

Investigation of the Effect of Ramadan Fasting on Sleep Patterns, Nutritional Characteristics, and Physical Activity Levels in Young Individuals Doing Active Sports

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Abstract

Fasting during Ramadan causes significant changes in important features of human life, such as sleep behaviors, nutrition, and physical activity. This study aimed to investigate the effects of Ramadan fasting on sleep patterns, nutritional characteristics, and physical activity levels in young individuals doing active sports. Twenty-six individuals (14 males-12 females) between the ages of 19-25 and doing active sports participated in the study voluntarily. In the study, the athletes' sleep patterns, nutrition, and physical activity characteristics were determined using a questionnaire. Participants answered a questionnaire about their sleep patterns, nutritional characteristics, and physical activity levels one week before and during the first week of Ramadan. Comparisons between before and Ramadan answers were made by paired t-tests. Wilcoxon's z was calculated for comparisons between the non-parametric variables. According to the statistical comparisons, the number of workouts per week, and daily training time, were significantly ($p<0.05$) decreased during Ramadan. In addition, it has been determined that the sleeping and waking hours have changed. It is seen that there is no statistically significant difference in total sleep times. There was no significant difference was found in the high-intensity, moderate-intensity physical activity and sitting times of the athletes ($p>0.05$). Significant decreases were found in walking and total calorie (MET) parameters ($p<0.001$). Moreover, no significant difference was found in the total calorie, carbohydrate, fat, protein, and liquid consumption. Ramadan fasting was affected by the number of workouts per week, daily training number, bedtime, waking-up time, walking, and total calorie (MET) parameters.

Keywords: Ramadan fasting, sleep patterns, nutrition, and physical activity characteristics

Introduction

One of Islam's five pillars is the month of Ramadan. According to this condition, healthy pubertal Muslim adolescents and adult men and women are required to fast (Abaidia, Daab & Bouzid, 2020). During Ramadan, fasting should not be eating, drinking, smoking, or having sexual intercourse from sunrise (Sahour) to sunset (iftar). Every year, during the ninth month of the Islamic calendar, Ramadan, Muslims fast for around 29 to 30 days. (Kocaaga et al., 2019; Chaouachi et al., 2009). The duration of fasting varies between 10-19 hours depending on the geographical location (Al-Hourani & Atoum, 2007). Ramadan fasting causes significant changes in nutrition, sleep patterns, physical activity, and some life habits. At this time; Sleeping and waking times, daily sleep time (Roky, Herrera & Ahmed, 2012), eating habits, meal times, and numbers vary significantly.

In order to fast in Ramadan, waking up and eating for at sahour at night or waiting to sleep until sahour and eating after eating can cause disruptions in sleep patterns (Wilson, Drust & Reilly, 2009). This causes a shorter nighttime sleep duration during Ramadan (Rocky et al., 2003) and an increase in daytime sleep duration (Margolis and Reed, 2004). Although some studies show that the decrease in total sleep time may cause performance loss; It has been emphasized that this performance loss can be seen at different levels concerning stress, mood, and psychomotor characteristics (Reilly & Edwards, 2007). In addition, the inability to consume food and liquid for about 10-19 hours between sunrise and sunset, as well as intense training for athletes who do active sports, can cause an energy deficit and dehydration (Waterhouse et al., 2009).

Because the Islamic year is based on the lunar calendar, the Ramadan month can occur at various times of the year and in various seasons. (Spring, summer, autumn, and winter). The month of Ramadan takes place at different times each year. It also occurs in different seasons every nine years. Due to this circumstance, those who fast during Ramadan have different consequences from those of the season as a whole. Day and night duration, temperature, and humidity are important variables. Ramadan fasting can have different effects depending on the situation of the variables listed above. Assuming that the fasting period can be 19 hours a day and the average duration is 12 hours (Chaouachi et al., 2009), doing sports in addition to this affects the fasting athletes. When arranging sports events, the sporting calendar does not take religious observances into account, therefore Muslim athletes must deal with this fasting period while training and participating (Abaidia, Daab & Bouzid, 2020). The purpose of this study is to investigate the sleep patterns, dietary habits, and levels of physical activity of people who fast and participate in sports. Informing the athletes, coaches, and relevant institutions and organizations in line with the information obtained.

Material and Method

Research Model

In order to determine the relationship or degree between two or more variables in this study, which was conducted to examine the sleep habits, dietary habits, and physical activity levels of people who fast and participate in active sports, instant scanning and relational scanning models from the general scanning model were used. (Karasar, 2002).

