



# Investigation of anxiety levels and sleep quality among athletes from different sport branches during the pandemic: A web-based cross-sectional survey from Türkiye

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## Abstract

**Aim:** COVID-19 pandemic which has disrupted the daily routine and professional life of every individual including professional athletes from every branch. In addition to the postponed race programme COVID-19 itself may cause anxiety and sleep problems which have the potential to further impair sport performance. This study aimed to determine level of anxiety and sleep status of sportsmen during the pandemic.

**Materials and Methods:** On line questionnaires addressing sleep and anxiety was posted to the athletes who were engaged in eight different sport branches (football, basketball, volleyball, athletics, boxing, kickboxing, tennis and badminton) responded to provide data to this study. Responses obtained through an online questionnaire conducted between April and May 2020 were evaluated. Pittsburgh Sleep Quality Index (PSQI) inventory was utilized to measure the quality of sleep and State and Trait-Anxiety Inventories (STAI-S, STAI-T) and Generalized Anxiety Disorder-7 (GAD-7) inventories were used for examining the anxiety level, quantitatively.

**Results:** A total of 343 athletes (129 women and 214 men, mean age:  $23.16 \pm 0.43$  yr; mean body mass index:  $22.88 \pm 0.12$  kg/m<sup>2</sup>) responded to the survey. The overall mean PSQI score was  $5.96 \pm 0.12$ , and athletics were the most affected group by the sleep quality ( $6.85 \pm 0.35$ ,  $p = 0.038$ ). Mean PSQI scores revealed low sleep quality during pandemic ( $5.96 \pm 0.12$ ), and athletics were the most affected group by the sleep quality ( $6.85 \pm 0.35$ ,  $p = 0.038$ ). Regarding state anxiety (STAI-S), athletes had border-line anxiety levels ( $41.11 \pm 0.21$ ), their trait anxiety (STAI-T) score was  $38.91 \pm 0.22$  ( $n=343$ ) for overall participants. According to the GAD-7 scores the athletics had mild anxiety level ( $8.15 \pm 0.21$ ), kickboxers being most affected group with GAD-7 scores of  $9.26 \pm 0.62$ , ( $p < 0.001$  vs other athletes,  $n=35$ ).

**Conclusion:** This cross-sectional study indicate that there was a poor sleep quality and a mild level of anxiety among sportsman during the pandemic.



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## Introduction

The New Coronavirus Disease (COVID-19), which was first reported in Wuhan, People's Republic of China, in December 2019 and started with unknown pneumonia cases, was declared as a pandemic by the World Health Organization in February 2020 [1]. This extraordinary situation has affected the daily life and occupational routine of every individual in many aspects.

The COVID-19 pandemic has also deeply affected the sports society. Several organizations, national championships and world championships in many sports branches

anceled or postponed due to the increase in COVID-19 cases in the sportive activities. Those involved postponement of all Union of European Football Associations (UEFA) Champions League and Europa League football matches, National Basketball Association (NBA) matches, the Tokyo 2020 Olympic Games and Formula 1 races were cancelled. Wimbledon Tennis Tournament in England was canceled in 2020 (for the first time in history). Many people who have been staying at home for a long time during the pandemic period have exposed to stress of this uncertain process, experiencing anxiety, fear and depression. These stress factors and new daily routine caused sleep disturbances or inability to sleep [2]. Athletes from all disciplines are affected both physically and mentally due to

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the uncertainty of the pandemic, cancellation of leagues, economic concerns, change/decrease in the training routines [3-5]. The suspension of the leagues for a while and then the accelerated re-start also put pressure on sportsmen and slowed down their physical and mental recovery [4]. At the same time, in 2019, the International Olympic Committee (IOC) emphasized that mental health problems (anxiety, depression, etc.) are common among elite athletes and therefore the mental health of athletes should be taken seriously [6]. Considering the social, physical and mental difficulties brought by the pandemic, the necessity of careful monitoring of the sportsmen physical and mental health status emerges.

Elite athletes are normally under competitive stress; however, as a part of the population, they are also affected by the physical and mental consequences of the COVID-19 pandemic [5]. The mental impact of the pandemic for elite athletes originated from the cancellation or postponement of competitions, violation of training, and frequent removal and placement of lockdowns, also introducing uncertainty for their own athletic career [4, 6, 7]. This study aimed to determine the anxiety level and sleep quality of the sportsmen from eight different branches living in Turkey during the pandemic period. This work is unique by means of investigating sleep quality and psychosocial status in the most frequently performed sports branches.

