



ORIGINAL ARTICLE

Social jetlag in adolescents: An evaluation from the chronotype and resilience perspectives

Adölesanlarda sosyal jetlag: Kronotip ve psikolojik dayanıklılık açısından bir değerlendirme

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How to cite ?

Çelik Özdemir H. Uslu E. Social jetlag in adolescents: An evaluation from the chronotype and resilience perspectives. Genel Tip Derg. 36(2026), 1-7

ABSTRACT

Aim: Adolescence is a sensitive developmental stage in which biological and social changes affect sleep patterns. During this period, delayed sleep timing may lead to social jetlag, the misalignment of biological and social clocks. Social jetlag has been associated with adverse health outcomes, but its relationship with resilience, a key protective factor for mental health, remains understudied. In this context, the aim of the study is to examine the relationship between chronotype, psychological resilience, and social jetlag in adolescents.

Materials and Methods: This descriptive and correlational study was conducted with 398 high school students (n=398) between April 2022 and June 2022. Data were collected using the Morningness Eveningness Scale for Children and the Child and Youth Resilience Measure. Social jetlag duration was calculated using the formula described in the literature.

Results: The adolescents' mean social jetlag duration was 2.07±1.17 hours, and 51.8% had social jetlag ≥2 hours. As the tendency to evening chronotype increased ($r=-0.386$, $p<0.001$) and resilience levels decreased ($r=-0.151$, $p<0.003$), social jetlag duration increased. Adolescents with social jetlag ≥2 hours were more prone to evening chronotype ($p<0.001$) and had lower resilience levels ($p<0.031$). Lower grade levels (9th, 10th, and 11th), evening chronotype tendency ($\beta=-0.079$; $p<0.001$), and low resilience ($\beta=-0.013$; $p=0.042$) were identified as factors increasing SJL.

Conclusion: Evening chronotype tendency, low resilience, and lower grade levels are risk factors for social jetlag in adolescents. These findings highlight the importance of nursing in screening for social jetlag, supporting healthy sleep behaviours, and developing resilience-enhancing interventions to promote adolescent health.

Keywords: Adolescents, chronotype, nursing, resilience, social jetlag

ÖZ

Amaç: Ergenlik dönemi, biyolojik ve sosyal değişimlerin uyku düzenlerini etkilediği hassas bir gelişim aşamasıdır. Bu dönemde uyku zamanının gecikmesi, bireyin biyolojik saati ile sosyal saat arasındaki uyumsuzluk anlamına gelen sosyal jetlag durumuna yol açabilir. Bu durum çeşitli olumsuz sağlık sonuçlarıyla ilişkili olduğu bilinmektedir. Ancak, ruh sağlığı açısından önemli bir koruyucu unsur olan psikolojik dayanıklılık ile sosyal jetlag arasındaki ilişki yeterince araştırılmamıştır. Bu kapsamda çalışmanın amacı adölesanlarda kronotip, psikolojik dayanıklılık ve sosyal jetlag arasındaki ilişkiyi incelemektir.

Gereç ve Yöntemler: Tanımlayıcı ve ilişki arayıcı nitelikteki bu çalışma, Nisan 2022 ile Haziran 2022 tarihleri arasında toplam 398 lise öğrencisi ile gerçekleştirilmiştir. Veriler, Çocuklar İçin Sabahçıl-Akşamcıl Ölçeği ile Çocuk ve Gençler İçin Psikolojik Dayanıklılık Ölçeği kullanılarak toplanmıştır. Sosyal jetlag süresi, ilgili literatürde tanımlanan formül kullanılarak hesaplanmıştır.

