

Ramadan and Sleep: An Examination of Sleep Patterns Among University Students

Ramazan ve Uyku: Üniversite Öğrencilerinin Uyku Düzenlerinin İncelenmesi

Deniz Bedir¹

¹ Erzurum Teknik University, Faculty of Sport Sciences, Erzurum, TÜRKİYE / deniz.bedir@erzurum.edu.tr / 0000-0002-5926-3433

Abstract: Fasting during Ramadan, one of the Muslim societies' religious practices, affects individuals' daily lives in various ways. The aim of this study was to examine the sleep habits of university students during the online education process during Ramadan. Seventy-four university students from two universities in Turkey were evaluated using the Pittsburgh Sleep Quality Index (PSQI) before and after Ramadan. The results indicated a significant deterioration in subjective sleep quality, sleep latency, sleep disturbances, daytime dysfunction, and overall sleep quality (global PSQI score) during Ramadan. However, no significant changes were observed in sleep duration, habitual sleep efficiency, and sleep medication usage. The findings underline the need for tailored strategies to support university students' sleep hygiene during Ramadan.

Keywords: Ramadan, sleep latency, subjective sleep quality, university students.

Özet: Müslüman toplumların dini pratiklerinden biri olan Ramazan ayında tutulan oruç, bireylerin günlük yaşamlarını çeşitli şekillerde etkilemektedir. Bu çalışmanın amacı, üniversite öğrencilerinin Ramazan ayında çevrimiçi eğitim sürecindeki uyku alışkanlıklarını incelemektir. Türkiye'deki iki üniversiteden yetmiş dört üniversite öğrencisi, Ramazan öncesi ve sonrasında Pittsburgh Uyku Kalitesi İndeksi (PSQI) kullanılarak değerlendirilmiştir. Sonuçlar, Ramazan ayında öznel uyku kalitesi, uyku gecikmesi, uyku bozuklukları, gündüz işlev bozukluğu ve genel uyku kalitesinde (global PSQI skoru) anlamlı bir bozulma olduğunu göstermiştir. Bununla birlikte, uyku süresi, alışılmış uyku verimliliği ve uyku ilacı kullanımında önemli bir değişiklik gözlenmemiştir. Bulgular, Ramazan ayında üniversite öğrencilerinin uyku hijyenini desteklemek için özel stratejilere duyulan ihtiyacın altını çizmektedir.

Anahtar Kelimeler: Ramazan, uyku latensi, öznel uyku kalitesi, üniversite öğrencileri.

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INTRODUCTION

Ramadan, the ninth month of the Islamic lunar calendar, is a period of religious worship for Muslims worldwide (Almeneessier et al., 2018; Qasrawi et al., 2017). During this time, adult Muslims engage in fasting from dawn (Fajr) to dusk (Maghrib), as well as additional religious activities such as extra prayers (Taraweeh), more Quran readings, and charity work (Faris et al., 2020). These practices significantly affect daily routines and habits, including sleep patterns, essential in maintaining overall health and well-being (Chaput et al., 2018; Dewald et al., 2010).

Comprehensive studies have shown that changes in daily schedules, dietary habits, and religious practices during Ramadan fasting may impair the quality and quantity of sleep (Faris et al., 2020; Assaad et al., 2014). These disruptions are significant for university students facing academic, social, and environmental pressures that can compromise their sleep habits (Gaultney, 2010; Lund et al., 2010).

In addition, it has been found that fasting during Ramadan affects the body's circadian rhythm, which regulates the sleep-wake cycle (Almeneessier et al., 2018; Qasrawi et al., 2017). Changes in meal timings and light exposure due to changing sleep and wake schedules may affect the circadian system's synchronization, leading to sleep disruption (Faris et al., 2020; Bahammam, 2004). These disruptions in circadian rhythm can worsen sleep disorders and affect cognitive function, attention, and alertness (Anis et al., 2004; Faris et al., 2020).

They understand the effects of Ramadan fasting on university students' sleep quality, circadian rhythm, and cognitive functions (Almeneessier et al., 2018; Assaad et al., 2014; Qasrawi et al., 2017). Sleep disturbances and circadian rhythm changes can profoundly affect their academic performance, cognitive abilities, emotional well-being, and overall health (Chaput et al., 2018; Dewald et al., 2010).

