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Does sleep quality affect intuitive eating and eating attitudes?: A cross-sectional study

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ABSTRACT

The aim of this study is to evaluate the effect of sleep quality on eating attitudes and intuitive eating behaviors in adults. The study was conducted with a total of 237 adults (33.8% male, 66.2% female) living in Ankara, Turkey. Data were collected through face-to-face interviews (37.56%) and Google forms (62.44%). The questionnaire included the Pittsburgh Sleep Quality Index (PSQI), Eating Attitude Test-26 (EAT-26), Intuitive Eating Scale-2 (IES-2) and the International Physical Activity Assessment Questionnaire (IPAQ) - short form. Statistically significant negative correlations were found between sleep quality and both the IES-2 score and EAT-26 score. The average IES-2 score for participants with good sleep quality was 0.192 points higher than for those with poor sleep quality. In conclusion, sleep quality may affect intuitive eating and other eating behaviors. However, future studies with larger samples and analysis of hunger and satiety hormones are needed to clarify the relationship between sleep quality, intuitive eating and eating behaviors.

Keywords: eating attitude; eating behaviors; emotional eating; intuitive eating; oral control

1. INTRODUCTION

Sleep is a unique, essential function of the brain, constituting an important part of human life that helps restore the entire body. However, increased stress and the rapid pace associated with global modernization negatively impact average sleep duration and sleep quality, and can lead to sleep problems and disorders (Lin et al., 2020).

Poor sleep quality or insufficient sleep is a significant public health problem, as it can lead to health issues such as diabetes, hypertension, and obesity (Quick et al., 2015). Sleep quality is also associated with impaired eating behaviors and negative eating attitudes. For example, among individuals experiencing sleep deprivation, eating behaviors such as skipping main meals, preferring high-fat, carbohydrate-rich snacks, and consuming fewer fruits and vegetables are common (Açik et al., 2021; Mohiti et al., 2019; Quick et al., 2016; Quick et al., 2015; Shigeta et al., 2001). In a study conducted by Fleig and Randler (2009), it was found that individuals who stay up late tend to consume more fast foods and caffeinated beverages (Fleig and Randler, 2009). Additionally, research indicates that emotional eating (i.e. eating triggered by negative emotions) and external eating behavior (i.e., eating triggered by external cues, such as the sight or smell of food) are more prevalent in women with poor sleep quality than in those with good sleep quality (Dweck et al., 2014).

Sleep also affects the release of the hunger and satiety hormones, including leptin, ghrelin, GLP-1, and orexin. Leptin and GLP-1 are known as a satiety hormone, while ghrelin and orexin are considered hunger hormones. Poor sleep quality and short sleep duration can result in decreased secretion of leptin and GLP-1, increased secretion of ghrelin, a disrupted leptin-to-ghrelin ratio and orexin system deficiency (Dweck et al., 2014; Knutson, 2007; Reutrakul et al., 2017; Reutrakul and Van Cauter, 2018). These changes, associated with reduced sleep quality and duration, activate the orexigenic system, leading individuals to consume more energy and food, thereby increasing the risk of obesity (Reutrakul and Van Cauter, 2018).

Intuitive eating is described as "the harmony of mind, body, and food integrated into a dynamic process" (Cadena-Schlam and López-Guimerà, 2015). Individuals following this approach eat desired foods in response to physiological hunger cues. They do not classify foods as 'good' or 'bad', avoid eating due to emotional or external triggers, and resist dieting (Horwath et al., 2019; Linardon et al., 2021). Instead of eating based on emotions such as anger, depression and stress, they consume foods solely to satisfy physical hunger. Those who practice intuitive eating are more likely to choose foods they enjoy consuming while ensuring their bodies function optimally. They decide when and how much to eat based on hunger signals. Once they feel satiated, they stop eating (Linardon et al., 2021).

