Daytime sleepiness, sleep time and social jetlag in undergraduate students

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Abstract

Introduction: Daytime sleepiness has been associated with several factors such as sleep quality, sleep hours and regularity. However, daytime sleepiness studies seldomly consider activity as a relevant variable (comparing working days vs. weekends). **Aim:** To study the relationship between sleeping hours, social jetlag and daytime sleepiness in undergraduate students. **Methods:** Participants responded to an online questionnaire, in order to gather sleep hours and daytime sleepiness (using the Epworth Scale). **Results:** Significant differences were observed in sleep hours during working days and weekends ($t_{(225)}$ = 13.660; $p < .001$; $d = 1.05$) as well as negative correlations between daytime sleepiness and sleep hours. **Discussion:** Further studies are needed with a more thorough variable control, considering study areas as well as chronotypes.

Keywords: sleep hours; daytime sleepiness; social jetlag;sleep quality.

Somnolencia Excesiva Diurna, tiempo de sueño y jetlag social en estudiantes universitario

Resumen

Introducción: La somnolencia diurna, como tendencia fisiológica a iniciar el sueño durante el día, se ha relacionado con diversas variables como calidad de sueño, tiempo de sueño y la regularidad en los horarios de sueño. Sin embargo, en los estudios sobre somnolencia diurna llevados a cabo en población universitaria no es frecuente que se considere como variable de estudio el tipo de días (hábiles o de descanso). **Objetivo:** Estudiar la relación entre las horas de sueño y *jetlag* social con los niveles de Somnolencia Diurna en estudiantes universitarios. **Método:** Los participantes respondieron un formulario online para recabar tiempos de sueño y nivel de somnolencia (Escala Epworth) y a partir de esos datos se calculó el nivel de *jetlag* social. **Resultados:** El promedio de horas de sueño en días lectivos fue mayor que en los fines de semana ($t_{(225)}$ = 13.66; $p < .001$; $d = 1.05$), y se encontró una correlación negativa entre niveles de somnolencia diurna y las horas de sueño. **Discusión:** Los estudiantes universitarios mexicanos refieren horas de sueño dentro del margen recomendado, sin embargo, han desarrollado diferentes tiempos de sueño por tipo de día y ello puede prolongarse a través del tiempo si las exigencias sociales no se revisan y reestructuran en pro de la salud integral. Se establece relación negativa entre el tiempo de sueño y nivel de somnolencia a pesar de encontrarse en niveles no patológicos; análisis y diseños diferentes tomando en cuenta integralmente más variables de sueño y controlando aquellas referentes al estado de ánimo, son líneas de estudio para seguir explorando.

Palabras clave: horas de sueño; somnolencia excesiva diurna; jetlag social; calidad de sueño.

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Introductión

Although studies related to daytime sleepiness have been carried out in Mexico, little research is reported in university students. In one such study (López-Meza et al., 2006), it is reported that 31.5% of the sample had Excessive Daytime Sleepiness (EDS), where the mean age was 37 and the older people showed higher levels of EDS.

In addition, social jet lag as a study variable is of recent interest for our society. Sleep is a type of behavior that encompasses one third of human life, so it is not surprising that it has made headlines in various research studies that initially sought to answer what its function and importance is. We now know that sleep is related to the body's energetic recovery, memory consolidation, and metabolic regularity occurring in the absence of sunlight (Lockley & Foster, 2012). In view of such findings, the importance of sleep time for the development of human life has been highlighted. For example, we now know that sleep occurs in response to certain environmental signals and in congruence with body reactions, one of which is sleepiness (Lockley & Foster, 2012; Pin, 2008).

