



## RESEARCH PAPER

### Gender, Age, and Levels of Physical Exercise Related Risk Factors effecting Sleep among Young Adult Varsity Student-Athletes

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## ABSTRACT

This study aimed to examine risk factor of sleep problems related with gender, age, levels of physical exercise among varsity student-athletes. Sample included 195 varsity student-athletes from six universities. Data gathering included personal and demographic information, physical exercise level, and sleep health using cross-sectional design. The descriptive analysis showed that over 50 percent of the entire sample was sleeping less than 7 hours per night. In addition, one-fourth of the participants were classified as poor sleepers. Mann-Whitney test indicated that female gender compared with male, lower age compared with greater age, low to moderate levels of physical exercise relative to high level of exercise were more vulnerable to experience sleep problems. These factors should be taken into account to counter sleep issues in varsity student-athletes.

**KEYWORDS:** Level of Physical Exercise, Risk Factors, Sleep

## Introduction

Sufficient level of quality and quantity of sleep is essential for smooth functioning of human bodily systems. It's the need of the physical and mental health. Particularly, insufficient sleep and poor sleep appeared to diminish psychological health (Michael A Grandner et al., 2021), cognitive functions, memory and learning consolidation (Delorme et al., 2021); it impairs glucose metabolism (Sanapo et al., 2022), cells repairing and growth, and exerts negative effect on infection (O'Brien et al., 2021), and weakens the immune system (Almondés, Marín Agudelo, & Jiménez-Correa, 2021).

Sleep problems are very common in student-athletes that may impact their academic and sports performance (Wilkes et al., 2021). More specifically, sleep has been found to be linked with accuracy of tennis skills (Vitale et al., 2021), body composition and aerobic capacity (Teece et al., 2021), free throw in basketball athletes, power in elite athletes (Lim, Kim, Kwon, & Lee, 2021), agility (Romdhani et al., 2021), strength, balance performance (Dana, Sabzi, Ghorbani, & Rad, 2021), sprint performance (Waterhouse, Atkinson, Edwards, & Reilly, 2007), and kicking accuracy in soccer athletes (Palucci Vieira et al., 2021). In addition, it is found to be related with risk of sports injuries (Clemente et al., 2021), thermoregulatory response, cardiac activity, speed of recovery after competitions (Mishica et al., 2021), fatigue, recover from muscular injury (Chennaoui et al., 2021), psychological stress, academic and cognitive performance (Wilkes et al., 2021) among athletes. These, factors, in turn, may impact sports and academic outcomes in student-

athletes. To sum up, sleep health is significantly important for mental and physical health of student-athletes that had serious demands to the careful and consistent assessments and screening for the prevalence of sleep problems among these populations.

In sum, student-athletes frequently experience sleep problems and sleep problems negatively effect on student athletes' physical and mental well-being. Identifications of risk factors effecting sleep health has important implications for prioritization of sleep health interventions. Determining sleep characteristics and clustering of student-athletes help identify the more or less under risk clusters of athletic populations that help to address sleep health issues among student-athletes. Although research has been done on non-student athletic populations for identifying the risk factors of sleep health; however, gap exists in the current evidences on this topic related to findings on student-athletes in university setting. Therefore, the aims of this finding are a) determining the prevalence of sleep problems among university student-athletes; b) to determine difference in sleep health related with athlete's characteristics including gender, age and levels of physical exercise.

### **Literature Review**

Human health and wellbeing depend on sleep, which can vary in quality depending on a number of circumstances. The quantity and quality of sleep are particularly important for young adult varsity student-athletes because of their rigorous schedules and physically demanding training plans. The objective of this review of the literature is to analyze and provide an overview of the current understanding of how gender, age, physical activity levels, and sleep affect young adult varsity student-athletes. For the purpose of improving this population's sleep habits and general health, it is essential to comprehend these characteristics in order to build focused interventions.

Several studies have looked into the differences between gender's sleep patters among young adult student athletes. According to research by Chennaoui et al. (2015), female athletes often report high level of sleep quality than their male counterparts. This finding could explained by the hormonal disparities between sexes, as well as variance in the stresses and training loads that male and female athletes are exposed. The subtle elements of gender-specific sleep discrepancies among varsity student-athletes, however, require further study.

The quantity of exercise they do and their degree of training have a big impact on how well student athletes sleep. According to a Juliff et al. (2018) study, excessive physical exercise may cause sleep disruptions and poor sleep quality. This is particularly important for collegiate players who follow strict training schedules. Numerous circumstances, including as stress, travel, competitive schedules, and academic requirements, might contribute to sleep problems. A few examples of interventions include personalized sleep plans, lifestyle modifications, and sleep education initiatives. According to a 2018 study by Mah et al., recording sleep patterns and implementing sleep hygiene training can significantly improve student-athletes' quality of sleep. The best training loads for enhancing sleep quality without degrading performance are still being investigated in this area.