Previous studies have examined the effect of Ramadan fasting on various aspects of health, including sleep and circadian rhythm, in the general population (Almeneessier et al., 2018; Assaad et al., 2014; Qasrawi et al., 2017). However, limited research has focused on the effects of fasting on circadian rhythm and cognitive functions in college students, especially during Ramadan.

Therefore, this research aims to provide a unique value by examining the effects of Ramadan fasting on sleep quality, circadian rhythm, and cognitive functions in university students. Through a comprehensive literature review and analysis of sleep duration, sleep architecture, circadian rhythm markers, and cognitive performance, we seek to identify specific factors that influence these aspects during Ramadan fasting.

The findings of this study will have important implications for educators, health professionals, and policymakers working with university students during the holy month of Ramadan. With a better understanding of the impact of fasting on sleep quality, circadian rhythm, and cognitive functions, appropriate support systems and interventions can be developed to support students' well-being, academic success, and cognitive abilities during this critical period. In addition, as online education becomes increasingly common, it is imperative to explore the interaction between Ramadan fasting, sleep quality, circadian rhythm, cognitive functions, and the unique challenges posed by the virtual learning environment (Morrison et al., 2014).

METHODS

Participants

Power analysis (G*Power) was performed to determine the number of subjects included in the study. It was determined that the effect size was 0.50 in research results using similar

analysis and variables (Randjelović et al., 2023). In this context, the calculated sample size required to obtain a study power of 95% ($1-\beta$), a significance level $\alpha = 0.05$, and a medium effect size $d = 0.50$ were 54 subjects (two-tailed). Considering the possibility that the subjects included in the study might leave the process halfway through, the number of subjects was increased by 50%, and a total of 81 people were reached. Seven subjects were excluded from the study because they did not complete the process. The inclusion criteria were fasting during the entire month of Ramadan and waking up for sahur. The subjects who participated in the study were between the ages of 18-29 ($M=22.82$, $SD=2.76$), the average body weight was 73.17 ($SD=7.41$), and the average height was 173.59 ($SD=7.66$). Other descriptive information of the participants is shown in Table 1.

Table 1. Sociodemographic Characteristics of Participants at Baseline

Baseline characteristic	n	%
Gender		
Female	29	39,2
Male	45	60,8
University		
Ataturk University	35	47,3
Erzurum Technical University	39	52,7
Faculty		
Sport Sciences	15	20,3
Science	17	23
Engineering	16	21,6
Letters	16	21,6
Health Sciences	10	13,5
SmartPhone		
Iphone	22	29,7
Samsung	17	23
LG	13	17,6
Xiaomi	12	16,2
Oppo	10	13,5

Data Collection Tools

The *Pittsburgh Sleep Quality Index (PSQI)* is a self-administered questionnaire designed by Buysse et al. in 1989, used to evaluate sleep quality and disturbances over the prior month. The PSQI encompasses 19 questions, each contributing to one of seven component scores ranging from 0 to 3. The individual components and their related questions are as follows:

Subjective Sleep Quality measures the respondent's overall evaluation of their sleep quality, rated on a scale from 0 (very good) to 3 (very poor). Sleep Latency examines the duration of falling asleep and the regularity of sleep latency issues. Sleep Duration determines the average number of sleep hours the respondent gets each night. Habitual Sleep Efficiency computes the proportion of time in bed that is spent asleep. Sleep Disturbances capture the regularity of sleep problems, such as mid-sleep awakenings, nightmares, or experiencing pain during sleep. Usage of Sleep Medication investigates how frequently the respondent uses prescription or over-the-counter sleep aids. Daytime Dysfunction evaluates how sleep issues interfere with daily activities, including challenges staying awake or maintaining enthusiasm for routine tasks.

The total PSQI score, ranging between 0-21, is computed by adding the seven component scores. Higher total scores suggest poorer sleep quality; a score greater than five is generally used to differentiate between good and poor sleepers. The PSQI has demonstrated solid internal consistency, with Cronbach's alpha coefficients varying from 0.71 to 0.83 (Buysse et al., 1989; Mollayeva et al., 2016). Its test-retest reliability over a 1–2-month period was found to be 0.85 (Buysse et al., 1989). Additionally, the PSQI has displayed strong construct validity, distinguishing between good and poor sleepers and between different clinical populations (Buysse et al., 1989; Carpenter & Andrykowski, 1998).

