

## The Relationship Between Sleep Quality and Performance During The Competition in Professional Badminton Players

*Profesyonel Badmintoncularda Uyku Kalitesinin Müsabaka Performansına Etkisi*

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**Abstract:** Sleep is crucial for athletic performance, as insufficient rest impairs cognitive function, psychomotor skills, and reaction time, all critical during competition. Research specifically on this relationship in badminton is limited. Therefore, this study investigated the relationship between sleep quality, gender differences, and tournament performance in professional badminton players. The sample included 78 professional badminton players (39 male, 39 female), aged 15–33. Sleep quality over the past month was assessed using the Pittsburgh Sleep Quality Index (PSQI). The tournament results and world rankings were taken from the Badminton World Federation Webpage. Non-parametric tests (Wilcoxon Signed-Rank Test) were used for gender comparisons due to non-normal data distribution, and Spearman Correlation Analysis was applied for variable relationships. The mean PSQI Total Score for all athletes was  $5.97 \pm 2.74$ , which is close to the threshold ( $>6$ ) indicating 'poor sleep quality'. Although there was no significant difference in the Total PSQI Score between genders ( $p = 0.752$ ), female athletes showed a significantly higher score in the Habitual Sleep Efficiency subscale ( $0.59 \pm 1.09$ ) compared to males ( $0.17 \pm 0.45$ ) ( $p = 0.036$ ). Furthermore, a negative, significant correlation was found between the PSQI Daytime Dysfunction subcomponent and tournament results specifically in male participants ( $p = 0.015$ ,  $\rho = -0.388$ ). International professional badminton players generally tend to experience a decline in sleep quality, while female athletes exhibit significantly lower sleep efficiency compared to male athletes.

**Keywords:** Badminton, sleep quality, performance, gender differences, pittsburgh sleep quality index.

**Özet:** Uyku, yetersiz dinlenmenin bilişsel işlevi, psikomotor becerileri ve tepki süresini bozması nedeniyle atletik performans için hayati öneme sahiptir; bu unsurların tamamı müsabaka sırasında kritik öneme sahiptir. Bu ilişkinin badminton özelindeki araştırmaları sınırlıdır. Bu nedenle, bu çalışma profesyonel badminton oyuncularında uyku kalitesi, cinsiyet farklılıkları ve turnuva performansı arasındaki ilişkiyi araştırmıştır. Örnekleme, 15-33 yaş aralığında 78 profesyonel badminton oyuncusundan (39 erkek, 39 kadın) oluşmuştur. Geçen ayki uyku kalitesi, Pittsburgh Uyku Kalitesi İndeksi (PSQI) kullanılarak değerlendirilmiştir. Turnuva sonuçları ve dünya sıralamaları Badminton Dünya Federasyonu Web Sayfasından alınmıştır. Verilerin normal dağılım göstermemesi nedeniyle cinsiyet karşılaştırmaları için parametrik olmayan testler (Wilcoxon İşaretli Sıralar Testi) kullanılırken, değişkenler arasındaki ilişkiler için Spearman Korelasyon Analizi uygulanmıştır. Tüm sporcular için ortalama PSQI Toplam Skoru  $5.97 \pm 2.74$  olup, bu değer "kötü uyku kalitesini" gösteren eşige ( $>6$ ) yakındır. Cinsiyetler arasında Toplam PSQI Skorunda anlamlı bir fark olmamasına rağmen ( $p = 0.752$ ), kadın sporcular Alışılmış Uyku Verimliliği alt ölçeğinde erkeklerle göre ( $0.17 \pm 0.45$ ) anlamlı derecede daha yüksek bir skor ( $0.59 \pm 1.09$ ) göstermiştir ( $p = 0.036$ ). Ayrıca, PSQI Gündüz İşlev Bozukluğu alt bileşeni ile turnuva sonuçları arasında, özellikle erkek katılımcılarda, negatif ve anlamlı bir korelasyon ( $p = 0.015$ ,  $\rho = -0.388$ ) bulunmuştur. Sonuç olarak; uluslararası düzeydeki profesyonel badmintoncuların genel uyku kalitelerinin bozulma eğiliminde olduğu ve kadın sporcuların erkek sporculara kıyasla daha düşük uyku verimliliğine sahip olduğu saptanmıştır.

