

Sleep disturbance and medical requests among university and college students in Chongqing, China

A cross-sectional study

Ting Wang, MD, Jiuheng Yin, MD, Chen Hu, MD, Wanzhen Tang, BS, PhD, Xiaowen Che, MD, Ying Liu, MD.

ABSTRACT

الأهداف: لدراسة مدى انتشار اضطرابات النوم، وأنماط النوم، والعوامل المرتبطة بالنوم، والمتطلبات الطبية بين طلاب الجامعات والكليات في تشونغتشينغ، الصين.

المنهجية: تم جمع البيانات الديموغرافية والإجابات على استبيان مشكلة النوم (SPQ) من 1973 طالباً من 11 جامعة و10 كليات بين نوفمبر 2022 ويناير 2023.

النتائج: كان معدل انتشار اضطرابات النوم لدى طلاب الجامعات والكليات مختلفاً في فترات مختلفة (58.17% أثناء إغلاق الحرم الجامعي و40.30% بعد رفع الإغلاق). وكان معدل الانتشار المشترك 49.72%. وأظهر انتشار الأنواع الستة من اضطرابات النوم نفس الميول. كان متوسط زمن النوم 32.79 دقيقة، وكان متوسط مدة النوم 7.53 ساعة. كان الذكور، وطلاب الجامعات، وطلاب الطبقة العليا، وتاريخ الاكتئاب، والضغط الأكاديمي، وأحداث الحياة الكبرى، وبيئة غرفة النوم السيئة، وإغلاق الحرم الجامعي من العوامل المرتبطة باضطراب النوم بين المشاركين. لم يكن لدى معظم المشاركين (52.09%) أي طلبات رعاية طبية، وكانت الأسباب الرئيسية هي قصور في سهولة الوصول للرعاية الطبية (75.15%)، والضغط الاقتصادي (68.49%)، والمخاوف بشأن الآثار العلاجية (58.51%)، والضغط الأكاديمي (56.56%).

الخلاصة: من الواضح أن معدل انتشار اضطرابات النوم بين طلاب الجامعات والكليات تحسن بعد رفع إغلاق الحرم الجامعي، وكانت العوامل الرئيسية المرتبطة باضطرابات النوم هي الدراسة والحياة والصحة النفسية وبيئة النوم. أبلغ الطلاب الذين تم فحصهم في هذه الدراسة عن انخفاض نسبي لطلبات الرعاية الطبية عندما يعانون من اضطرابات النوم.

Objectives: To investigate the prevalence of sleep disturbance, sleep patterns, sleep-related factors, and medical demands among university and college students in Chongqing, China.

Methods: Demographic data and responses to the sleep problem questionnaire (SPQ) were collected from 1973 students from 11 universities and 10 colleges between November 2022 and January 2023.

Results: The prevalence of sleep disturbance in university and college students was different in different periods (58.17% during campus lockdown and 40.30% after the lifting of lockdown). The combined prevalence was 49.72%. The prevalence

of the 6 types of sleep disturbance showed the same trend. The average sleep latency was 32.79 minutes and the average sleep duration was 7.53 hours. Male, university students, upper-class students, history of depression, academic stress, major life events, bad bedroom environment, and campus lockdown were factors related to sleep disturbance among respondents. Most of the respondents (52.09%) had no medical care requests, and the major reasons were a lack of access to medical care (75.15%), economic pressure (68.49%), concerns regarding curative effects (58.51%), and academic pressure (56.56%).

Conclusion: The prevalence of sleep disturbance for university and college students was obviously improved after the lifting of campus lockdown, and the major factors related to sleep disturbance were study, life, mental health, and sleep environment. The students examined herein reported relatively low medical care requests when they experience sleep disturbance.

Keywords: sleep disturbance, university students, college students, medical requests

Saudi Med J 2023; Vol. 44 (11): 1153-1159
doi: 10.15537/smj.2023.44.11.20230420

From the Department of Nursing (Wang, Tang, Che, Liu), Faculty of Nursing, Chongqing Medical and Pharmaceutical College, from the Department of General Surgery (Yin), The Second Affiliated Hospital, Army Medical University, and from the Department of Encephalopathy (Hu), Chongqing Traditional Chinese Medicine Hospital, Chongqing, China.