Bulgular: Adölesanların ortalama sosyal jetlag süresi 2,07 ± 1,17 saat olarak bulunmuştur. Katılımcıların yüzde 51,8'inde sosyal jetlag süresi 2 saat ve üzerinde ölçülmüştür. Akşam kronotipi eğilimi arttıkça ($r = -0,386$; $p < 0,001$) ve psikolojik dayanıklılık düzeyi azaldıkça ($r = -0,151$; $p < 0,003$) sosyal jetlag süresinin arttığı belirlenmiştir. Sosyal jetlag süresi 2 saat ve üzerinde olan adölesanlar, daha yüksek düzeyde akşam kronotipi eğilimi göstermiş ($p < 0,001$) ve daha düşük psikolojik dayanıklılık düzeyine sahip olmuştur ($p < 0,031$). Dokuzuncu, onuncu ve on birinci sınıflarda öğrenim gören öğrenciler, akşam yönelimli kronotipe sahip olmak ($\beta = -0,079$; $p < 0,001$) ve düşük psikolojik dayanıklılık düzeyine sahip olmak ($\beta = -0,013$; $p = 0,042$) sosyal jetlag süresini artıran faktörler olarak belirlenmiştir.

Sonuç: Akşam yönelimli kronotip eğilimi, düşük psikolojik dayanıklılık düzeyi ve daha düşük sınıf seviyelerinde öğrenim görmek, adölesanlarda sosyal jetlag yaşama riskini artıran önemli faktörlerdir. Elde edilen bulgular, hemşirelik uygulamalarında sosyal jetlag durumunun erken dönemde tanınmasının, sağlıklı uyku alışkanlıklarının desteklenmesinin ve psikolojik dayanıklılığı artırmaya yönelik müdahalelerin geliştirilmesinin adölesan sağlığının korunması ve desteklenmesi açısından büyük önem taşıdığını göstermektedir.

Anahtar kelimeler: Adölesan, hemşirelik, kronotip, psikolojik dayanıklılık, sosyal jetlag

Introduction

Adolescence is a critical stage in life to reach full human potential (1). This period is marked by increased independence as well as the emergence of new social roles influencing behaviour, including sleep (2). During this period, sleep behaviour and physiology undergo a significant maturation process, even reflected in sleep EEG, making it essential to investigate sleep in this population (2).

One of the concepts related to sleep is chronotype. Chronotype defines a person's daily activities, energy levels, and sleep preferences. Morning chronotypes tend to wake up early, are highly active in the first half of the day, and prefer early sleep. Evening chronotypes, on the other hand, prefer waking up late, and the evening is their most active time of the day (3). Intermediate-type chronotypes fall between morning and evening chronotypes in the chronotype spectrum (4). The differentiation of sleep patterns during adolescence leads to delayed sleep timing (3), possibly bringing about the risk of social jetlag (SJL).

SJL refers to the disruption of synchronisation between an individual's chronotype and social working hours. In other words, it is the misalignment of biological and social clocks (3,5) and is more common among adolescents, given the impacts of adolescence (3). The physical effects of SJL on adolescent health include obesity (6), cardiovascular and metabolic problems (7), and menstrual symptoms (8). Mental effects may include sleep problems (9,10), anxiety (11), irritable mood (9), depressive symptoms (10), risk of self-injury (12) and aggression (13). SJL can also cause a decline in academic performance (9). As previous research results indicate, studies assessing SJL in adolescents have mostly focused on diseases or symptoms. Thus, we believe evaluating the relationship between SJL and positive mental health variables in adolescents, specifically resilience, would contribute to the literature. In this study, we identified "resilience" as a positive factor influencing mental health.

Resilience is the ability to overcome various negative situations quickly. In other words, it is the capacity of an individual to recover rapidly after stressful events, adapt to these situations, and return to their previous state (14). It helps adolescents to combat stressors, strengthen their ability to cope with the adverse effects following a trauma (15), increase self-esteem (16) and well-being (17). Studies examining the relationship between resilience, which supports adolescent development, and sleep appear to be limited. However, they do note that adolescents with good sleep quality (18) and inclined to morning chronotype tend to have higher resilience (19). However, no study has been found that explores the relationship between SJL, a sleep-related characteristic, and resilience, which impacts the mental health of adolescents in various ways.

