



**BODY MASS INDEX LEAN TOWARDS SLEEP HABITS IN SEX-SPECIFIC
RECREATIONAL ATHLETES: A COMPARATIVE ANALYSIS**

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ABSTRACT

The Body Mass Index (BMI) is a widely used tool to assess populations' health status. Insufficient sleep performs a significant role on the health of both genders. Many studies indicated that sleep habits associated many health complications due to overweight and obesity. This comparative study was conducted to analysis four hundred recreational athletes from Fiji National University, Lautoka-campus, FIJI. The participants were classified into underweight, normal, overweight, and obese categories according to their BMI. To measure BMI, we used height and weight. Pittsburgh Sleep Quality Index (PSQI) is a self-reported questionnaire that used to evaluate sleep quality during past thirty days, and Epworth Sleepiness Scale (ESS) is a self-reported measure designed to estimate the level of the daytime sleepiness. For Statistical analysis, descriptive statistics were calculated for participants' age, weight, height, and BMI. An independent t-test and Eta Squared was applied for the statistical analysis. A p-value ≤ 0.05 was taken as statistically significant. The results indicate that 18.75% participants were underweight, 52.75.5% has normal weight, 15.25% overweight and only 19% were obese. There were no significant differences found between male and female recreational athletes for the BMI, PSQI, and ESS in the underweight, normal, overweight, and obese groups. Therefore, when any gender has a high level of BMI, their quality of sleep is poor. More study is needed on how to effectively intervene in different categories of body mass index and sleep habits in between genders.

KEYWORDS: Body Mass Index, Sleep, Sleepiness, Body Weight, Health.

INTRODUCTION

Body mass index (BMI) used as a screening tool for classifying an individual's weight as underweight, normal weight, overweight, and obese. Overweight and obese people face an increased risk of health problems such as diabetes, high blood pressure, high blood cholesterol, and sleeping disorder. Sufficient sleep is an excellent indicator of physical health, mental health, and better performance in both the general and athlete population. Poor sleep and shortened sleep may also lead to weight gain and obesity. All these revealed in issues such as vascular problems, cerebrovascular diseases, development of neurodegenerative, and obesity.^[1] Elite sportspersons possess a significant challenge to sleep due to the psychological and physiological demands as well as training and competition schedules.^[2] Sleep apnea has an estimated prevalence of 9% to 28% among females and 27% to 34% among males, 30 to 70 years of age.

Various studies have examined relationships between sleep and obesity risk in adults.^[1-5]

Both genders face different challenges to sleep. Females are more prone to insomnia, while males are more likely to suffer from a sleep disorder like sleep apnea and snoring. Galland et al. found that 56% of adolescents had poor sleep quality with a higher prevalence in females (63.1%) than in males (44.5%), and sleep hygiene was significantly worse in females.^[4] The prevalence of insomnia symptoms increased from 3.4% to 12.2% in females and from 4.3% to 9.1% in males.^[5] A study showed that women aged 20–29 years have more mediocre sleep quality than men.^[6] Mahfouz et al. revealed that female students have poor sleep quality (69.1%) as they slept a mean of 4.77 hours/night.^[7] Qassim et al. found female have better sleep quality than male. They also revealed that there was a significant difference in mean PSQI scores between male and

female.^[8] However, men may consider their quality of sleep better than women.^[9]

This study may provide insight understanding about how overweight and obese affects sleep habits and what are the ill effect on the health and quality of life. Therefore, this study set up to establish whether differences existed in body composition and sleep habits between recreational athletes.

MATERIAL AND METHODS

Design: We conducted a comparative analysis of four hundred recreational athletes from Fiji National University, Lautoka, Fiji.

Participants: The data were collected from 400 males (n=200) and female (n=200) recreational athletes from within the Lautoka campus. The participants were recruited by convenience sampling. The selected recreational athletes were classified into underweight, normal, overweight, and obese categories according to their Body Mass Index.

Anthropometric Measurement: Researchers collected all anthropometric measurements. The Anthropometric data were as average age 19.41 ± 3.07 years, Height 160.46 ± 7.86 cm Weight 62.04 ± 22.36 kg, and BMI 24.89 ± 7.76 (kg/cm²) for both types of athletes.

Measuring Instruments

A portable electronic calibrated weighing cum Studio scale was used for height and weight measurement.

Body Mass Index (BMI)

BMI was calculated with the help of height and weight measurement. As described as divide weight in kilograms by height in meters, then divide the output by height again. The categories of BMI are underweight (<18.5), Healthy (18.5-24.9), overweight (25-29.9), and obese (30 >).

RESULTS

Table-1. Descriptive statistics of body composition and sleep habits.

