

## Research Paper

## The Impact of Yoga Exercises on Athletes' Anxiety and Sleep Quality in the Coronavirus Pandemic

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## ABSTRACT

**Purpose:** The rapid and limitless outbreak of the coronavirus in 2019 caused athletes to quarantine in their homes, resulting in stress and anxiety and the experience of negative symptoms, such as sleep disorder. The present study aims to investigate the effect of 8 weeks of yoga exercise on athletes' anxiety and sleep quality during the pandemic.

**Methods:** Twenty-four athletes with an average age of 18 to 25 years were selected and classified into two experimental and control groups. Before and after the intervention, Beck's anxiety inventory and Pittsburgh's sleep quality inventory were used to collect data. The experimental group training protocol consisted of 24 Hatha yoga exercise sessions (60 minutes, three times a week). Due to the coronavirus epidemic, online training was conducted by an experienced yoga coach. The statistical method of covariance analysis was used to investigate the difference between the pre-test and post-test.

**Results:** Data analysis showed that in the experimental group, the anxiety mean scores in the pre-test decreased in the post-test, and the quality of sleep scores improved after yoga sessions. Also, a significant difference was observed between the experimental and control groups regarding anxiety ( $P < 0.05$ ) and sleep quality ( $P < 0.05$ ).

**Conclusion:** According to the results, yoga exercises are an effective way to reduce anxiety and improve athletes, sleep quality, and athletes can benefit from yoga exercises along with their specialized exercises to control their negative emotions, reduce mental symptoms, and enjoy relaxation. Not only athletes but all people in the community can incorporate yoga and meditation exercises into their lifestyles to control their negative emotions.

## Keywords:

Meditation, Anxiety, Sleep quality, Coronavirus, Mental health, Yoga

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## Highlights

- Physical exercise has an important effect on the health of the human body and mind. Exercise can reduce stress hormones. Daily exercises can correct the circadian rhythms and reduce the symptoms of sleeplessness and insomnia.
- Daily exercises should be moderate to intense, and one of the exercises recommended to improve sleep and reduce anxiety is yoga.

## Plain Language Summary

The physical postures of yoga (asanas) and its breathing techniques and relaxation affect reducing anxiety. Asanas reduce muscle tension in the neck, shoulders, and back and increase blood flow. In addition, it increases a person's self-awareness. If you have anxiety and do not sleep well, yoga exercises can help you a lot.

## Introduction

In December 2019, in Wuhan City, China, with the news of several people being infected with unusual pneumonia, a new type of coronavirus was identified as the cause of a new respiratory disease with human epidemics [1]. The World Health Organization (WHO) chose the official name of COVID-19, which was derived from the three words “corona, virus, and disease” [1]. The outbreak of this new and deadly virus around the world created a great deal of concern among people, and the governments used the quarantine method in the face of it [2]. This pandemic not only threatened physical health but also people’s mental health. Also, public centers and sports facilities, where essential events were locked down, including sports competitions, even the 2020 Olympics, in different parts of the world, due to the very fast outspread of the new and deadly disease, imposed athletes’ quarantines in their homes [3]. Physical exercises and activities encountered pandemic conditions, the closure of sports facilities, and restrictions on physical activities. Many athletes were preparing for competitions before the outbreak, or those who sought to maintain their health by exercising; the lack of a certain date and the tough conditions of training may cause anxiety and psychological damage [4]. The expansion of COVID-19 not only caused public health concerns but also caused psychological disorders, including anxiety, fear, depression, labeling, avoidance behaviors, irritability, sleep disorders, and stress [5]. When pandemic conditions and diseases cause anxiety and fear in ordinary people, this anxiety may also affect athletes [6]. It is acknowledged that semi-professional athletes reported significant disorders in all lifestyle factors, including social interactions, physical activity, sleep patterns, and mental health. They showed significant irregularities in the entire sleep