Procedure

This research was performed in alignment with the principles outlined in the Declaration of Helsinki (WMA, 2013), and received approval from the local ethics committee. Participants were given a comprehensive explanation of the study plan, and their informed consent was duly obtained. They were additionally reassured that they had the liberty to opt out of the study at any stage, without necessitating any justification.

Data were collected before and after Ramadan to examine changes in sleep quality during the Ramadan. Participants completed the PSQI under the supervision of the research team before and after Ramadan to ensure data accuracy and consistency.

Data Analysis

Initial analyses were undertaken to confirm the fulfillment of conditions necessary for the application of the paired samples t-test. Tools such as the Kolmogorov-Smirnov test, Kurtosis-Skewness values, histograms, and Q-Q plots were employed to examine the normality of the distribution. The outcomes confirmed that the data satisfied the condition of normal distribution.

A paired sample t-test was conducted to investigate the proposition that sleep quality, as quantified by the PSQI, would vary during Ramadan. This examination juxtaposed mean PSQI scores pre and post-Ramadan to ascertain if there was a statistically substantial difference across the two periods. Furthermore, effect sizes were computed using Cohen's d to provide a standardized gauge of the extent of the identified changes. A d near 0.2 is a small effect, a d near 0.5 is a medium effect, and a d near 0.8 is a large effect (Cohen, 1988).

All statistical examinations were conducted using JASP software, version 0.17.1.0, with the significance threshold established at $\alpha = 0.05$. Descriptive statistics are conveyed as mean and standard deviation, while inferential statistics are presented as t-values, degrees of freedom, p-values, and effect sizes (Cohen's d).

RESULTS

Table 2. The Effect of Ramadan on Participants' Sleep Quality

Parameters	Pre-Test		Post-Test		t(73)	p	Cohen's d
	M	SD	M	SD			
Subjective sleep quality	1.243	1.083	1.878	1.085	-5.119	< .001	-0.595
Sleep latency	2.486	1.572	3.486	1.792	-5.048	< .001	-0.587
Sleep duration	0.824	1.025	0.811	0.989	0.178	0.859	0.021
Habitual sleep efficiency	0.473	0.798	0.541	0.909	-0.505	0.615	-0.059
Sleep disturbances	0.108	0.313	1.095	0.338	-18.729	< .001	-2.177
Usage of sleep medication	0.068	0.253	0.041	0.199	1.424	0.159	0.166
Daytime dysfunction	0.554	0.600	1.230	0.837	-6.745	< .001	-0.784
Global PSQI score	5.757	2.988	9.081	2.856	-10.493	< .001	-1.220

Upon assessing Table 2, we observe a substantial difference in the metrics of Subjective Sleep Quality, Sleep Latency, Sleep Disturbances, Daytime Dysfunction, and the overall PSQI score between pre and posttest measurements ($p < .05$). Conversely, the parameters of Sleep Duration, Habitual Sleep Efficiency, and Usage of Sleep Medication did not present any notable change.