It is hypothesized that sleep quality can influence eating behaviors, including intuitive eating, through hunger and satiety cues. However, research on the relationship between sleep quality and intuitive eating is limited. This study aimed to assess the effect of sleep quality on eating attitudes and intuitive eating behaviors in adults.

2. MATERIALS AND METHODS

2.1 Population and samples

This research was carried out between January 2022 and May 2022, among 237 volunteer participants aged 18 to 70 who resided in Ankara, Turkey. Individuals with chronic diseases requiring a special diet (e.g., diabetes, chronic renal failure, celiac disease, etc.) (n = 20), those following a special diet (n = 17), individuals taking medication that affects appetite and/or sleep quality (n = 6), those with psychiatric or sleep disorders (n = 4), and pregnant or lactating women (n = 1) were excluded from the study. Considering variations among subscales and variables, with an effect size of 0.15 (very small in the worst scenario), a power of 0.90, and a type-I error of 0.05, the maximum number of predictors was set at 30. Using GPower 3.1.9.6 software, the sample size of this study was determined to be 226 participants, with an additional 5% added to account for potential errors in data collection.

2.2 Data collection tools

Data were collected through face-to-face interviews (37.56%) and Google forms (62.44%), which provided easily accessible and suitable online surveys due to the COVID-19 pandemic. The survey link was shared with the participants via various social media platforms (WhatsApp, Instagram, Facebook, etc.). The authors posted the survey link on their personal social media accounts (Instagram, Facebook, etc.) or sent it via Whatsapp to individuals living in Ankara. Participants' city of residence was included in the questionnaire, and those living outside Ankara were excluded from the study (n = 3). The questionnaire consists of descriptive information about the participants, anthropometric measurements, the Pittsburgh Sleep Quality Index (PSQI), the Eating Attitude Test-26 (EAT-26), the Intuitive Eating Scale-2 (IES-2), and the International Physical Activity Questionnaire (IPAQ) - short form.

2.2.1 Anthropometric measurements

Participants' body weight and height were based on self-report due to the coronavirus disease (COVID-19) pandemic. Body mass index (BMI) was calculated in kg/m^2 using the formula: body weight (kg) / height (m^2) and was assessed according to the World Health Organization (WHO) classification (Purnell, 2015).

2.2.2 Assessing eating attitudes

The eating attitudes of the participants were assessed using EAT-26. The validity and reliability were established by Savasir and Erol (1989). The EAT-26 is the short version of the EAT-40, comprising 26 items. Ergüney-Okumuş and Sertel-Berk (2019) conducted the Turkish adaptation of the EAT-26. This scale use a 6-point Likert format and includes three subscales: dieting behavior, bulimic behavior, and oral control behavior. Participants could score a minimum of 0 and a maximum of 78 points, with higher scores indicating a greater risk of impaired eating attitude and potential eating disorders. The cut-off point for the EAT-26 is 20 points, meaning participants who score 20 or higher are considered to have "impaired eating behavior" (Ergüney-Okumuş and Sertel-Berk, 2019; Savasir and Erol, 1989). In this study, the overall Cronbach's alpha for the EAT-26 scale was 0.867.

2.2.3 Assessing intuitive eating

The intuitional nutrition of the participants was assessed using the IES-2. The IES-2 is a valid four-subscale instrument designed to measure the degree of adherence to intuitive eating principles.