Received 6th June 2023. Accepted 12th September 2023.

Address correspondence and reprint request to: Dr. Ying Liu, School of nursing, Chongqing Medical and Pharmaceutical College, Chongqing, China. E-mail: liuyingsly@163.com
ORCID ID: <https://orcid.org/0000-0003-2551-7033>

University and college students always complain to have poor sleep, and the incidence of sleep disturbance was increasing due to the outbreak of COVID-19 in recent years, which negatively influence their health maintenance, academic performance, and self-development.¹ Studies have reported that insufficient sleep has a significant association with obesity, cardio-metabolic disease, infertility, and etc.²⁻⁴ Besides, studies have also figured out that poor quality sleep severely impairs personal attention and learning ability, thus affecting academic performance in students.^{5,6} Meanwhile, individuals may reduce activities participation and interaction with others due to their sleepiness and fatigue during the daytime, which can significantly affect the development of leadership and need for cognition in their college life.⁷ However, the current status of sleep quality of university and college students after the lifting of several years' lockdown is unknown. Therefore, researchers are expected to constantly carry out more studies focusing on university and college students' sleep disturbance, such as different prevalence or related factors in different periods or different group, and more medical treatments are required to improve their sleep quality. Studies have reported that psychotherapies, pharmacotherapies, or their combination are effective treatment for the improvement of sleep quality.⁸ However, few was known regarding the medical care demands for university and college students in sleep disturbance and the related factors or major problems of their being absence from the treatment. Therefore, the objectives of this research are: firstly, to figure out the prevalence of university and college students' sleep disturbance around the period of the lift of COVID-19 in Chongqing, China. Secondly, to demonstrate the their sleep patterns in this particular time. Thirdly, to assess the difference of sleep disturbances between different groups in university and college students. Fourthly, to investigate the medical care demands and the reasons influencing their medical care conduction.

Methods. This study was a cross-sectional survey based on a questionnaire among students from 11 universities and 10 colleges in Chongqing, China, from November 2022 to January 2023, when almost all the university and college students experienced

Disclosure. This study was funded by Chongqing Education Commission, science and technology research projects (KJQN202202802), Chongqing, China.

a long period from lockdown in campus to the lift because of the COVID-19. Inclusion criteria were: students' age of 18-24 years, studying in Chongqing, and willing to participate in the study. Exclusion criteria were: age under 18 years or over 24 years and presence of severed disease. Students were randomly selected within each university or college and the quantity of respondents of each group is limited, so that to ensure the representativeness of the sample. Ethical approval was obtained from the ethics committee of Chongqing Medical and Pharmaceutical College in Chongqing, China. Informed consent was obtained from all individual participants included in the study.

Data were collected by an electronic questionnaire based on demographic questions and the sleep problem questionnaire (SPQ).⁹

Personal data regarding age, gender, university or college, year of study, monthly living expenses, previous history of depression, anxiety, sleep disorder or other, smoking and drinking frequency, sleep time, sleep latency, sleep duration, awaking time, and related factors for sleep disturbance (bad bed environment, academic pressure, major life event, campus lockdown, and satiation and siesta) were collected in the questionnaire.

Medical care demands for sleep disturbance, and main reasons of no medical care demands (negligence for sleep disturbance, concerns on curative effect, economic pressure, academic pressure, and lacking access to medical care), and interest and preference for sleep intervention (drug therapy, cognitive behavioral therapy, physical therapy, traditional Chinese medicine therapy, and comprehensive treatment) were also investigated in the questionnaire.

The SPQ is an 8-item questionnaire assessing the different types of sleep disturbance as shown in **Table 1**. The evaluated items are: I) I'm suffering from having difficulties initiating sleep; II) I'm suffering from having difficulties maintaining sleep; III) I'm suffering from waking up in the early morning and being not able to return to sleep; IV) sleep disturbance causing significant distress or impairment for me; V) there are at least 3 times sleep problems occurring per week; VI) my sleep problems last more than one month; VII) I sleep at least 3 times in 24 hours; VIII) I voluntarily (namely, not due to shift work) sleep in irregular patterns.⁹ A dichotomous answer mode (yes/no) was employed. The diagnostic criteria is shown in **Table 1**.