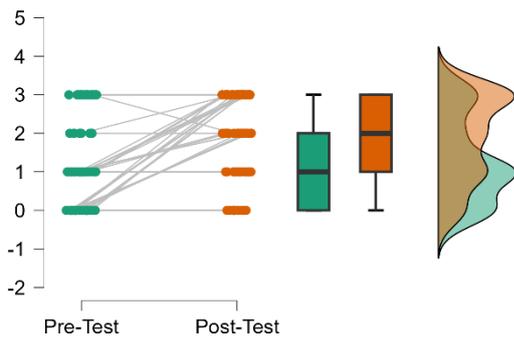


Figure 1. Subjective sleep quality

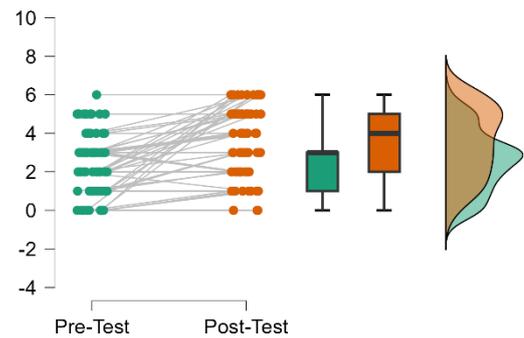


Figure 2. Sleep latency

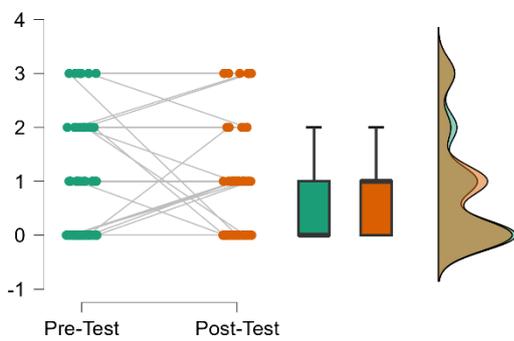


Figure 3. Sleep duration

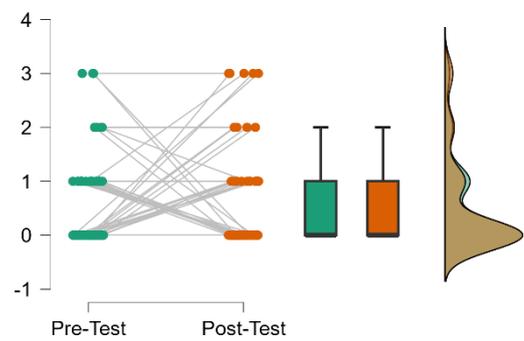


Figure 4. Habitual sleep efficiency

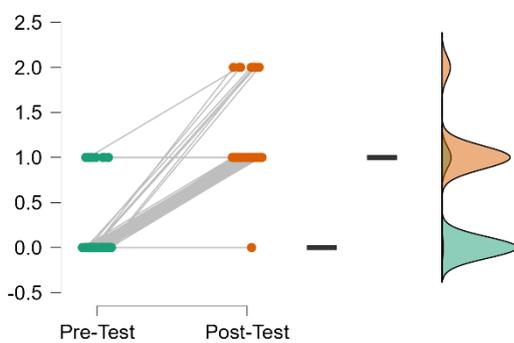


Figure 5. Sleep disturbances

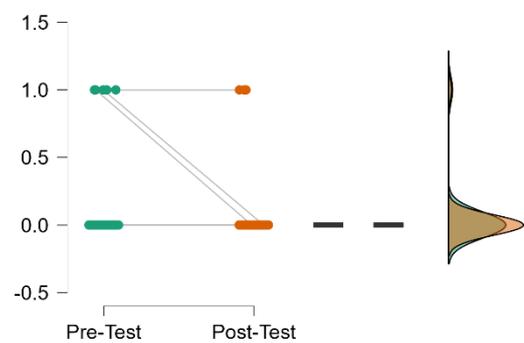


Figure 6. Usage of sleep medication

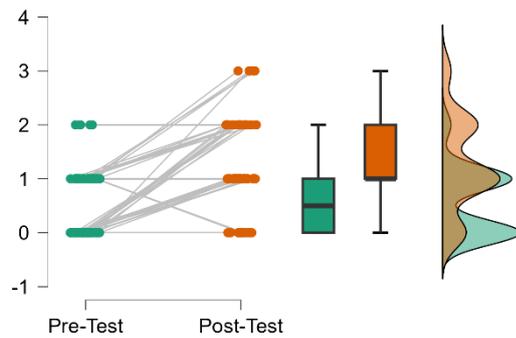


Figure 7. Daytime dysfunction

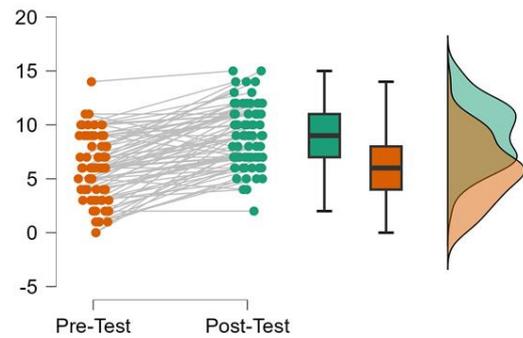


Figure 8. Global PSQI score

When the figures showing the differences in the sleep quality sub-dimensions and global PSQI scores of the participants during the process are examined, it is seen that there is a significant increase in Subjective sleep quality, Sleep latency, Sleep disturbances, Daytime dysfunction sub-dimensions and Global PSQI score in post-test measurements compared to pre-test results. This can be interpreted as a relative deterioration in students' sleep quality during Ramadan during the online education process. In the sub-dimensions of Sleep duration, Habitual sleep efficiency, and Usage of sleep medication, it is seen that some students' scores increased, and some students' scores decreased oppositely. This situation caused the change in pre-posttest averages not to be significant.