## Materials and Methods

### *Study design and participants*

The study was conducted during April and May 2020. Online questionnaires with informed consent were sent to potential athletes through WhatsApp and study was advertised in social media. The contact numbers were obtained from club representative and questionnaire link was sent, the responders personal details except special branch were optional. Athletes from sport branches including football, basketball, volleyball, athletics, boxing, kickboxing, tennis and badminton were considered.

The survey battery consisted of three questionnaires: personal demographic questionnaire, State and Trait Anxiety Inventories (STAI-S and STAI-T) and General Anxiety Disorder-7 (GAD-7), and Pittsburgh Sleep Quality Index (PSQI). Questions were administered for the online survey and the survey link was sent to the sportsmen.

The study protocol was approved by the Scientific Research Ethics Committee of Karadeniz Technical University (No: 2020-102). This cross-sectional research was performed according to the good clinical practices recommended by the Declaration of Helsinki and its amendments

### *Demographical survey questions*

In the demographic survey; age, gender, marital status, number of children, body-mass index and engaged sport branch were questioned.

### *Pittsburgh sleep quality index questionnaire*

The Pittsburgh Sleep Quality Index is a questionnaire which was developed by Buysse et al. in 1989 to evaluate sleep quality [8]. It is a self-report based screening survey

that evaluates the amount of sleep, sleep disturbance and sleep quality of the individual during the last one month period. It is a reliable and consistent sleep questionnaire and consists of seven components (and total nineteen questions): subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction. Each item in 19 questions in the survey is scored between 0-3 points: 0 (not during the past month), 1 (less than once a week), 2 (once or twice a week), 3 (three or more times a week). The sum of the seven component scores gives the total PSQI score which has a value between "0" and "21". A total score higher than "5" indicates the poor sleeping quality [8-10].

### *State and Trait-Anxiety Inventories (STAI-S and STAI-T)*

The STAI-S and STAI-T were developed by Spielberger et al. 11 adapted into Turkish by Öner and LeCompte in 1983, and this translation and scoring method was used in our study. In both scales, 20 questions are asked and a 4-point Likert option is presented; for the STAI-S scale, these options are "Not at all", "Somewhat", "Many", and "Totally", and for the STAI-T scale: "Almost none time", "Sometimes", "Most of the time", "Almost always". The scores obtained from both scales theoretically vary between 20 and 80; consequently a high score indicates a high level of anxiety. The average score level of individual in normal psychology determined in the literature ranges from 36 to 41. STAI-S and STAI-T scores of an individual are evaluated separately, not compared [10-12].

### *General Anxiety Disorder-7 (GAD-7) Questionnaire*

GAD-7 is a short self-report test developed by Spitzer et al. according to DSM-IV-TR criteria, evaluating generalized anxiety disorder, revealing the anxiety level in the last two weeks [13]. It is a 7-item four-Likert type questionnaire (0 = none, 1 = many days, 2 = more than half of the days, 3 = almost every day), which evaluates the experiences asked in the scale items in the last 2 weeks. The total scores obtained from the scale "5", "10", and "15" represent cut-off points for "mild", "moderate", and "severe anxiety", respectively [13].

### *Statistical analysis*

Demographic characteristics of the participants were calculated using the percentage and frequency from descriptive statistics. The scores obtained from the scales were determined as mean  $\pm$  standard deviation. Before performing the hypothesis tests, whether the data showed normal distribution was examined with the Kolmogorov-Smirnov test. Since the data were not distributed normally in all subgroups ( $p < 0.05$ ); Mann Whitney U test was used when comparing two groups, Kruskal Wallis test when comparing more than two groups. The association between PSQI (with 7 components), STAI-S, STAI-T and GAD-7 scores was analyzed using the Spearman correlation coefficient. IBM SPSS version 20.0 program was used for the analyzes and the significance level was accepted as  $p < 0.05$ . Violin plot graphics of the subcomponents of the PSQI inventory