Statistical analysis. All the statistical analysis was carried out by using the Statistical Package for Social Sciences, version 26.0 (IBM Corp., Armonk, NY, USA). Data were calculated with frequency to explore the sample characteristics. The Chi-square test was

Table 1 - Diagnostic criteria of sleep problem questionnaire.

Types of sleep disturbance	Items
Difficulties initiating sleep	Question 1
Difficulties maintaining sleep	Question 2
Early awakening	Question 3
Subjective impairment	Question 4
Insomnia	Question 1/2/3 + Question 4 + Question 5 + Question 6
Irregular sleep - wake type	Question 7/8 + Question 4 + Question 5 + Question 6

used to test significant difference of the 6 types of sleep disturbance from pre- to after-lift of campus lockdown and variable related factors, such as gender, university or college, previous history of depression, lockdown, academic pressure, bad bedroom environment, and major life event. Kruskal-Wallis test was used to test the significant difference among different years of undergraduates. A p -value of <0.05 and 95% confidence intervals (CI) were set to represent the statistical significance and precision of results.

Results. A total of 1973 out of 2298 completed questionnaires were valid. The respondents' average age is 19.59 years old. **Table 2** shows the demographic and sociodemographic characteristics of the respondents.

Table 3 shows that almost half of the students have sleep disturbance, and the prevalence of difficulties initiating sleep, early awaking, and subjective impairment are relatively common types of sleep disturbance in the respondents. The total prevalence of sleep disturbance during campus lockdown is higher than after lift, and they are the same results in all types.

The average of sleep latency is 32.79 minutes and the average of sleep duration is 7.53 hours. Besides, as shown in **Table 4**, only a few university and college students sleep before 22:00 o'clock. Most of them sleep between 22:00-24:00, which is more than those between 24:00-2:00. Very few of them even sleep after 2:00. Furthermore, more than half of the university and college students can fall asleep in 30 minutes, however, there are nearly a quarter of them need more than 60 minutes to fall asleep. In addition, 18.3% of the students sleep less than 7 hours.

Table 2 shows the difference of incidence rate among the 6 types of sleep disturbance, including the gender, higher education students, undergrade year of study, depression history, major life events, bad bedroom environment, academic stress, and campus lockdown. From the outcomes, we can see that the incidence rate of males is higher than that of females ($p=0.000$; $p<0.05$). University students' sleep quality is poorer than that of

college students ($p=0.000$; $p<0.05$). Sleep disturbance prevalence is increasing in Freshmen, sophomores or junior students, and senior students ($p=0.000$; $p<0.05$). Students with academic stress, or depression history, or major life events sleep worse than those who not ($p<0.05$). Students in bad bedroom environment are more difficult to have a good sleep ($p=0.000$; $p<0.05$).

Table 5 shows the medical care demands of Chinese university and college students who occurred with sleep disturbance. There are 981 respondents that have at least one type of sleep disturbance, among which more than half of them have no medical care demands. Lacking access to medical care is the main reason for the university and college students to be absent from medical care. Besides, worrying on economic pressure, concerns on curative effect of medical treatment, academic pressure, and negligence to their sleep problems are also important factors for their absence to medical care. As for the interests and preference for sleep intervention among the students who have medical care demands, cognitive behavioral therapy is the most acceptable treatment for the respondents, which is higher than drug therapy and other treatments.

Discussion. Compared with prior related studies, our study clearly and comprehensively reports the prevalence of 6 types of sleep disturbance in a particular period around the lift of COVID-19 lockdown in Chongqing, China, and we collected our data from 11 universities and 10 colleges. The largest proportion in campus lockdown is difficulties initiating sleep (44.43%), followed by early awaking (36.83%), difficulties maintaining sleep (36.63%), subjective impairment (35.87%), insomnia (20.89%), and irregular sleep-wake type (18.17%). A study have reported that the prevalence of sleep initiation problem increased to 55% during COVID-19 lockdown, approximately 33% for early awaking problem, and approximately 40% for the sleep maintenance problem, which are coincident with our outcomes.¹⁰ We can see that the prevalence of each type of sleep disturbance decreased dramatically

Table 2 - Sleep disturbance in different group.