Study Group

A total of twenty-one (13 males-8 females) subjects doing active sports and regularly fasting in Ramadan [(Mean±SD) age: 21.04±1.39 years; stature: 171.47±9.70 cm; sports age: 6.52±4.45 years] subject have participated voluntarily.

Data Collection Tools

Sleep Behavior

In the study, sleep behavior data of the athletes (bedtime, wake-up time, total sleep time, and the views of the athletes about their sleep attitudes in Ramadan) were collected through a questionnaire created by the researchers.

Diet

By developing a nutrition form one week before Ramadan and during the first week of Ramadan, daily food consumption data were gathered. Following that, from these data, the total calorie, carbohydrate, protein, fat, and fluid consumption was estimated. BEBIS (Nutrition Data System) was used for nutritional assessment.

International Physical Activity Questionnaire (IPAQ)

IPAQ is a validated tool for determining participants' physical activity level (Craig et al., 2003). IPAQ assesses the frequency, duration, and intensity of physical activity over the previous seven days in all circumstances and calculates metabolic equivalents (MET). The weekly amount of physical exercise is represented by MET. It is determined by the frequency, duration, and intensity of physical activity over the previous seven days. Physical activity levels were determined as hours per week (MET-hours/week) using established criteria (IPAQ, 2005). Based on self-reported MET, frequency, and intensity of physical activity, people can be divided into low, moderate, and high levels of physical activity groups. Less than 600 MET-min/week of exercise was reported by participants in the inactive (sedentary, low) group, between 601 and 3,000 MET-min/week was reported by participants in the minimally active (moderate level of physical activity), and over 3,000 MET-min/week was reported by participants in the physically active (high, recommended level) group. The Turkish short version of IPAQ was used to measure the PA levels of the study's participants (Saglam et al., 2010; Ozkan et al., 2021). Evidence for construct validity, criterion validity (accelerometer-IPAQ short form) ($r=0.30$), and test-retest stability ($r=0.69$) was found in the translation and validation studies for the Turkish version for university students (Saglam et al., 2010).

Data Collection Procedure

After giving detailed information about the study. Participants were asked to fill out the Athlete Sleep Behavior form, Daily food consumption form, and International Physical Activity Level Questionnaire (IPAQ). The week before Ramadan and the first week of Ramadan were used to collect all the data. Ethics committee approval for this research was given by Yozgat Bozok University Social and Human Sciences Ethics Committee (Date: 20.07.2023, Decision No: 05/05). The study conformed to all ethical standards, and participants were informed of the study's name, subject, purpose, and use of the collected personal data for scientific purposes. Furthermore, it was noted that individuals have the right to withdraw from the study at any time during the research if they so desire.

Data Analysis

A statistical tool for the social sciences (SPSS version 20.0, SPSS Inc., Chicago, IL, USA) was used for all analyses. For the statistical study, descriptive statistics mean and

standard deviations (SD) were computed for each variable. If normality assumptions were met, paired t-tests were used to compare quantitative data (dietary intake (total calorie, liquid, protein, fat, and CHO), physical activity levels, and sleep behavior) between Ramadan (fasting) and non-Ramadan (non-fasting). The level of significance was 0.05.

Findings

A total of twenty-one (13 males-8 females) subjects doing active sports and regularly fasting in Ramadan [(X±SS) age: 21.04 ± 1.39 years; stature: 171.47 ± 9.70 cm; weight: 65.09 ± 11.11 kg; sports age: 6.52 ± 4.45 years] subject participated voluntarily.

Table 1. Sleep Behaviors of Participants Before and During Ramadan

| Variable | BR (mean ± SD) | DR (mean ± SD) | t | df | P |
|-------------------------|-------------------|-------------------|------------|----|---------------|
| Bedtime (24 hour) | 00:45 ± 1.41 | 01:36 ± 2.15 | -2.275 (Z) | | 0.023* |
| Wake-up time (24 hours) | 09:10 ± 1.18 | 10:57 ± 1.94 | -4.365 | 20 | 0.000* |
| Total Sleep time (min) | 505.00 ± 64,23 | 561.60 ± 101.36 | -1.983 | 20 | 0.061 |

BR: Before Ramadan, DR: During Ramadan

As a result of the statistical analysis, a statistically significant increase was found in the bedtime (Z= -2.275, p<0.05) and the Wake-up time (t=-4.365, p<0.001) of the athletes. However, there was no significant difference in total sleep times (t=-1.983, p>0.05) (Table 1).

