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ORIGINAL PAPER

INSOMNIA AND DAYTIME SLEEPINESS OF TURKISH STUDENTS AND THEIR ASSOCIATIONS WITH SELECTED LIFESTYLE ELEMENTS SUCH AS PHYSICAL ACTIVITY AND COFFEE CONSUMPTION

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Summary

Background. Insomnia and daytime sleepiness, influenced by lifestyle factors impacting overall well-being and academic performance, are commonly observed among students. The study investigates associations between insomnia, daytime sleepiness, and lifestyle factors such as physical activity and coffee consumption among Turkish public health students.

Material and methods. A cross-sectional study was conducted among 414 students from a Turkish university. An online survey was used, including demographic questions, coffee consumption, insomnia, and physical activity. Data was analyzed using descriptive statistics and linear regression analysis.

Results. 92.2% of men and 86.4% of women drank coffee daily. 21.7% of women and 7.8% of men engaged in regular physical activity. 62.6% of women and 49.4% of men reported 7-8 hours of sleep, while 41.6% of men and 31.2% of women reported less than 7 hours. Clinical insomnia was found in 32.5% of men and 37.4% of women. Severe insomnia affected 15.6% of men and 3.9% of women. Significant daytime sleepiness was noted in 9.1% of men. Age and insomnia index were significant predictors of daytime sleepiness (R^2=0.057; F=4.13; p=0.000).

Conclusions. The prevalence of insomnia and daytime sleepiness among students highlights the need for interventions promoting sleep hygiene. Strategies should address lifestyle factors and emphasize sleep hygiene for academic performance.

Keywords: sleep hygiene, sleepiness, caffeine, insomnia, physical activity

Introduction

Humans have diverse biological, psychological, social, and cultural needs, with sleep being a fundamental requirement for survival. Healthy sleep is closely linked to cognitive performance (learning, memory, decision-making, attention), physical health (weight management, muscle gain, metabolism), and mental health (anxiety, depression, emotional regulation) [1]. Research confirms that sleep disorders are associated with worse academic performance [2]. Unfortunately, sleep hygiene is still an underestimated yet crucial element of a healthy lifestyle [3]. On a global scale, nearly 30-40% of individuals experience poor sleep quality, obtaining no more than three restful nights per week, while only 13% consistently achieve optimal sleep [4]. Sleep disorders such as daytime sleepiness and insomnia are common health problems affecting people worldwide, significantly reducing their quality of life and functioning efficiency. Proper diagnosis of the problems is crucial from a public health perspective, and simple, reliable questionnaire tests can aid [5]. Insomnia is defined as difficulty falling asleep or staying asleep, despite adequate circumstances and opportunities for sleep [6]. According to Young [7], sleepiness is a difficulty in maintaining an appropriate level of wakefulness. Both insomnia and excessive daytime sleepiness occur among students worldwide, significantly reducing their quality of life. According to research by Babicki et al. [8], conducted among students from 60 countries around the world, the above disorders have an increasing tendency. Sleep problems are particularly prevalent among young adults, and the COVID-19 pandemic, which significantly disrupted students' circadian rhythms, has exacerbated insomnia. It seems reasonable to study students after the COVID-19 pandemic, especially in countries with a dynamically increasing human development index [9].

While the literature is replete with studies examining sleep problems in student populations, most of the studies have been conducted in Western countries [10]. It is plausible

that factors influencing the association may differ in countries like Türkiye, with distinct cultural and social contexts. In this regard, the study can contribute to a better understanding of sleep problems and the development of effective intervention programs specifically tailored for health sciences students in Türkiye. Hypothetically, it can be assumed that the population of young, studying people who are at the stage of experiencing life and entering adulthood is characterized by irregularity in terms of night rest, and as studies show, engaging in various behaviors, including unhealthy behaviors [11], which may cause problems with subjective feelings of various manifestations of fatigue during the day, as well as their quality of night rest [12]. It is important to identify significant determinants of daytime sleepiness from selected socio-cultural factors such as age, gender, sleep duration, physical activity, and coffee consumption, as well as their level of the insomnia index. It can be assumed that all the factors are significant predictors of perceived energy decrease, manifesting as daytime sleepiness, but to varying degrees. According to research, physical activity is one of the most important elements of a healthy lifestyle, significantly enhancing daytime well-being and improving sleep quality [13]. However, coffee consumption, despite being a common stimulant for waking up and improving well-being, has a detrimental effect on sleep [14].