1) Unconditional permission to eat (UPE): The subscale assesses individuals' willingness to consume the food of their choice when they are hungry, without evaluating the food as healthy or unhealthy.
2) Eating for physiological rather than emotional reasons (EPR): This subscale reflects the consumption of food to satisfy the physical hunger rather than using food to cope with emotions such as anxiety, loneliness and boredom.
3) Reliance on hunger and satiety cues (RHSC): This subscale assesses the effects of internal hunger and satiety cues, focusing on the reliance on these cues to guide eating behaviors.
4) Body-food congruence (BFC): This subscale reflects the tendency of individuals to choose nutritious foods while considering their body's functioning and overall well-being, as well as their personal taste preferences. Individuals who exhibit a high congruence between their body needs and food choices do not feel pressured to consume healthy foods; instead, they choose to do so because they believe it aligns with their body's needs (Carbonneau et al., 2016). The IES-2 is composed of 23 items, which are rated using a five-point Likert scale (1 = Strongly disagree, 5 = Strongly agree). The scoring is calculated by summing the responses for each items and averaging them. Participants with a score above the scale's midpoint are considered to have a higher tendency toward intuitive eating (Tylka, 2006). The validity and reliability of the IES-2 were established by Baş et al. (2017). In this study, the IES-2 Cronbach's alpha value was 0.847.

2.2.4 Assessing sleep quality

PSQI was utilized to assess sleep quality. This index was developed by Buysse et al. (1989), and its validity and reliability in the Turkish language were assessed by Ağargün et al. (1996). The PSQI provides information on sleep quality and disturbances over the past month. The survey is composed of 24 questions, 19 of which are self-reported. The final self-report question, numbered 19, asks whether the participant has a roommate or spouse. The roommate or spouse is responsible for answering the remaining five questions. Only the self-reported questions are included in the scoring. The PSQI includes seven components: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Each question has a score ranging from 0 to 3. The scores from seven components are summed to obtain the PSQI total score. A total score of five or less is considered "good" sleep quality, while scores higher than five indicate "poor" sleep quality (Ağargün et al., 1996).

2.2.5 Assessing the level of physical activity

The participant's physical activity levels were assessed using the IPAQ (Craig et al., 2003). This questionnaire was developed to gather information about the daily physical activity levels. The validity and reliability of the IPAQ were assessed by Savcı et al. (2006). The short form of the IPAQ consists of seven questions that inquire about the time spent walking, engaging in moderate and vigorous activities, and sitting over the past week. Standard metabolic equivalents (MET-min) were established for these activities. 3.0 MET for moderate indoor physical activity, 3.3 MET for walking, 4.0 MET for moderate-intensity physical activity, 5.5 MET for vigorous physical exercise during gardening, 6.0 MET for cycling, and 8.0 MET for vigorous physical activity. The activity score is calculated by multiplying the time spent on each activity, the number of days the activity is performed weekly, and the MET value of that activity. An individual's overall physical activity level is determined by summing all activity scores. Based on their physical activity levels, individuals are classified as inactive (<600 MET-min/week), minimally active (600-3000 MET-min/week), or very active (>3000 MET-min/week) (Savcı et al., 2006).

2.3 Data analysis

Descriptive statistics were gathered, including mean, standard deviation, frequency (n) and percentage (%). For the inferential statistics approach, the Pearson correlation coefficient and Kendall's τ coefficient were used to explore correlation between 11 independent variables (PSQI, BMI, age, sex, presence of disease, education level, income, smoking, alcohol use, daily water consumption, IPAQ total score) and 2 dependent variables (ıntuitive eating and eating attitudes scores). In addition, regression analysis was conducted using all predictors to estimate the dependent variables based on independent variables. Adjusted R^2 was used as a measure of the model accuracy. To compare models, the Akaike Information Criterion (AIC) was utilized, and the final model was reported. The significance level was set at 0.05. SPSS 26 was used as the stastistical software program to calculate the statistical data.

3. RESULTS

The sociodemographic characteristics and water consumption data of the participants are presented in Table 1. The mean age of the participants was 37.32±13.55 years. Of the participants, 33.8% were male, and 66.2% were female. The mean BMI was 24.71±4.17 kg/m^2, with 52.7% classified as normal weight, 35.9% as overweight, and 11.0% as obese. In addition, 55.7% of the participants were married, 45.1% held an undergraduate degree, and 38.4% had a graduate degree. Regarding income, 56.5% of the participants reported that it was equivalent to their expenses. A total of 70.9% did not smoke, and 68.4% did not consume alcohol. The participants' daily water consumption averaged 1.66±0.70 liters. It was found that 44.6% of the individuals in the study were inactive. The intuitive eating scale and eating attitude scores were 3.34±0.61 and 15.94±11.82, respectively. Furthermore, 84% of the participants reported having no chronic disease, while 58.6% were classified as poor sleepers.

