

The effect of Ramadan fasting on sleep quality, total sleep time, and daytime sleepiness in soccer players.

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Abstract

This study aimed to examine the effect of Ramadan fasting on sleep quality, total sleep time, and daytime sleepiness in soccer players. Twenty-four U15 Algerian amateur soccer players voluntarily participated in this descriptive study (age = 14.25 ± 0.60 years, height = 167.08 ± 5.52 cm, weight = 54.34 ± 8.19 kg). The subjects responded to PSQI and ESS scale before (10-days prior), the middle of Ramadan and 21 days after Ramadan, statistical analyses were performed using SPSS. PSQI and ESS scores increased significantly during Ramadan (both $p < 0.001$), and TST also decreased significantly during Ramadan ($p < 0.001$), where the ES was large magnitude. Components of the PSQI there were no significant in components 4,5,6 ($p > 0.05$). Components 1,2,3,7 was significant ($p < 0.05$). in conclusion Ramadan fasting impaired sleep quality, total sleep time decreased, and increased daytime sleepiness in soccer players.

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1. Introduction

Ramadan is a fundamental tenet of Islam and requires healthy adult Muslims to abstain from eating and drinking from sunrise to sunset during the month of Ramadan. Because the Islamic calendar is lunar, Ramadan falls at different times of the calendar year over a 33-year cycle, and the average daily fasting time ranges from 12 to 18 hours per day. Muslims eat the "suhour" meal before fasting, then fast until sunset, eating and drinking are permitted until the following dawn. The time between sunset and dawn can vary greatly, depending on latitude and time of year. Adhering to eating only at night can lead to several changes in sleep schedules (Trabelsi et al., 2022). The month of Ramadan is accompanied by disturbances in the quantity and quality of sleep (Zerguini et al., 2007).

Sleep is essential for optimal athletic performance and recovery. Sleep also plays a key role in adapting to exercise and preventing injury (Copenhaver & Diamond, 2017). Ramadan fasting also affects circadian rhythms (BaHamam & Almeneessier, 2020), causes significant sleep disturbances, increased subjective and objective daytime sleepiness, and decreased sleep duration (Herrera, 2012). While Ramadan fasting has been clearly shown to increase fatigue and it results in significant hormonal, metabolic, and inflammatory changes associated with sleep disturbances, altered sleep patterns, reduced sleep hours, decreased energy, and fatigue in athletes (Chennaoui et al., 2009). Sleep deprivation is associated with a loss of cognitive ability and may significantly impair tasks requiring flexible thinking, potentially impacting decision-making during athletic competition. Finally, sleep deprivation has been found to have a negative impact on several measures of subjective well-being, including fatigue, mood, pain, depression, and confusion (Watson et al., 2017).

Based on previous studies, a BaHamam, (2003) several changes in circadian rhythms, social activity, and eating habits were observed during Ramadan. These changes affected daytime performance and led to increased sleepiness despite minimal changes in TST. Lipert et al., (2021) found that sleep quality and physical performance deteriorated in athletes during Ramadan. Herrera, (2012) also demonstrated that adult male Muslim soccer players recovering from injury had generally poor sleep quality and that there was a significant decrease in total sleep time during Ramadan. Hsouna et al., (2019) concluded in their study that sleep duration was shortened and sleep quality improved afterward compared to Ramadan. Furthermore, Ramadan fasting has recently been shown to reduce total sleep time and increase excessive daytime sleepiness (ESS), with an approximately one-

The effect of Ramadan fasting on sleep quality, total sleep time, and daytime sleepiness in soccer players.

hour decrease in TST and an approximately one-point increase in ESS during Ramadan (Faris et al., 2020). All of these studies used the PSQI questionnaire and the ESS scale to monitor sleep, total sleep time (TST), and daytime sleepiness. This is what we will use in our study. We hypothesize that total sleep time (TST) decreases during Ramadan fasting, and sleep quality increases with daytime sleepiness. Therefore, this study aimed to evaluate the effect of Ramadan fasting on sleep quality, total sleep time, and daytime sleepiness in soccer players under the age of 15.

2. Method and Materials

2.1. Participants

Twenty-four U15 Algerian amateur soccer players voluntarily participated in this study (mean \pm SD: age = 14.25 \pm 0.60 years, body height = 167.08 \pm 5.52 cm, body weight = 54.34 \pm 8.19 kg, BMI = 19.55 \pm 3.08 kg/m²). The players were informed of the study objectives.

2.2. Study Design

The study was conducted during Ramadan 2025, with an average fasting day of approximately 15 hours. A descriptive study conducted over three periods: 10 days before Ramadan (BR), Middle of Ramadan (MidR), and three weeks after Ramadan (AR). Subjects completed The Pittsburgh Sleep Quality Index (PSQI) questionnaire. And Epworth Sleepiness Scale (ESS).