Aim of the work

The study aims at examining associations between insomnia, daytime sleepiness, and selected lifestyle elements, specifically physical activity and coffee consumption, among Turkish public health students.

Material and methods

Sample characteristics and procedure

A cross-sectional study was conducted at one of the largest universities in Türkiye, using an online survey technique administered immediately after classes. A link to an anonymous survey created using Google Forms was sent to students' emails. From a population of almost 1,000 public health students (paramedics, radiotherapy technicians, audio metrists, medical secretaries, dental health technicians, nuclear medicine technicians, anesthetists, medical imaging technicians, and medical laboratory technicians) enrolled in the spring semester of the 2023-2024 academic year at the Vocational School of Health Services, a sample of 414 health technician students who agreed to participate in the anonymous survey was randomly selected.

Measures

Sociodemographic

Demographic statistics were self-reported by participants, including age (years), gender (women, men), sleep duration (hours), daily coffee consumption, and regular physical activity (at least twice a week).

Daytime sleepiness

The Epworth Sleepiness Scale (ESS), originally developed by Johns in 1992 and adapted to Turkish by Izci et al. [15], consists of eight items rated on a four-point Likert-type

scale. It provides information about general sleepiness levels by evaluating an individual's sleepiness in eight different life situations. Scores range from 0-24, with higher scores indicating greater sleepiness. The reliability of the tool, as measured by Cronbach's alpha coefficient, is 0.86. In the present study, the Cronbach's alpha was 0.66. Permission to use the scale in the study was obtained from Izci, who conducted its validity and reliability assessment in Turkish.

Insomnia

The Insomnia Severity Index (ISI) was used. The Turkish validity and reliability of the scale developed by Bastien et al. [16] were carried out by Boysan et al. [17]. The scale consists of 7 items, each scored between 0-4 points, with total scores ranging from 0-28. Higher scores indicate more severe sleep problems. The scale's break points are: "0-7 points = Clinically insignificant insomnia", "8-14 points = Insomnia lower threshold", "15-21 points = Clinical insomnia (moderately severe)", "22-28 points = Clinical insomnia (severe)". The Cronbach alpha value of the scale was reported as 0.79. In the present study, the Cronbach's alpha was 0.74.

Statistical analyses

The collected data was subjected to statistical processing using the Statistica 13.3 program. Descriptive statistics, including frequencies, percentages, means, standard deviations, medians, and interquartile ranges, were computed to summarize the sample characteristics and study variables. The collected data enabled meeting the assumptions regarding, among others, the normality of distributions and the use of parametric tests.

To examine the relationship between daytime sleepiness and potential predictors, linear univariate regression analysis was conducted. The dependent variable was the ESS score, while the independent variables included age, gender, average sleep duration, daily coffee consumption, regular physical activity, and the ISI score. Both unstandardized (B) and standardized (β) regression coefficients were calculated to quantify the strength and direction of the associations. They enable prediction of the dependent variable. The coefficient of determination (R^2) was used to determine the proportion of variance in the ESS score explained by the model.

The t-test for independent samples was employed to assess the significance of differences between means for the ISI and the ESS by gender.

In all analyses, effects were considered statistically significant if the probability value (*p*-value) was below the threshold of 0.05 ($p<0.05$).

Results

The vast majority of respondents (92.2% of men and 86.4% of women) drink coffee daily, while regular physical activity is declared by only 21.7% of women and 7.8% of men (Table 1). Most women (62.6%) and almost half of men (49.4%) report an average sleep duration of 7-8 hours per day. Short sleep of less than 7 hours was reported by 41.6% of men and 31.2% of women. Clinical insomnia was diagnosed in 32.5% of men (including severe insomnia in 15.6% of them) and 37.4% of women (including severe insomnia in 3.9%). No clinically significant insomnia was found in 33.8% of men and 19.3% of women. Excessive daytime sleepiness requiring medical attention was diagnosed only in the group of men (9.1%). Most women (52.8%) and almost half of men (48.1%) do not experience significant daytime sleepiness. The level of sleepiness at which a person might consider consulting a doctor

concerns 29.4% of women and 24.7% of men. No statistically significant difference was found in the average insomnia and daytime sleepiness index due to gender.