**Anahtar Kelimeler:** Badminton, uyku kalitesi, performans, cinsiyet farklılıkları, pittsburgh uyku kalitesi indeksi.

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## INTRODUCTION

Sleep plays an important role in an athlete's lifestyle. During the sleep process, there are two main stages. These are the rapid eye movement phase (REM) and the no rapid eye movement (NREM) phase. The NREM stage is divided into stages 1 (N1), 2 (N2), and 3 (N3) (Malhotra & Avidan, 2014). These processes include changes in brain waves, heart rate, respiration, blood pressure, body temperature, and hormonal oscillations (Tobaldini et al., 2017). The disruption of these physiological processes undermines not only physical recovery but also branch-specific cognitive abilities in athletes. Consequently, quality and adequate sleep are essential for maintaining immune function and repairing muscles and cartilage after strenuous physical strain, providing a vital foundation for athletic performance.

For optimal sleep quality, it is important to create a comfortable, cool, dark, and quiet environment away from electronic devices (Ferrar et al., 2018). At the same time, for quality sleep, short sleep latency, short transition from light to deep sleep, an increase in the amount or intensity of deep sleep, and total time spent in bed are required (van Sluijs et al., 2020). When looking at the differences in terms of sleep quality, it was found that females have more sleep problems than males (Mallampalli & Carter, 2014; Silva et al., 2019).

These hormonal system and circadian rhythm differences between the sexes pose a risk for sleep disorders (Silva et al., 2019). However, elite competitors sometimes do not maintain regular sleep, often failing to comply with the required and recommended sleep time (7-9 hours) necessary for recovery (Romyn et al., 2018; Kirschen et al., 2020).

Sleep plays an important role in sportive performance development periods. A healthy sleep after heavy training loads can prevent the effect of stress-inducing systems by regulating circulating cortisol and sympathetic system activity (Roberts et al., 2019). At the same time, early morning training, anxiety, and pre-competition thoughts are factors that reduce the sleep time and quality of athletes (Juliff et al., 2015; Kölling et al., 2019). This is particularly critical in sports such as badminton, which is an explosive branch requiring multiple decisions per second; even millisecond delays caused by sleep deprivation can directly impact competition outcomes. Insufficient sleep leads to decreased psychomotor functions, impaired mood, and slowed reaction times—all of which are detrimental to the high demands of agility, attention, and cognitive performance required on the badminton court (Vitale et al., 2019).

Other factors that can harm sleep quality include increased physiological load, long-distance travel, jet lag, and stress conditions (Watson, 2017). When athletes are exposed to poor sleep quality, decreased performance and muscle recovery may occur, leading to injury (Hatia et al., 2024; Silva et al., 2019). Objective measurement methods (e.g., polysomnography) and subjective tools like the Pittsburgh Sleep Quality Index (PSQI) are used to assess these disturbances (Bani Younis et al., 2019). The PSQI is a widely used questionnaire assessing seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction (Ağargün et al., 1997; Buysse et al., 1989).

When the literature is reviewed, there are not enough studies to explain the relationship between sleep quality and performance specifically in the badminton branch. Therefore, this study aims to investigate the relationship between subjective sleep quality and competitive performance indicators in well-trained, elite badminton players during an international competition period. The study hypothesized that female athletes would have higher total PSQI scores than their male counterparts.

## METHODS

**Research Model:** This study was designed in accordance with the correlational survey model, one of the general survey models. The primary objective of this model is to determine the change between two or more variables and, if any, the degree of this change. In this context, the study examined the direction and intensity of the relationship between the variables of sleep quality (measured by PSQI) and tournament performance (BWF rankings and results) in professional badminton players (using Spearman Correlation Analysis). Additionally, it was attempted to determine whether these variables differed according to the gender variable (using the Wilcoxon test).

**Purpose of the research:** This study aimed to investigate the relationship between professional-level athletes and elite badminton players' sleep quality and performance during the competition period. The study hypothesized that female athletes would have higher total PSQI scores than their male counterparts.

**Research Group:** The optimal sample size for the study was determined using G\*Power 3.1.9.7 software, and a post hoc power analysis was performed to evaluate it. This analysis was based on a t-test designed to detect differences in the PSQI total scores between female and male. A two-tailed test was used, with the significance level fixed at  $\alpha = 0.05$ . The total sample size ( $N = 78$ ,  $n_1 = 39$ ,  $n_2 = 39$ ) and medium expected effect size in the literature ( $d = 0.50$ ) were entered as parameters. Under these parameters, the calculation resulted in a statistical power ( $1-\beta$ ) of 0.587. This value is below the commonly accepted threshold of 0.80. This indicates that if there is a difference between the groups at the assumed effect size, there is a low probability (58.7%) of detecting this difference statistically significantly with the current sample size and a high risk ( $\beta \sim 0.413$ ) of Type II error.