Young adult varsity student-athletes' sleep patterns are influenced by a variety of complex connected factors, including gender, age, and levels of physical activity. Although the field has made significant strides, there is still much to learn about the particularities of sleep in this population. The development of focused therapies that can enhance sleep quality and, as a result, the general health and performance of student-athletes depends on

having a thorough grasp of these factors. Future research should focus on the multifaceted nature of sleep in the context of varsity sports, with the aim of deepening our knowledge and developing scientifically-supported sleep management strategies for this particular group.

## **Material and Methods**

### **Participants**

195 varsity student-athletes with experience competing in domestic and international sporting events willingly agreed to take part in this study (see Table 1). Student-athletes from a various sport were recruited from the six universities through sports related officials (director sports, sports coaches, supporting staff of sports offices) as well as using personal contacts. All athletes were members of university sports and athletic teams.

### **Instruments**

The data was collected by administering a questionnaire composed of three sections including demographic/ personal information, physical exercise, and Pittsburg Sleep Quality Index (PSQI).

#### **Demographic information**

This section consisted of questions related to university name, study program, study year/semester, age, and gender, and the type of sports in which they are participating.

#### **Physical exercise**

Level of physical exercise was assessed using the criteria determined by world health organization guidelines for physical exercise for adult's ages 18 years and higher (Bull et al., 2020). A four item questionnaire was developed based on WHO guidelines and was used for data collection (Bull et al., 2020). This allowed the researchers to classify the participants into inactive, low, moderate, and high level of physical exercisers.

#### **Pittsburg Sleep Quality Index (PSQI)**

The selected individuals' sleep quality and sleep issues were evaluated using the Pittsburg Sleep Quality Index (PSQI), which was created by Buysse, Reynolds III, Monk, Berman, and Kupfer in 1989. This instrument is suggested for use in evaluating athletes' sleep patterns, cleanliness, and difficulties connected to their sleep (Matthew W. Driller et al., 2022).

### **Data Analysis**

Shapiro-Wilk and Levene's tests, which were used to evaluate the assumption of normality prior to data analysis, showed that the data was not regularly distributed (values 0.05). Non-parametric tests were therefore deemed appropriate for data analysis. Mann-Whitney Student-athletes were divided into groups based on their levels of physical activity and gender, and a U test was used to compare the variations in sleep-related variables across the groups. The analysis was conducted using SPSS 22. P value 0.05 was used to determine significance level. Demographic variables were examined using descriptive statistical analysis.

## Results and Discussion

### Participant's Demographic characteristics

The descriptive statistical analysis was performed for the analysis of participant's demographic characteristics. Participants ages ranged from 18 to 25 years ( $M= 21.82$ ,  $SD= 1.67$ ). Their experience ranged from 1 to 10 years ( $M= 4.28$ ,  $SD= 2.094$ ). Among those, the ages of 23.6 % ranged from 18-20 years, 41.5% ranged from 21-22 years, and the ages of the 34.9 % ranged from 23-25 years, respectively. Moreover, 62.6 % were males and 37.4 % were females, 20 % were doing low to moderate level of physical exercise and 80% were high engaged in high level of physical exercise, respectively. In addition, 25.1 % of the participants were categorized as poor sleepers and 74.9 % of the participants were good sleepers. The mean of the global score of PSQI was  $4.73 \pm 2.088$ , with 25.1 % sample classified as poor sleepers. Table 1 exemplifies the socio-demographic traits of the participants.

**Table 1**  
**Characteristics of Participants by gender, playing level, scholarship status, and exercise level and sleep**

	Gender		Exercise level		Sleep status	
	Male	Female	Moderate	High	Good	Poor
<i>n</i>	122	73	39	156	146	49
%	62.6	37.4	20.0	80.0	74.9	25.1

### Prevalence of sleep problems in varsity athletes

The study found that most participants (93.3%) reported good subjective sleep quality, with only a few (6.7%) experiencing some issues. Regarding sleep latency, a majority (66.2%) had no problems, while one-third (33.8%) reported slight or some issues. Approximately half (47.7%) received 7 or more hours of sleep, while the rest (52.3%) got less. Notably, 14.4% experienced sleep efficiency problems. Sleep disturbance affected 10.3% of participants, but the use of sleep medications was low (8.2%). Daytime dysfunction was reported by 15.9% of participants, highlighting a concern in this student-athlete population. The descriptive analysis revealed that the sleep of one-fourth of the participants (25.1%) was poor. This indicates that sleep quality was a matter of serious concern concerning sleep quality of the student-athletic population.

