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## Chinese University Students Sleep Patterns Amid Covid-19 Home Quarantine

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### Abstract

**Objective:** Investigate the sleep patterns and prevalence of sleep disorders among Chinese university students during the home quarantine of coronavirus disease 2019 (COVID-19), so as to provide the scientific basis for sleep counselling. **Methods:** Using a random sampling method, 7,364 university students were selected to participate in the survey from April to May 2020. Using PSQI to investigate the sleep status of Chinese university students in home quarantine during the pandemic. **Results:** (1) The mean PSQI score of those university students was  $3.83 \pm 2.60$ , and the mean bedtime was  $23:29 \pm 1:08$ , with only 51.87% (3820) of them falling asleep before 23:00; (2) The average sleep efficiency of Chinese university students was  $75.76 \% \pm 9.89\%$ , with 23.51% (1731) of Chinese university students sleep efficiency less than 85% and the incidence of sleep disorders was 8.73% (643); (3) Male students sleep better compared to female students; (4) Senior university students were more likely to have sleep problems compared to junior university students. **Conclusion:** There were some differences in the sleep patterns of university students between males and females and different grades, with female students having worse sleep patterns compared to male students and senior students having worse sleep patterns than their junior counterparts.

**Keywords:** Chinese University Students, COVID-19, Sleep Patterns, PSQI

### Introduction

The covid-19 outbreak as in many parts of the world, resulted in additional challenges for students' academic environment. University students are one of the prominent victims of the performed restricted quarantine strategies' effects, becoming vulnerable to various problems such as university closure and they are in a particular period of rapid physical and mental development, facing various issues such as academic development, environmental adaptation and interpersonal relationship, and need high sleep quality to deal with these challenges (Eslaminejad et al., 2017). Therefore, investigating university students' sleep patterns amid covid-19 home quarantine is essential to understand their physical and mental status better.

Pittsburgh Sleep Quality Index (PSQI) contains seven components: sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medication, and

daytime dysfunction (Buysse et al., 1989). It is a comprehensive measure of an individual's objective physiological indicators and subjective psychological indicators (Genderson et al., 2013; Harvey et al., 2005), it is also an essential indicator of the quality of life, closely related to stress, emotions and mental health (Kanaan et al., 2015; Nofzinger et al., 2004). However, with the outbreak of novel coronavirus pneumonia (COVID-19) in early 2020, university students are at high risk of sleep disorders because they have experienced sudden cancellation of face-to-face classes, forced to leave their dormitories, long-term home quarantine, and online learning activities, and are under pressure from multiple factors such as the epidemic, academics, and family (He et al., 2020; Wang & Huang, 2020). Furthermore, sleep disorders often cause university students cognitive impairment, reduce their ability to learn, and may even cause physical, psychological and other related diseases (Ji et al., 2020; Wang et al., 2021). Some studies point out that the physical damage caused by these public health emergencies may be recovered in a short period, but the psychological impact lasts for a long time (Li et al., 2021). Moreover, public health emergencies have a sudden onset, public attributes and serious social hazards, which can easily lead to group trauma within a specific range, causing many survivors to suffer sleep disorders (Wang et al., 2021). Therefore, it is necessary to investigate the sleep patterns of Chinese university students during the home quarantine period of the epidemic to better understand and predict their status to provide more timely and effective support.

In order to investigate the sleep status of university students and the incidence of sleep disorders during the home quarantine of the epidemic, this study investigated and analyzed the sleep status of Chinese university students in a university in Sichuan Province from April to May 2020, hoping to provide a theoretical basis for preventing and controlling university students' mental health crisis in similar major public health events in the future, expecting to guide universities to improve the coping ability of sudden public (mass trauma) events and turning crises into development opportunities.

## **Methods**

### *Participants*

In this study, a random sampling method was used to select 9318 university students from a university in Sichuan to administer the test. During the period of the epidemic home quarantine of novel coronavirus (from April to May 2020), involved 31 provinces across China. A total of 7364 valid questionnaires were received, with an effective rate of 79.03%, 3422 male and 3942 female students. The exclusion criteria include too low filling time, more than 70% of the same consecutive answers, and incomplete filling. To protect participants' privacy, this survey was conducted anonymously.