Variables	Total (N)	Difficulties initiating sleep	Difficulties maintaining sleep	Early awaking	Insomnia	Subjective impairment	Irregular sleep-wake type
<i>Gender</i>							
Male	652	307 (47.1)	252 (38.7)	258 (39.6)	155 (23.8)	249 (38.2)	145 (22.2)
Female	1321	420 (31.8)	332 (25.1)	336 (25.4)	157 (11.9)	350 (26.5)	133 (10.1)
<i>P-values</i>		0.000	0.000	0.000	0.000	0.000	0.000
<i>Higher education students</i>							
University	1138	458 (40.3)	377 (33.1)	379 (33.3)	217 (19.1)	388 (34.1)	194 (17.0)
College	835	268 (32.1)	207 (24.8)	215 (25.7)	95 (11.4)	211 (25.3)	84 (10.1)
<i>P-values</i>		0.000	0.000	0.000	0.000	0.000	0.000
<i>Undergrade year of study</i>							
Freshman	546	148 (27.1)	121 (22.2)	114 (20.9)	48 (8.8)	131 (24.0)	36 (6.6)
Sophomores/junior	940	300 (40.5)	229 (30.9)	237 (32.0)	128 (17.3)	233 (39.0)	115 (15.5)
Senior	487	279 (40.7)	234 (34.1)	243 (35.4)	136 (19.8)	235 (39.3)	121 (18.5)
<i>P-values</i>		0.000	0.000	0.000	0.000	0.000	0.000
<i>Depression history</i>							
Yes	126	59 (46.8)	52 (41.3)	48 (38.1)	26 (20.6)	48 (38.1)	27 (21.4)
No	1847	668 (36.2)	532 (28.8)	546 (29.6)	245 (13.3)	541 (29.3)	244 (13.2)
<i>P-values</i>		0.016	0.003	0.043	0.020	0.037	0.010
<i>Academic stress</i>							
Yes	951	398 (41.8)	344 (36.2)	336 (35.3)	182 (19.1)	295 (31.0)	164 (17.2)
No	1022	329 (32.2)	240 (23.5)	258 (25.2)	130 (12.7)	240 (23.5)	114 (11.1)
<i>P-values</i>		0.000	0.000	0.000	0.000	0.000	0.000
<i>Major life events</i>							
Yes	796	312 (39.2)	262 (32.9)	271 (34.0)	142 (17.8)	263 (33.0)	127 (15.9)
No	1177	407 (34.6)	322 (27.4)	323 (27.4)	170 (14.4)	336 (28.5)	150 (12.7)
<i>P-values</i>		0.037	0.008	0.002	0.043	0.033	0.044
<i>Bad bedroom environment</i>							
Yes	995	449 (45.1)	375 (37.7)	365 (36.7)	209 (21.0)	367 (36.9)	187 (18.7)
No	978	278 (28.4)	209 (21.4)	229 (23.4)	103 (10.5)	232 (23.7)	91 (9.3)
<i>P-values</i>		0.000	0.000	0.000	0.000	0.000	0.000

Values are presented as numbers and percentages (%).

Table 3 - The prevalence of sleep disturbance.

Sleep disturbance	Combined	In lockdown	After lift
Difficulties initiating sleep	727 (36.8)	459 (44.1)	268 (27.0)
Difficulties maintaining sleep	584 (29.6)	381 (36.6)	203 (20.4)
Early awaking	594 (30.1)	383 (36.8)	211 (21.2)
Insomnia	312 (15.8)	211 (20.9)	101 (10.2)
Subjective impairment	599 (30.4)	373 (35.9)	224 (22.6)
Irregular sleep-wake type	278 (14.0)	189 (18.2)	89 (9.0)
Total	981 (49.7)	605 (58.2)	376 (40.3)

Values are presented as numbers and percentages (%).

after the lift of campus lockdown. As we know, China has a very strict and effective epidemic prevention and control strategy since 2020, and finally reached a major decision to lift the defense to COVID-19 after the comprehensive research and analysis by many experts in December 2023. The poor sleep quality in lockdown may be because of a long-time lockdown and prolonged separation from friends and family.¹¹⁻¹³ The prevalence

of insomnia throughout our investigation is lower when compared with other studies carried out in the epidemic outbreaks.¹⁴ However, few reports were carried out to declare the prevalence of subjective impairment and irregular sleep-wake type in university and college students, therefore, it would be particularly informative to have more studies with larger sample sizes in order to document their prevalence in this group.