Table 1. The relationship between insomnia severity and daily sleepiness levels according to students' demographic characteristics

Gender of the respondents		**N**			**%**		
Male		77			18.6		
Female		337			81.4		
Variable		**Male**			**Female**		
		n	**%**		**n**	**%**	
Age	**18-20**	52	67.5		198	58.8	
	21-22	25	23.5		87	25.8	
	23-24	-	-		12	3.6	
	25-26	-	-		40	11.9	
Sleep time	**less than 7 hours**	32	41.6		105	31.2	
	7-8 hours	38	49.4		211	62.6	
	over 8 hours and more	7	9.1		21	6.2	
Physical activity	**Yes**	6	7.8		73	21.7	
	No	71	92.2		264	78.3	
Drinking coffee	**Yes**	71	92.2		291	86.4	
	No	6	7.8		46	13.6	
ESS	**A**	37	48.1		178	52.8	
	B	14	18.2		60	17.8	
	C	19	24.7		99	29.4	
	D	7	9.1		--	--	
ISI	**A**	26	33.8		65	19.3	
	B	26	33.8		146	43.3	
	C	13	16.9		113	33.5	
	D	12	15.6		13	3.9	
Indicators	**Gender**	$\bar{x}$	***SD***	***Me***	***Q***	***t***	***p***
ISI	**Male**	13.32	7.02	13.00	5.5	1.126	0.2607
	Female	12.52	5.22	12.00	4.5		
ESS	**Male**	8.15	4.88	8.00	3.00	1.539	0.1244
	Female	7.38	3.70	7.00	3.50		

In the assumed regression model accounting for variables explaining daytime sleepiness, such as age, gender, average sleep duration, daily coffee drinking, regular physical activity, and insomnia index, the model was found to be statistically significant (Figure 1). The analyzed model explained almost 6% of the variability in the sleepiness index (R^2=0.057; df=6; F=4.13; *p*=0.000). Out of the six predictors of daytime sleepiness, two were statistically significant: age (B=-0.449; β=-0.106; t=-2.151; *p*=0.032) and the insomnia index (B=0.152; β=0.215; t=3.839; *p*=0.000).

