiety, which if uncontrolled, can negatively impact performance and possibly promote unsporting conduct. The present study examined competitive anxiety levels of combat sports athletes and determined whether self-reported scores were associated with mental toughness and Sportspersonship attitudes. A cross-sectional survey design was used whereby participants (N = 194 elevated levels have been shown to impair performance.[6]PsycARTICLES, SPORTDiscus, Web of Science, ProQuest, and Sage databases were searched for experimental studies that fulfilled the inclusion criteria. Risk of bias was assessed using the 12 criteria Cochrane Review Book Group tool. Hedge's g and 95% confidence intervals (CIs The reflecting impulse model explains the impact of cognitive anxiety on performance.[7] According to this concept, task execution requires two interrelated systems: a reflecting system that uses working memory's cognitive resources and an intuitive system that is learned via experience.[8]

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The psychological setup of athletes significantly influences their top-level performance, as mental factors determine competitive behavior, mental processes, and preparation before competitions.[2]

Through regulating an individual's stress response system and appropriately managing anxiety, yoga has a significant psychological function in helping people relax and deal with stressful situations more readily. Many people can reduce their stress levels by doing various yoga positions, particularly breathing exercises, as yoga is therapeutic.[9]football and handball players were selected as subjects for the study from the arts and science college and they were randomly divided into two groups equally with fifteen each in experimental and control groups. All the selected players have undergone training in their respective games and apart from the training, experimental group underwent one hour yoga training in the morning session before the games training for six weeks. The pretest and posttest were conducted in the psychological variables of Stress and Anxiety. Stress was assessed with the help of Everly and Girdano stress scale and Anxiety was measured by using sports competition anxiety questionnaire designed by Rainer Martens. The collected data were statistically analyzed using ANCOVA to find out the significant difference between the groups if any. The significant level was fixed at 0.05. It was concluded from the result of the study that yogasanas training had significant impact on stress and anxiety among the inter collegiate players. INTRODUCTION Yoga helps psychologically to relax and handle stressful situations more easily. Yoga teaches us to have a calm mind and can focus our energy on the particular activity. Yoga brings positive thoughts and self-acceptance. Yoga is a great form of exercise and a mind-body practice that can have physical, mental and emotional benefits. Yoga also is an effective way to develop greater self-awareness, acceptance, and the ability to be present in the moment. Regular yoga practice brings about mental clarity and calmness, increases body awareness and also relieves chronic stress patterns, relaxes the mind, centers attention and also sharpens concentration. Yoga, which is a way of life, is characterized by balance, health, harmony, and bliss (Nagendra and Nagarathna, 1977 Raising the parasympathetic tone lowers blood pressure, anxiety, and other psychosomatic patterns, enhances lung and cognitive function and fosters physical well-being and self-awareness.[10]

Extensive analysis demonstrated that nasal breathing causes synchronized oscillations in the human piriform cortex, amygdala, and hippocampal local field potential activity.[11]

Pranayama practices involve the stretching of lung tissue, which activates slowly adapting receptors and generates hyperpolarizing currents. These inhibitory signals, transmitted *via* the vagus nerve from the cardiorespiratory region, are thought to harmonize neural activity in the brain. This process induces changes in the autonomic nervous system, promoting parasympathetic dominance and reducing metabolic activity. Additionally, Pranayama influences various lung reflexes associated with inhalation and exhalation, interacting with central neural mechanisms to establish a renewed state of physiological balance in the body.[12]

The practice of yoga has demonstrated numerous beneficial effects on various physiological systems in the body. Consistent yoga practice has been linked to notable enhancements in cardiorespiratory, cardiovascular, and thermoregulatory functions, creating a foundation for improved overall health and systemic balance.[13]

Alternate nostril breathing enhances lung VC and cardiopulmonary function, with added benefits when paired with yogic bellows breathing or voluntary internal breath retention, improving oxygen delivery and ventilatory efficiency. Yogic bellows breathing also reduces heart and respiratory rates, indicating better autonomic regulation. Together, these practices support Pranayama's role in promoting homeostasis and parasympathetic balance.[14]the effect of Pranayama or Yogic Breathing Practices (YBP

Interestingly, it's important to remember that elevated breathing rates correspond with amygdala activation during anxious or fearful times, influencing neocortex neuronal activity. This demonstrates a clear link between respiration and thought processes.[15]which the brain eliminates by averaging across population activity (Georgopoulos *et al*., 1986; Lee *et al*., 1988; Shadlen and Newsome, 1994; Maynard *et al*., 1999 Yoga enhances joint mobility, muscle tone, and spine flexibility, making it beneficial for basketball, volleyball, and handball athletes by boosting focus, coordination, and overall health. It also promotes relaxation, strengthens internal organs, and reduces stress, improving performance and agility.[16] A study in 2021 revealed that integrating mental training and yoga practices, performed four days a week for 60 minutes each session, led to significant enhancements in the volleying and serving skills of college female volleyball players.[17] Thus, numerous studies have examined the effects of yoga on psychological factors and have consistently shown that it has a significant positive impact on improving psychological well-being.