**Data Collection:** In this study, the Pittsburgh Sleep Quality Index (PSQI), which assesses sleep quality and disturbances over the past month, was used as the data collection tool. The questionnaire was administered to 78 professional badminton players (39 men, 39 women) aged 15-33 who participated in an international tournament held in Turkey in 2019. The scale assessed the athletes' subjective sleep quality over the one-month period leading up to and including the competition phase. The English version of the scale was used for foreign participants, while the Turkish version was used for Turkish participants. The participants' tournament results and world rankings were recorded from the Badminton World Federation (BWF) website. To ensure the operationalization of performance variables, World Rankings were defined as the athletes' official standing on the BWF website at the time of the tournament. Tournament Results represent the specific placement (e.g., final ranking in the draw) achieved by each athlete during the international tournament where the data collection took place.

**Pittsburgh Sleep Quality Index (PSQI):** The PSQI is a reliable and valid subjective measurement tool that assesses sleep quality over the past month. The scale consists of 19 questions answered by the individual and is divided into seven core component scores. The sum of these seven components (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medication use, and daytime dysfunction) yielded a global PSQI score ranging from 0 to 21. A high total score (greater than 6) on the scale indicates poor sleep quality.

The English version of the scale was used for foreign athletes participating in our study, while the Turkish version was developed by Buysse et al. (1989) and validated and reliability tested in our country by Ağargün et al. (1996). was used for Turkish participants. All participants gave their consent to participate in the study after reading the information sheet about the scale (Ağargün et al., 1997; Buysse et al., 1989).

**Analysis of Data:** Statistical analyses were performed using the JASP (version 0.16.3) software. Pittsburgh Sleep Quality Index (PSQI) scores collected from 78 professional badminton players (39 male, 39 female), along with age, world ranking, and tournament result data, were analyzed. First, comparisons between two independent groups were performed to examine the differences between sexes in PSQI total scores and subcomponents. Since the assumption of normal distribution was violated, non-parametric tests were employed. Specifically, the Mann-Whitney U test was used for gender-based group comparisons, and Spearman's rank correlation analysis ( $\rho$ ) was applied to determine the degree and direction of the relationships between variables.

The variables analyzed for correlations included PSQI subcomponents, total scores, age, world rankings, and tournament results. In this analysis, the strength of the relationship was reported using Spearman's rho ( $\rho$ ) coefficient, and significance was reported using the p-value. The statistical significance level was set at  $p < 0.050$ .

**Ethical Declaration:** Ethical approval permission was obtained from Dokuz Eylül University Institute of Health Sciences Ethics Committee with the meeting number 2021/05-29 on 29.05.2021.

## RESULTS

This study included 78 athletes (39 male and 39 female) with an average age of  $20.51 \pm 3.61$  years. Males had an average age of  $21.20 \pm 3.42$  years, a World Ranking Score

of  $710.35 \pm 467.55$ , and Average Tournament Results of  $40.06 \pm 39.91$ . Female athletes had an average age of  $19.82 \pm 3.74$  years, a World Ranking Score of  $636.87 \pm 403.34$ , and Average Tournament Results of  $31.35 \pm 28.86$ . Table 1 presents the demographic and performance data in detail.

**Table 1.** Descriptive and performance results

	All Participants (N=78)	Male (n=39)	Female (n=39)	$\Delta$	$p$	$z$
Age	$20.51 \pm 3.61$	$21.20 \pm 3.42$	$19.82 \pm 3.74$	-1.38	0.106	1.618
World Ranking Score	$21.51 \pm 3.62$	$710.35 \pm 467.55$	$636.87 \pm 403.34$	-73.48	0.202	1.284
Lowest-Highest World Ranking					45-1480	
Tournament Results	$40.06 \pm 39.91$	$48.76 \pm 47.32$	$31.35 \pm 28.86$	-17.42	0.164	1.400
Lowest-Highest Tournament Result					1-128	