2.3. Data collection

2.3.1. The Pittsburgh Sleep Quality Index (PSQI)

The PSQI is a 19-item self-report questionnaire, including multiple-choice and open-ended questions, that assesses various aspects of sleep over the past month. This index distinguishes "poor" from "good" sleep quality by measuring 7 components. A total score of 5 or ≥ 5 indicates poor sleep quality (Buysse et al., 1989).

2.3.2. Epworth Sleepiness Scale (ESS)

It's a tool used to assess an individual's DS. It asks the player to rate their likelihood of falling asleep in 8 different situations. ESS scores were interpreted as follows 0-5: lower than normal DS; 6-10: higher than normal DS; 11-12: mild excessive DS; 13-15: moderate DS and 16-24: severe DS (Johns, 2019).

2.4. Statistical Analysis

Statistical analyses were conducted using SPSS V 30.0. The normal distribution of the data was detected by the Shapiro-Wilk test. We obtained

following results for the three periods (BR, MidR, AR) for global ESS score data, P-value was > 0.05 . ($p = 0.06$, $p = 0.12$, $p = 0.06$ respectively), for TST data ($p = 0.09$, $p = 0.21$, $p = 0.07$ respectively), parametric tests were performed and the statistical analysis was performed by ANOVA one way and the Bonferroni test for comparing several pairs of means in a set of data. When data were not normally distributed, we got the following results for the three periods (BR, MidR, AR) for global PSQI score data P-value less than < 0.05 ($p = 0.03$, $p = 0.17$, $p = 0.00004$ respectively), non-parametric tests were used, the Kruskal-Wallis test and the Mann-Whitney test. Significant differences were accepted for all tests with $p < 0.05$.

3. Results

Table 1. Subjective sleep quality and daytime sleepiness, Total sleep time, and Components. Mean \pm SD, and P-value before (BR), Middle of Ramadan (MidR), and three weeks after Ramadan (AR), as estimated by (PSQI) and (ESS).

	BR	MidR	AR	P-value
Component 1: subjective sleep quality (AU)	1.67 \pm 0.38	2.38 \pm 0.65 &*	0.04 \pm 0.2	<0.001
Component 2: sleep latency (AU)	1.08 \pm 0.5	1.08 \pm 0.28	0.71 \pm 0.46 #&	0.004
Component 3: sleep duration (AU)	0.25 \pm 0.44	2.38 \pm 0.77 &*	0.25 \pm 0.44	<0.001
Component 4: habitual sleep efficiency (AU)	0.00 \pm 0.00	0.08 \pm 0.28	0.00 \pm 0.00	0.13
Component 5: sleep disturbances (AU)	0.63 \pm 0.49	0.5 \pm 0.51	0.67 \pm 0.48	0.48
Component 6: use of sleeping medications (AU)	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00	1.000
Component 7: daytime dysfunction over the last month (AU)	0.00 \pm 0.00	0.25 \pm 0.44 &*	0.00 \pm 0.00	0.002
Total sleep time (TST) (hh:min)	7.54 \pm 0.72	4.46 \pm 0.99 &*	7.60 \pm 0.57	<0.001
Quality of sleep (Global PSQI score) (AU)	2.13 \pm 1.07	6.67 \pm 1.79 &*	1.63 \pm 0.77	<0.001
Daytime sleepiness (Global ESS score) (AU)	2.75 \pm 1.07	7.37 \pm 2.12 &*	3.00 \pm 1.25	<0.001

Note. BR: Before Ramadan; MidR: middle of Ramadan; AR: 21 days after the Ramadan fasting; &: Significant difference compared to BR; *: Significant difference compared to AR; #: Significant difference compared to MidR; AU: arbitrary units.

The effect of Ramadan fasting on sleep quality, total sleep time, and daytime sleepiness in soccer players.

Table 2. P-value, effect size, and magnitude. For Quality of sleep (Global PSQI score), total sleep time (TST), and Daytime sleepiness (Global ESS score)

periods	BR - MidR			BR - AR			MidR - AR		
	Sig	ES	Magnitu de	Sig	ES	Magnitu de	Sig	ES	Magnitu de
Quality of sleep (Global PSQI score)	<0.00 1	3.0 8	Large	0,09 4	0.5 4	Moderate	<0.00 1	3.6 6	Large
Total sleep time (TST)	<0.00 1	3.5 6	Large	1,00 0	0.0 9	Trivial	<0.00 1	3.8 9	Large
Daytime sleepiness (Global ESS score)	<0.00 1	2.7 5	Large	0.41 0	0.2 1	Small	<0.00 1	2.5 1	Large