**Table 1.** General descriptive results of psychological tests performed.

Variables (for all sportsmen, n = 343)	Minimum	Maximum	Mean ± Standart Deviation	
Lying down (to sleep) duration – <i>minutes</i>	1	240	21.61 ± 1.22	
Sleep duration – hours	1.5	12	8.26 ± 0.09	
PSQI scores	Component I. Subjective sleep quality	0	3	1.72 ± 0.04
	Component II. Sleep latency	0	3	1.17 ± 0.05
	Component III. Sleep duration	0	3	0.35 ± 0.04
	Component IV. Habitual sleep efficiency	0	3	1.11 ± 0.07
	Component V. Sleep disturbances	0	3	1.15 ± 0.03
	Component VI. Use of sleeping medication	0	3	0.10 ± 0.02
	Component VII. Daytime dysfunction	0	2	0.36 ± 0.03
	Total PSQI score	1	14	5.96 ± 0.12
STAI-S score	31	60	41.11 ± 0.21	
STAI-T score	20	60	38.91 ± 0.22	
GAD-7 score	0	21	8.15 ± 0.21	

**Table 2.** Comparative analysis results of the psychological tests performed (in pairs) ( $S\rho$ : Spearman’s rho coefficient).

Correlation of test scores	Correlation coefficient	p value
STAI-S - STAI-T ( $S\rho$ )	0.857	<0.001
STAI-S - GAD7 ( $S\rho$ )	0.866	<0.001
STAI-T - GAD7 ( $S\rho$ )	0.781	<0.001
STAI-S – PSQI ( $S\rho$ )	0.869	<0.001
STAI-T – PSQI ( $S\rho$ )	0.878	<0.001
GAD7 – PSQI ( $S\rho$ )	0.985	<0.001

were prepared on the website of BoxPlotR, an online free software based on the R program [14].

**Results**

A total of 343 sportsmen, engaging in eight different sport branches including football, basketball, volleyball, athletics, boxing, kickboxing, tennis and badminton volunteered to participate in this study. Of which 129 were women and 214 men. The mean age of total participants was  $23.16 \pm 0.43$  yr and their body mass index was  $22.88 \pm 0.12$  kg/m<sup>2</sup>. All sportmen participating in the study declared that they were healthy (with no psychiatric or clinical conditions), and not diagnosed with coronavirus positivity at the time of response to the questionnaire.

Sleep latency (lying down to falling asleep durations, minutes), sleep duration (as hours), scores of all PSQI components, STAI-S, STAI-T and GAD-7 scores for all sportsmen are presented in Table 1. In terms of total PSQI mean values; athletes had low sleep quality during pandemic ( $5.96 \pm 0.12$ ), and athletes were the most affected group by the sleep quality ( $6.85 \pm 0.35$ ,  $p = 0.038$ ).

Correlation analysis among STAI-S, STAI-T and GAD-7 and global PSQI scores are presented in Table 2. Regarding state anxiety (STAI-S), athletes had border-line anxiety levels ( $41.11 \pm 0.21$ ), their trait anxiety (STAI-T) score was  $38.91 \pm 0.22$  (n=343) for overall participants. According to the GAD-7 scores the athletes had mild level

of anxiety ( $8.15 \pm 0.21$ ), kickboxers being most affected group with GAD-7 scores of  $9.26 \pm 0.62$ , ( $p < 0.001$  vs other athletes, n=35).

Demographic data and the mean PSQI, STAI-S, STAI-T and GAD-7 scores of the subgroups and the significance levels in the comparisons of the subgroups are given in Table 3. PSQI, STAI-S, STAI-T and GAD-7 scores according to branches of sportsmen are presented in Figure 2A-D.

**Discussion**

Study results indicate that overall the athletes had low sleep quality during the pandemic. Regarding the state anxiety, athletes had border-line anxiety levels. Among athletes kickboxers were the most affected group.

As the study did not address specific causes of anxiety and sleep dysfunction we have no evidence based explanation for the highest level of COVID-19 related anxiety. Although not questioned they might have sudden postponement of planned fight for career ranking and left training camp, lost their sparring partners for training.

Our study has two merits; one is COVID-19-related anxiety (during the COVID-19 outbreak) and the other being sleep status in relation to the anxiety. Sleep hygiene is critical for healthy life and physical performance. Several studies published the relationship of sports performance with severe anxiety [15-17]. Apart from catching COVID-19 disease, increases in psychological problems have also been observed in sportsmen due to reasons such as not being able to continue their training regularly, uncertainty about the future, and anxiety [5].