From a nursing perspective, adolescence is also a sensitive period where preventive, promotive, and supportive health interventions can be carried out effectively (20). Nurses are in a unique position to monitor adolescents' sleep patterns, provide health

education on sleep hygiene, and support resilience-enhancing strategies (21-23). Evaluating SJL not only contributes to academic knowledge but also guides nursing practices aiming to strengthen mental health, reduce risk behaviours, and improve overall well-being in this age group (21,24). However, we could not identify any study examining SJL in adolescents specifically from the perspective of psychological resilience. This highlights the originality and necessity of the present study, particularly in contributing to nursing science and practice.

Given the information that SJL is most commonly observed in adolescents, and because it creates a groundwork for physical and mental health problems, is associated with chronotype tendencies, and the relationship with resilience has not been previously examined, evaluating SJL in adolescents in this context and providing necessary support becomes crucial. Thus, the research is designed to examine the relationship between chronotype and resilience variables with SJL in adolescents. The research questions are as follows:

- What is the duration and level of SJL in adolescents?
- Are there differences in the duration and level of SJL in adolescents based on demographic characteristics and sleep features?
- Is there a relationship between the duration of SJL, chronotype, and the level of resilience in adolescents?
- Are there differences in the level of SJL, chronotype, and the level of resilience in adolescents?
- What variables influence the duration of SJL in adolescents?

Materials and Methods

Design

The research has a descriptive and correlational design. The dependent variables were the duration and SJL level. The independent variables included the adolescents' demographics, sleep-related features, chronotype level, and level of resilience.

Participants

There are 29 public high schools in Eskişehir. "Cluster sampling method" was used to determine the high schools to be included in the study, and two were included by using the lottery method. As a result, the study population covered 1198 students (N = 1198). The parameters used for this calculation included a 95% confidence level, 5% margin of error, and a response distribution of 50%, which yielded a minimum required sample size of 292 students. The study was concluded with 398 students (n = 398), selected from each class by "simple random sampling method".

Inclusion criteria were (i) adolescents enrolled in the said school and (ii) volunteering to participate in the study. The exclusion criteria were (i) being diagnosed with a psychiatric disorder and (ii) missing sleep-related data. During the study process, students who did not meet the inclusion criteria or did not agree to participate in the research were excluded from the sample.

Data collection

Research data were collected between April 2022 and June 2022. The researcher visited high schools two days a week, and the data were gathered through face-to-face interviews. The average completion time for students to complete the scales was 15 minutes. The researcher who collected the data, XXX, is a nurse pursuing a master's degree in psychiatric nursing, actively working as a clinician in the same field, and guiding nurses undergoing education in psychiatric nursing.

Data collection tools

The Personal Information Form was developed by the researcher using the literature (5,23) as a guide. The form has two parts covering the students' demographics and sleep characteristics.

The Morningness-Eveningness Scale for Children (MESC) evaluates the chronotype of adolescents and consists of 10 questions, each with four or five answer options. The scores from the scale can range from 10 to 43 points. The student exhibits evening chronotype characteristics as the score decreases, while an increase indicates morning chronotype characteristics. The scores from the Turkish version (25) of the scale (26) for the evening type, intermediate type and morning type are ≤ 21 , 22–34, and ≥ 35 , respectively.

Child and Youth Resilience Measure (CYRM-12) is a 12-item 5-point Likert-type scale that evaluates the resilience of children and adolescents. The possible scores from the scale range from 12 to 60 points, with higher scores indicating a higher level of resilience. The Turkish version (27) of the scale (28) was used for this study.

SJL is a numerical value obtained by subtracting the midpoint of sleep (MSS) on scheduled days (school days) from the midpoint of sleep (MSF) on free days (days without school). This value is calculated in three successive steps (Table 1) (5).