	VARIABLES	Body Mass Index Status			
		UNDER WEIGHT (N=52)13%	NORMAL WEIGHT (N=211)52.75%	OVER WEIGHT (N=61)15.25%	OBESE (N=76)19%
1	Gender(M/F)	23/29	101/110	36/25	52/24
2	Gender%	44.23/55.77	47.87/52.13	59.02/40.98	68.42/31.58
3	BMI(kg/cm ²)	17.36±0.86	26.44±5.82	27.20±1.58	36.75±7.10
4	PSQI	7.64±2.83	7.90±2.18	7.98±2.07	8.33±2.22
5	ESS	10.14±3.48	10.65±3.92	10.96±3.21	11.36±3.32

The table-1 showed mean and S.D. for gender differences, BMI, and sleep habits. From the whole study population, only 13% of participants were underweight, 52.75% normal/healthy, 15.25% overweight, and 19% obese. The data showed that the numbers of females were more than male for underweight and healthy weight

The Pittsburgh Sleeps Quality Index (PSQI)

The PSQI is a self-reported questionnaire used to evaluate sleep quality during the past thirty days. Ten individual items generate seven "component" score. Each sleep component yields a score range from 0 (no difficulty) to 3 (severe difficulty) and, when summed, generates a sum score ranging from 0 to 21. Scores > 5 indicate significant disturbance.

Epworth Sleepiness Scale (ESS)

The ESS is a self-reported measure designed to estimate the level of the daytime sleepiness in recent times. The measure consists of eight items on a four-point Likert scale on which respondents rate their response regarding the chance of dozing in a given situation, from 0 (would never) to 3 (high chance). Total scores range from 0 to 24, with higher scores represent more significant sleepiness.

Procedure: Before the administration of the test, concern were taken from all recreational athletes, and all the essential instructions were given to all that they have to follow while providing their response on the PSQI, ESS and also during anthropometric measurement. Participants completed questionnaires and anthropometric measurement tests in a lab setting. To fill questionnaires, recreational athletes took 5-6 minutes to complete.

Statistical Analysis: Descriptive statistics as mean, standard deviation (S.D.), and percentage were calculated for participants' age, weight, height, and BMI. Independent t-test was applied for the comparative analysis in between underweight, normal, overweight, and obese categories. To find the size of the effect of an independent variable into the same group, Eta Squared was also applied. A p-value ≤ 0.05 was taken as statistically significant. The Statistical Package for Social Sciences Version 20 for Windows (SPSS Inc., USA) was used to analyze the data.

whereas male was overweight and obese than female. PSQI was the lowest for underweight and highest for obese recreational athletes. ESS was lowest for underweight and highest for obese recreational athletes.

Table 2. Comparative analysis for BMI and sleep habits between the male and female recreational athletes for underweight group.

GENDER		N	Mean±(SD)	Mean Difference	t	Sign.(p-value)	Eta Squared
BMI	MALE	23	17.36±.972	-.008	-.032	.974	.000
	FEMALE	29	17.37±.805				
PSQI	MALE	23	8.81±3.39	.660	.832	.409	.012
	FEMALE	29	8.15±2.69				
ESS	MALE	23	10.24±3.48	0.013	.012	.990	.000
	FEMALE	29	10.23±4.70				

The result revealed while considering mean score, female recreational athletes showed almost same BMI as male recreational athletes, while male recreational athletes showed more PSQI and ESS than female

recreational athletes. An independent sample t-test showed that there were insignificant differences between male and female recreational athletes for BMI, PSQI, and ESS in the underweight group.

Table 3. Comparative analysis for BMI and sleep habits between the male and female recreational athletes for normal/healthy group.

GENDER		N	Mean±(SD)	Mean Difference	t	Sign.(p-value)	Eta Squared
BMI	MALE	101	21.93±1.58	.394	1.832	.068	.013
	FEMALE	110	21.54±1.81				
PSQI	MALE	101	7.88±2.04	-.032	-.115	.908	.000
	FEMALE	110	7.92±2.29				
ESS	MALE	101	10.22±3.77	-.705	1.438	.152	.008
	FEMALE	110	10.92±4.00				

The result revealed that female recreational athletes showed higher PSQI than male recreational athletes, while male recreational athletes showed more BMI and ESS than female recreational athletes. An independent sample t-test showed that there were insignificant

differences between male and female recreational athletes for BMI, PSQI, and ESS in normal/healthy group.

Table 4. Comparative analysis for BMI and sleep habits between the male and female recreational athletes for overweight group.

GENDER		N	Mean±SD	Mean Difference	t	Sign.(p-value)	Eta Squared
BMI	MALE	36	27.41±1.68	.472	1.362	.177	.022
	FEMALE	25	26.94±1.43				
PSQI	MALE	36	8.00±1.68	.053	.115	.909	.000
	FEMALE	25	7.95±2.48				
ESS	MALE	36	10.91±3.93	.148	.166	.868	.000
	FEMALE	25	10.76±4.16				

The result revealed that male recreational athletes have higher BMI, PSQI, and ESS than female recreational athletes. An independent sample t-test showed that there

were insignificant differences between male and female recreational athletes for BMI, PSQI, and ESS in overweight group.