time and sleep latency; the number of exercise and training sessions also decreased significantly in the semi-professional athletes [7]. Physical activity is a universal intervention to improve mental and general health and prevent mental illnesses among all people in the community [8]. Exercise affects numerous physiological and psychological functions in the human body, one of the most crucial of which is sleep and anxiety. The relationship between sleep and anxiety is bilateral, and studies show that long-term sleeplessness leads to pathological anxiety [9, 10]. In anxiety disorders, the person is subject to false warnings that may be severe, frequent, or even continuous. These false warnings may lead to inefficient arousal, often leading to persistent sleep and wakefulness problems. Another point that emphasizes the relationship between anxiety and sleep is that sleep disorder is a diagnostic symptom for some anxiety disorders, such as generalized anxiety disorder and post-traumatic stress disorder [11]. Sports activities are a healthy, safe, simple, and inexpensive way to improve sleep [12]. People, especially athletes, use a variety of physical activities as a tool to reduce anxiety and increase sleep quality since regular exercise improves healthy sleep cycles and is believed to have antidepressant and antianxiety effects while acknowledging that it protects the person from the disadvantages of stress [13]. In this regard, research showed that athletes who maintained a regular training schedule during the pandemic reported less anxiety. Therefore, exercising during the pandemic had a positive impact on the level of anxiety among athletes. The group comparison results showed high scores of anxiety during the pandemic for women, younger athletes, professional athletes, and athletes without a training program. Therefore, exercising during the pandemic has a positive effect on athletes’ anxiety levels. According to research studies, relaxation, music therapy, therapeutic touch, acupuncture, and yoga are among the

methods to reduce anxiety. Nowadays, yoga acts as an alternative therapy or drug to improve brain function. Many researchers have used yoga interventions to reduce brain disorders, neurological diseases, and cognitive disorders [14]. Yoga interventions increase the strength of the  $\alpha$ ,  $\beta$ , and  $\delta$  bands in the frontal, central, parietal, occipital, and temporal lobes. Beta power increases theta only in the occipital lobe and gamma-band power in the frontal and slightly in the temporal lobes. The researchers showed that the yoga training program increased the overall activity of the brain waves, thus improving cognitive functions, reducing anxiety, and increasing staying-focused capabilities [15]. In addition, it showed that Hatha yoga or motor yoga exercises include a set of activities that affect the mind and body. It also enhances the abilities of individuals both physically and mentally and helps them stay focused [16, 17]. On the other hand, Hatha yoga is a sport that also showed that yoga improved symptoms of anxiety and its secondary effects, depression, quality of life, and immunity, and that exercise training has a great impact on cognitive performance and staying focused [18]. In a qualitative study, we evaluated the need for yoga training at work and home during a holiday due to the COVID-19 pandemic and acknowledged the need to perform yoga training to reduce anxiety and stress and positively affect the body's immunity with better sleep. They offered daily sessions of online yoga as a tool to achieve mental and physical health. Also, in the quarantine conditions, many people reported sleep disorders and showed that staying at home can disrupt sleep [19]. They recommended behavioral cognitive interventions to improve the quality of sleep and decrease anxiety for those who encountered new programs and changed requirements. Relieving sleep problems in the quarantine restricts stress and possibly prevents disruption of social relationships [20]. Described physical activity and yoga as a non-pharmacological approach to the Corona epidemic to maintain mental health [21]; therefore, given the effectiveness of the yoga exercises and the pandemic conditions of COVID-19, which caused anxiety and disruption of sleep rhythm in athletes, this study sought to answer whether yoga affects athletes' anxiety and sleep quality in lockdowns or by restricting activities in sports centers.

## Materials and Methods

A quasi-experimental study was conducted with a pre-test, post-test design, consisting of two experimental and control groups. Subjects included 24 futsal women with a mean age of 20.43 from semi-professional clubs with about 5 years of experience in futsal club teams that were stopped in the COVID-19 pandemic, and the timing of

their upcoming competitions was unclear. In this study, the researcher included assumptions, positing a 95% type I error, an 80% statistical power, and a medium effect size by Cohen's conventions. Consequently, the required sample size has been determined based on these considerations.