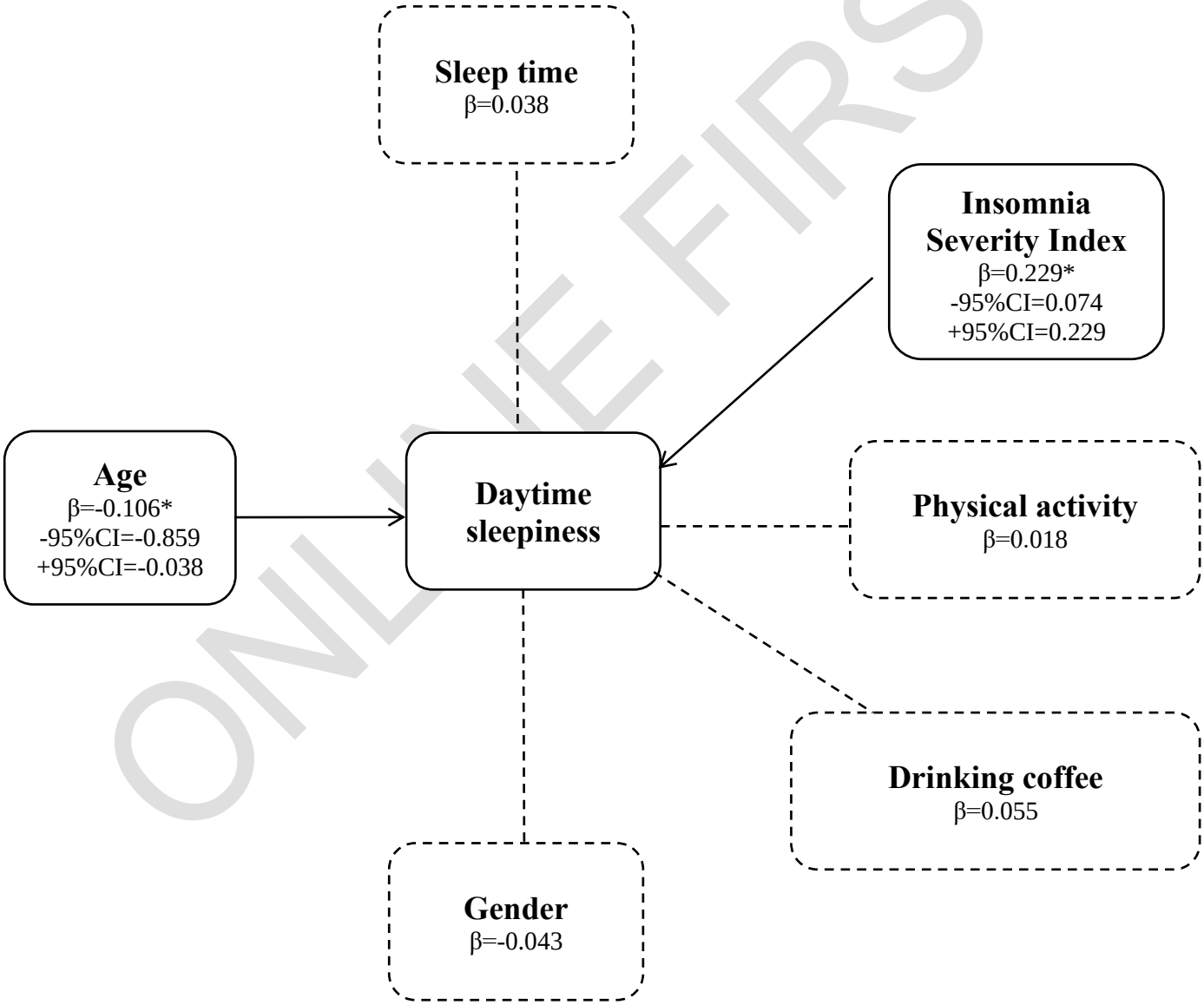

Figure 1. The assumed research model in which the daytime sleepiness index was assumed as the dependent variable

Notes: *statistically significant values at $p \leq 0.05$.

Discussion

Student life is associated with intense experiences and irregular lifestyles. Universities are usually located in large cities, offering attractive ways to spend free time, including nighttime activities. Contemporary globalizing culture promotes an intensive lifestyle, blurring the boundaries between day and night. Thanks to new digital media, young people function in a virtual space where the boundary does not exist. Besides studying, student life may involve additional work, including night shifts, and unprecedented entertainment opportunities. All this is not conducive to observing sleep hygiene rules. Studies indicate that good sleep hygiene can lead to better academic results for students. Unfortunately, it deteriorates with the length of study [18]. Kang and Chen [19], reveal that sleep quality, daytime sleepiness, and general fatigue result from irregular sleep schedules and insufficient sleep. Almost half of the respondents reported sleep durations below 7 hours, which is correlated with irregular sleep.

In our research, short sleep duration (below 7 hours) concerns a large group of respondents, particularly men (41%). However, no significant relationship between sleep duration and daytime sleepiness was found. Excessive daytime sleepiness was diagnosed in 33.8% of men and 29.4% of women, which are lower values than those observed by other researchers.

Silva Araujo et al. [20] reported that the prevalence of poor sleep quality and excessive daytime sleepiness among university students was 79.2% and 51.3%, respectively. Among the intermediate determinants of health, a higher prevalence of poor sleep quality was observed in students who reported health problems in the previous month (18.4%), smokers (23.5%), those who drank stimulant beverages before going to bed (25.8%), and those who used electronic

devices before going to bed during the week (18.4%), as compared to those who did not have the behaviors. Other studies found that more than half of students (56%) had excessive daytime sleepiness, and 38% slept less than 6 hours a day. Researchers have proven that sleep disorders are associated with interference with academic achievement, falling asleep during classes, and being late or absent [21]. In the study conducted on Ajman University students, about 53% of the participants had high ESS scores indicating excessive daytime sleepiness. Also, 57% had irregular sleep hours, and 68% reported sleeping < 7 hours on average yesterday. There was also a significant correlation between the ESS score and the frequency of irregular sleep hours [22]. Many studies show that excessive sleepiness and generally poorer sleep quality are significantly associated with gender. Women experience worse sleep, more problems with daytime sleepiness, and difficulties in falling asleep, and the associations with mental health indicators are stronger in women than men [23]. In our studies, gender is not a significant predictor of sleepiness, and no statistically significant difference between men and women in the insomnia index was found.

Insomnia generally develops with age and is higher in women [24]. It is a serious disorder, affecting medical, psychiatric, personal, and social dimensions, worsening quality of life and interpersonal relationships [25]. Sleep deprivation negatively impacts individuals, causing greater sleepiness and reduced alertness during the day. Studies indicate it significantly affects human behavior and decisions. Sleep-deprived men are more likely to make riskier decisions, while women tend to be more cautious [26]. The scale of sleep problems is serious; da Silva Cardoso et al. [27], report that 76% of students experience insomnia, and 34% suffer from excessive daytime sleepiness.