The current study specifically aimed to investigate how practicing yoga affects anxiety levels and corresponding cardiorespiratory variables among Inter-University players of different games. To optimize the relevance of our findings in competitive scenarios, we conducted our experiment during the pre-competition phase, focusing on university players who had already undergone thorough training for their respective games at university-level competitions. The study aimed to examine the impact of yogic practice on a sports player's anxiety level and selected cardiorespiratory variables during a competition phase.

MATERIAL AND METHODS

Selection of the Subjects

The research received formal approval from the University's Board of Studies Committee and adhered to the ethical principles outlined in the Declaration of Helsinki. All

participants provided written informed consent before their involvement in the study.

After the ethical clearance, a total of 120 Inter-University male players from Basketball, Volleyball, and Handball games of HNB Garhwal University, Srinagar Garhwal Uttarakhand, having participated in inter-university competitions aged between 19 to 26 years, were recruited for the study. The subjects were classified into the Experimental group - Basketball players 20, Volleyball players 20, and Handball players 20) and the Control group (Basketball players 20, Volleyball players 20, and Handball players 20). The selected physiological parameters were vital capacity (VC), resting heart rate (RHR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and the psychological variable chosen as anxiety. The rationale for combining basketball, volleyball, and handball players in this study is rooted in the unique yet complementary nature of these high-intensity sports, allowing for a comprehensive assessment of yoga's benefits. This inclusive approach aims to demonstrate yoga's universal ability to enhance physiological and psychological well-being and reduce physiological and psychological parameters across diverse athletic demands. By encompassing a range of competitive environments, the study highlights yoga's broad applicability as a powerful intervention for athletes (Figure 1).

Tools used for data collection

The VC was measured by an electro-spirometer (REF Mini Spir). The subject was asked to take a deep breath and then blow hard into the mouthpiece of the spirometer with a sharp blast. Three recordings were taken at one-minute intervals, and the highest reading was noted. The RHR was measured by the palpation method of the radial artery for a minute. Three readings were taken, and their average was recorded. SBP and DBP were measured by an electro-sphygmomanometer (Omron HEM-8712). Three readings were taken, and their average was recorded. The psychological variable, i.e., Pre-competition anxiety, was measured with the help of Rainer Martens' 1977 sports competition anxiety test (SCAT). This scale consists of 15 items with three alternative options. A score of less than 17 indicates a low level of anxiety, 17 to 24 indicates an average level of anxiety, and more than 24 indicates a high level of anxiety.

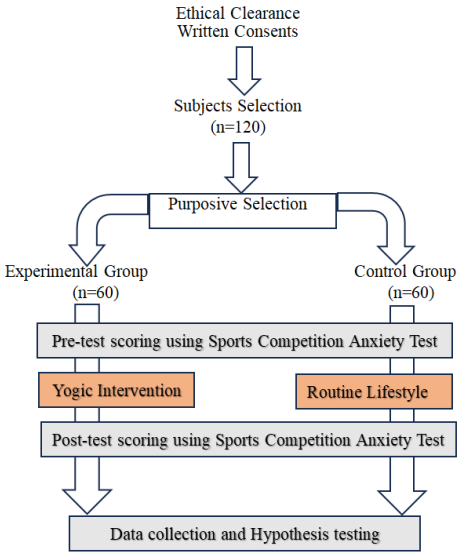

Figure 1: Flowchart depicting the subject recruitment and evaluation protocol for the study

Yogic Intervention

The experimental group engaged in 30 minutes of evening yoga practice five days a week for four weeks, in addition to their Games training (Table 1).

The control group did not do any relaxation therapy and continued with their normal game training during this period.

Testing Procedure

Pre and post-tests were administered on both group's experiment and control by measuring the various physiological parameters and administering the Rainer Martens' psychological scale of sports competition anxiety questionnaire before and after the four weeks of yoga practices (1977).

Statistical Procedure

The data was analyzed by using various descriptive and inferential statistics. For descriptive statistics, mean and standard deviation (SD) were used. In order to determine the significant difference in pre and post-test data obtained for sports competition anxiety for experimental and control groups, a dependent 't' test (paired t-test) was administered. The level of significance was set at 0.05 level.

RESULT

It is evident from Table 2 that there were significant differences between the pre-test and post-test values of measured physiological parameters of the experimental group of basketball players. The respective t-values for VC, RHR, SBP, and DBP are 6.27, 6.53, 11.56, and 7.64, respectively; the probabilities were found to be approaching zero.