Sleepiness is a physiological function, defined as the increased propensity to fall asleep (Bittencourt et al., 2005), dependent on environmental markers and internal biological clock-dependent reactions. The circadian cycle is one of the most obvious environmental markers: many physiological processes involved in energetic, cognitive, and metabolic resources depend on sunlight. During wake hours, there are three very specific times when high levels of expected sleepiness are experienced, which are mainly synchronized with changes in sunlight intensity, low energy resources, and hormonal processes (Chang et al., 2012; Lockley et al., 2008). However, when a person has difficulty staying awake or alert during the day, outside of these expected times, they may be experiencing EDS.

EDS is the propensity to sleep during the day at times more associated with wakefulness and is experienced as the inability to remain alert or awake during episodes of the day that require activity. The presence of EDS at inappropriate times of the day according to environmental and biological demands indicates the probable disruption of the sleep-wake cycle and is mainly caused by chronic lack of sleep, irregular schedules during the week, extended work time, insomnia, poor quality of sleep, fragmented sleep, among others (Pacheco & Rehman, 2022).

The EDS variable has been studied in different populations, mainly adults involved in activities that require change in work schedules, nighttime drivers (Kronholm et al., 2008; Pandi-Perumal et al., 2006), and, recently, high school and university students.

In a study on sleepiness conducted with university students, de la Portilla-Maya et al. (2019) reported that 29% of the sample showed mild levels of daytime sleepiness; 41%, mild to moderate; and 10%, EDS. In addition, they observed that women more frequently presented with EDS compared to men, while men were more frequently located in the normal or mild levels. A systematic review by Jahrami et al. (2019) found that medical students from six different countries, with a mean age of 21, slept an average of 6.3 hours (this without distinguishing between working and rest days). The analyzed studies reported a pooled prevalence of 34.6% for EDS. On the other hand, Mendes et al. (2019) found the presence of EDS in 48% of the participants in their study, as well as a relationship (with a small effect) between EDS and reported sleep quality.

It is also reported that certain individual factors, such as age, gender, sleep time, and sleep quality index do not predict the risk of EDS. Some of the most frequent consequences of EDS are depression, increased risk of obesity, and motor vehicle accidents (Owens, 2014).

The required sleep time changes with age. For example, while a newborn requires up to 15 hours of sleep throughout the day, a preschooler requires up to 11 hours (including naps). As individuals grow older, the required hours of sleep decrease. A late adolescent entering early adulthood should cover a quota of 7 to 9 hours of constant sleep (Suni & Singh, 2022). Social demands for activity (school

attendance, religious services, work schedules, etc.) influence the hours spent sleeping. Several studies have shown the existence of two different sleep patterns in early and middle adulthood: class days and rest days (Gradisar et al., 2011; Owens, 2014). Such differences can have a negative impact on daily functioning, affecting work, social, and academic activities.

The differences in sleep time between class days and rest days have been analyzed in several studies. Wittmann et al. (2006) proposed the concept of social jet lag, defined as the mismatch between the biological clock and the social schedule, alluding directly to the mismatch between the hours of sleep on class days and the hours slept during the weekend. In this research, a calculation was proposed to measure the social jet lag from:

Castilhos et al. (2017) conducted a systematic review that included the relationship between behavioral or health aspects (e.g., sleep deficit, risk of obesity, risk of metabolic alterations—especially in male workers with rotating shifts, the presence of depression) and social jet lag. On the other hand, Scheffler and Kyba (2016), measured social jet lag using data on the usage of a social network as an indicator of sleep and wake times. They observed activity time and identified a difference in usage of the application between class days and rest days over the course of a year. They detected a one-hour social jet lag and increased social jet lag at different times of the year.

Regarding social jet lag and the presence of EDS, it has been reported that short duration of sleep time as well as social jet lag influence the level of daytime sleepiness in child and adolescent populations (Komada et al., 2016).

Therefore, the main objective of this research was to study the relationship between hours of sleep, social jet lag, and daytime sleepiness in university students. The specific objectives were to make a descriptive analysis of daytime sleepiness in the sample and to study the differences between the sleep time reported during class days and rest days. Finally, the possible associations between gender and levels of sleepiness, weekday and weekend sleep were studied.