At the same time, 100% of the athletes stated that sleep is important for sportive performance. 76.2% (n=16) reported that their sleep pattern was disrupted during Ramadan, and 57.1% (n=12) experienced a loss of performance due to sleep patterns during Ramadan. It was stated that 52.4% (n=11) had difficulty in training due to sleep patterns during Ramadan.

Table 2. Nutritional Behaviors of the Participants Before and During Ramadan

| Variable | BR (mean ± SD) | DR (mean ± SD) | t | df | P |
|---------------------------|-------------------|-------------------|------------|----|-------|
| Total Calories (kcal/day) | 1838.64 ± 739.05 | 1571.13 ± 556.93 | 1.218 | 20 | 0.238 |
| Carbohydrate (gr/day) | 217.55 ± 120.98 | 178.35 ± 86,67 | -1.199 (Z) | | 0.230 |
| Fat (gr/day) | 71.81 ± 30.49 | 61.90 ± 24.68 | 1.222 | 20 | 0.236 |
| Protein (gr/day) | 74.30 ± 29.43 | 71.53 ± 25.89 | -0.226 (Z) | | 0.821 |
| Liquid (ml/day) | 1239.69 ± 664.80 | 1561.59 ± 680.19 | -1.755 (Z) | | 0.079 |

As a result of the statistical analysis, no significant difference was found in the total calorie (t=1.218), carbohydrate (Z=-1.199), fat (t= 1.222), protein (Z=-0.226), and liquid (Z=-1.755) consumption in the nutritional consumption values of the athletes (p>0.05).

Table 3. Physical Activity Behavior of Participants Before and During Ramadan

| Variable | BR (mean±SD) | DR (mean±SD) | t | df | P |
|---|-------------------|-------------------|------------|----|---------------|
| High-intensity Physical Activity (MET/Week) | 2260.95 ± 1767.69 | 1506.67 ± 1461.80 | -1.270 (Z) | | 0.204 |
| Moderate-intensity Physical Activity (MET/Week) | 682.29 ± 838.01 | 750.48 ± 919.82 | -0.383 (Z) | | 0.702 |
| Walking (MET/Week) | 1881.79 ± 1613.53 | 570.43 ± 697.48 | -3.605 (Z) | | 0.000* |
| Sitting duration (MET/Week) | 458.00 ± 731.10 | 278.57 ± 182.76 | 0.993 (Z) | | 0.321 |
| Total calorie (MET/Week) | 4825.02 ± 2686.97 | 2432.05 ± 1923.83 | 3.706 | 20 | 0.001* |
| Number of workouts per week (Week/day) | 3.33 ± 1.35 | 2.38 ± 1.35 | 4.074 | 20 | 0.001* |
| Daily training time (min) | 83.09 ± 35.86 | 51.66 ± 34.03 | 3.529 | 20 | 0.002* |

As a result of the statistical analysis, no significant difference was found in the high-intensity ($Z=-1.270$) and moderate-intensity physical activity ($Z=-0.383$) levels and sitting times ($Z=0.993$) of the athletes ($p>0.05$). Significant decreases were found in walking ($Z=-3.605$) and total calorie parameters ($p<0.001$). At the same time, there is a statistically significant decrease was found number of workouts per week ($t=4.074$, $p<0.001$) and daily training time ($t=3.529$, $p<0.002$).

Discussion and Conclusion

When the results obtained within the scope of this study are examined, it is seen that Ramadan causes many changes in sleep, physical activity, and nutrition characteristics. Within the parameters of the study, the most significant results were attained; it was found that the sleeping and waking hours had changed. It can be shown that the total amount of sleep time is not statistically different. In addition, there was no significant difference was found in the high-intensity, moderate-intensity physical activity and sitting times of the athletes. Significant decreases were found in walking and total calorie (MET) parameters. The number of workouts per week, and daily training time, were significantly decreased during Ramadan. Moreover, no significant difference was found in the total calorie, carbohydrate, fat, protein, and liquid consumption.