Clinical insomnia was diagnosed in 37.4% of women and 32.5% of men, with half of the men experiencing severe conditions. The insomnia index significantly determines daytime sleepiness, consistent with other authors' findings [28,29]. Maithani et al. [30] confirmed a

strong correlation between sleep quality and daytime sleepiness, highlighting the role of psychological factors.

In other studies, 73% of Turkish students had poor sleep, with researchers attributing it to falling asleep after midnight, sleeping less than 7 hours, and smoking [31]. Poor sleep quality is increasingly recognized as a serious social problem, evidenced by the growing use of substances affecting sleep and alertness [32]. Ramos et al. [33] found poor sleep quality in 65% of students and excessive daytime sleepiness in 55%, showing a significant relationship between the sleep parameters and student stress levels. Numerous environmental factors determine sleep quality. Some researchers emphasize poor time management skills correlated with poorer sleep [34], while others highlight nutrition [35]. Increasing attention is being paid to the excessive use of blue light-emitting screen devices before going to bed [27]. Studies indicate that using electronic devices before sleep promotes insomnia and delays the chronotype [36].

There is a significant correlation between digital media addiction and daytime sleepiness. It seems that modern health education in the field of sleep hygiene should consider the popularization of digital hygiene principles [37]. Physical activity significantly and positively affects daytime sleepiness levels [38]. However, our studies did not find a significant relationship. Similarly, no significant relationship was found regarding another popular lifestyle element, drinking coffee. Caffeine, a psychoactive substance in coffee, affects sleep and wakefulness by stimulating alertness and efficiency, counteracting sleepiness but potentially disrupting sleep [39]. İlhan Alp et al. [40] prove that drinking two or more cups of coffee daily worsens sleep quality and increases insomnia in students. Caffeine temporarily improves well-being but is addictive and can ultimately lead to increased perceived sleepiness during the day. Pecotić et al. [41] showed that students consuming a lot of caffeine struggle more to stay awake during lectures or study sessions. Other studies indicate that poor sleep quality is linked to

coffee and energy drink consumption, perceived stress, and excessive daytime sleepiness [42]. The lack of significant relationships in our studies might be due to unknown levels of physical activity engagement and the timing of caffeine consumption. The multifaceted complexity of factors determining daytime sleepiness makes it challenging to fully control them.

The selection of only some lifestyle elements and their simplified declarative measurement was a limitation of our study . When generalizing the results, it is necessary to consider not only the cultural specificity of a given geographical region but also the field of study, which can shape attitudes toward health and a healthy lifestyle to varying extents. Employing objective measures of sleep, such as actigraphy, in future studies will provide a more comprehensive understanding of sleep patterns. Moreover, it is essential for future research to examine the correlation between mobile phone and computer screen use before bedtime and melatonin secretion, given that most digital screens emit blue light which can disrupt the sleep-wake cycle. A statistical analysis categorizing students by workload stress is also advisable, as paramedics may experience different stress levels, as compared to laboratory technicians.

Conclusions

The high prevalence of clinical insomnia (37.4% in women and 32.5% in men) and excessive daytime sleepiness (31.6%) underscores the significance of insomnia as a predictor of sleepiness, highlighting the need for health education in sleep hygiene among Turkish health sciences students. Our study identified age and insomnia severity as significant predictors of daytime sleepiness, while factors such as gender, average sleep duration, daily coffee consumption, and regular physical activity showed no significant associations.

The findings suggest that interventions aimed at improving sleep hygiene should prioritize the early identification and management of insomnia. Future research should also explore the impact of culturally relevant factors, such as family obligations and social norms, on sleep patterns and daytime sleepiness. Additionally, further investigation into the effects of physical activity timing and intensity, as well as caffeine consumption, on sleep outcomes is warranted.

Disclosures and acknowledgments

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Written consent for data collection was obtained from the Research Ethics Committee of Dokuz Eylül University (No. 2020/15-50). The study adhered to ethical requirements of anonymity and voluntary participation**.** Following the Helsinki Declaration, written informed consent was obtained from each university student before inclusion.

Artificial intelligence (AI) was not used in the creation of the manuscript. It was only used in the editing of sources and academic English translation.

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