### *Instruments*

The Pittsburgh sleep quality index (PSQI) was compiled by Buysse (1989), a psychiatrist at the University of Pittsburgh (Buysse et al., 1989), and translated into Chinese by Liu Xianchen in 1996 (Liu et al., 1996). It includes 18 self-assessment items that comprise a total of seven dimensions (sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction). The scale uses a 4-point scale (each factor is scored from 0 to 3), "0" means no difficulty, "3" means very difficult, and the sum of all items constitutes the total PSQI score (total score 0-21). The higher the score, the worse the sleep quality, and the scale has a good reliability level for measuring sleep quality. The over all Cronbach's alpha coefficient was 0.845. (Lu et al., 2014).

Demographic and sociological information (such as age, gender, grade, and location) were investigated.

### Data Collection

During the home quarantine period of the epidemic, an online questionnaire was distributed to university students in a university in Sichuan Province. The questionnaire was filled out and collected in strict compliance with academic ethics. The participants have been informed of the basic information of this questionnaire, its purpose and the commitment to confidentiality of information in the guidance section of the questionnaire, and can only enter the answer screen after the participants have confirmed and agreed. The online questionnaires were released by the counsellors of each class in the school through the usual Chinese social media platforms (such as WeChat, and QQ), and students were invited to answer questions online using their cell phones or computers, or other electronic devices. After the online test, 9,318 questionnaires were returned.

### Statistical Analysis

Statistical analysis was performed using SPSS 21.0. Collected data were analyzed using the chi-square test. Differences in sleep quality status between men and women were tested by t-test, and differences in sleep quality status by grade were tested by one-way ANOVA, with  $P < 0.05$  being considered statistically significant.

### Results

#### General Information of Respondents

7364 valid questionnaires were received, including 3422 male subjects and 3942 female subjects, average age  $19.70 \pm 1.35$  years, and the general conditions of participants are shown in Table 1.

Table 1  
*General information questionnaire*

	Item	Number of people	Percentage
Gender	Man	3422	46.50%
	Female	3942	53.5%
Grade	Freshman	4418	60.00%
	Sophomore	1517	20.60%
	Junior	1030	14.00%
	Senior	399	5.40%

#### Sleep quality of Chinese university students during the epidemic

The mean PSQI score of 7364 university students was  $3.83 \pm 2.65$ , with a minimum value of 0 and a maximum value of 17. A total PSQI score  $>7$  was used as a cut-off for judging sleep quality problems (Buysse et al., 1989), 6721 (91.27%) had good sleep quality and 643 (8.73 %) had sleep disorders.

As shown in Table 2, the prevalence of sleep disorders was 7.74% (265/3422) for male students and 9.59% (378/3942) for female students, with a statistically significant difference compared to each other ( $\chi^2 = 7.83$ ,  $p = 0.005$ ).

Table 2

*Comparison of the incidence of sleep disorders by gender*

	Incidence of sleep disorders	Chi-Square	p
Man	7.74% ( 265/ 3422 )	7.83	0.005
Female	9.59% ( 378 / 3942 )		

As shown in Table 3, the prevalence of sleep disorders was 7.9% (349/4418) in freshman students, 8.24% (125/1517) in sophomore students, 11.65% (120/1030) in junior students, and 10.53% (42/399) in senior students. The comparison between freshman and junior students was statistically significant,  $\chi^2=14.937$ ,  $p=0.0001$ , and a statistically significant comparison between sophomore and junior year,  $\chi^2=8.208$ ,  $p=0.004$ .