Participants in the study went to bed 51 minutes later during Ramadan and stayed in bed for an additional 1 hour 47 minutes. When the total sleep time is examined, it is seen that they sleep fifty-one minutes more during Ramadan (Table 1). Likewise, Wilson, Drust & Reilly (2009) found that the participants' bedtimes, wake-up times, and total sleep duration changed during Ramadan Bahammam et al. (2013). When the study he has done is

examined demonstrating a delay in bedtime and wake-up time during Ramadan. Similarly, Roky et al. (2001) in their study, delayed sleep during Ramadan. Karli et al. (2007) showed that the daily routine sleep duration of the participants increased during Ramadan. Lipert et al. (2021) stated that the sleep quality of the athletes deteriorated during Ramadan. In some studies (Margolis and Reed 2004; Roky et al., 2001), it has been determined that the duration of sleep at night decreases and the duration of sleep during the day increases (Tian et al., 2011).

Human circadian rhythms are fundamentally based on sleep-wake cycles, and their disruption can affect behavior and performance (Reilly & Edwards, 2007). Athletes should avoid sleep deficits and chronic sleep deprivation, which frequently go hand in hand with the lifestyle changes occurring during Ramadan (Chamari, et al., 2019). Sleep is crucial for sports performance as well as injury prevention. There are noticeable alterations in the sleeping and waking hours of the sportsmen, according to the current study previous studies looking at sleep habits throughout Ramadan.

The total calorie, carbohydrate, fat, protein, and liquid intake in this study did not differ in a manner that could be considered statistically significant (Table 2). Similar results were found in the study by Al-Hourani & Atoum (2007) where estimations of energy, carbohydrates, protein, fat, and sugar remained constant despite fewer meals being taken. This study found that overall energy intake did not differ significantly between pre-Ramadan and Ramadan, which was consistent with many other studies (Rahman et al., 2004; Norouzy et al., 2013; Karli et al., 2007; Chaouachi et al., 2009). Contrary to these studies, Amir-Hossein Memari et al. (2011) found that the total calories taken during Ramadan decreased in their study. According to Farooq et al. (2015), although there was a rise in protein and fat consumption during Ramadan, there was no change in energy usage. According to Kocaaga et al. (2019), Ramadan intermittent fasting was successful in terms of total calorie intake and meal consumption, with the exception of drink and fat intake.

When the above study results are examined, it is observed that different results are obtained. It is thought that these differences vary depending on characteristics such as eating culture, being an athlete, gender, and age. Ramadan fasting is distinguished by variations in meal frequency and scheduling. It is customary to have two meals, one before dawn (Sahour) and one shortly after dusk (Iftar). Meals are exclusively nocturnal and less frequent, which may have an impact on energy and nutrient consumption. Furthermore, experienced athletes can maintain enough energy intake as well as appropriate training loads during Ramadan fasting. Athletes who train during the Ramadan fasting should carefully periodize their training load and monitor their food intake.

In the present study, no significant difference was found in the high-intensity and moderate-intensity physical activity levels and sitting times of the athletes. Significant decreases were found in walking and total calorie parameters. At the same time, there is a statistically significant decrease was found number of workouts per week and daily training time (Table 3). The average level of physical activity was 1.54 before Ramadan and 1.51 during Ramadan, according to the study by Al-Hourani & Atoum (2007), and there was no statistically significant difference between the two. On the other hand, Kocaaga et al. (2019) found a substantial decrease in total calorie expenditure, moderate-intensity physical activity, and high-intensity physical activity during Ramadan. Additionally, Aziz, et al. (2018) discovered that Ramadan fasting had a negative impact on players' physical activity profiles during a soccer match. According to Lessan, et al. (2018), Ramadan is correlated with decreased physical activity. According to Chtourou et al. (2011), Ramadan fasting had an

impact on teenage soccer players' anaerobic and aerobic performance during the Yo-Yo, RSA, and Wingate tests. As we know that Ramadan fasting leads to changes in nocturnal sleep pattern disturbances, daytime sleepiness, physical activity, nutrition intake, meal time, and daily habits (Waterhouse et al., 2009). Due to these reasons when the above study results are examined, it is seen that different results are obtained. Athletes who maintain their total caloric and macronutrient intake, training load, body composition, and sleep time and quality throughout Ramadan are unlikely to experience significant performance declines, according to recent evidence from well-controlled research (Chaouachi et al., 2012).

In conclusion, a significant decrease was found in walking and total calorie (MET) parameters, the number of weekly training and daily training time during Ramadan. Moreover, while sleeping and waking hours varied, there was no statistically significant difference in overall sleep time. Total calorie, carbohydrate, fat, protein, and hydration intake in the participants' diets did not differ significantly from one another. In addition, no significant difference was found in the high-intensity, moderate-intensity physical activity and sitting times of the athletes before and during Ramadan.

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