**Table 2**  
**Rate of Sleep Issues among Varsity Student-Athletes (Descriptive Statistics)**

PSQI Components	Problem			
	No		Yes	
	<i>n</i>	%	<i>n</i>	%
Subjective sleep quality	182	93.3	13	6.7
Sleep latency	129	66.2	66	33.8
Sleep duration	> 7 hours 93	>7 hours 47.7	< 7 hours 102	< 7 hours 52.3
Habitual sleep efficiency	184	94.3	11	5.7
Use of sleep medication	179	91.8	16	7.2

Sleep disturbance	175	89.7	20	10.3
Daytime dysfunction	164	84.1	31	15.9

### Risk Factors

#### Sleep variables according to gender

According to the study, men athletes had higher subjective sleep quality scores than female athletes did (Mdn = 110.53 vs. Mdn = 90.50), with a significant difference ( $p .01$ ) indicating that male athletes had superior subjective sleep quality. Male athletes had a lower overall score (Global PSQI Score) than female athletes (Mdn = 108.75), which was also significantly different ( $p .05$ ), indicating that male athletes had better overall sleep quality. In contrast, among athletes there were no discernible gender differences in sleep latency, sleep length, habitual sleep efficiency, sleep disruptions, use of sleep medicine, or daytime dysfunction ( $p >.05$  for all comparisons).

**Table 3**  
The Mann-Whitney U Test, Summary of Differences between Males and Females

PSQI factor	Gender		Z-value
	Male (n =122)	Female (n= 73)	
Subjective sleep quality	Mean rank 90.50	Mean rank 110.53	-2.688*
sleep latency	97.15	99.42	-.291
sleep duration	92.58	107.05	-1.931
habitual sleep efficiency	98.49	97.18	-.256
sleep disturbances	94.51	103.83	-1.755
use of sleep medication	99.56	95.40	-1.048
daytime dysfunction	93.04	106.29	-1.788
Over all sleep quality	91.57	108.75	-2.097*

Note. \*  $p <.05$  †  $p <.001$

#### Sleep variables according to level of physical exercise

Higher levels of physical activity were significantly associated with better sleep quality among student-athletes, as evidenced by better outcomes in subjective sleep quality, sleep latency, habitual sleep efficiency, sleep disturbances, use of sleep medication, and the overall global PSQI score ( $p.01$  for most components and  $p.001$  for use of sleep medication). However, there were no significant differences between student-athletes who engaged in low to moderate levels of physical exercise and those who engaged in high levels of physical activity in terms of sleep duration ( $p >.05$ ) or daytime dysfunction ( $p >.05$ ).

**Table 4**  
Summary of Differences between Low to moderate and High level of Exercising Athletes

PSQI factor	Exercise level		Z-value
	Low to moderate (n =39)	High (n= 156)	
Subjective sleep quality	Mean rank 119.76	Mean rank 92.56	-3.018*

Sleep latency	118.73	92.82	-2.739*
sleep duration	87.58	100.61	-1.437
Habitual sleep efficiency	109.36	95.16	-2.307*
Sleep disturbance	112.49	94.38	-2.820*
Use of sleep medication	112.47	94.38	-3.766†
daytime dysfunction	101.92	97.02	-.547
Over all sleep quality	127.42	90.64	-3.711†

Note. \*  $p < .05$  †  $p < .001$

## Discussions

The study aimed to demonstrate sleep issues and risk factors influencing sleep health among varsity student-athletes. The findings concerning the prevalence of sleep problems demonstrated that sleep complaints with certain level of concerns existed in five components of PSQI out of seven components. Among those, sleep duration and sleep latency were identified as a matter of serious concern with respect to sleep health in this population. This is due to the fact that, in terms of sleep length and latency, respectively, more than half and a third of the individuals had sleep issues. The dysfunction of the daytime, habitual sleep quality, and sleep disturbance come after sleep duration and sleep latency were noted as the subject of some worry since, respectively, 15.9%, 14.4%, and 10.3% of these components had a prevalence of sleep difficulties. Additionally, 25.1% of the subjects were found to have trouble sleeping. The average global PSQI score was  $4.73 \pm 2.088$ , and 25.1% of the sample was considered to be a bad sleeper.

### Sleep quantity (duration, hrs/night)

In early adults, research suggests that sleep more than 8 hours per night is considered essential for normal health (Vlahoyiannis et al., 2021). However, more than eight hours of sleep is required because recovery demands have augmented in student-athletic populations due to their dual nature of working loads such as academic and athletic (Gomez et al., 2018). The evidence from studies revealing improved athletic performance when sleep duration was increased by up to two hours supports this viewpoint (Swinbourne, Miller, Smart, Dulson, & Gill, 2018).