Watson et al. indicated positive correlations between the increase in the sleep duration and quality of the sportsmen, the increase in the training/match performance success and the decrease in the risk of injury/disease [18]. Sleep, which is one of the most basic biological activities of a human, is an essential component for physical development, conscious emotional response, cognitive performance and quality of life, in which body tissues get away from metabolic processes that are active all day long and prepare the body for physiological performance [18,19]. It is essential for life that people spend about one-third of

**Table 3.** Demographic data and the mean test scores of the subgroups and the significance levels in the comparisons of the subgroups.

Demographic and personal data				PSQI scores and comparisons by subgroups		STAI-S scores and comparisons by subgroups		STAI-T scores and comparisons by subgroups		GAD-7 scores and comparisons by subgroups	
Variables		N	%	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
Gender	Women	129	37.6	6.12 $\pm$ 0.22	0.58	41.24 $\pm$ 0.29	0.18	39.42 $\pm$ 0.28	0.11	8.96 $\pm$ 0.29	<b>0.001</b>
	Men	214	62.4	5.86 $\pm$ 0.15		41.03 $\pm$ 0.28		38.61 $\pm$ 0.31		7.66 $\pm$ 0.28	
Marital status	Married	281	81.9	6.50 $\pm$ 0.30	<b>0.049</b>	41.69 $\pm$ 0.57	0.60	39.61 $\pm$ 0.67	0.37	7.45 $\pm$ 0.56	0.10
	Single	62	19.1	5.84 $\pm$ 0.13		40.98 $\pm$ 0.22		38.76 $\pm$ 0.22		8.30 $\pm$ 0.22	
Age distribution	$\leq$ 25 years old	257	74.9	5.89 $\pm$ 0.14	0.38	41.07 $\pm$ 0.23	0.92	38.66 $\pm$ 0.24	0.17	8.41 $\pm$ 0.23	<b>0.03</b>
	26-70 years old	86	25.1	6.16 $\pm$ 0.25		41.22 $\pm$ 0.47		39.67 $\pm$ 0.68		7.36 $\pm$ 0.49	
Number of children	None	291	84.8	5.85 $\pm$ 0.13	0.17	40.98 $\pm$ 0.21	0.43	38.81 $\pm$ 0.22	0.66	8.37 $\pm$ 0.22	<b>0.007</b>
	1	28	8.2	7.00 $\pm$ 0.52		40.68 $\pm$ 0.48		38.54 $\pm$ 0.74		8.25 $\pm$ 0.82	
	2	19	5.5	6.05 $\pm$ 0.40		42.79 $\pm$ 1.23		40.53 $\pm$ 1.27		5.47 $\pm$ 0.91	
	3 or more	5	1.5	6.40 $\pm$ 1.44		44.80 $\pm$ 3.81		40.60 $\pm$ 5.77		5.00 $\pm$ 1.30	
BMI distribution	Under-weight	6	1.7	5.50 $\pm$ 0.85	0.69	41.00 $\pm$ 1.07	0.74	39.50 $\pm$ 2.03	0.55	8.67 $\pm$ 2.86	0.52
	Normal	290	84.5	5.96 $\pm$ 0.14		41.01 $\pm$ 0.22		38.94 $\pm$ 0.23		8.29 $\pm$ 0.22	
	Overweight	43	12.5	5.88 $\pm$ 0.31		41.65 $\pm$ 0.62		38.63 $\pm$ 0.75		7.19 $\pm$ 0.65	
	Class I Obesity	4	1.2	7.75 $\pm$ 1.75		42.50 $\pm$ 1.85		39.00 $\pm$ 1.87		7.75 $\pm$ 2.14	
	Class II Obesity	-	-	-		-		-		-	
Class III Obesity	-	-	-	-	-	-					
Partner status	Alone	21	6.1	5.62 $\pm$ 0.41	0.26	41.43 $\pm$ 0.77	0.68	40.38 $\pm$ 0.98	0.11	9.00 $\pm$ 0.76	0.15
	With spouse &/ children	63	18.4	6.44 $\pm$ 0.30		41.68 $\pm$ 0.56		39.59 $\pm$ 0.66		7.33 $\pm$ 0.57	
	With parents	236	68.8	5.80 $\pm$ 0.14		40.88 $\pm$ 0.24		38.59 $\pm$ 0.24		8.32 $\pm$ 0.25	
	Other	23	6.7	6.65 $\pm$ 0.65		41.57 $\pm$ 0.78		39.04 $\pm$ 0.84		7.87 $\pm$ 0.68	
Sport branch	Football	102	29.7	5.86 $\pm$ 0.22	<b>0.038</b>	40.80 $\pm$ 0.37	0.51	38.79 $\pm$ 0.34	0.11	6.77 $\pm$ 0.47	<b>&lt; 0.001</b>
	Basketball	35	10.2	5.77 $\pm$ 0.30		41.77 $\pm$ 0.78		40.63 $\pm$ 0.86		8.71 $\pm$ 0.49	
	Volleyball	35	10.2	6.00 $\pm$ 0.43		40.37 $\pm$ 0.39		38.34 $\pm$ 0.50		8.46 $\pm$ 0.44	
	Athletics	34	9.9	6.85 $\pm$ 0.35		42.50 $\pm$ 0.87		39.32 $\pm$ 1.16		8.09 $\pm$ 0.66	
	Boxing	33	9.6	5.03 $\pm$ 0.36		40.70 $\pm$ 0.64		38.61 $\pm$ 0.52		8.58 $\pm$ 0.49	
	Kickboxing	35	10.2	6.06 $\pm$ 0.46		41.09 $\pm$ 0.47		38.83 $\pm$ 0.33		9.26 $\pm$ 0.62	
	Tennis	36	10.5	6.31 $\pm$ 0.39		41.69 $\pm$ 0.74		38.33 $\pm$ 0.92		9.08 $\pm$ 0.55	
	Badminton	33	9.6	5.97 $\pm$ 0.41		40.48 $\pm$ 0.48		38.67 $\pm$ 0.43		8.91 $\pm$ 0.70	
Smoking status	Non-smokers	293	85.4	5.90 $\pm$ 0.13	0.31	41.03 $\pm$ 0.21	0.43	38.66 $\pm$ 0.23	0.009	8.18 $\pm$ 0.23	0.50
	Smokers	50	14.6	6.32 $\pm$ 0.38		41.58 $\pm$ 0.65		40.38 $\pm$ 0.69		7.96 $\pm$ 0.57	