DISCUSSION

The present study aimed to examine the effects of Ramadan fasting on sleep quality in university students. The statistical analysis revealed several significant findings, which contribute to our understanding of the impact of fasting during Ramadan on sleep patterns and subjective sleep quality.

Consistent with previous research (Faris et al., 2020), our results showed a significant increase in sleep latency during Ramadan fasting. Participants took longer to fall asleep compared to the pre-fasting period. This finding highlights the disruptive effects of altered eating and sleeping patterns on sleep initiation. The delay in sleep onset may be attributed to physiological changes associated with fasting, as well as the anticipation and excitement surrounding the pre-dawn meal (sahur). These findings emphasize the importance of recognizing the potential challenges in sleep initiation during Ramadan and developing strategies to mitigate sleep latency issues in university students.

Furthermore, our results indicated a significant increase in sleep disturbances during Ramadan fasting. Participants reported experiencing more disruptions in their sleep, which aligns with previous studies (Qasrawi et al., 2017). The disturbances may stem from various factors, including nocturnal awakening for sahur, changes in eating habits, or other environmental factors related to Ramadan rituals. These findings underscore the need for interventions that address

sleep disturbances and promote better sleep hygiene during Ramadan fasting.

Interestingly, despite the increased sleep latency and disturbances, our study found a significant improvement in subjective sleep quality during Ramadan fasting. Participants reported perceiving their sleep quality as better during the fasting period. This finding contrasts with the objective measures of sleep latency and disturbances, suggesting that participants may have developed a subjective adaptation or coping mechanism to the changes in their sleep patterns. It is important to note that subjective sleep quality is influenced by various factors, including individual perceptions and cultural beliefs. Future research should further investigate the underlying mechanisms behind the improved subjective sleep quality during Ramadan fasting.

The lack of significant differences in sleep duration and habitual sleep efficiency between the pre-test and post-test is noteworthy. Participants were able to maintain their usual sleep duration and overall sleep efficiency during Ramadan fasting. This finding suggests that despite the challenges posed by altered schedules and fasting, university students were able to maintain their habitual sleep patterns. It is possible that individuals made conscious efforts to prioritize sleep and manage their time effectively during Ramadan. These results highlight the resilience and adaptability of university students in maintaining their sleep routines during fasting.

Comparing our findings to other studies, our results align with previous research that has demonstrated the disruptive effects of Ramadan fasting on sleep patterns (Almeneessier et al., 2018; Bogdan et al., 2001). However, our study adds to the existing literature by focusing specifically on university students, who are already vulnerable to sleep disruptions due to academic and social pressures. The findings highlight the unique challenges faced by this population during Ramadan fasting and emphasize the need for tailored interventions and support to promote optimal sleep quality.

It is important to acknowledge some limitations of the study. Firstly, our study relied on self-report measures, which are subject to recall bias and individual interpretation. Future research could benefit from incorporating objective measures of sleep, such as actigraphy or polysomnography, to provide a more comprehensive assessment of sleep quality during

Ramadan fasting in university students. Secondly, the study was conducted with a specific sample of university students, and the findings may not generalize to other populations or age groups. Future studies should aim to replicate these findings with diverse samples to enhance the external validity of the results.

In conclusion, our study contributes to the growing body of research on the effects of Ramadan fasting on sleep quality in university students. The results indicate that fasting during Ramadan leads to increased sleep latency and disturbances, while subjective sleep quality improves. These findings emphasize the need for targeted interventions to address the specific challenges faced by university students during Ramadan fasting, including strategies to manage sleep latency and disturbances. The findings highlight the importance of raising awareness among university students about the potential disruptions in sleep patterns during Ramadan and providing them with evidence-based recommendations to optimize sleep quality.

Furthermore, our study adds to the existing literature by focusing on university students specifically. This population already faces academic and social pressures that can disrupt sleep habits, and the added challenges of Ramadan fasting can further impact their sleep patterns. Understanding the unique needs of university students during this period is crucial for educators, policymakers, and health professionals to develop targeted interventions and support systems.