In examining the correlation between the intuitive eating and eating attitude score with demographic characteristics, sleep quality, daily water consumption and physical activities, the findings are summarized in Table 2. Intuitive eating based on physiological rather than the emotional reasons ($\tau = -0.114$; $p = 0.036$) and total intuitive eating scores ($\tau = -0.112$; $p = 0.038$) were higher among good sleepers compared to poor sleepers. A negative correlation was found between BMI and reliance on hunger and satiety cues in the intuitive eating subscale ($r = -0.140$; $p = 0.031$), as well as total intuitive eating ($r = -0.135$; $p = 0.039$). Intuitive eating based on physiological rather than emotional reasons was higher in males than females ($\tau = 0.168$; $p = 0.002$). The body-food choice congruence subscale score for intuitive eating was higher in non-smokers than in smokers ($\tau = 0.128$; $p = 0.019$).

The eating attitude bulimia and food anxiety subscale ($\tau = 0.125$; $p = 0.031$), oral control subscale ($\tau = 0.120$; $p = 0.031$), and total eating attitude score ($\tau = 0.114$; $p = 0.035$) were lower among good sleepers than poor sleepers. A negative correlation was observed between BMI and the oral control subscale ($r = -0.245$; $p < 0.001$). Score on the dieting behaviour subscale ($\tau = -0.127$; $p = 0.021$) and total eating attitude ($\tau = -0.158$; $p = 0.003$) were higher in females than in males.

It was found that score on the bulimic behavior subscale ($\tau = -0.136$; $p = 0.014$) and total eating attitude scores ($\tau = -0.104$; $p = 0.043$) were lower among those who responsed "my income is less than my expenses" compare to those who responsed "my income is more than my expenses".

The variables affecting the IES are presented in Table 3. According to the regression analysis conducted to determine these influences, sleep quality ($B = 0.192$; $t = 2.369$; $p = 0.019$), BMI ($B = -0.032$; $t = -2.925$; $p = 0.004$), age ($B = 0.007$; $t = 2.006$; $p = 0.046$) and alcohol use ($B = -0.427$; $t = -2.089$; $p = 0.038$) were statistically significant. The model was significant ($F = 3.121$; $p = 0.004$), with an explanatory coefficient of 5.9%. The average intuitive eating score of those with good sleep quality was 0.192 points higher than those with poor sleep quality. Results indicated that for each one-unit increase in BMI, the intuitive eating score decreased by 0.032 points. In addition, each additional year of age corresponded to a

0.007-point increase in the intuitive eating score. Those who did not use or quit alcohol had a 0.427-point lower intuitive eating score compared to those who consumed alcohol.

The variables effecting the EAS are presented in Table 4. According to the regression analysis conducted to determine these influences, sex (B = 3.832; t = 2.224; p = 0.027) and educational level (B = 26.383; t = 2.231; p = 0.027) were statistically significant. The model was significant (F = 2.332; p = 0.020), with an explanatory coefficient of 4.3%. Educational level and gender had the strongest impact on the eating attitude score. Women's eating attitude score was 3,832 points higher than men's. The eating attitude score of primary school graduates was 26.383 points lower than that of individuals with higher education levels.