Method

Design

Non-experimental, cross-sectional, descriptive, and correlational (García Cabrero & Vega Pérez, 2009).

Participants

The sample consisted of 226 university students from the city of Morelia, Michoacan (Mexico), of whom 170 were women (75.2%) and 56, men (24.8%). The ages ranged between 18 and 28 years (M = 20.85; SD = 1.90).

Instruments

Sociodemographic Data Questionnaire. This questionnaire was constructed specifically for this research study to collect data such as gender, age, the time the participant went to sleep and got up (both on class days and rest days), among others.

Epworth Sleepiness Scale. This is a self administered instrument with a Likert-type response format. The adaptation to the Mexican population (Sandoval-Rincón et al., 2013) has an internal consistency of α = 0.89. It poses 8 questions or scenarios in which the probability of falling asleep is estimated on a scale from 0 to 3, adding up to a total of 24 points. Scores equal to or lower than 10 are considered normal; scores 11-14, medium sleepiness; scores 15-17, moderate sleepiness; and scores greater than 18 imply severe sleepiness.

Estimation of Social Jet Lag. It was calculated based on the proposal of Wittmann et al. (2006) from the difference in hours of the middle sleep point between class days and rest days. Two groups were formed: a group with probable social jet lag (difference of two hours or more) and a group without social jet lag (difference of less than two hours).

Procedure

The invitation to participate was disseminated through posters placed in different schools of several universities in the city of Morelia, Michoacán (Mexico). A digital poster inviting participation in the study was also disseminated through Facebook. The poster included the URL

address hosting the form, and a QR code was also used for interested parties to access it. The form was created on Google Forms and included an informed consent form, the Epworth Scale, and the sociodemographic questionnaire. The form was active for approximately three months. Subsequently, the database was generated.

In the informed consent form, the nature of the research was explained, as well as the confidentiality in the handling of the data, which would be analyzed as a group. All the above was based on the guidelines provided by the Psychologist's Code of Ethics (Sociedad Mexicana de Psicología, 2010). In addition, an individualized report was sent to each participant by e-mail informing them of their level of daytime sleepiness and the general recommendations for the care of their sleep hygiene.

Data Analysis

The analyses were carried out with SPSS version 21 software. Descriptive data was obtained for the sample (mean and standard deviation). The normality of the distributions was evaluated using the Shapiro-Wilk test. Comparisons between measurements were made with Student's t-test (and Welch's t-test when the assumption of homogeneity of variances was not met). Correlations were evaluated with a Pearson's r test. For all analyses, an alpha of .05 was used as a criterion for assessing statistical significance.

Results

It was observed that the mean number of minutes of sleep during the weekend (M = 527.7; SD = 90.59) was higher than that reported on class days (M = 427.18; SD = 100.76), and the difference was statistically significant ($t_{(225)} = 13.66$; $p < .001$; $d = 0.91$). The participants reported sleeping on rest days longer than on class days (M = 100.53, SD = 110.64) (see Figure 1). The mean social jet lag in minutes was 90.25 (SD = 62.87) (see Figure 2).

Regarding levels of sleepiness, the mean score of the scale (M = 9.58; SD = 4.37) was within the normal range, but scores ranging from 0 to 24 were also obtained. A total of 135 (59.7%) showed no sleepiness, but 58 (25.7%) obtained values suggesting the presence of medium sleepiness; 23, (10.2%) of moderate sleepiness; and 10 (4.4%) of severe sleepiness (see Figure 3).

No significant differences ($t_{(157.36)} = 1.077$; $p = .28$) were observed when comparing the level of sleepiness between those who showed probable social jet lag (M =10.01; SD = 4.16; n = 57) and those who did not (M = 9.36; SD = 4.47; n = 151) (see Figure 4).

As for the correlations between weekday and weekend sleep and social jet lag with sleepiness, the level of sleepiness correlated negatively with weekday sleep time ($r = -.181$; $p = .006$) and with weekend sleep time ($r = -.201$; $p = .002$). However, no correlation was observed between social jet lag and sleepiness ($r = .038$; $p = .566$) (see Figure 5).