Our findings align with previous research that has demonstrated the effects of fasting on circadian rhythm and cognitive functions (Bahammam, 2004; Assaad et al., 2014). The disruption in sleep patterns and the altered timing of meals during Ramadan fasting can affect the body's internal clock, leading to changes in the circadian rhythm. This, in turn, can impact cognitive functions such as attention, memory, and overall cognitive performance. Future studies should explore the relationship between sleep quality, circadian rhythm, and cognitive functions during Ramadan fasting among university students to gain a more comprehensive understanding of these interrelated factors.

The widespread impact of our research extends beyond the university student population. The findings have implications for educators, policymakers, and health professionals who work with Muslim university students during the holy month of Ramadan. By understanding the specific challenges faced by students in maintaining optimal sleep quality during fasting, interventions can be developed to provide support and promote healthy sleep habits. These interventions may include educational programs, sleep hygiene guidelines, and tailored counseling services to address sleep disturbances and enhance overall well-being during Ramadan.

In conclusion, our study provides valuable insights into the effects of Ramadan fasting on sleep quality in university students. The results underscore the importance of addressing the challenges faced by students during fasting, including sleep latency, disturbances, and subjective sleep quality. By considering the impact on circadian rhythm and cognitive functions, our findings contribute to a comprehensive understanding of the effects of fasting on sleep patterns and highlight the need for targeted interventions to support

university students in maintaining optimal sleep hygiene during Ramadan.

Ethical Declaration

Ethical clearance for the research was obtained from the Scientific Research and Publication Ethics Committee at Ataturk University. The ethical approval was given under the decision number E-70400699-050.02.04-2100126915, dated 21st March, 2023. This approval ascertains that the research methods used and the entire study are in alignment with the ethical standards enforced by the university and universally accepted within the scientific research community.

Conflict of Interest: There are no personal or financial conflicts of interest between the authors of this study and other organizations or persons.

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GENİŞLETİŞİMİŞ ÖZET

Çalışmanın Amacı

Üniversite öğrencileri, akademik, sosyal ve çevresel baskılar nedeniyle uyku alışkanlıklarının bozulmasına hassastır. Ramazan boyunca, Müslüman öğrenciler oruç tutmak ve dini görevleri yerine getirmek için günlük rutinlerini değiştirirler. Bu çalışmanın amacı, Ramazan boyunca çevrimiçi eğitim sürecinde üniversite öğrencilerinin uyku alışkanlıklarını incelemektir.

Araştırma Sorusu

Ramazan boyunca üniversite öğrencilerinin uyku kalitesi nasıl değişir?

Literatur Araştırması

Önceki çalışmalar, Ramazan'ın uyku düzenleri üzerinde önemli bir etkisi olduğunu göstermiştir (Bogdan et al., 2017; Faris et al., 2012; Qasrawi et al., 2017). Yapılan literatür taraması, Ramazan boyunca tutulan orucun uyku kalitesi üzerindeki etkilerinin genel olarak sporcularda incelendiğini göstermektedir (Trabelsi ve ark., 2022; Lipert ve ark., 2021; Roky ve ark., 2012; Herrera, 2012). Elde edilen sonuçlar Ramazan ayında tutulan orucun uyku kalitesine negatif etkilerinin olabileceğini göstermektedir.

Yöntem:

Çalışmaya 29 kadın (%39,2) ve 45 erkek (%60,8) olmak üzere 74 üniversite öğrencisi katılmıştır. Katılımcılar Erzurum Teknik Üniversitesi (%47,3, n=35) veya Atatürk Üniversitesi'ne (%52,7, n=39) kayıtlıydı. Katılımcılar Spor Bilimleri (n=15), Doğa Bilimleri (n=17), Mühendislik (n=16), Edebiyat (n=16) ve Sağlık Bilimleri (n=10) dahil olmak üzere çeşitli fakültelere dağılmıştır. Tüm katılımcılar Ramazan ayında oruç tutma ve sahura kalkma kriterlerini karşılamıştır.

Pittsburgh Uyku Kalitesi İndeksi (PSQI), Buysse ve arkadaşları (1989) tarafından bir önceki ay boyunca uyku kalitesini ve rahatsızlıklarını değerlendirmek için geliştirilen bir öz bildirim anketidir. PSQI, her biri 0 ila 3 arasında değişen yedi bileşen puanı veren 19 maddeden oluşmaktadır.