Table 1. Sociodemographic characteristics, daily water consumption and physical activity data of individuals (n = 237)

Variables		**M±SD or n (%)**
Age (year)		37.32±13.55
Sex	Male	80 (33.8)
	Female	157 (66.2)
BMI (kg/m^2)		24.71±4.17
BMI	Normal	126 (52.7)
	Overweight	85 (35.9)
	Obese	26 (11.0)
Marital status	Single	58 (24.5)
	Married	132 (55.7)
	Divorced	47 (20.0)
Educational level	Primary school	1 (0.4)
	Middle school	6 (2.5)
	High school	17 (7.2)
Educational level	Associate degree	15 (6.3)
	License	107 (45.1)
	Postgraduate	91 (38.4)
Income	Lower income than expenses	44 (18.6)
	Income equal to expense	134 (56.5)
	Higher income than expenses	59 (24.9)
Smoking status	Smoker	44 (18.6)
	Ex-smoker	25 (10.5)
	Non-smoker	168 (70.9)
Alcohol use	Consumer	66 (27.8)
	Ex-consumer	9 (3.8)
	Non-consumer	162 (68.4)
Water consumption (L/day)		1.66±0.70
	Inactive	78 (44.6)
Physical activity level (MET-min/week) *	Minimally active	70 (40.0)
	Very active	27 (15.4)
PSQI	Good sleepers	98 (41.4)
	Poor sleepers	139 (58.6)
Chronic disease	No	199 (84.0)
	Yes	38 (16.0)
Intuitive eating score		3.34±0.61
Eating attitude score		15.94±11.82

*175 individuals fully completed the IPAQ questionnaire.

Table 2. Evaluation of the relationship between individuals' sociodemographic characteristics, daily water consumption and physical activities, and intuitive eating and eating attitudes

	Intuitive eating score					**Eating attitude score**			
	UPE	**EPR**	**RHSC**	**BFC**	**Total**	**Dieting behavior**	**Bulimic behavior**	**Oral control behavior**	**Total**
PSQI (Categorical)**	-0.059 (0.287)	-0.114 **(0.036)**	-0.075 (0.181)	-0.079 (0.158)	-0.112 **(0.038)**	-0.112 **(0.038)**	0.125 **(0.031)**	0.120 **(0.031)**	0.114 (0.035)
BMI*	0.003 (0.964)	-0.107 (0.100)	-0.140 **(0.031)**	-0.048 (0.467)	-0.135 (0.039)	0.077 (0.238)	0.063 (0.333)	-0.245 (<0.001)	-0.019 (0.774)
Age*	-0.042 (0.521)	0.041 (0.533)	0.016 (0.807)	0.032 (0.623)	0.024 (0.712)	0.057 (0.380)	-0.072 (0.270)	-0.065 (0.321)	-0.010 (0.879)
Sex**	-0.039 (0.478)	0.168 (0.002)	0.011 (0.843)	-0.019 (0.735)	0.086 (0.111)	-0.127 (0.021)	-0.105 (0.070)	-0.091 (0.100)	-0.158 (0.003)
Disease status**	-0.087 (0.113)	0.021 (0.696)	0.001 (0.984)	0.010 (0.857)	0.005 (0.919)	0.010 (0.858)	-0.070 (0.226)	0.055 (0.327)	-0.016 (0.772)
Educational level**	0.022 (0.673)	0.009 (0.863)	0.048 (0.361)	0.090 (0.090)	0.054 (0.285)	0.003 (0.959)	-0.007 (0.896)	-0.053 (0.311)	-0.006 (0.909)
Income**	-0.060 (0.253)	-0.006 (0.908)	0.011 (0.838)	0.017 (0.758)	-0.016 (0.755)	-0.027 (0.606)	-0.136 (0.014)	-0.094 (0.076)	-0.104 (0.043)
Smoking status**	-0.067 (0.209)	-0.011 (0.835)	0.048 (0.371)	0.128 (0.019)	0.020 (0.706)	0.037 (0.495)	0.057 (0.312)	0.028 (0.603)	0.035 (0.499)
Alcohol use**	0.025 (0.646)	-0.087 (0.105)	0.023 (0.677)	0.058 (0.297)	-0.030 (0.570)	-0.005 (0.920)	-0.030 (0.602)	-0.032 (0.564)	-0.050 (0.346)
Daily water consumption*	-0.076 (0.250)	0.061 (0.360)	0.009 (0.898)	0.076 (0.249)	0.031 (0.637)	0.121 (0.066)	-0.042 (0.529)	-0.037 (0.577)	0.046 (0.488)
IPAQ (Walking)*	0.001 (0.994)	-0.035 (0.605)	-0.009 (0.899)	0.051 (0.449)	-0.011 (0.874)	-0.036 (0.599)	0.011 (0.874)	-0.035 (0.601)	-0.030 (0.662)
IPAQ (Moderate)*	0.061 (0.390)	0.020 (0.782)	-0.067 (0.343)	0.033 (0.644)	0.007 (0.921)	0.062 (0.383)	0.051 (0.476)	0.050 (0.483)	0.069 (0.333)
IPAQ (Vigorous)*	-0.023 (0.746)	0.103 (0.149)	<0.001 (0.997)	0.052 (0.467)	0.061 (0.392)	0.024 (0.739)	-0.022 (0.762)	0.001 (0.990)	0.008 (0.911)
IPAQ (Sitting)*	-0.012 (0.863)	-0.031 (0.650)	-0.127 (0.065)	-0.125 (0.071)	-0.112 (0.105)	0.121 (0.079)	0.066 (0.341)	0.090 (0.194)	0.120 (0.082)
IPAQ (Total)*	-0.025 (0.745)	0.079 (0.297)	0.016 (0.831)	0.082 (0.283)	0.062 (0.412)	0.051 (0.506)	0.021 (0.785)	0.017 (0.825)	0.042 (0.578)