Regarding possible differences by gender, no significant differences were observed in any of the variables (see Table 1).

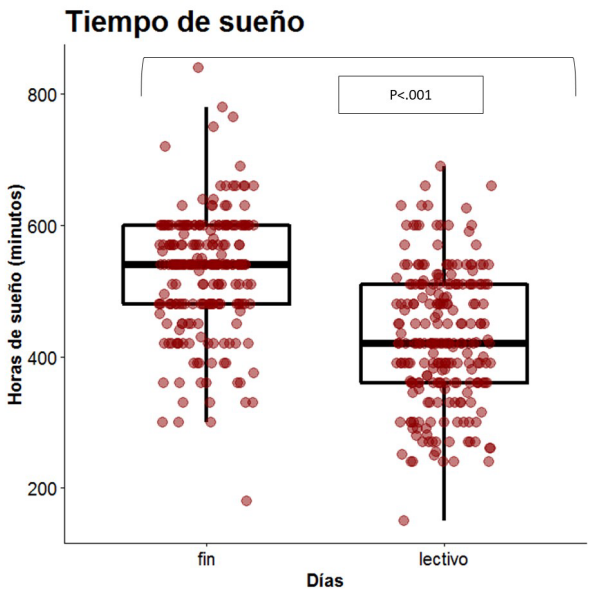
Discusión

The main objective of this study was to explore the relationship between sleep time and social jet lag and the level of daytime sleepiness. To this end, it was first described that there is a marked difference between sleep time by type of day, i.e., between class days vs. rest days. These findings were consistent with those by other researchers for this population (Buboltz et al., 2001; Gradisar et al., 2011; Owens, 2014; Wheaton et al., 2016). The issue of differences in sleep time during the same week is of great interest and importance, since its occurrence and persistence lie outside the general recommendations suggested by sleep medicine. This is because several abnormal consequences for health have been listed, such as changes in mood, decrease in the availability of energetic resources, cognitive alterations, metabolic alterations, and alteration of the sleep-wake cycle, to name a few.

Such differences in sleep time seem to be a consequence of social demands in the general population, but particularly in the university population. Wittmann et al. (2006) referred to this precisely as a lag caused by social demands; this social jet lag represents a topic that has currently been discussed in several research studies.

Figure 1

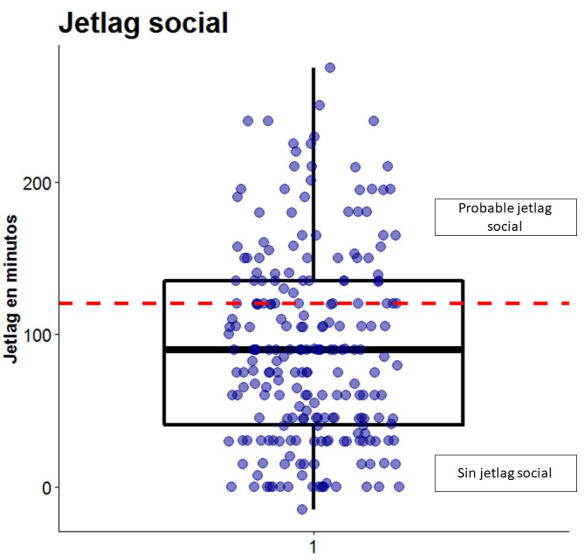
Sleep Time (Minutes)



Note. Difference between weekend and weekdays.