Note:  $\Delta$ : Delta differences of between groups,  $z$ : effect size,  $p$ : statistical significant \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

The total PSQI score for all participants was  $5.97 \pm 2.74$ , which is close to the threshold value ( $>6$ ) considered indicative of "poor sleepers." In the PSQI subscales, Subjective Sleep Quality was  $1.07 \pm 0.71$ , Sleep Latency was  $1.167 \pm 0.91$ , Sleep Duration was  $0.65 \pm 0.84$ , Habitual Sleep Efficiency was  $0.38 \pm 0.85$ , Sleep Disturbances were  $1.28 \pm 0.50$ , Sleep Medication Use was  $0.21 \pm 0.72$ , and Daytime Functional Impairment was  $1.19 \pm 0.86$ .

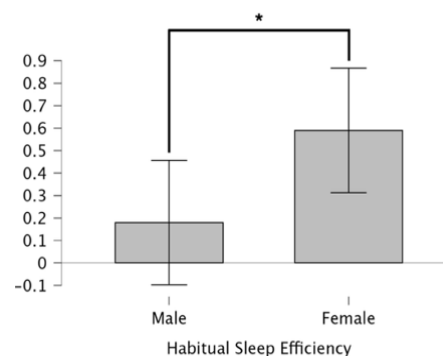
The total scores and subscale parameters of PSQI differences between sexes were analyzed using the Wilcoxon Signed-Rank Test because the data did not show a normal distribution (see Table 2). In the comparison

between sexes, there was no statistically significant difference in PSQI Total Score between male ( $5.84 \pm 2.40$ ) and female ( $6.10 \pm 3.11$ ) ( $p = 0.752$ ). A significant difference was found between sexes in the Habitual Sleep Efficiency sub-component of the PSQI ( $p = 0.036$ ). The female habitual sleep efficiency subscore ( $0.59 \pm 1.09$ ) was higher ( $\Delta = 0.42$ ) than that of male athletes ( $0.17 \pm 0.45$ ) (see Figure 1). This indicates that females have lower sleep efficiency in this component. The other subcomponents, Subjective Sleep Quality ( $p = 0.200$ ), Sleep Latency ( $p = 0.136$ ), Sleep Duration ( $p = 0.570$ ), sleep disorders ( $p = 0.308$ ), Sleep Medication Use ( $p = 1.000$ ), and Daytime Dysfunction ( $p = 0.597$ ), showed no significant difference between sexes.

**Table 2:** Total PSQI scores and division by sex

Parameters	All Participants (N=78)	Male (n=39)	Female (n=39)	$\Delta$	$p$	$z$
PSQI Total Score	$5.97 \pm 2.74$	$5.84 \pm 2.40$	$6.10 \pm 3.11$	-0.13	0.752	-0.322
Subjective Sleep Quality	$1.07 \pm 0.71$	$1.17 \pm 0.75$	$0.97 \pm 0.66$	-0.2	0.200	1.178
Sleep Latency	$1.167 \pm 0.91$	$1.30 \pm 0.89$	$1.02 \pm 0.93$	-0.28	0.136	1.449
Sleep Duration	$0.65 \pm 0.84$	$0.59 \pm 0.81$	$0.71 \pm 0.88$	1.3	0.570	-0.568
Habitual Sleep Efficiency	$0.38 \pm 0.85$	$0.17 \pm 0.45$	$0.59 \pm 1.09$	0.42	0.036*	-2.101
Sleep Disturbances	$1.28 \pm 0.50$	$1.23 \pm 0.53$	$1.33 \pm 0.47$	0.1	0.308	-0.978
Use of Sleep Medication	$0.21 \pm 0.72$	$0.23 \pm 0.74$	$0.20 \pm 0.73$	-0.03	1.000	0.267
Daytime Dysfunction	$1.19 \pm 0.86$	$1.12 \pm 0.92$	$1.25 \pm 0.91$	0.13	0.597	-0.524

Note:  $\Delta$ : Delta differences of between groups,  $z$ : effect size,  $p$ : statistical significant \*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$



Note: The bar on the left represents habitual sleep efficiency values for male athletes, whereas the bar on the right represents those for female athletes. The straight line indicates the significance between the groups. Statistical significance is indicated by an asterisk (\* $p < 0.05$ ).