On the other hand, no significant difference between the pre-test and post-test mean of measured physiological

Table 1: Schedule of yogic intervention

Practice	*Time (Minutes)*	*Rounds*
1. Prayer	3	1
2. Pranayama		
A. Nadi Shodhan Pranayama	5	10
B. Bhramari Pranayama	5	5
C. Ujjayi Pranayama	5	5
3. Yoga Nidra	10	1
4. Shanti path	2	1
Total	30	

Table 2: Measured physiological parameters of basketball sports persons

Physiological parameters	*Control group*		*Experimental group*	
	Pre-test	*Post-test*	*Pre-test*	*Post-test*
VC (L)	4.10 ± 0.52	4.21 ± 0.70	4.32 ± 0.25	3.65 ± 0.46*
Resting heart rate (bpm)	67.20 ± 9.18	68.80 ± 9.64	64.35 ± 12.49	69.40 ± 10.15*
Systolic pressure (mmHg)	129.50 ± 2.98	130.50 ± 3.95	129.50 ± 3.95	118.45 ± 1.60*
Diastolic pressure (mmHg)	70.05 ± 4.82	74.95 ± 5.96	76.70 ± 4.26	69.00 ± 3.58*

Critical $t_{0.05}$ (19) =1.73; * indicates $p < 0.05$.

Table 3: Measured physiological parameters of volleyball sports persons

Physiological parameters	*Control group*		*Experimental group*	
	Pre-test	*Post-test*	*Pre-test*	*Post-test*
VC (L)	4.79 ± 0.57	4.79 ± 0.41	4.29 ± 0.04	3.86 ± 0.42*
Resting heart rate (bpm)	64.05 ± 9.03	66.50 ± 7.09	69.55 ± 9.52	64.35 ± 12.03*
Systolic pressure (mmHg)	125.75 ± 6.15	128.25 ± 4.34	125.75 ± 6.15	118.25 ± 1.51*
Diastolic pressure (mmHg)	74.40 ± 5.40	70.80 ± 4.83	78.65 ± 3.89	73.25 ± 4.57*

Critical $t_{0.05}$ (19) =1.73; * indicates $p < 0.05$.

parameters of the control group of basketball players was noted (Table 2). The calculated t-values for VC, RHH, SBP, and DBP are 0.47, 1.36, 0.00, and 2.53, respectively; while *p-values* are 0.641, 0.191, 1.00, and 0.020, respectively.

The pre-test and post-test values of VC, RHR, SBP, and DBP are presented in Table 3. Statistically significant differences between the pre-test and post-test means of measured physiological parameters of the experimental group of volleyball sportspersons were noted with t-values 3.23, 6.11, 5.66, 4.56, and *p-values* 0.004, 0.000, 0.000, 0.000, respectively for VC, RHR, SBP, and DBP. However, in the control group, the volleyball players demonstrated unchanged VC (t = 3.23; p = 0.969), significantly increased RHR (t = 1.626; p = 0.120), and insignificant decreases for the SBP (t = 1.436; p = 0.167) and DBP (t = 1.962; p = 0.065).

Table 4 depicts the pre-test and post-test values of both groups of handball player participants. Like that of the basketball players and volleyball players, the experimental group of handball players also demonstrated significant decreases in all the measured physiological parameters. The calculated t-values for VC, RHR, SBP, and DBP are 5.12, 5.46, 13.69, and 9.67, respectively, with p-values near zero. It is also evident from Table 4 that pre-test and post-test values of measured physiological parameters of the control group of handball players did not differ significantly. The calculated t-values were 1.26, 0.94, 0.17, and 1.77, with *p-values* of 0.224, 0.058, 0.869, and 0.092, respectively, for VC, RHR, SBP, and DBP.

As listed in Table 5, the anxiety levels of experimental groups of basketball players, volleyball players, and handball players were significantly reduced after the yogic intervention with t-values of 4.95 (p = 0.001), 5.72 (p = 0.000), and 6.47 (p = 0.000), respectively.

Contrary to this, the post-test anxiety levels of control groups of basketball players, volleyball players, and handball players were only insignificantly altered compared to the pre-test anxiety levels (Table 5) with t-values of 1.48 (p = 0.16), 0.61 (p = 0.55), and 1.60 (p = 0.13), respectively.

DISCUSSION

The present study showed a significant reduction in anxiety levels among the experimental group. On the contrary, the control group exhibited no significant difference in anxiety levels. These results suggest that a four-week yoga intervention significantly reduces anxiety among basketball, volleyball, and handball players during the competition phase. Anxiety manifests in various forms,

Table 4: Measured physiological parameters of handball sports persons

Physiological parameters	*Control group*		*Experimental group*	
	Pre-test	*Post-test*	*Pre-test*	*Post-test*
VC (L)	4.69 ± 0.53	4.83 ± 0.37	4.66 ± 0.69	3.86 ± 0.43*
Resting heart rate (bpm)	65.60 ± 9.04	69.05 ± 9.57	76.25 ± 7.13	65.05 ± 8.89*
Systolic pressure (mmHg)	125.30 ± 6.35	124.90 ± 6.45	129.50 ± 2.98	117.90 ± 1.55*
Diastolic pressure (mmHg)	74.40 ± 5.40	71.10 ± 4.84	77.60 ± 3.12	69.80 ± 4.38*

Critical $t_{0.05}$ (19) =1.73; * indicates $p < 0.05$.