Figure 2

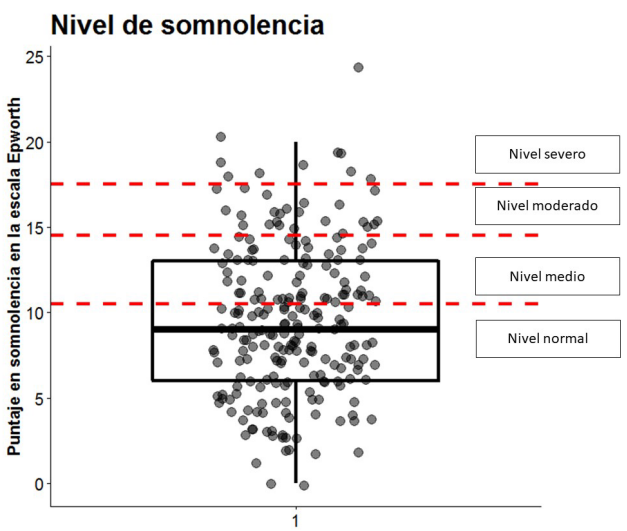
Social Jet Lag Distribution.



Note. Values without social jet lag, with M = 90.25 min.

Figure 3

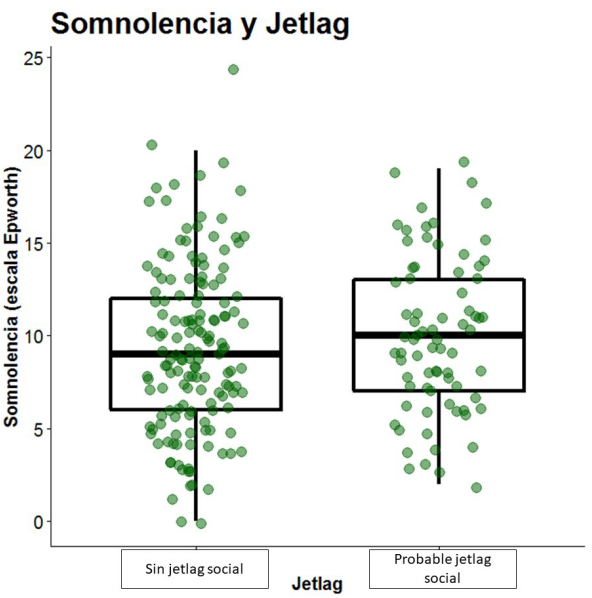
Distribution of Sleepiness Levels



Note. (N = 226).

Figure 4

Comparison between Levels of Daytime Sleepiness in Groups with no and Probable Social Jet Lag.



Note. No significant difference showed

Figure 5

Relationship between Daytime Sleepiness with Sleep Time on Class days, Rest days and Social Jet Lag