**Figure 1.** A comparison of the average sleep efficiency of different sexes

### Results of Correlation Analysis

Spearman's correlation analysis was used to evaluate the relationship between tournament results and world ranking scores as well as between PSQI total scores and subparameters. A significant negative correlation was found between PSQI daytime dysfunction and tournament results in male participants ( $p = 0.015$ ,  $\rho = -0.388$ ). No significant correlations were found in the female participants or in the entire group.

### DISCUSSION

The aim of this study was to examine the relationship between sleep quality, sex differences, and competition performance in professional badminton players participating in international competitions. The main finding of this study is that professional badminton players competing at the international level generally have a tendency toward impaired sleep quality, and sleep efficiency is lower in female athletes. Regarding the specific hypothesis that female athletes would exhibit higher total PSQI scores than males, the results did not support this prediction, as no statistically significant difference was found between the groups (Table 2,  $p = 0.752$ ). However, it should be noted that the post-hoc power analysis revealed a statistical power of  $(1-\beta) = 0.587$ , which is below the conventional threshold of 0.80. This suggests a potential Type II error risk, meaning that the lack of significance might be attributed to the limited sample size rather than a true biological or psychological parity between genders regarding overall sleep quality. In male athletes, a significant negative correlation was found between daytime dysfunction and tournament results. The absence of this correlation in female athletes suggests the presence of robust 'compensatory mechanisms.' Elite female athletes may exhibit a higher capacity to maintain high-stakes performance levels despite perceived daytime sleepiness, potentially through increased cognitive effort or physiological adaptation during competition. This resilience allows them to decouple their subjective sleep quality from their actual physical output on the court. International professional badminton players generally tend to experience a decline in sleep quality, while female athletes exhibit significantly lower sleep efficiency compared to male athletes. No direct relationship was found between PSQI subscale scores and athletes' world rankings.

The mean PSQI Total Score ( $5.97 \pm 2.74$ ) of all professional badminton players participating in the study was very close to the threshold value ( $>6$ ) believed to indicate 'poor sleep quality.' This finding is consistent with the existing literature showing that elite athletes struggle to maintain a regular sleep schedule and do not adhere to the recommended 7–9 hours of sleep (Manunyanon et al., 2025). It has been reported that the average night sleep in elite athletes, as reported by PSQI or actigraphy, is generally in the 6–6.5-hour range, and that the proportion of athletes exceeding global PSQI thresholds is significant. This highlights the importance of sleep optimization in field applications. The sleep quality of elite athletes can be negatively affected by increased physiological load, long-distance travel, jet lag, late-night training sessions and competitions, emotional states, and stress (Nedelec et al., 2018). During competition periods in particular, it has been

observed that athletes sleep worse on nights before competition than on nights without competition. This can be attributed to factors such as anxiety, stress, and preoccupation with one's thoughts. Furthermore, research indicates that pre-competition anxiety can make it harder to fall asleep and increase the frequency of awakening at night. Consequently, the distribution of REM and SWS may change, potentially impacting cognitive processes and motor learning (Hatia et al., 2024; L et al., 2021). Additionally, it has been reported that intense travel and match schedules can worsen PSQI scores and sleep efficiency. A decrease in sleep duration and efficiency has been observed within 48 hours of travelling (Charest & Grandner, 2020; Halson et al., 2022; Hatia et al., 2024). Poor sleep reports via the PSQI are particularly common among elite athletes, and this condition can negatively affect training compliance and cognitive-motor performance during competition (Charest & Grandner, 2020; Halson et al., 2022).

Although there was no significant difference in the PSQI Total Score between sexes, female athletes had a significantly higher score on the Habitual Sleep Efficiency subscale ( $p = 0.036$ ,  $\rho = -2.101$ ). The higher variance observed in the habitual sleep efficiency of female athletes may be attributed to several unmeasured confounding factors. Specifically, fluctuations in ovarian hormones during the menstrual cycle have been shown to influence sleep architecture and efficiency in elite female athletes. Additionally, travel-related stress and disruptions in circadian rhythms during international competitions might impact female athletes differently, potentially leading to the observed variability in their sleep data. This finding is consistent with previous studies indicating that female athletes report sleep disturbances more frequently, despite inconsistent results from subjective and objective studies. Short-term (acute) sleep disturbances, in particular, have a more pronounced effect on reaction time, decision-making speed, and technical skills, whereas chronic sleep deprivation has a negative long-term effect on conditioning capacity, recovery processes, and hormone profiles (e.g., cortisol and growth hormone), limiting the relationship between one-off results and long-term ability/ranking (Charest & Grandner, 2020). Hormone cycles, menstrual cycles, psychosocial stress, and circadian differences are potential factors that could explain this phenomenon (Carter et al., 2020; Duston et al., 2025; Nobari et al., 2023; Silva et al., 2019; Teece et al., 2023; Xu & Li, 2024).