Table 1: SJL Calculation

Steps	Formula
Step 1: Calculate the weekly mean sleep time.	$[(TST_s \times 5) + (TST_f \times 2)] / 7$
Step 2: Calculate separately the midpoint of sleep on school days and the midpoint of sleep on free days.	$MSS = \text{Evening bedtime on school days} + (TST_s \times 0,5); MSF = \text{Evening bedtime on free days} + (TST_f \times 0,5)$
Step 3: Subtract MSF from MSS and find the SJL value from the absolute value obtained.	$SJL = MSS - MSF $

MSS; Midpoint of sleep on school days, **MSF;** Midpoint of sleep on free days, **TST;** Total sleep time, **TSTs;** Total sleep time during the school day, **TSTf;** Total sleep time on free days, **SJL;** Social Jetlag

Rigour, validity and reliability

The EQUATOR directive and STROBE reporting method were used throughout the research (29). The Cronbach alpha value of MESC was 0.719, and CYRM-12 was 0.835 in this study. The researcher who collected the study data did not have prior

knowledge of the employees and students of the institution from which the data were collected. As the data were self-reported, the possibility of reporting bias and social desirability bias was considered, and the researcher provided a standardised explanation to minimise misunderstandings.

Data analysis

A statistical software package was used to analyse the data. Minimum, maximum, mean, standard deviation, median, first quartile, third quartile, frequency and percentage were used in reporting study data. The normal distribution of quantitative data was assessed using the Shapiro-Wilk test and graphical examinations. Independent samples t-test was used to assess variables showing normal distribution between two groups, one-way analysis of variance (ANOVA) and Bonferroni test for evaluations among more than two groups with normal distribution. Mann-Whitney U test was used to assess variables not showing normal distribution between two groups. Pearson correlation analysis was employed to determine the level of relationship between quantitative variables. Pearson chi-square test and Fisher-Freeman-Halton exact test were used to compare quantitative data. Cronbach's alpha coefficient was used to determine the internal consistency levels of the scale items. Linear regression analysis was performed to determine the factors affecting the SJL value. Statistical significance was accepted at $p < 0.05$.

Ethical statement

The study protocol was approved by Eskişehir Osmangazi University Non-Interventional Clinical Research Ethics Committee (E-25403353-05099). Institutional permission were obtained by Eskişehir District National Education Directorate (E-88074293-605-47788432). Written consents were obtained from students and parents who agreed to participate in the research.

Results

The mean age of the adolescents was 16.52 ± 1.17 . Eighty-five point two percent of them spent time in bed with television/computer/phone before sleeping. More than half (68.1%) were intermediate chronotypes. The mean duration of SJL was 2.07 ± 1.17 hours, and 51.8% experienced SJL for two hours or more (Table 2, Table 3).

Adolescents in the 12th grade had a shorter SJL duration ($p < 0.001$) and lower SJL level ($p < 0.001$) than other grades. Those who spent time in bed with television/computer/phone before going to sleep had a longer SJL duration ($p = 0.013$) and higher SJL level ($p < 0.001$) than those who did not (Table 2).

As MESC scores decreased, SJL duration increased ($r = -0.386$, $p < 0.001$). MESC score was lower in those with SJL level of two hours or more than other SJL groups ($p < 0.001$). As the adolescents' CYRM-12 score decreased, the SJL duration increased ($r = -0.151$, $p < 0.003$). CYRM-12 score was lower in those with SJL level of two hours or more than other SJL groups ($p < 0.031$) (Table 2).

Table 2: Adolescents' demographic/sleep characteristics, scale scores, and the comparison of these variables with SJL duration/level (n=398)