Individuals were selected for the study based on inclusion and exclusion criteria. The inclusion criteria included being semi-professional athletes in the futsal and football clubs of Ahvaz City, Iran with an age range between 18 and 23 years. These athletes had no history of mental illnesses or mood disorders in the past two years. They actively participated in team practices and competitions until the interruption caused by the COVID-19 quarantine. Additionally, participants did not use any specific medications, especially those affecting the nervous system. They were physically healthy and capable of performing yoga exercises without any physical injuries. Furthermore, the volunteers' willingness to participate in the research, along with possessing the necessary physical abilities for yoga exercises, were prerequisites for entry into the study. The exclusion criteria included the use of medications that affect the central nervous system, such as tranquilizers, anti-anxiety drugs, and antidepressants. Participants were informed that they could withdraw from the research stages if they chose not to continue their cooperation. The Beck anxiety inventory (BAI) was used to measure the anxiety of the subjects, which is a self-report questionnaire to measure the severity of anxiety in adolescents and adults. This questionnaire measures the symptoms of clinical anxiety in individuals. It is a scale, i.e. the subject selects one of four options for each item that indicates the severity of anxiety. The BAI has been studied by many abroad and inside the country, indicating that it is the best questionnaire to determine anxiety [22]. The reliability of this tool is 0.80 to 0.94 [23-25]. The re-tested reliability was reported to be 0.75, and the correlation of its components was 0.30 to 0.76 [26]. This questionnaire has acceptable credibility and reliability in Iran [22].

Pittsburgh sleep quality inventory measured the sleep quality. This questionnaire has seven sub-scales, subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. In the Iranian version of this questionnaire, validity was 0.86 and reliability was 0.89. In another study, the reliability was 0.46 by Cronbach's  $\alpha$  and 0.52 by the bisection method [27].

Table 1. Hata yoga exercises

Sessions	Contents					
1	Introduction					
2	Getting to know the concepts of Hatha yoga	Getting to know pranayama	Getting to know shavasana			
3 and 4	Chest and clavicle breathing	Shoulder and spine stretches	Sun salutation in seven cycles	Cyclic asanas	Cool down, stretching	Meditation and prayer
5	Abdominal breathing	Shoulder, neck, and spine stretches	Chandra Namaskar in seven cycles	Cyclic asanas	Cool down, stretching	Meditation and prayer
6	Chest breathing	The lower body and middle body stretches	Sun salutation Ashtanga	Cyclic asanas	Cool down, stretching	Meditation and prayer
7	Abdominal breathing	Shoulder, neck, and spine stretches	Chandra Namaskar in seven cycles	Cyclic asanas	Cool down, stretching	Meditation prayer and mindfulness
8	Chest and clavicle breathing	Shoulder, neck, and spine stretches	Sun salutation in seven cycles	Cyclic asanas	Cool down, stretching	Meditation prayer and mindfulness
9	Chest and clavicle breathing	Lower body stretches	Anxiety asanas in seven cycles	Cyclic asanas	Cool down, stretching	Meditation and prayer
10	Chest and clavicle breathing	Foot stretches	Anxiety asanas in seven cycles	Cyclic asanas	Cool down, stretching	Meditation mindfulness and prayer
11	Kapalabhati breathing	Spine, and foot stretches	Waist asanas in seven cycles	Cyclic asanas	Cool down, stretching	Trataka candle meditation prayer
12	Kapalabhati breathing	Spine and foot stretches	Waist asanas in seven cycles	Cyclic asanas	Cool down, stretching	Trataka candle meditation prayer
13	Abdominal breathing	Lower body stretches	Anxiety asanas in seven cycles	Cyclic asanas	Cool down, stretching	Leaf meditation
14	Kapalabhati breathing	Spine and foot stretches	Waist asanas in seven cycles	Cyclic asanas	Cool down, stretching	Trataka candle meditation prayer
15	Anomaviloma breathing	Pelvic stretches	Asanas related to varicose veins in seven cycles	Cyclic asanas	Cool down, stretching	Meditation, visualization, and prayer
16	Anomaviloma breathing	Pelvic stretches	Asanas related to the pelvic region include Trikonasana, and Parshvakonasana in seven cycles	Cyclic asanas	Cool down, stretching	Meditation and prayer
17 and 18	Bee breathing	Wrists, elbows, arms stretches	Asanas related to thyroid and balance in seven cycles	Cyclic asanas	Cool down, stretching	Trataka meditation with rose flowers and prayer
19	Anomaviloma breathing	Pelvic stretches	Asanas related to the pelvic region include Trikonasana, and Parshvakon asana in seven cycles	Cyclic asanas	Cool down, stretching	Meditation in the form of yoga nidra and prayer
20	Bee breathing	Wrists, elbows, and arms stretches	Asanas related to thyroid and balance in 7 cycles	Cyclic asanas	Cool down, stretching	Body scan and prayer
21 and 22	Ojai breathing	Feet and toe stretches	Boat pose (Navasana) in Ten cycles	Cyclic asanas	Cool down, stretching	Meditation, visualization, and prayer
23	Three minutes of breathing	Neck stretches	Dolphin pose and mountain pose (Tadasana) in Ten cycles	Cyclic asanas	Cool down, stretching	Meditation, visualization, and prayer
24	Three minutes of breathing	Neck stretches	Dolphin pose and mountain pose (Tadasana) in ten cycle	Cyclic asanas	Cool down and stretching	Meditation, body scan, and prayer