Generally, decreased sleep efficiency is expected to negatively affect performance (i.e., tournament results). However, at this level, elite athletes can compensate for decreased sleep efficiency by activating compensatory mechanisms owing to their high cognitive and physical abilities, enabling them to successfully complete competitions. However, insufficient sleep negatively affects cognitive function, resulting in decreased psychomotor function and mood, slowed reaction times, and confusion. In sports such as badminton, which require high cognitive demand, a decline in performance and an increased risk of injury due to insufficient sleep can be expected (Charest & Grandner, 2020; Kaczmarek et al., 2025).

## Conclusions

This study has provided important data on the relationship between sleep quality, sex, and performance indicators in international professional badminton players. These findings suggest that the overall sleep quality of athletes tends to be impaired, with female athletes exhibiting significantly lower sleep efficiency than their male counterparts. However, the total PSQI scores did not differ significantly between the two groups.

However, no direct relationship was found between sleep subdimensions and world ranking, a long-term performance indicator. Nevertheless, the weak but significant correlation between daytime dysfunction and tournament results in male athletes suggests that sleep quality impairments may have a subtle impact on acute performance. In conclusion, optimizing sleep quality is critical for the health and sustained performance of elite badminton players.

## Limitations

There are some limitations to this study that should be acknowledged. Firstly, the statistical power for gender comparisons remained at 0.587, which is below the desired

0.80 threshold. Future studies with larger cohorts are needed to confirm these findings and to achieve a more robust statistical power for detecting subtle gender-based differences in sleep patterns. Additionally, factors such as the menstrual cycle in female athletes and specific travel-related stress were not controlled, which may have influenced the variance in sleep efficiency.

## Practical Implications

Given the intensity of competition and travel schedules, practices such as sleep extension, strategic napping, relaxation techniques, and pre-competition anxiety management are critical for achieving optimal performance in badminton, a sport with a high cognitive demand.

**Ethics Statement:** In the present article, the ethical rules of the journal were followed in the research process in the current article. The responsibility for any violations that may arise regarding the article belongs to the author. The approval of Manisa Celal Bayar University Ethics Committee dated 15.02.2021 and numbered 2021/05-29 was obtained.

**Conflict of Interest:** There is no personal or financial conflict of interest between the authors in the present study.

**Author Contribution Rate:** In the present study, the contribution rates of all authors are equal.

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## GENİŞLETİLMİŞ ÖZET

**Çalışmanın Amacı:** Bu bilimsel çalışma, profesyonel badminton oyuncularında uyku kalitesinin rekabet dönemindeki performansları üzerindeki potansiyel etkilerini kapsamlı bir şekilde incelemeyi amaçlamıştır. Çalışma, uyku kalitesi (Pittsburgh Uyku Kalitesi İndeksi - PSQI ile öznel olarak ölçülen), cinsiyet farklılıkları ve uluslararası turnuvalarda elde edilen turnuva performansı (Badminton Dünya Federasyonu - BWF sıralamaları ve sonuçları) arasındaki ilişkileri araştırmıştır. Badminton gibi yüksek bilişsel talep ve hızlı reaksiyon gerektiren spor dallarında, yetersiz uykunun bilişsel işlev, psikomotor beceriler ve reaksiyon süresi gibi kritik yarışma becerilerini olumsuz etkilediği bilinmesine rağmen, bu alana özgü literatürdeki boşluğu doldurmayı hedeflemektedir.

**Araştırma Problemleri:** Çalışma, uluslararası profesyonel badminton oyuncularının genel uyku kalitesi durumunu tespit etmeyi ve bu kalitenin alt boyutları açısından erkek ve

kadın sporcular arasında anlamlı bir fark olup olmadığını sorgulamıştır. Ayrıca, uyku kalitesi parametreleri (PSQI toplam ve alt ölçek skorları) ile kısa dönemli turnuva sonuçları ve uzun dönemli dünya sıralamaları arasında herhangi bir ilişkinin derecesini ve yönünü belirlemeyi amaçlamıştır. Çalışmanın önceden belirlenmiş hipotezlerinden biri, kadın sporcuların erkek meslektaşlarına göre daha yüksek PSQI toplam puanlarına (daha kötü uyku kalitesine) sahip olacağı yönündeydi.