Table 4 - Sleep patterns of university and college students.

Sleep patterns	n (%)
<i>Sleep time</i>	
<22:00	307 (15.6)
22:00≤T<24:00	1173 (59.4)
24:00≤T<2:00	451 (22.9)
≥2:00	42 (2.1)
<i>Sleep latency</i>	
<30 minutes	1034 (52.4)
30≤T<60 minutes	461 (23.4)
60≤T<120 minutes	348 (17.6)
≥120 minutes	130 (6.6)
<i>Sleep duration</i>	
≤5 hours	100 (5.1)
5<T<7 hours	261 (13.2)
7≤T≤9 hours	1501 (76.1)
>9 hours	111 (5.6)

Values are presented as numbers and percentages (%).

Table 5 - Medical care requests of college students with sleep disturbance.

Items	n (%)
<i>Have medical care requests for sleep disturbance?</i>	
Yes	470 (47.9)
No	511 (52.1)
<i>Main reason of no medical care requests*</i>	
Negligence for sleep disturbance	178 (34.8)
Concerns on curative effect	299 (58.5)
Economic pressure	350 (68.5)
Academic pressure	289 (56.6)
Lacking access to medical care	384 (75.1)
<i>Interest and preference for sleep intervention**</i>	
Drug therapy	104 (22.1)
Cognitive behavioral therapy	163 (34.7)
Physical therapy	78 (16.6)
Traditional Chinese medicine therapy	85 (18.1)
Comprehensive treatment	40 (8.5)

Values are presented as numbers and percentages (%).

*participants' number was 511.

**participants' number was 470.

†multiple-choice question.

Our study finds that the manifestation of university and college students' sleep patterns are having a relatively long sleep latency, a late sleep time, and a relatively short sleep duration. Approximately 52.41% of the respondents need more than 30 minutes to fall asleep, and the average of sleep latency is 32.79 minutes, which is similar to other studies.¹ It is recommended that young people aged between 18-25 should fall asleep before 22:00 and have a sleep duration of 7-9 hours per day.^{6,15} However, our findings show that only 15.56% of the university and college students go to bed before 22:00, most of them (59.45%) going to bed between 22:00-24:00, and almost 25% going to bed after 24:00,

indicating that they tend to stay up late on their own initiative. As has been mentioned above, more than half of them suffering from a long sleep latency, and there are nearly 20% of them cannot obtain a sufficient sleep time, which may have negative effects on their academic performance, physical and mental health, or even suicide behaviors.^{4,6,16-18} A study has shown that sleep duration less than 6 hours was inversely associated to suicide behaviors.¹⁹

Our study compared several factors affecting the sleep disturbance of university and college students, especially education type and undergrade year of study, which were not fully noticed by researchers. The difference between genders on sleep disturbance is controversial. Some studies showed that the female appear to be more prone to have complaint regarding sleep disturbance.^{1,20} However, in our study, the prevalence of male college students in all types of sleep disturbance is higher than female, which is consistent with some other studies, in which they have reported that the female were more likely to sleep more efficiently than men with sleep diary data, actigraphy or other measurements, for women tending to underestimate their sleep, whereas men tending to overestimate their sleep.²¹⁻²³ However, few is known regarding the prevalence of sleep disturbance in different kinds of higher education students and different undergrade year of study. Therefore, the comparison carried out in our study is aiming to clarify the difference of sleep disturbance prevalence between them, and we found that university students are more susceptible to have sleep disturbance. Moreover, the prevalence of sleep disturbance is decreasing as follows: senior students, sophomores or junior students, and freshmen, which may be corrected with the increasing level of depressive symptoms, anxiety symptoms, and academic or other stress in different undergrade year of study. A systematic review and meta-analysis reported that the pooled depressive symptoms prevalence of 6 study was 29% for freshmen, 21% for sophomores, 24% for junior students, and 29% for senior students, whereas anxiety symptoms prevalence was 19% for freshmen, 19% for sophomores, 22% for junior students, and 25% for senior students.²⁴ The depressive symptoms, anxiety symptoms, and academic stress are highly correlated with sleep disturbance, and there is a bidirectional relationship between them.²⁵⁻³¹ Our study has shown that depressive symptoms and academic stress are correlated with the occurring of sleep disturbance, besides, major life events, bad bedroom environment, and campus lockdown have also been proved to be critical risk factors of sleep disturbance. Students who suffering from negative life events, bad bedroom