**Procedure**

At first, the research steps were explained to the subjects, and the samples were randomly divided into two experimental and control groups. Then, the amount of anxiety and sleep quality in both groups were measured using a questionnaire. Experimental group subjects were asked to fill out two questionnaires (sleep quality and anxiety) and then attend online yoga training for 8 weeks, three sessions a week, and 1 hour offered by the coach. No exercise was provided to the control group.

After 8 weeks, both group’s anxiety and sleep quality were re-evaluated as post-tests. The yoga exercise program includes a warm-up and then asana exercises (stretching movements, exercise involving all muscles, stretching for pain, and muscle contraction), pranayama exercises (sitting with a straight back posture and deep inhale and exhale with special, coordinated rhythm and holding breath for a short period), and meditation exercises (sleeping in solitude, breathing with proper rhythm, isometric contractions of the large muscles, stretching, releasing, and focusing) [28].

Table 1 presents the exercises of each session. Due to the specific conditions of the coronavirus pandemic and the lockdown of sports clubs, yoga exercises were held online using Skype’s video call feature for each session for the experimental group subjects. The questionnaires were sent via an Internet link at a specific time (during the pre-test and post-test) to all participants. It is worth

noting that after completing the research sessions, observing the rights of the subjects, and benefiting from yoga exercises, control group subjects also practiced.

**Data analysis**

SPSS software, version 20, was used to analyze the data. The Shapiro-Wilk test was used to evaluate the normal data distribution, and the one-way covariance analysis test was used to investigate the effect of exercise.

**Results**

The subjects were 24 women with a mean age of 20.0±2.21 years and the history of playing football of 4.0±1.53 years. Table 2 presents the descriptive statistics of the subjects’ demographic characteristics.

Table 3 presents the mean and standard deviation of the dependent variables of this research, including anxiety and quality of sleep.