Demographic characteristics/Sleep characteristics/ Scale scores			SJL duration			SJL level			
						SJL<1h	1h≤SJL<2h	SJL≥2h	
Demographic characteristics	n	%	Mean±SD	Test value	p	n (%)	n (%)	n (%)	Test value p
Gender				^a 0.294	0.769				^b 4.702 0.095
Female	143	35.9	2.09±1.17			24 (16.8)	37 (25.9)	82 (57.3)	
Male	255	64.1	2.05±1.17			38 (14.9)	93 (36.5)	124 (48.6)	
Grade level				^a 8.500	<0.001*				^b 45.150 <0.001*
9	89	22.4	2.29±1.02			4 (4.5)	36 (40.4)	49 (55.1)	
10	106	26.6	2.31±1.15			10 (9.4)	32 (30.2)	64 (60.4)	
11	111	27.9	2.06±1.04			15 (13.5)	33 (29.7)	63 (56.8)	
12	92	23.1	1.57±1.34			33 (35.9)	29 (31.5)	30 (32.6)	
Sleep characteristics	n	%	Mean±SD / Median (Q1,Q3)	Test value	p	n (%)	n (%)	n (%)	Test value p
Having difficulty falling asleep	144	36.2	2.03±1.19	^d -0.469	0.639	23 (16)	46 (31.9)	75 (52.1)	^b 0.063 0.969
Feeling the need to nap during the day	215	54.0	2.13±1.24	^d 1.183	0.237	34 (15.8)	63 (29.3)	118 (54.9)	^b 2.516 0.284
Using sleep aids to fall asleep	12	3.0	1.88 (1.07, 3.5)	^f -0.138	0.891	5 (41.7)	6 (50)	5 (41.7)	^c 0.590 0.785
Spending time in bed with electronic devices	339	85.2	2.13±1.13	^d 2.497	0.013*	49 (14.5)	100 (29.5)	190 (56)	^b 16.991 <0.001*
Scale scores	Min-Max	Mean±SD	r	p		n (%)	n (%)	n (%)	Test value p
MESC	11-41	24.79±5.30	-0.386	<0.001*		27.40±5.21	26.02±4.58	23.22±5.26	^a 22.204 <0.001*
CYRM-12	12-60	43.26±8.67	-0.151	0.003*		44.77±7.39	44.26±8.47	42.17±9.04	^a 3.496 0.031*

^aOne-way analysis of variance, results presented as mean ± standard deviation. ^bPearson chi-square test, ^cFisher-Freeman-Halton exact test, ^dIndependent samples t-test, results presented as mean ± standard deviation. ^eMann-Whitney U test, results presented as median (first quartile, third quartile). *p < 0.05, r = Pearson correlation coefficient. **SJL:** Social Jetlag, **MESC:** Morningness-Eveningness Scale for Children, **CYRM-12:** Child and Youth Resilience Measure.

Table 3: Adolescents' chronotype and SJL characteristics (n=398)

Chronotype characteristics	n	%
Evening type (≤21)	111	27.9
Intermediate-type (22-34)	271	68.1
Morning type (≥35)	16	4.0
SJL characteristics	n	%
SJL level		
SJL < 1h	62	15.6
1h ≤ SJL < 2h	130	32.7
2 h ≤ SJL	206	51.8
	Min-Max (Median)	Mean±SD
SJL duration (h)	0-6.30 (2)	2.07±1.17
Sleep time		
School days	21:00-04:40 (23:49)	23:49 ± 01:15
Free days	21:03-08:00 (01:00)	01:00 ± 01:14
Wake-up time		
School days	4:11-09:40 (07:00)	07:06 ± 00:36
Free days	05:00-15:30 (10:00)	09:46 ± 01:44
Time to fall asleep (min)	1-90 (15)	19.34±17.02
School days sleep time (h)	0.92-11.18 (7.33)	7.19±1.32
Free days sleep time (h)	2.00-12.50 (9.00)	8.90±1.64
Average sleep time (h)	1.45-10.63 (7.81)	7.68±1.23

SJL: Social Jetlag

Variables found to be related were included in the linear regression analysis to determine the factors af-

fecting the SJL value [$F=18.364$, $p<0.001$, $R^2=0.220$, $R^2_{adj}=0.208$]. A one-point decrease in MESC and CYRM-12 causes an increase in SJL duration by 0.079 hours (Std.Beta=-0.357, $p<0.001$) and 0.013 hours (Std. Beta=-0.093, $p=0.042$), respectively. When 12th graders are taken as the reference, adolescents in 9th, 10th, and 11th grades had SJL durations that were 0.684 hours, 0.746 hours, and 0.499 hours longer, respectively (Std.Beta=0.244, 0.282, 0.19, $p<0.05$) (Table 4).