The Pearson correlation coefficient* was calculated for the relationship between scale total scores and continuous variables, and Kendall's τ coefficient** was calculated for the relationship between categorical variables, UPE, Unconditional Permission to Eat; EPR, Eating for Physiological Rather than Emotional Reasons; RHSC, Reliance on Hunger and Satiety cues; BFC, Body-Food Congruence, p values that less than 0.05 are statistical significant.

Table 3. Determination of variables influencing the intuitive eating score

	B	Beta	Standard error	t (p)
Constant	3.78		0.255	14.844 **(<0.001)**
PSQI (Categorical)	0.192	0.226	0.081	2.369 **(0.019)**
BMI	-0.032	0.345	0.011	-2.925 **(0.004)**
Age	0.007	0.162	0.003	2.006 **(0.046)**
Educational level	-0.215	0.074	0.158	-1.356 (0.177)
Alcohol use	-0.427	0.176	0.204	-2.089 **(0.038)**
Daily water consumption	0.007	<0.001	0.058	0.120 (0.905)
Total IPAQ	<0.001	0.017	0.001	0.643 (0.521)
				Adjusted R^2 = 0.059; AIC=-239.375; F (p) = 3.121 **(0.004)**

* The variables included in the model; PSQI, BMI, age, sex, disease status, educational status, income, smoking status, alcohol use, daily water consumption, and IPAQ total score

Table 4. Analysis of variables influencing the eating attitude score

	B	Beta	Standard error	t (p)
Constant	10.432		5.729	1.821 (0.070)
PSQI (Categorical)	-1.536	0.060	1.610	-0.954 (0.341)
BMI	-0.028	0.001	0.217	-0.129 (0.898)
Age	0.034	0.017	0.068	0.502 (0.616)
Sex	3.832	0.324	1.723	2.224 **(0.027)**
Educational level	26.383	0.326	11.825	2.231 **(0.027)**
Income	3.350	0.173	2.064	1.623 (0.106)
Daily water consumption	0.978	0.050	1.121	0.872 (0.384)
Total IPAQ	<0.001	0.050	0.001	0.878 (0.381)
				Adjusted R^2 = 0.043; AIC=1169,986; F (p) = 2.332 **(0.020)**