their lives asleep, and sleep has a great impact on both the health and performance of sportsmen. In a study conducted with male basketball players, the average night sleep hours of the players were increased from 6.6 hours to 8.5 hours for 5 to 7 weeks and compared with their previous performances; 5% increase in speed, 9% increase in free throw accuracy, and 9.2% improvement in free throw percentage and 3-pointer target [20]. In another study, increasing 2 hours in the night's sleep time resulted in an improvement in the serving accuracy percentage of tennis players from 36% to 41% [21]. Athletic performance has been found to worsen with even mild sleep loss in a number of areas, including speed, endurance, and performance accuracy, and chronic sleep deprivation has been shown to negatively affect athletic performance [22].

While a good sleep helps a rested body and thus increase performance and recover the muscles, the decrease in sleep

quality and duration causes a decrease in the decision-making ability, irritability, decreased athletic performance, mood swings, physical and mental stress [23]. In the study, the rate of sportsmen with high stress, anxiety and depression scores is less than 50%, but it was determined that these three variables were both related to sleep quality and there was a significant difference between the groups. The negative effects of the COVID-19 pandemic have greatly affected elite sportsmen as well as the general public. It has been determined that staying at home for a long time causes psychological effects such as the closure of schools and public areas, the postponement or cancellation of sports organizations and the decrease in people's social activities, depression and anxiety in order to reduce social distance [24].

This explorative cross-sectional study provided evidence of an association between COVID-19 anxiety and decreas-

ing sleep quality among the sportsmen from eight different branches. Although no detailed examination of possible factor(s) causing this was not examined, forced quarantine and fear of COVID-19 disease, stress, lack of access to gyms and/or sport clubs, sleep/wake cycle changes, eating disorders, income anxiety might have contributed to this. It is already known that a variety factors negatively affect the performance, mental and physical health of sportsmen. It is necessary to be aware of what the sportsmen are going through in this period, and to take measures to improve their performance and health. In addition, the health and sportive performance of the sportsmen who have COVID-19 disease should be monitored and evaluated with further studies.

Results from this self-rated study indicates that athletes from variety of branches had affected from the COVID-19 which posed a significant risk for their professional performance and overall health. The COVID-19 pandemic is now over and these data may not be useful for any decision. But, this and related data could be used for possible future similar lock-down cases for maintaining optimum sportive performance.

#### *Ethical approval*

The study protocol was approved by the Scientific Research Ethics Committee of Karadeniz Technical University (No: 2020-102).

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