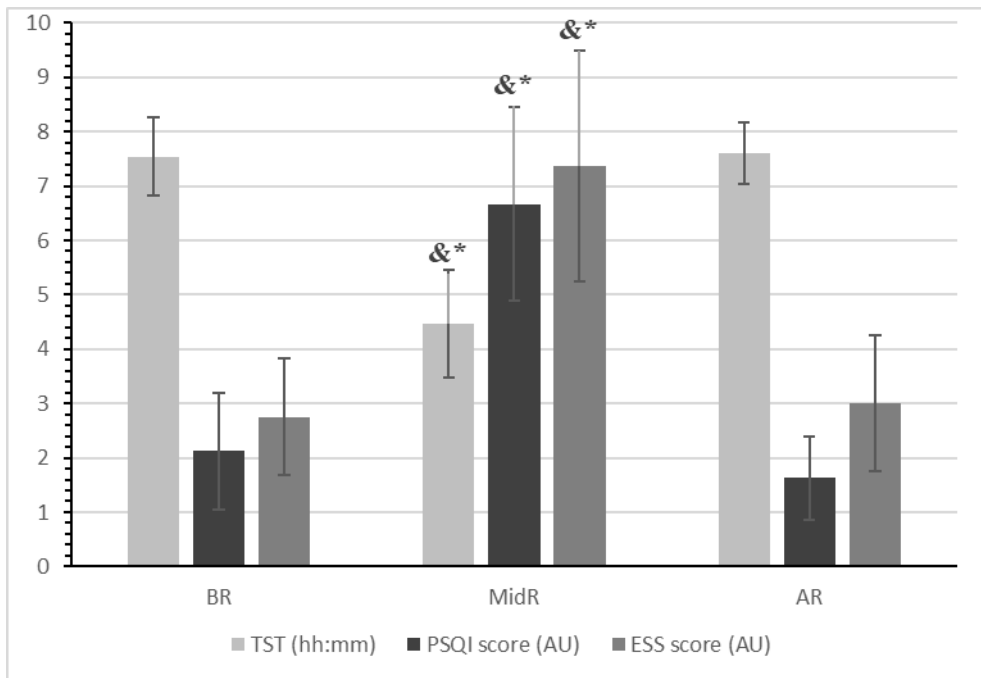


Figure 1. Mean \pm SD of players' sleep quality (PSQI score), total sleep time (TST), and daytime sleepiness (ESS score) before Ramadan (BR), Middle of Ramadan (MidR), and three weeks after Ramadan (AR).

Table 1 includes mean, SD, and P-value of the seven components, TST, and Quality of sleep (Global PSQI score). The results of our study showed that there were no significant in components 4,5,6, and the P-value ($p= 0.13$, $p= 0.48$, $p= 1,00$ respectively). Components 1,2,3,7 was significant and the P-value ($p= <0.001$, $p= 0.004$, $p= <0.001$, $p = 0.002$ respectively).

Quality of sleep (Global PSQI score) There was a significantly large and robust, the P-value ($p = <0.001$), and the effect size between the two periods (BR - MidR) was $ES = 3.08$ Large magnitude, (BR - AR) $ES = 0.54$ Moderate magnitude, and between (MidR - AR) $ES = 3.66$ Large magnitude (Table 2). Total sleep time TST, there was a significantly large and robust, the P-value ($p = <0.001$), and the effect size between the two periods (BR - MidR) was $ES = 3.56$ Large magnitude, (BR - AR) $ES = 0.09$ Trivial magnitude, and between (MidR - AR) $ES = 3.89$ Large magnitude (Table 2). Also, the daytime sleepiness (Global ESS score) was significantly large and robust, the P-value ($p = <0.001$) Table 1, and the effect size between the two periods (BR - MidR) was $ES = 2.75$ Large magnitude, (BR - AR) $ES = 0.21$ Small magnitude, and between (MidR - AR) $ES = 2.51$ Large magnitude (Table 2).