Table 3

*Comparison of the prevalence of sleep disorders in different grades*

Grade	Incidence of sleep disorders	Chi-Square	p
Freshman	7.90% ( 349/4418 )	0.178	0.673
Sophomore	8.24% ( 125/1517 )		
Freshman	7.90% ( 349/4418 )	14.937	0.0001
Junior	11.65% ( 120/1030 )		
Freshman	7.90% ( 349/4418 )	3.386	0.066
Senior	10.53% ( 42/399 )		
Sophomore	8.24% ( 125/1517 )	8.208	0.004
Junior	11.65% ( 120/1030 )		
Sophomore	8.24% ( 125/1517 )	2.076	0.15
Senior	10.53% ( 42/399 )		
Junior	11.65% ( 120/1030 )	0.362	0.548
Senior	10.53% ( 42/399 )		

Difference tests in sleep quality among university students of different genders and grades

The results of the gender difference test showed that female students scored significantly higher PSQI scores than male students in sleep quality, time to sleep, sleep efficiency, sleep disorder, daytime dysfunction, and total score.

The results of the grade difference test showed that juniors scored significantly higher than seniors in sleep quality, sleep disorders, and sleep efficiency; freshmen scored significantly lower than other grades in almost every component, and sophomores scored significantly lower than seniors in terms of time to sleep and total PSQI scores; seniors scored significantly higher than freshmen in terms of sleep efficiency; seniors scored significantly higher in terms of sleep disorders, hypnotic drug use in terms of sleep efficiency, the scores of juniors were significantly higher than those of freshmen; the scores of sleep disorders and hypnotic drug use of juniors were significantly higher than those of freshmen.

Table 4  
Sleep quality of university students and gender differences(  $\bar{x} \pm s$ )

Item		Freshman	Sophomore	Junior	Senior	Difference Tests of Grade		Difference Tests of Gender	
						F	n <sup>2</sup>	t	Cohen'd
A Sleep quality	Man (3422)	0.76±0.66	0.74±0.65	0.74±0.66	0.83±0.67	0.85±0.70			
	Female (3942)	0.82±0.65	0.79±0.64	0.84±0.65	0.90±0.67	0.82±0.66	7.340	1<3***,2<3**	-3.770** -0.090
	total	0.79±0.66	0.77±0.65	0.79±0.66	0.87±0.67	0.83±0.68			
B Sleep latency	Man (3422)	0.79±0.89	0.72±0.86	0.81±0.9	0.99±0.93	1.02±1.00			
	Female (3942)	1.00±0.94	0.92±0.92	1.04±0.93	1.23±0.97	1.09±0.98	33.850	1<2***,1<3***,1<4*,2<3***,2<4*	-9.510** -0.230
	total	0.90±0.92	0.83±0.9	0.93±0.9	1.12±0.96	1.06±0.99			
C Sleep duration	Man (3422)	0.30±0.57	0.30±0.5	0.30±0.5	0.30±0.58	0.33±0.62			
	Female (3942)	0.26±0.53	0.26±0.53	0.22±0.5	0.30±0.55	0.28±0.56	1.330	空白	3.530** 0.070
	total	0.28±0.56	0.28±0.5	0.26±0.5	0.30±0.57	0.30±0.59			
D Sleep efficiency	Man (3422)	0.30±0.65	0.28±0.63	0.32±0.66	0.35±0.7	0.42±0.70			
	Female (3942)	0.37±0.71	0.34±0.68	0.36±0.7	0.48±0.82	0.39±0.73	8.750	1<3***,1<4***,2<3***	-3.810** -0.100
	total	0.36±0.72	0.31±0.66	0.34±0.66	0.42±0.77	0.41±0.72			
E Sleep disturbances	Man (3422)	0.63±0.48	0.61±0.49	0.61±0.49	0.69±0.46	0.73±0.44			
	Female (3942)	0.71±0.45	0.69±0.46	0.71±0.4	0.78±0.41	0.77±0.42	13.490	1<3***,1<4***,2<3***,2<4**	-7.730** -0.170
	total	0.67±0.47	0.65±0.48	0.66±0.47	0.74±0.44	0.75±0.43			
F Use of sleep medication	Man (3422)	0.01±0.18	0.01±0.16	0.007±0.11	0.03±0.24	0.04±0.33			
	Female (3942)	0.02±0.17	0.013±0.15	0.015±0.17	0.02±0.16	0.03±0.29	2.800	1<4*,2<4*	-0.140 -1.090
	total	0.02±0.17	0.01±0.16	0.01±0.1	0.02±0.20	0.04±0.31			
G Daytime dysfunction	Man (3422)	0.81±0.82	0.80±0.8	0.80±0.8	0.81±0.86	0.87±0.86			
	Female (3942)	0.86±0.82	0.84±0.8	0.86±0.8	0.96±0.85	0.84±0.82	1.850	1<3*	-2.960** -0.060
	total	0.84±0.82	0.82±0.8	0.83±0.8	0.89±0.86	0.85±0.84			
Total PSQI score	Man (3422)	3.61±2.59	3.47±2.5	3.58±2.4	3.99±2.67	4.26±2.97			
	Female (3942)	4.03±2.60	3.84±2.5	4.06±2.5	4.69±2.76	4.22±2.67	23.200	1<2*,1<3***,1<4***,2<3***,2<4**	-6.910** 0.300
	total	3.86±2.65	3.67±2.5	3.83±2.5	4.36±2.74	4.24±2.81			