Table 4. Variables affecting SJL duration (n=398)

Variables	Beta (95% CI)	Std. Beta	t	p
Constant	3.886 (3.142, 4.629)		10.272	<0.001*
MESC	-0.079 (-0.099,-0.059)	-0.357	-7.741	<0.001*
CYRM-12	-0.013 (-0.025,-0.001)	-0.093	-2.038	0.042*
Grade level (9)	0.684 (0.378, 0.989)	0.244	4.403	<0.001*
Grade level (10)	0.746 (0.453, 1.038)	0.282	5.011	<0.001*
Grade level (11)	0.499 (0.210, 0.788)	0.191	3.398	0.001*
Spending time in bed with electronic devices	0.216 (-0.077, 0.509)	0.066	1.452	0.147

* $p<0.05$, **Std.Beta** = Standardized beta coefficient, **CI** = Confidence Interval **SJL**: Social Jetlag, **MESC**: Morningness-Eveningness Scale for Children, **CYRM-12**: Child and Youth Resilience Measure.

Discussion

Investigating the relationship between SJL and chronotype and resilience, this study demonstrated that evening chronotype tendency, low resilience level and lower grade levels are risk factors for SJL.

SJL is seen more frequently and for longer durations in adolescents. Despite variations across studies, many publications report that more than half of adolescents experience SJL of two hours or more (11,23), which may extend up to four hours in some studies (11,23,30). This study found results consistent with the existing literature, indicating that over half of adolescents (51.8%) experience SJL lasting two hours or more, with an average SJL duration of two hours and nine minutes. Given the impact of SJL on adolescents' physical (6,7,31) and mental (9-13,20) health, this result points to the necessity of managing SJL for the preservation of adolescent health. From a nursing perspective, this also underlines the role of nurses in monitoring adolescents' sleep patterns, screening for SJL risk, and implementing school-based sleep hygiene education (23,32). For instance, in a study conducted on adolescents during the Covid-19 pandemic, the SJL duration, which was two hours and 37 minutes before the pandemic, decreased to one hour and 53 minutes during the pandemic due to an increase in weekday sleep time and delayed wake-up times (33). These findings highlight the importance of synchronising students' wake-up and school start times in the management of SJL.

Some studies suggest that SJL duration increases as adolescents progress to higher grade levels (9), whereas, in a study conducted in Türkiye (23), the SJL duration of 9th-grade adolescents decreased, and lower grade levels was a risk factor for SJL, consistent

with the results of the present study. The results of both studies showed that the SJL duration of 12th-grade adolescents was shorter, and the SJL level was lower compared to other grades, suggesting that the research results within Türkiye are consistent but different from the international literature. This may indicate that the countries' education and training systems impact the SJL duration and level of adolescents. In the Turkish education system, adolescents at the 12th-grade level prepare for an exam to determine their vocational education process. The preparation period for the exam may contribute to adopting a healthy and disciplined lifestyle, including sleep habits. Their sleeping habits may change positively, and they may be more mindful of their sleep and wake-up times, reducing the risk of SJL. This may have reduced the risk of SJL in adolescents.

The use of electronic devices in bed is common among adolescents, and this habit is believed to increase SJL levels so much so that some articles have identified this habit as a risk factor for SJL (23,34). This study also determined that the SJL duration and level of adolescents who spent time in bed with television/computer/phone before sleep were longer and higher than those who did not. Consistent with this finding, a large-scale study conducted in Brazil with approximately 65,000 young people also revealed that increased screen time was associated with higher levels of SJL (35). Similarly, a study involving approximately 20,000 students identified the frequency of social media use before sleep and playing video games before bedtime as the strongest predictors of SJL (36). These findings further support the growing body of evidence linking screen-related behaviors to circadian rhythm disruptions in adolescents.