* The variables included in the model; PSQI, BMI, age, sex, disease status, educational status, income, smoking, alcohol use, daily water consumption, IPAQ total score

4. DISCUSSION

Sleep is a vital physiological requirement, and poor sleep quality is associated with numerous public health problems and disrupted eating behaviors. In our study, approximately 60% of individuals were found to have poor sleep quality (Table 1). Studies conducted in Turkey on sleep quality have shown similar findings (Duran and Erkin, 2021; Şahin-Bodur et al., 2023). Sleep quality may be influenced by socioeconomic factors, age, gender, obesity and educational level (Hur et al., 2021; Sheehan et al., 2020; Suna and Ayaz, 2022). Consistent with our study, most participants were female, and their educational levels were relatively high (Duran and Erkin, 2021; Şahin-Bodur et al., 2023). Furthermore, the study by Şahin-Bodur et al. (2023) approximately 75% of participants had a BMI in the normal range; however, the mean age of their participants was lower than that of our study (Şahin-Bodur et al., 2023). In our study, it is believed that approximately half of the population fell within the normal BMI range, and the predominance of women and the high educational level of participants are factors that may affect sleep quality.

In this study, we found statistically significant negative correlations between sleep quality and total IES-2 scores on the subscale assessing eating for physiological rather than emotional reasons (Table 2). Regression analysis showed that individuals with good sleep quality had higher intuitive eating scores than those with poor sleep quality (Table 3). Appetite-regulating adipokines and hormones are influenced by the expression of related DNA sequences, and sleep quality (Table 3). Appetite-regulating adipokines and hormones are influenced by the expression of related DNA sequences, and sleep impacts gene expression; thus, sleep deprivation can alter the levels of these adipokines and hormones (Lin et al., 2020). Individuals who experience hunger and appetite due to sleep deprivation are more likely to choose high-energy, refined-carbohydrate foods, such as sweets, salty snacks and starchy foods (Gomes et al., 2023). Foods high in refined carbohydrates are known to reduce satiety levels. Additionally, sleep deprivation may increase food intake by altering the brain's reward system in response to food-related cues. One study found that young adults experiencing acute sleep deprivation showed increased activation in reward-related brain areas when viewing food-related images (Benjamins et al., 2021). Both acute and chronic sleep deprivation can cause mood changes and increase anxiety and stress by elevating proinflammatory cytokines, such as IL-1β and IL-6 (Thompson et al., 2022). As a result, individuals may be inclined to increase their food intake to manage mood, anxiety and stress levels.

In this study, the subscale score for eating due to physiological reasons was higher in men than in women (Table 2). Similar findings have been reported in other studies (Horwath et al., 2019; Murray et al., 2023; Smith et al., 2020). This result may be related to men generally having higher body satisfaction and self-esteem compared to women. Body dissatisfaction and low self-esteem have been shown to negatively affect intuitive eating behaviors (Linardon et al., 2021; Romano and

Heron, 2022). Moreover, women are more likely than men to experience depression, stress and anxiety (Thompson and Romeo, 2015). Individuals experiencing these moods may be prone to overeating food and may find it challenging to adhere to intuitive eating principles.

In the study, the body-food congruence subscale score was higher for non-smokers than for smokers (Table 2). Smoking is known to suppress taste buds and alter flavor recognition (Nettore et al., 2020; Prokopidis and Witard, 2022). In addition, research has shown that smokers are more likely to crave foods high in fat, carbohydrates and simple sugars compared to non-smokers, with smoking increasing the risk of food addiction by 86% (Hoover et al., 2022; Najem et al., 2020). Individuals with high body-food congruence tend to prefer nutritious foods that support their bodies, promote health, and satisfy their taste preferences. However, due to the effects of smoking, smokers may be less inclined toward body-food congruence and intuitive eating behaviors.