environment, or longer campus lockdown were more likely to have sleep disturbance, which are consistent with the results of other studies.^{10,32-35}

According to the investigation results of our study, almost half of university and college students have no medical care demands as a result of various reasons. Lacking access to medical help is the most prominent reason, followed by economic pressure, concerns on curative effect, academic pressure, and negligence for sleep disturbance, which may be the major reasons why university and college students' sleep problems increased dramatically from approximately 27% in 1982 to approximately 68% in the last decades.³⁶ In our study, we found that 92.60% of respondents' monthly living expenses are in 2000 Yuan, which may not be enough for affording the treatment cost of sleep disturbance. As is mentioned above, university and college students have a great pressure on academic study, and sleep disturbance always require periodic treatment, which may have negative influences on their study, thus, resulting in their fear of accepting a treatment.^{30,31} Therefore, university and college students have insufficient ways, money, time, energy, and awareness to the treatment of sleep disturbance. More information and sleep hygiene education should be provided to this particular group so that to arouse their attention to their sleep problems and help them find a proper way to improve their sleep quality. Moreover, public health and school departments should establish long-term stable free institutions in campus to provide students with free sleep counseling or non-drug treatment service, such as psychotherapies, and carry out their referral to medical institutions for treatment in time when needed. As is acknowledged to us, drugs for sleep disturbance may have negative effects on the individuals.³⁷ In our study, university and college students with sleep disturbance tend to choose cognitive behavioral therapy accounted for 34.68%, higher than drug therapy and other treatments, which has proved to be helpful for students to change the usefulness cognitive and behavioral patterns of quality sleep and be superior to medication and produces longer-lasting positive effects.^{38,39} The possible reason for the outcome is that university and college students' sleep disturbance are mainly related to bad sleep environment, unhealthy lifestyle, or incorrect concept of sleep, therefore, the cognitive behavior therapy can help them improve the situation.

The current study showed that sleep disturbance was always a problem in the whole world, and we should find a suitable treatment for university and college students to help them improve the present situation. Our study also find that cognitive behavior therapy is the most

acceptable way to improve their sleep quality, therefore, effective cognitive behavior therapy strategy focusing on university and college students is challenging, and making cognitive behavior therapy as a voluntary work on campus is considerable.

Study limitations. The inability to obtain more universities and colleges students in the particular investigation period, because after the lift of campus lockdown, most of the students went back to home and kept staying home for a long time.

In conclusion, the prevalence of sleep disturbance for university and college students are obviously improved after the lift of COVID-19 lockdown, and the major related factors of sleep disturbance for them are from study, life, mental health, and sleep environment. They have relatively low demands for medical care when occurred with sleep disturbance.

Acknowledgment. The authors gratefully acknowledge AJE (<https://china.aje.com/cn/login>) for their English language editing.