To check the normality of the data distribution, the Shapiro-Wilk test was used. The results showed that the data has a normal distribution (P>0.05). To investigate the effect of yoga exercises on athletes’ anxiety and their quality of sleep, the analysis of covariance (ANCOVA) test was used. At first, the assumptions of the analysis of the covariance test, including the normality of the data, the linearity of the data distribution, the homogeneity of the variances, the similarity of the regression slope, and

**Table 2.** Descriptive statistics of subjects’ demographic characteristics

Subjects	Mean±SD				
	Age (y)	Sport History (Y)	Height (cm)	Weight (Kg)	BMI (kg/m <sup>2</sup> )
Control group	20.0±2.21	4.0±1.53	158.80±3.60	59.9±3.46	23.1±0.95
Experimental group	20.83±2.20	4.41±1.44	155.95±4.03	58.57±4.3	23.67±1.07

BMI: Body mass index.

**Table 3.** Descriptive statistics of variables

Variables	Groups	Mean±SD	
		Pre-test	Post-test
Anxiety	Control	26.83±6.84	28.0±5.36
	Experimental	24.67±6.58	14.58±4.37
Sleep quality	Control	11.83±2.85	12.08±2.22
	Experimental	13.0±2.55	8.25±1.71

the validity of the covariance variable measurement tool, were examined. The results of the ANCOVA for the anxiety variable showed a significant difference between the control and experimental groups in the post-test scores ( $P < 0.0001$ ,  $F = 333.243$ ). Also, the results of the ANCOVA for the sleep quality variable showed a significant difference between the control and experimental groups in the post-test scores ( $P < 0.0001$ ,  $F = 104.686$ ) (Table 4).

## Discussion

The present study was conducted to examine the effectiveness of yoga exercises to improve sleep quality and anxiety. Due to the specific conditions of athletes during the coronavirus pandemic, this research was conducted on a group of professional Iranian club futsal players. The first result was that yoga training affected athletes' anxiety during the coronavirus pandemic. The results are consistent with previous studies when the pandemic had not spread yet, confirming the positive effects of yoga on anxiety. Thus, the present results are consistent with DiBenedetto [28]. They examined the challenges of athletes in the home quarantine caused by COVID-19 and found that training programs helped reduce anxiety without the need for specific equipment [29]. Tanwar and Rajan conducted a review study and summarized that yoga is a psychological and non-pharmaceutical approach that helps maintain mental health and reduce anxiety during the COVID-19 pandemic by reducing mental issues. Anxiety treatment is one of the main reasons people do yoga [21]. Yoga, as a type of mind-body treatment [30], has become a popular approach to achieve physical and especially mental health [31]. The release of endogenous opioids caused by exercise may be associated with improved mood during exercise [32]. This effect has been confirmed by various studies in yoga [33]. Yoga also affects the amount of hypothalamic, pituitary, and adrenal responses, leading to adaptability in the secretion of endocrine glands in the face of substances such as cortisol

and adrenocorticotrophic hormones [34, 35]. It has been found that yoga increases thalamic gamma-aminobutyric acid (GABA), which is considered a drug treatment for anxiety and mood disorders [36, 34]. It is plausible that increasing GABA through yoga is part of its mechanism of action to improve anxiety.

In addition, it is thought that Pranayama, or focusing on the breath, takes place through a change to control the parasympathetic nervous system by the vagus nerve and re-evaluating the sympathetic nervous system [37], confirming the results of experimental research that indicates a relationship between anxiety and sympathetic activation, vagus nerve deactivation, increased respiratory frequency, and reduced breathing depth. These results have been reported in qualitative studies and case reports, i.e. anxiety reduction after yoga classes [38-40]. Thus, according to the results of the present study and the results of earlier research studies, yoga gains further importance as an appropriate exercise during the COVID-19 pandemic to reduce athletes' anxiety at home.