4. Discussion

The current study revealed that sleep quality, total sleep duration, and daytime sleepiness among athletes deteriorated during Ramadan. Overall, most athletes experienced decreased sleep quality and quantity during Ramadan compared to pre- and post-Ramadan sleep patterns. During Ramadan, overall sleep quality among athletes decreased, and daytime sleepiness increased. In our study, we found that the average sleep duration of the players during Ramadan (MidR) was 4.46 hours. General recommendations emphasize that adults get 7–9 hours of sleep per night to maintain optimal health and performance (Hirshkowitz et al., 2015). compared to 7.54 h before Ramadan BR and 7.60 h after Ramadan AR (Table 1) and Figure 1, there was a significantly large and robust, the P-value ($p = <0.001$), and the effect size ES between BR and MidR was 3.56 large magnitude, and also the effect size between MidR and AR was 3.89 large magnitude (Table 1). The lower the sleep rate, the higher the PSQI score, which indicates sleep disturbances and poor sleep quality. The main reason for the decrease in total sleep time is due to staying up late (sleeping late) and getting up at 4:30 to eat the Sahour meal, after which the player

The effect of Ramadan fasting on sleep quality, total sleep time, and daytime sleepiness in soccer players.

cannot sleep and goes to school. The mean PSQI score was greater than 5 during Ramadan 6.67, compared to 2.13 BR and 1.63 AR (Table 1) and Figure 1. There was a significantly large and robust, the P-value ($p = <0.001$), and the effect size between the two periods BR - MidR was $ES = 3.08$ Large magnitude, BR - AR: $ES = 0.54$ Moderate magnitude, and between MidR - AR: $ES = 3.66$ Large magnitude (Table 2). Also the results of our study showed that there were no significant in components 4,5,6 and the P-value ($p = 0.13$, $p = 0.48$, $p = 1,00$ respectively). We noticed that they did not take any medication to help them sleep, whether during the 3 periods, and components 1, 2, 3, 7 was significant and the P-value ($p = <0.001$, $p = 0.004$, $p = <0.001$, $p = 0.002$ respectively). The results of our study are consistent with those of Lipert et al., (2021), who found that sleep quality and physical performance deteriorated in athletes during Ramadan. This was confirmed by Trabelsi et al., (2021) in their study, where PSQI scores significantly increased during Ramadan. Herrera, (2012) study also agrees with our findings, as there was a significant decrease in total sleep time during Ramadan. Hsouna et al., (2019) concluded in their study that sleep duration decreased during Ramadan. Zerguini et al., (2007) also found this, who concluded that the average change in total sleep time decreased by -30 minutes, and subjective sleep quality decreased during Ramadan. This may be because food intake is concentrated during the hours of darkness, causing chronobiological shifts that impair sleep-wake patterns. In contrast, a study by BaHammam, (2003) showed no significant change in TST. Ramadan fasting lowers BGL and affects weight loss, potentially leading to muscle glycogen deficiency and muscle protein breakdown (Ziaee et al., 2006). However, Slimani, (2021) concluded that adherence to fasting during Ramadan did not reveal any alterations in body composition, despite minor differences. Furthermore, changes in food intake, such as total energy intake, meal timing, meal composition, or fluid intake, may influence sleep. Food affects the availability of Trp and the synthesis of 5-HT and MEL, which are important in promoting sleep.

In our study, we also collected data using the ESS scale, a complementary scale to the PSQI questionnaire, to determine the status of "daytime sleepiness" in athletes, as frequent daytime sleepiness may indicate sleep disturbances. In our study, we found the mean ESS scale score during Ramadan 7.37, compared to 2.75 BR and 3.00 AR (Table 1) and Figure 1. there was a significantly large and robust, the P-value ($p = <0.001$) and the effect size between the two periods BR - MidR was $ES = 2.75$ Large magnitude, BR - AR was $ES = 0.21$ Small magnitude, and

between MidR - AR was $ES = 2.51$ Large magnitude (Table 2). The results of our study are consistent with those of BaHammam, (2003), who concluded that there were several alterations in circadian rhythms and social activity during Ramadan. These changes impacted daytime performance and led to increased sleepiness. This was confirmed by Trabelsi et al., (2021) in their study, where scores on the Excessive Sleepiness Scale (ESS) increased significantly during Ramadan. Faris et al., (2020) also confirmed in their study that Ramadan fasting increases excessive daytime sleepiness (ESS), with an increase of approximately one point in the ESS score.

It was interesting to discuss the effect of Ramadan fasting on sleep quality, total sleep time, and daytime sleepiness, given its impact on physical performance during training and competition. The effect of Ramadan fasting on these variables remains controversial, especially since Ramadan coincides with the competition season. This study will also have implications for future research.

5. Conclusion

In light of the findings of this study, players may need more stringent monitoring during the month of Ramadan to promote proper sleep patterns and improve sleep quality and physical performance. We also concluded that Ramadan fasting impaired sleep quality and increased daytime sleepiness in soccer players, and whenever the shorter the total sleep duration, the greater the daytime sleepiness. There is a possible impact of the social media and mobile phone use time on sleep, which are known to be significantly associated with disturbed sleep.

The effect of Ramadan fasting on sleep quality, total sleep time, and daytime sleepiness in soccer players.

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The effect of Ramadan fasting on sleep quality, total sleep time, and daytime sleepiness in soccer players.

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