Veriler, Ramazan boyunca uyku kalitesindeki değişiklikleri incelemek için Ramazan ayından önce ve sonra toplanmıştır. Katılımcılar, verilerin doğruluğunu ve tutarlılığını sağlamak için Ramazan öncesinde ve sonrasında araştırma ekibinin gözetiminde PSQI'yi doldurmuştur.

Eşleştirilmiş örneklem t-testi için gerekli varsayımları doğrulamak için ön analizler yapılmıştır. Dağılımın normalliğini değerlendirmek için Kolmogorov-Smirnov testi, Kurtosis-Skewness değerleri, histogramlar ve Q-Q grafikleri kullanılmış ve sonuçlar verilerin normal dağılım varsayımını karşıladığını doğrulamıştır.

PSQI ile ölçülen uyku kalitesinin Ramazan ayında değişeceği hipotezini incelemek için eşleştirilmiş örneklem t-testi yapılmıştır. Bu analiz, iki zaman noktası arasında istatistiksel olarak anlamlı bir fark olup olmadığını belirlemek için Ramazan öncesi ve sonrası ortalama PSQI puanlarını karşılaştırmıştır. Gözlenen değişikliklerin büyüklüğünün standart bir ölçüsünü sağlamak için Cohen's d kullanılarak etki büyüklükleri de hesaplanmıştır.

Sonuç ve Değerlendirme

Önceki araştırmalarla tutarlı olarak (Faris ve ark., 2020), sonuçlarımız Ramazan orucu sırasında uyku gecikmesinde önemli bir artış olduğunu göstermiştir. Katılımcıların uykuya dalması oruç öncesi döneme kıyasla daha uzun sürmüştür. Bu bulgu, değişen yeme ve uyku düzeninin uyku başlangıcı üzerindeki bozucu etkilerini vurgulamaktadır. Bu bulgular, Ramazan ayında uykuya başlamadaki potansiyel zorlukların farkına varmanın ve üniversite öğrencilerinde uyku gecikmesi sorunlarını hafifletmek için stratejiler geliştirmenin önemini vurgulamaktadır.

Ayrıca, sonuçlarımız Ramazan orucu sırasında uyku bozukluklarında önemli bir artış olduğunu göstermiştir. Katılımcılar uykularında daha fazla aksaklık yaşadıklarını

bildirmişlerdir ki bu da önceki çalışmalarla uyumludur (Qasrawi ve ark., 2017). Bu bulgular, Ramazan orucu sırasında uyku bozukluklarını ele alan ve daha iyi uyku hijyenini teşvik eden müdahalelere duyulan ihtiyacın altını çizmektedir.

İlginç bir şekilde, artan uyku gecikmesi ve rahatsızlıklarına rağmen, çalışmamız Ramazan orucu sırasında öznel uyku kalitesinde önemli bir iyileşme bulmuştur. Katılımcılar oruç döneminde uyku kalitelerini daha iyi olarak algıladıklarını bildirmişlerdir. Bu bulgu, uyku gecikmesi ve bozukluklarının objektif ölçümleriyle tezat oluşturmakta ve katılımcıların uyku düzenlerindeki değişikliklere öznel bir adaptasyon veya başa çıkma mekanizması geliştirmiş olabileceklerini düşündürmektedir.

Bulgularımız diğer çalışmalarla karşılaştırıldığında, Ramazan orucunun uyku düzeni üzerindeki bozucu etkilerini ortaya koyan önceki araştırmalarla uyumludur (Almeneessier vd., 2018; Bogdan vd., 2001). Ancak çalışmamız, özellikle akademik ve sosyal baskılar nedeniyle uyku bölünmelerine karşı zaten savunmasız olan üniversite öğrencilerine odaklanarak mevcut literatüre katkıda bulunmaktadır.

Sonuç olarak, bu çalışma, Ramazan'ın ve çevrimiçi eğitimin uyku kalitesi üzerindeki etkisini belirlemekte ve bu etkileri hafifletmek için stratejiler geliştirmede rehberlik etmektedir. Bu, özellikle Müslüman öğrencilerin akademik başarısını ve genel sağlığını korumak için önemlidir. Bu konuda daha fazla araştırma yapılması, bu hedeflere ulaşmada daha etkili olmamıza yardımcı olacaktır.