References

1. Becker SP, Jarrett MA, Luebbe AM, Garner AA, Burns GL, Kofler MJ. Sleep in a large, multi-university sample of college students: sleep problem prevalence, gender differences, and mental health correlates. *Sleep Health* 2018; 4: 174-181.
2. Lee JH, Cho J. Sleep and obesity. *Sleep Med Clin* 2022; 17: 111-116.
3. Pengo MF, Parati G. Sleep disturbances as a cause of cardio-metabolic diseases: adding another piece to the puzzle. *Eur J Prev Cardiol* 2022; 29: 2389-2390.
4. Palnitkar G, Phillips CL, Hoyos CM, Marren AJ, Bowman MC, Yee BJ. Linking sleep disturbance to idiopathic male infertility. *Sleep Med Rev* 2018; 42: 149-159.
5. Seoane HA, Moschetto L, Orliacq F, Orliacq J, Serrano E, Cazenave MI, et al. Sleep disruption in medicine students and its relationship with impaired academic performance: a systematic review and meta-analysis. *Sleep Med Rev* 2020; 53: 101333.
6. Al-Khani AM, Sarhandi MI, Zaghoul MS, Ewid M, Saquib N. A cross-sectional survey on sleep quality, mental health, and academic performance among medical students in Saudi Arabia. *BMC Res Notes* 2019; 12: 665.
7. Chen WL, Chen JH. Sleep deprivation and the development of leadership and need for cognition during the college years. *J Adolesc* 2019; 73: 95-99.
8. Zhang Y, Ren R, Yang L, Zhang H, Shi Y, Shi J, et al. Comparative efficacy and acceptability of psychotherapies, pharmacotherapies, and their combination for the treatment of adult insomnia: a systematic review and network meta-analysis. *Sleep Med Rev* 2022; 65: 101687.
9. Schlarb AA, Friedrich A, Claßen M. Sleep problems in university students - an intervention. *Neuropsychiatr Dis Treat* 2017; 13: 1989-2001.