Examination of differences in the sleep patterns of university students by gender and grade

The average bedtime of Chinese university students was 23:29±1:08. Only 51.87% (3820/7364) of university students fell asleep before 23:00. The average sleep efficiency of university students was 75.76% ± 9.89% (5633/7364), and 23.51% (1731/7364) of university students had less than 85% sleep efficiency. The average daily sleep time of university students was 8.07±1.01 hours, among which 87.19% (6421/7364) of university students had a daily sleep time of 7-9 hours, 4.43% (326/7364) of university students had a daily sleep time of fewer than 7 hours, and 8.38% (617/7364) of university students had a daily sleep time of more than 9 hours.

There were significant gender differences in bedtime, wake-up time, and sleep time, with male students going to bed significantly later than female students, male students waking up

significantly later than female students, and female students' sleep duration significantly longer than male students (see Table 5).

The bedtime of juniors was significantly later than that of sophomores and seniors, the wake-up time of sophomores was significantly earlier than that of freshmen, and juniors were significantly earlier than that of other grades. In contrast, the sleep time of juniors was significantly higher than that of sophomores, and sophomores' sleep time was significantly higher than freshmen's (see Table 5).

Table 5

*Sleep patterns and demographic differences among university students(  $\bar{x} \pm s$ )*

Item		Freshman	Sophomore	Junior	Senior	Difference Tests of		Cohen's d	
						Grade	Gender		
Bedtime (hh: mm)	Man (3422)	23:31±1:08	23:32±1:08	23:28±1:08	23:35±1:11	23:20±0:57	2.990	3.770*	0.1
	Female (3942)	23:24±1:08	23:24±1:07	23:24±1:08	23:30±1:15	23:20±1:08			
	total	23:29±1:08	23:29±1:08	23:26±1:125	23:34±1:14	23:29±1:08			
Wake-up time (hh: mm)	Man (3422)	8:22±1:11	8:19±1:10	8:23±1:09	8:34±1:19	8:19±1:01	11.630	-	5.000*
	Female (3942)	8:31±1:12	8:27±1:00	8:35±1:16	8:41±1:16	8:30±1:11			
	total	8:29±1:11	8:25±1:10	8:31±1:13	8:41±1:10	8:29±1:11			
Sleep duration (hh: mm)	Man (3422)	8:02±1:00	8:02±1:01	8:04±1:00	8:03±0:59	7:57±1:00	4.080	-	5.350*
	Female (3942)	8:10±1:02	8:10±1:01	8:17±1:02	8:04±1:03	8:07±1:02			
	total	8:07±1:01	8:07±1:01	8:11±1:01	8:04±1:02	8:04±1:01			

**Conclusion**

Previous studies have shown that the epidemic had a significant negative psychological impact on both the general public and special groups such as patients, medical personnel, children and the elderly (Cao et al., 2020; Duong et al., 2020; Huang et al., 2020; Liu et al., 2020). According to WHO, the emergence of pandemics stresses all segments of society. Students' mental health can be significantly affected in the face of public health emergencies. Some studies also related to pandemics (including avian influenza and SARS) have shown that pandemics harm the mental health of individuals (Cao et al., 2020; Duong et al., 2020).