**Literatür Araştırması:** Literatür, yeterli ve kaliteli uykunun atletik yaşam tarzında merkezi bir rol oynadığını ve yorgunluktan sonra kas onarımı, bağışıklık fonksiyonunun iyileştirilmesi ve fiziksel stresin etkilerinin önlenmesi gibi önemli fizyolojik süreçleri desteklediğini göstermektedir. Ancak, elit sporcuların genellikle önerilen 7-9 saatlik uyku süresine uymakta zorlandıkları belirtilmektedir. Badminton gibi yüksek bilişsel talep

gerektiren sporlarda, uyku eksikliđinin psikomotor fonksiyonlarda azalmaya, ruh halinde bozulmaya, reaksiyon süresinde yavaşlamaya ve kafa karışıklığına yol açarak performansı ciddi şekilde düşürebileceđi vurgulanmaktadır. Cinsiyet farklılıkları bağlamında, literatürde kadınların hormonal sistem ve sirkadiyen ritim farklılıkları nedeniyle erkeklere göre daha fazla uyku sorunu (uyku kalitesi, süresi ve gecikmesi) bildirme eğiliminde olduđu görülmüştür. Bu durum, araştırmanın cinsiyetler arası uyku kalitesi farklılıklarını incelemesi için önemli bir teorik zemin oluşturmuştur.

**Yöntem ve Analiz:** Çalışmanın örneklemini, 2019 yılında Türkiye'de düzenlenen uluslararası bir turnuvaya katılan, yaşları 15–33 arasında deđişen 78 profesyonel badminton oyuncusundan (39 erkek, 39 kadın) oluşmaktadır. Katılımcıların son bir aydaki öznel uyku kalitesi, güvenilir ve geçerli bir araç olan Pittsburgh Uyku Kalitesi İndeksi (PSQI) kullanılarak deđerlendirilmiştir. PSQI, yedi bileşen skorunun (öznel uyku kalitesi, uyku gecikmesi, uyku süresi, alışılmış uyku verimliliđi, uyku bozuklukları, uyku ilacı kullanımı ve gündüz işlev bozukluđu) toplamından oluşan ve 0 ile 21 arasında deđişen küresel bir skor üretir; daha yüksek skor, daha kötü uyku kalitesini ifade eder. Verilerin

istatistiksel analizi, verilerin normal dağılım varsayımını ihlal etmesi nedeniyle parametrik olmayan testler kullanılarak gerçekleştirilmiştir. Cinsiyetler arası karşılaştırmalar için Wilcoxon İşaretili Sıralar Testi , uyku parametreleri ile turnuva sonuçları ve dünya sıralamaları arasındaki ilişkilerin derecesini ve yönünü belirlemek için ise Spearman Korelasyon Analizi uygulanmıştır.

**Sonuç ve Deđerlendirme:** Tüm sporcuların ortalama PSQI Toplam Skoru ( $5.97 \pm 2.74$ ), 'kötü uyku kalitesini' gösteren eşik değere ( $>6$ ) yakındır. PSQI Toplam Skorunda cinsiyetler arasında anlamlı bir fark bulunmamasına rağmen ( $p = 0.752$ ), Alışılmış Uyku Verimliliđi alt ölçeğinde anlamlı bir fark tespit edilmiştir ( $p = 0.036$ ). Kadın sporcuların bu alt ölçekteki puanının erkeklerden daha yüksek olması, kadınların daha düşük uyku verimliliđine sahip olduğunu göstermektedir. Korelasyon analizi sonucunda ise, özellikle erkek katılımcılarda PSQI'nin Gündüz İşlev Bozukluđu alt bileşeni ile turnuva sonuçları arasında negatif, anlamlı bir korelasyon ( $\rho = -0.388$ ,  $p = 0.015$ ) bulunmuştur. Bu bulgular, uluslararası profesyonel badminton oyuncularının genel uyku kalitesinde bozulmaya eğilimli olduğunu ve kadın sporcuların erkeklere göre daha düşük uyku verimliliđi gösterdiğini ortaya koymuştur.