Table-5. Comparative analysis for BMI and sleep habits between the male and female recreational athletes for the obese group

GENDER		N	Mean	Mean Difference	t	Sign. (p-value)	Eta Squared
BMI	MALE	52	37.77±7.53	3.614	2.33*	.022	.053
	FEMALE	24	34.16±5.15				
PSQI	MALE	52	8.45±2.39	.415	.837	.405	.007
	FEMALE	24	8.04±1.69				
ESS	MALE	52	11.71±3.35	.602	-.821	.413	.007
	FEMALE	24	11.11±3.10				

*Statistically significant at ≤ 0.05 level

The result revealed that female recreational athletes showed higher ESS scores than male recreational

athletes, while male participants showed higher BMI and PSQI than female recreational athletes. An independent

sample t-test showed that there was significant difference in BMI score in male and female recreational athletes. The magnitude of the differences between mean was higher ($\eta^2 = .053$). This implies that male has a higher significant difference than female recreational athletes, whereas insignificant differences were found between male and female recreational athletes for PSQI and ESS in obese groups.

DISCUSSION

The purpose of the present research was to compare the BMI and sleep quality between sex-specific recreational athletes. The findings of this research show that the PSQI is lowest with normal/healthy, whereas highest with underweight participants. Ali *et al.* reported that there were insignificant differences were found for PSQI and daytime sleepiness in the male and female participants in those who have normal BMI.^[10] An analysis found high rates of obesity in the student's athlete population. 24% of student-athletes were obese, and 20% were overweight in Philadelphia.^[11] A study provides data on obesity prevalence that revealed that 71% of females and 56% of the male are obese, whereas overall, 63.6% of obesity prevalence was indicated.^[12] Study conduct on prevalence of obesity, overweight and abdominal obesity among adolescents residing in urban areas, it noted that prevalence of obesity equal 24% and 14% and overweight equals 19.5% and 20.8% in male and female respectively.^[13] A study carried out on football players found that 18% of players have obesity or class 2 obesity.^[14] In the present study also, there is a higher proportion of overweight males than females during this age ranged. Analyzing the difference between the body composition and sleep suggests that the female recreational athletes showed higher BMI than male recreational athletes, while male recreational athletes showed PSQI and ESS than female recreational athletes for the underweight group. The female recreational athletes showed higher PSQI than male recreational athletes. A cross-sectional study reported that the female had a higher percentage of body fat than males throughout all age groups.^[15] It is evident from the data presented in a study; even at lower BMI, both male and female participants had a higher percentage of body fat. At higher BMI, the percentage of body fat was comparatively lower when calculated by Deurenberg equation compared to other methods. Ode states that 33% fat for athlete female were used to define over fatness. Sensitivity was high in linemen (1.0), sensitivity was low (0.56), and specificity was high (0.90) in female nonathletes.^[16] on average, the fat content of women is higher than that of men representing 26.9% of the total body weight compared with 14.7% for men. A finding reported that the odds ratio for overweight in adolescents using time-diary sleep times was not significantly affected by sleep duration. In contrast, the odds ratio for overweight was increased dramatically with reduced sleep duration when sleep duration was self-reported.^[17] The male recreational athletes showed more BMI and Daytime Sleep than female recreational athletes for the

normal group. A study differentiating between the genders with obstructive sleep apnea and found that controlling for energy balance, depression, and demographic variables did not mitigate the relationship between sleep and overweight.^[18]

The result of the present study revealed that male recreational athletes showed higher BMI, PSQI and ESS than female recreational athletes for the overweight group. The female recreational athletes showed higher ESS scores than male recreational athletes. In the National Health and Nutrition Examination Survey (NHANES) data, the difference between male and female also found in the association between sleep duration and BMI, with the female being progressively more likely to be obese as sleep duration was reduced below 7 hours per night, whereas male was more likely to be obese with six or fewer hours of sleep per night. Conversely, there is a negative correlation between body fat, body mass, and sleep duration.^[19] Lower fat in males and females who sleep 7-8 hours per night compared to those show-up 5-6 hours of sleep per night.^[20] A study revealed that there is no significant difference between PSQI and ESS in male and female.^[8] A negative correlation between sleep duration and fat percentage in the healthy female, supporting the idea that sleep duration is significantly associated with body fat.^[21] ESS is the lowest in underweight, whereas the highest in obese recreational athletes.

CONCLUSION

It is evident from the results that when any types of recreational athletes have a high level of BMI, their quality of sleep is poor. Our findings suggest that to improve the quality of sleep, we must control the level of fat and remain active and healthy. More study is needed on how to effectively intervene in different categories of body mass index and sleep habits in between genders at various stages of life.

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