### Sleep Quality

Our study observed that the overall sleep quality (global score of PSQI) was  $4.73 \pm 2.088$ , with 25.1 % sample classified as poor sleepers. Our findings contradicts with outcomes of the research exhibited that the mean score of PSQI was  $6.89 \pm 3.03$ , with 65% of the student-athletes were rated as poor sleepers (Leduc, Tee, Weakley, Ramirez, & Jones, 2019). In contrast to our study, poor sleep quality (PSQI score of  $8.147 \pm 3.051$ ) was reported in a sample of student-athletes (Michael A. Grandner et al., 2021). Furthermore, 42.4% of poor sleepers were identified in a sample of student-athletes based on PSQI global score (Mah et al., 2018). Inconsistent to our study, prevalent of poor sleep is remarkably higher in other studies. These results imply that a high prevalence of poor sleep is present among student-athletes. Similar to sleep duration, sleep quality is also appeared to be effected by academic and athletic load in student-athletic populations (Astridge et al., 2021).

### Risk factors in relation to sleep-related issues

Major findings of the evaluation of risk variables of sleep issues in student-athletes revealed that subjective and overall sleep quality were significantly lower in female athletes than in male athletes when gender-related risk factors were analyzed. Participants

who practiced low to moderate levels of physical activity reported significantly higher subjective sleep quality issues, sleep latency, habitual sleep efficiency issues, sleep disturbances, and use of sleep medication than participants who reported high levels of physical activity. Overall, the findings demonstrated that younger age compared to older age, female gender compared to male, and low to moderate levels of physical activity were preferable to intensive exercise.

Current study observed that female student-athletes were experiencing lower level of sleep quality than male student-athletes. This outcome is consistent with a previous study's finding that women have longer sleep latency than men (Silva et al., 2008). In contrast, another study observed no difference in sleep quality among varsity male and female student-athletes, however, the problem of sleep medication was greater in female student-athletes than male-student athletes (Rebello, Roberts, Fenuta, Cote, & Bodner, 2022). In addition, better sleep quality was also observed in female student-athletes compared with male student-athletes (Mah et al., 2018). Our findings is also contradicts with the past research revealed that females student-athletes showed higher sleep efficiency and lower duration wake after sleep onset than males counterparts (Carter et al., 2020). The underlying cause of appearance of the differences in sleep variables among males and females might be due to physiological and personality related differences across gender.

The analysis of age and sleep demonstrated that increased age was related with increased overall sleep quality and decreased sleep latency. Our findings are consistent with another study conducted in varsity student-athletes demonstrated that greater age in early adult varsity student-athletes was associated with lower daytime sleepiness (Mah et al., 2018). However, our findings contradicts with a study conducted in adolescent athletes reported that sleep quality was better in athletes with higher age compared with lower age in adolescent athletes (Gomes et al., 2017). It is possibility that the contradiction in findings may emerge due to the age differences of participant in our study and in the study conducted by Gomes et al. (2017). However, align with the research of Mah et al. (2018), our study suggest that lower age in early adult varsity athletic population are at greater risk to occurrences of sleep complaints that should be given special attention by the professionals for prevention, treatment, and management sleep health in this population.

The age group of our sample composed of early adults with ages ranged from 18 to 25 years. Sleep differences related to age were documented in past research. However, the overall trends in occurrence of sleep differences vary in different age groups in different stages in life span because multiple variables have impact on sleep in different age categories (Kocevska et al., 2021). The exact cause of improvement in sleep quality as the varsity student-athletes age is currently unknown and, therefore, further research may answer this question for age related differences in sleep observed in this study.

## **Conclusion**

In sum, this study observed a higher level of prevalence of insufficient sleep and delayed sleep along with one-fourth sample experiencing poor sleep quality. Female gender, freshman and lower age and athletes participating in sports requiring moderate to lower level of physical exercise were identified as risk factors concerning sleep issues among varsity student-athletes. Implications and recommendation in the line of observed findings are discussed. The findings of this study may facilitate identifications, treatment, that may lead to point out better prevention of sleep issues among varsity student-athletic populations.

**Recommendations**

A higher level of prevalence of sleep issues with respect to sleep quality and quantity in varsity student-athletes warrant for further screening to diagnose sleep disorders in the students and student-athletes studying in higher education institutions. There is need to spread awareness and sleep education campaign among university student-athletes. Professionals working with varsity student-athletes should provide counseling and support services to improve sleep health in this population. Sleep health interventions, preventions and management programs should take in to account the female gender, freshman and lower age and athletes participating in sports requiring moderate to lower level of physical exercise.



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