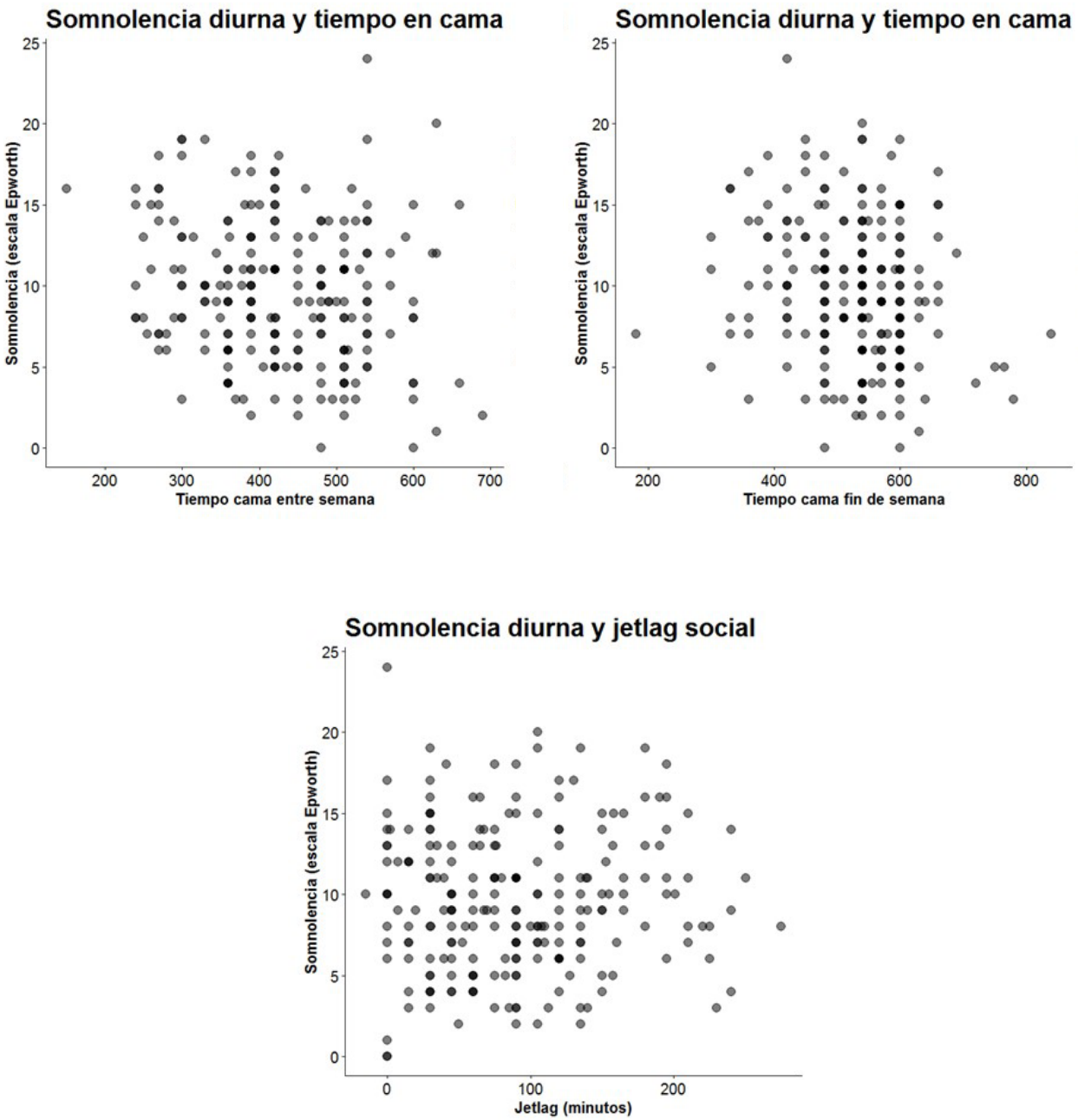


Table 1
Comparison of Means by Gender in the Variables of Study

	Female	Male	*t*	*Df*	*p*
	M (*SD*)	*M* (*SD*)			
SWD	424.95 (103.66)	428.34 (91.48)	0.218	221	0.828
SWE	529.08 (86.92)	521.36 (102.59)	-0.506	83.074	0.614
Jetlag	92.00 (63.97)	84.51 (59.37)	-0.772	221	0.441
Sleepiness	9.60 (4.25)	9.59 (4.83)	0.023	221	0.928

Understanding the causes of this time arrangement for different days has been addressed from the perspective of social demands (Owens, 2014; Wheaton et al., 2016; Wittmann et al., 2006), and it has been found that school start times influence, from adolescence onwards, the way one sleeps and the time devoted to it (Yip et al., 2022). This determines sleep duration and so called sleep patterns in adulthood.

The socially imposed schedules for the start of school mean that many students wake up at times when they should be sleeping in order to get ready for college or university; such start times are generally in the morning, between seven or eight. In addition, the organization of schedules for students rarely assigns time and spaces for rest and food, which leads us to ask ourselves why, if in an eight hour job we must have time for food, the same is not considered at the curricular level for all academic instances. The issue of social jet lag, which has been imposed by needs unrelated to human biology, is an area of recent research. It will be important to discuss it and, above all, to take relevant actions for the care of overall health so that productivity can be assessed from a different perspective.