10. Marelli S, Castelnovo A, Somma A, Castronovo V, Mombelli S, Bottoni D, et al. Impact of COVID-19 lockdown on sleep quality in university students and administration staff. *J Neurol* 2021; 268: 8-15.
11. Jahrami HA, Alhaj OA, Humood AM, Alenezi AF, Fekih-Romdhane F, AlRasheed MM, et al. Sleep disturbances during the COVID-19 pandemic: a systematic review, meta-analysis, and meta-regression. *Sleep Med Rev* 2022; 62: 101591.
12. Qi X, Pei Y, Malone SK, Wu B. Social isolation, sleep disturbance, and cognitive functioning (HRS): a longitudinal mediation study. *J Gerontol A Biol Sci Med Sci* 2023; glad004.
13. McLay L, Jamieson HA, France KG, Schluter PJ. Loneliness and social isolation is associated with sleep problems among older community dwelling women and men with complex needs. *Sci Rep* 2021; 11: 4877.
14. Yuan K, Zheng YB, Wang YJ, Sun YK, Gong YM, Huang YT, et al. A systematic review and meta-analysis on prevalence of and risk factors associated with depression, anxiety and insomnia in infectious diseases, including COVID-19: a call to action. *Mol Psychiatry* 2022; 27: 3214-3222.
15. Li D, Li X. Independent and combined associations between physical activity and sedentary time with sleep quality among Chinese college students. *Int J Environ Res Public Health* 2022; 19: 6697.
16. Alqudah M, Balousha SAM, Al-Shboul O, Al-Dwairi A, Alfaqih MA, Alzoubi KH. Insomnia among medical and paramedical students in Jordan: impact on academic performance. *Biomed Res Int* 2019; 2019: 7136906.
17. Russell K, Allan S, Beattie L, Bohan J, MacMahon K, Rasmussen S. Sleep problem, suicide and self-harm in university students: a systematic review. *Sleep Med Rev* 2019; 44: 58-69.
18. Harris LM, Huang X, Linthicum KP, Bryen CP, Ribeiro JD. Sleep disturbances as risk factors for suicidal thoughts and behaviours: a meta-analysis of longitudinal studies. *Sci Rep* 2020; 10: 13888.
19. Liu P, Huang W, Chen S, Xiang H, Lin W, Wang H, et al. The association among childhood maltreatment, sleep duration and suicide behaviors in Chinese young people. *J Affect Disord* 2023; 327: 190-196.
20. Duan H, Gong M, Zhang Q, Huang X, Wan B. Research on sleep status, body mass index, anxiety and depression of college students during the post-pandemic era in Wuhan, China. *J Affect Disord* 2022; 301: 189-192.
21. Kocavska D, Lysen TS, Dotinga A, Koopman-Verhoeff ME, Luijk MPCM, Antypa N, et al. Sleep characteristics across the lifespan in 1.1 million people from the Netherlands, United Kingdom, and United States: a systematic review and meta-analysis. *Nat Hum Behav* 2021; 5: 113-122.
22. Ulander M, Rångtall F, Theorell-Haglöw J. Sleep measurements in women. *Sleep Med Clin* 2021; 16: 635-648.
23. Baker FC, Yuksel D, de Zambotti M. Gender differences in sleep. [Updated 2023; 2023 Jan 27]. available from: <https://www.sciencedirect.com/science/article/abs/pii/B9780128229637001122?via%3Dihub>
24. Deng J, Zhou F, Hou W, Silver Z, Wong CY, Chang O, et al. The prevalence of depressive symptoms, anxiety symptoms and sleep disturbance in higher education students during the COVID-19 pandemic: a systematic review and meta-analysis. *Psychiatry Res* 2021; 301: 113863.
25. Fang H, Tu S, Sheng J, Shao A. Depression in sleep disturbance: a review on a bidirectional relationship, mechanisms and treatment. *J Cell Mol Med* 2019; 23: 2324-2332.
26. Ramón-Arbués E, Gea-Caballero V, Granada-López JM, Juárez-Vela R, Pellicer-García B, Antón-Solanas I. The prevalence of depression, anxiety and stress and their associated factors in college students. *Int J Environ Res Public Health* 2020; 17: 7001.
27. Joo HJ, Kwon KA, Shin J, Park S, Jang SI. Association between sleep quality and depressive symptoms. *J Affect Disord* 2022; 310: 258-265.
28. Richards A, Kanady JC, Neylan TC. Correction: sleep disturbance in PTSD and other anxiety-related disorders: an updated review of clinical features, physiological characteristics, and psychological and neurobiological mechanisms. *Neuropsychopharmacology* 2020; 45: 240-241.
29. Shi C, Wang S, Tang Q, Liu X, Li Y. Cross-lagged relationship between anxiety, depression, and sleep disturbance among college students during and after collective isolation. *Front Public Health* 2022; 10: 1038862.
30. Veeramachaneni K, Slavish DC, Dietch JR, Kelly K, Taylor DJ. Intraindividual variability in sleep and perceived stress in young adults. *Sleep Health* 2019; 5: 572-579.
31. Zhang X, Gao F, Kang Z, Zhou H, Zhang J, Li J, et al. Perceived academic stress and depression: the mediation role of mobile phone addiction and sleep quality. *Front Public Health* 2022; 10: 760387.
32. Evans S, Alkan E, Bhangoo JK, Tenenbaum H, Ng-Knight T. Effects of the COVID-19 lockdown on mental health, wellbeing, sleep, and alcohol use in a UK student sample. *Psychiatry Res* 2021; 298: 113819.
33. Li YL, Qiu D, Hu C, Ouyang FY, He J, Zang DF, et al. Stressful life events and poor sleep quality: a cross-sectional survey in the Chinese governmental employees. *Sleep Med* 2021; 85: 123-130.
34. Riedy SM, Smith MG, Rocha S, Basner M. Noise as a sleep aid: a systematic review. *Sleep Med Rev* 2021; 55: 101385.
35. Foulkes L, McMillan D, Gregory AM. A bad night's sleep on campus: an interview study of first-year university students with poor sleep quality. *Sleep Health* 2019; 5: 280-287.
36. Li D, Li X. Independent and combined associations between physical activity and sedentary time with sleep quality among Chinese college students. *Int J Environ Res Public Health* 2022; 19: 6697.
37. Riemann D, Baglioni C, Bassetti C, Bjorvatn B, Dolenc Groselj L, Ellis JG, et al. European guideline for the diagnosis and treatment of insomnia. *J Sleep Res* 2017; 26: 675-700.
38. Dyrberg H, Bjorvatn B, Larsen ER. Cognitive behavioral therapy for chronic insomnia in outpatients with major depression—a randomised controlled trial. *J Clin Med* 2022; 11: 5845.
39. Cassel M, Blom K, Gatzacis J, Renblad P, Kaldo V, Jernelöv S. Clinical feasibility of cognitive behavioural therapy for insomnia in a real-world mixed sample at a specialized psychiatric outpatient clinic. *BMC Psychiatry* 2022; 22: 600.