This study found that the average sleep efficiency of Chinese university students was less than 85%. The average PSQI total score of Chinese university students was lower than 7, 7.74% of university students had a PSQI total score of more than 7, which was consistent with the results of previous studies (Zhang & Diao, 2006). In this study, freshmen and sophomores made up the majority of subjects, while relatively few juniors and seniors were more likely to have sleep problems. The average sleep time of university students was more than 8 hours, this may be because during the home quarantine of COVID-19, there are relatively few activities and students control their work and rest time more relaxed. Although they slept late, they woke up late, so the overall length of sleep was long, but the efficiency of sleep and the quality of sleep were poor.

The results of the grade difference test showed that the individual factors of sleep showed relatively significant grade differences. Sleep quality, sleep disturbances, and sleep efficiency scores of juniors were significantly higher than freshmen and Sophomore. Overall, seniors and juniors have ~~were~~ worse sleep than freshmen and Sophomores. Wang Haiqing found that the higher the grade level, the higher the detection rate of sleep disorders would be. As for the reason, higher levels of stress, anxiety, and depression were found in upper grades compared to freshman and sophomore students(Wang et al., 2016). Previous studies also have shown that older students have increased levels of depression (Bostanci et al., 2005; Naushad et al., 2014), which is likely due to juniors and seniors facing higher levels of academic and employment pressures than younger students. However, some researchers, Bayram and Bilgel (2008), concluded that freshman and sophomore students have the highest levels of depression, anxiety, and stress (Bayram & Bilgel, 2008). Such discrepant results suggest that future research needs to delve further into the specific stressors of each college year to treat and care for all university students properly.

The results of the gender difference test showed that female students were significantly higher than male students on the PSQI scores of sleep quality, sleep duration, sleep efficiency, sleep disturbance, daytime dysfunction, and total score. Male students' bedtime and wake-up time were significantly later than female students, and female students' sleep time was significantly higher than the male students. Overall, male students' sleep was better than female students, similar to the results of previous studies (Ling & Xin, 2014). Previous findings find that female students require longer sleep latency compared to male students, have more prominent sleep disturbances, sleep less efficiently (Becker et al., 2018), use more hypnotic drugs, function worse during the day (Becker et al., 2018), have worse sleep patterns, and wake up more easily (Tsai & Li, 2004). With the continuous development of the changing times, female rising status in society and more economic independence, along with the increasing social pressure, coupled with female unique personalities and physiological characteristics. Which may affect the sleep quality of female university students (Ham et al., 2017). Overall, gender differences in sleep quality among university students and the reasons for the differences need to be further explored.

In conclusion, during the home quarantine period of the epidemic, the sleep patterns of Chinese university students showed late bedtime and sleep problems were prone to occur in upper grades. Future studies could pay more attention to the sleep problems that may occur in senior students.

However, the present study has some limitations. First, this study used an online questionnaire to fill out and did not balance factors such as regional and severity of the epidemic, which would introduce some sampling bias into the study. Second, this study measured university students' sleep status by subjective reporting and did not use objective instruments (such as sleep wristwatches) to test university students' sleep, and the subjective reporting may differ from the actual situation (Nelson et al., 2014). Third, this study attempted to have students report the average of their sleep without considering the variability of sleep rhythms during the week, fluctuations in the regional development of the epidemic, and the health of family members. Future research could focus more on these aspects, balancing the impact of area safety and other factors, which would provide a more comprehensive and precise understanding of the epidemic's impact on the sleep patterns of university students to provide more targeted help.



### Significance of the Study

This study could help to understand the sleep patterns of university students of different grades and genders, and provide theoretical evidence for exploring the impact of university students' sleep patterns on individual mental health amid covid-19 home quarantine. University students in the epidemic need active attention, help and support from the government, families and administrators of higher education institutions. Therefore, according to the results of this study, when the covid-19 gradually stabilizes, the government and schools should cooperate to solve the problems of university students and provide them with crisis-oriented, high-quality, and timely psychological services.

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