Table 5: Anxiety levels of all the sportspersons

Psychological parameters	*Control group*		*Experimental group*	
	Pre-test	*Post-test*	*Pre-test*	*Post-test*
Basketball	26.25 ± 2.67	27.05 ± 1.67	22.25 ± 3.21	20.25 ± 2.24*
Volleyball	24.25 ± 3.18	24.50 ± 2.67	22.35 ± 3.59	20.95 ± 2.98*
Handball	26.05 ± 1.88	26.80 ± 1.99	23.20 ± 3.25	22.35 ± 3.30*

Tab t.05 (19) =1.73; * indicates $p < 0.05$.

including trait anxiety, state anxiety, situation-specific anxiety, and competitive anxiety. Competitive anxiety, an emotional response to stressors associated with competition, manifests before and during game performance. The four-week yoga intervention, comprising prayers, pranayama (including Nadi Shodhan Pranayama, Bhramari Pranayama, and Ujjayi Pranayama), Yoga Nidra, and a 30-minute Shanti Path session conducted 5 days a week, played a significant role in reducing anxiety levels in the experimental group. The statistical significance of reduced anxiety levels can be attributed to the relaxing and stress-handling benefits of yoga. Yoga interventions offer a range of healing benefits that facilitate stress reduction through various asanas, particularly breathing (pranayama) practices. These practices enhance lung function, and cognitive capacity, and reduce blood pressure, anxiety, and other psychosomatic patterns. The efficacy of yoga interventions in reducing anxiety levels among basketball, volleyball, and handball players is thus evident. The study's findings align with multiple previous research findings as those demonstrated the significant impact of yoga interventions in overcoming anxiety.[1,3,9] state, and national Additionally, significant differences in anxiety levels were identified in the experimental group, with no significant differences in the control group, as shown by several earlier reports.[4,18,19]

The present study's findings are also supported by the literature on anxiety reduction, which is based on controlled breathing patterns. Any kind of perceived threat or pressure situation creates respiratory activity into hyper mode, leading to various somatic changes in different body systems of individuals. Calmness induced by regular practice of pranayama controls HPA activity that leads to check-in unwanted upheaval in psycho-somatic activity.

Pranayama significantly improves VC, RHH, and blood pressure by enhancing respiratory efficiency, cardiovascular function, and autonomic balance. A yogic intervention strengthens the respiratory muscles and promotes lung elasticity. The ability of the lung to take in air and maximize oxygen exchange is explained by deep breathing and alternate nostrils. Numerous studies demonstrate that, depending on training intensity and length, regular practice might boost his virtual ability by 10 to 30%.

The yogic intervention also helps lower blood pressure, both diastolic and systolic. This is accomplished by enhanced endothelial function and blood vessel relaxation. It also raised nitric oxide release and decreased sympathetic overdrive to improve vascular relaxation. Through the reduction of cardiovascular stress and the promotion of parasympathetic dominance, Ujjayi Pranayama lowers blood pressure. It has been demonstrated that regular practice, through increased vagal activity and decreased sympathetic response to stimuli, considerably lowers heart rate and systolic and diastolic blood pressure.

The yogic intervention significantly improves the various physiological and psychological aspects by addressing the root causes of efficiency in the respiratory and cardiovascular systems, overcoming anxiety, and achieving overall body-mind harmony.

Overall, yogic intervention comparing pranayama and meditation is beneficial in controlling autonomic nervous system activity, which leads to a positive impact on individuals' cardio-respiratory variables and negative emotional states causing anxiety.

CONCLUSION

Since, anxiety negatively impacts all aspects of life, such as social, personal, and academic performance, regular yoga practice seems to be effective for reducing anxiety and can serve as a relaxation therapy specifically for sportspeople. Including yoga intervention in the players' training program may be beneficial for the psycho-physiological preparation of the players before participating in the competition by reducing pre-competition sports anxiety and improving the cardio-respiratory parameters.

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PEER-REVIEWED CERTIFICATION

During the review of this manuscript, a double-blind peer-review policy has been followed. The author(s) of this manuscript received review comments from a minimum of two peer-reviewers. Author(s) submitted revised manuscript as per the comments of the assigned reviewers. On the basis of revision(s) done by the author(s) and compliance to the Reviewers' comments on the manuscript, Editor(s) has approved the revised manuscript for final publication.