Regarding the relationship between the level of daytime sleepiness and sleep time, it was negative. For this particular sample, the time dedicated to sleep—although there was a lag between the types of days—remains within the margin of the minimum and maximum time recommended by sleep medicine. It would be interesting for us to replicate this study including university program as a variable in order to gain knowledge on this topic, specifically to make observations in groups that report sleep times below the minimum recommended or in groups that report more time than what is biologically healthy.

One of the university populations that is most referred to in the literature is medical and nursing residents and students (Alqudah et al., 2022; Jahrami et al., 2019; de la Portilla-Maya et al., 2019). It is necessary to continue exploring the sleep behavior of students in health sciences, above all, to rethink the recommendations that will drive the redesign of the education and health care topics.

When analyzing the comparison of daytime sleepiness with the groups with probable and no social jet lag, no significant differences were observed. One probable reason is that, although the sample shows a time lag between their sleep time by type of day, it does not exceed the minimum and maximum time for healthy sleep. This type of comparison has not been reported by other studies for this population, although it has been reported for adolescents, where findings have indicated that short sleep duration and increased social jet lag have an impact on high levels of DS (Komada et al., 2016). Kayaba et al. (2018) highlight that social jet lag equal to or greater than two hours, as well as sleep duration less than six hours, would lead to undesirable health effects.

As for the exploration of the level of daytime sleepiness in university students, values that

correspond to normal levels were shown. These results may be due to the fact that the time dedicated to sleep is not outside the margins recommended according to age. Even the different times found in this study for the different types of days are within the range recommended by experts in sleep hygiene, which could lead us to conclude that Mexican students, for the most part, sleep for the most part within the range recommended by experts in Sleep Hygiene, which could lead us to conclude that Mexican students, for the most part, are careful with their sleep.

This is a positive aspect in view of the landscape that some studies have presented, such as that of Mendes et al. (2019), who reported high values in sleep time on rest days, in addition to the perception of poor sleep quality by the student community despite the fact that they have a sleep efficiency of 85%. On the other hand, Orzech et al. (2011) reported through a repeated measure design an average of six hours of sleep in addition to the perception of poor sleep quality. Although in the present study the variable sleep quality and sleep efficiency was not analyzed, it will be important to consider it for future studies. A study design where the aforementioned variables are contemplated in addition to that of social jet lag would allow to delve more deeply into a behavior that is so relevant for human development.

In this research, different levels of daytime sleepiness were identified, where severe cases—EDS, for example—were minimal. Note that Nunes et al. (2021) recently reported a 55% incidence of EDS associated with the presence of depressive symptomatology. Another study reported levels of EDS in 34.6% of the sample, with a confidence interval ranging between 18.3% and 50.9%, specifically in medical students. This leads to wonder if the program studied at university age determines the hours of sleep, level of daytime sleepiness, and social jet lag, and, if so, if the fact that students in health sciences do not have self care practices throughout their education is determined by social demands.

Based on the analysis by gender, no significant differences were observed between them for sleep variables. For example, literature has reported that females can perceive worse sleep quality compared to males (Orzech et al., 2011), and although the influence that gender has on the circadian phenotype and, therefore, in sleep is being studied, it seems that it interacts with the medical condition (Spitschan et al., 2022). In view of this, it is essential to study this further for the objectives pursued in this work.

Among the limitations of this study, we highlight the control of variables such as the absence or presence of mood or psychiatric disorders, the division by study program, and analysis of sleep quality in addition to sleep chronotypes, a line that motivates us to go deeper and propose novel designs for its approach and study.

We therefore consider it necessary to continue observing the evolution of the difference in sleep times in the student population in longitudinal and repeated-measure designs, controlling for the presence of mood and anxiety disorders. It would also be convenient to identify sleep chronotypes, a variable recently accepted in the field of sleep research, in order to design a more comprehensive comparison between groups. On the other hand, it would be advisable to differentiate by age group to observe possible changes in the variables and how this affects academic performance and cognitive functioning.

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