Adolescents exhibiting evening chronotype characteristics are more affected by early school start times. This leads adolescents to wake up early to catch up with school hours despite going to bed late, resulting in less sleep than morning chronotypes (35, 36). Consequently, adolescents attempt to compensate for the insufficient sleep during the weekdays by sleeping more on the weekends (37). Due to this difference in sleep time between weekdays and weekends, adolescents with an evening chronotype experience more SJL (5,33). The findings of this research, supporting the existing literature, indicate that the increase in the evening chronotype tendency of adolescents increases the duration and the level of SJL and that the evening chronotype is a risk factor for SJL. Considering the fact that the evening chronotype peak may be affected by school start times (37), the results of this study may guide policymakers.

Resilience is particularly important for personal development and identity formation during adolescence (38). In adolescents, there is a relationship between sleep and resilience. Sleep problems are not only a risk factor for adolescents' physical health but also for their mental health, reducing resilience (18). However, it is noted that planning the wake-up time and school start time for

longer sleep time according to evening chronotype adolescents is protective against depression and suicidal ideation in adolescents (39). From the perspective of SJL, it has been observed that depressive symptoms increase in adolescents experiencing two hours or more of SJL (40). According to the findings of the study, as adolescents' resilience levels decrease, their levels of SJL increase, suggesting that low resilience may be a risk factor for SJL. These results highlight the importance of considering resilience in the management of sleep-related challenges. Furthermore, examining SJL in relation to psychological resilience is expected to offer a valuable contribution to the existing literature.

In light of these findings, there are several important implications for nursing practice that can contribute to the prevention and management of social jetlag in adolescents: (i) Screening and monitoring; nurses can play a key role in identifying adolescents at risk for SJL, particularly those in lower grade levels, through regular screening and follow-up. (ii) Sleep hygiene education; nurses can design and implement structured sleep hygiene and chronobiology education programs tailored to adolescents, while also involving parents and teachers. (iii) Resilience-based interventions; nurses can lead resilience-enhancing psychoeducation and group programs to support adolescents' mental health and buffer the effects of SJL. (iv) Interdisciplinary advocacy; nurses can collaborate with educators and policymakers to promote school environments and schedules that align with adolescents' biological rhythms, ensuring healthier developmental outcomes.

Strengths and Limitations

Research assessing SJL in adolescents has mainly addressed the issue within the context of physical/mental illness symptoms. The present study investigated the relationship between SJL and resilience, a positive mental health variable. To the researchers' knowledge, the relationship between these two variables has been examined for the first time in the literature, contributing quantitative data on the subject. This constitutes the strength of the research. However, the study has some limitations. The first limitation is that the research was conducted in only two public high schools, selected through cluster sampling and a lottery method. Although randomization was applied, the limited number of schools may not adequately reflect the diversity of the broader student population in Eskişehir. Therefore, the generalizability of the findings is limited, and potential sampling bias should be taken into account when interpreting the results. Planning studies with large samples in different regions/countries is recommended. Another important limitation is that socio-economic variables were not taken into consideration. Differences in socio-economic status may affect students' sleep patterns, circadian preferences, and mental well-being, and should be examined in future research. Another limitation is that the data was collected using the self-report method. It is recommended to use objective measurements (such as actigraphy) to evaluate circadian parameters and sleep-related

characteristics in future studies. Furthermore, the data were collected in the post-pandemic period, which may have influenced students' sleep habits and daily routines. These effects were not directly measured or controlled in the study, and should be addressed in future investigations. The last limitation of the study is the research design, i.e. descriptive and correlational. Therefore, causality has been determined at a limited level. Planning prospective cohort designs or studies evaluating the mediating effects would contribute to the literature in this regard.

Conclusion

According to the results of this study, evening chronotype tendency, low resilience level, and lower grade levels (9th, 10th, and 11th grades) are risk factors for SJL in adolescents. These findings highlight the importance of addressing behavioural, developmental, and psychosocial factors in adolescent health. They also suggest that education professionals, health professionals, and policymakers should collaborate to strengthen resilience, promote sleep health, and adapt educational practices in order to reduce the risks associated with SJL.

Acknowledgements

The researchers express their gratitude to the students and parents who participated in the study.

Conflicts of Interest

The authors declare no conflicts of interest.

Funding Sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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