The second result of the study showed a significant difference between the two groups, experimental and control, in the post-test scores for sleep quality. The mean scores of sleep quality in yoga-trained athletes were higher. In similar studies, Andreato et al. suggest that staying at home during the pandemic causes a sudden change in the everyday program and uncertainty about the date of athletes' return to activities, resulting in athletes experiencing conditions, leading to negative emotions and sleep disorders. They described deep breathing techniques, meditation, and relaxation as improving the quality of sleep [29]. Butzer et al. explored the effect of yoga on students and stated that they sleep sooner, sleep more relaxed, and fall asleep faster, as the most common improvements of students regarding sleep [41]. The results are also consistent with the results of Halpern et al, regarding the positive effect of yoga and relaxation

**Table 4.** Result of the analysis of covariance test on the sleep quality and anxiety variable

Variables	Source	Sum of Square	df	Mean of Square	F	Sig.	$\eta^2$
Sleep quality	Pre-test	63.307	1	63.307	55.721	0.0001	0.726
	Group	118.940	1	118.940	104.686	0.000	0.833
	Error	23.859	21	1.136			
Anxiety	Pre-test	474.693	1	474.693	190.881	0.000	0.901
	Group	828.727	1	828.727	333.243	0.000	0.872
	Error	52.224	21	2.487			

on anxiety [42]. Elite athletes have a lower quantity and quality of sleep compared to the general population [43]. People (especially athletes) use different types of exercise as a tool to enhance sleep quality [44]. Exercise is a new non-pharmacological intervention for people who do not sleep well. Many studies have promised that it may improve sleep quality [45]. Exercise and sports, such as yoga are currently overtaking medicine and psychotherapy in solving sleeplessness problems [44, 45]. Yoga helps the person's mind relax and indirectly gives the person a deep sleep. By doing yoga, the person gets rid of cortisol. This issue increases the amount of oxygen in the body along with the secretion of sleep-facilitating hormones [46]. According to the laws of social distance, online yoga sessions on social media are the best alternative to in-person sessions. Concerning the improvement of sleep quality in people during the COVID-19 pandemic, it can be concluded that the improvement of sleep quality in athletes can also be achieved by yoga because, according to previous studies, yoga is followed by the subjective and mental relaxation of athletes, bringing about a deep and high-quality sleep [47]. Accordingly, teams are recommended to use yoga as an appropriate treatment for anxiety and sleep disorders and improve the mental conditions of their athletes in the COVID-19 pandemic. Besides, it is useful to use yoga applications and online exercises to improve anxiety about concerns about the ambiguities of returning to training and the potential disorders of athletes' sleep quality in COVID-19 conditions. Moreover, the daily stresses of life on people's mental health in the post-corona era and the prevalence of its virus mutations have increased mental disorders. Athletes are also not free from these conditions and are affected by the current situation. Non-pharmaceutical strategies, such as physical activity and home exercise are the best ways to improve these disorders and may have more long-term effects. Since yoga is a physical activity implemented without special equipment and without time and space constraints, it can be considered in the lifestyle of the community in addition to being an exercise for professional athletes. Thus, it is suggested that sports teams use yoga as an appropriate treatment for anxiety and sleep disorders and improve the mental conditions of their athletes under certain social conditions and also in normal conditions.

## Conclusion

Yoga interventions have effectively reduced anxiety levels in athletes and improved their sleep quality. Such interventions, when conducted online, serve as a valuable resource in situations where in-person exercises

and physical activities outside the home are not feasible, such as during pandemics and associated quarantines. Online yoga practices emerge as an effective method to address both physical and psychological challenges, including anxiety and sleep quality.

## Limitations

The study's limitations arise from its online nature, as some individuals may not derive the same benefits from online classes as they would from in-person sessions.

## Ethical Considerations

### Compliance with ethical guidelines

Before commencing the research, participants completed an informed consent form after the researcher's detailed explanation of the training program. Voluntariness characterized participation in the research stages. Participants were assured of the confidentiality of their information within the research team, and the researcher, maintaining anonymity, would disseminate the results of this study. No financial obligations were imposed on participants for their involvement in this research, and they retained the entitlement to compensation in the event of any encountered issues, be they physical or psychological. The researcher is responsible to address and cover the costs associated with the treatment of adverse effects that may arise during the study.

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## Authors' contributions

All authors equally contributed to preparing this article.

## Conflict of interest

The authors declared no conflict of interest.

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