Another factor affecting intuitive eating is obesity. Individuals with a low BMI are generally expected to have a higher tendency towards intuitive eating compared to those with a high BMI. Additionally, intuitive eating is thought to support body weight loss (Hawks et al., 2005; Van Dyke and Drinkwater, 2014). In our study, intuitive eating scores improved as BMI decreased (Table 3). Negative correlations were also found between BMI and both the reliance on hunger and satiety cues subscale score and the total IES-2 score (Table 2). These findings are consistent with previous research (Atalay et al., 2020; Camilleri et al., 2016; Gast et al., 2012; Horwath et al., 2019; Linardon et al., 2021; Özkan and Bilici, 2021; Yılmaz and Arpa Zemzemoglu, 2021), suggesting that individuals with higher body weight may be more likely to diet, which can lead them away from intuitive eating behaviors.

In our study, positive correlations were observed between poor sleep quality and the bulimia and food anxiety, oral control subscales, and total EAT-26 scores (Table 2). Previous studies have reported that poor sleep quality is associated with impaired eating behaviors, such as emotional eating, night eating syndrome, skipping breakfast, late-night snacking, replacing meals with snacks and irregular mealtimes (Faris et al., 2021; Gomes et al., 2023; Köse and Tayfur, 2021; Mohiti et al., 2019). Poor sleep quality negatively impacts eating behavior scores (Bos et al., 2013), and the prevalence of disordered eating behaviors is higher in individuals with poor sleep quality compared to those with good sleep quality (Arslan and Aydemir, 2019). Sleep deprivation may disrupt hunger-satiety signaling, melatonin release, and circadian rhythms, all of which can lead to disordered eating behaviors (Chaput and St-Onge, 2014; Çiftçi and Kızıl, 2023; Godos et al., 2021; Soltanieh et al., 2021; Zisapel, 2018). Moreover, poor sleep quality is associated with psychological stress; short sleep duration can increase the release of stress hormones such as cortisol, epinephrine and norepinephrine (Hirotsu et al., 2015; Soltanieh et al., 2021; Vgontzas et al., 2008).

Research indicates that women are more prone than men to impaired eating behaviors (Yu et al., 2018). Studies have shown that the prevalence of unhealthy eating behaviors, such as vomiting, starvation, consuming minimal food relative to vital needs, and skipping meals, is higher among women than men (Neumark-Sztainer et al., 2011; Striegel-Moore et al., 2009). In a study by Yu women scored higher than men on diet, bulimia, and food anxiety subscale, as well as on total EAT-26 scores (Yu et al., 2018). Similarly, our study found that the dieting behavior score was higher in women than in men (Table 2), and the overall eating attitude score for women was approximately 4 points higher than for men (Table 4). Women's greater emphasis on appearance, combined with higher levels of stress and anxiety, may contribute to a higher incidence of body weight-related eating behavior disorders.

In our study, educational level was identified as one of the factors influencing eating attitude scores, with the risk of impaired eating attitudes and behaviors decreasing as educational level increased (Table 4). Previous research has shown that individuals with higher levels of educational tend to have better diet quality healthier eating behaviors than those with lower educational level (Lê et al., 2013; Nakamura et al., 2015). However, in our study, the impact of educational level on eating behaviors could not be fully assessed due to the high educational level of the most participants. Future studies should aim to collect data from individuals with a wider range of educational backgrounds.

5. CONCLUSION

Poor sleep quality can negatively impact intuitive eating as well as eating attitudes and behaviors. Our findings indicate that sleep quality, age, BMI, and alcohol use significantly affect the intuitive eating score. In addition, being female and having a lower educational level were found to be important factors in eating attitudes. It is suggested that sleep quality may influence intuitive eating and other eating attitudes through effects on hunger-satiety signals and mood. This study enhances our understanding of the role of sleep quality in eating behaviors and intuitive eating, suggesting that improving sleep quality may contribute to better eating attitudes and behaviors.

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