Relation between Circadian Rhythm, Sleep Quality, and Academic Anxiety

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Abstract. In this era of intense competition and economic downturn, there are many uncertain factors in society, and college students are facing great academic and employment pressures. Currently, college students pay more attention to their job opportunities, and because they are just adults, they may lack knowledge about physical and mental health, and pay insufficient attention to sleep problems and mental health. This article investigates how academic worry affects sleep in college students using the literature review method. The study found that sleep procrastination and insufficient sleep would directly and significantly affect the anxiety level and learning state of college students. Students with night-type circadian rhythm have a significantly higher anxiety level than others, and the anxiety level of graduating students is significantly higher than that of other grades. Moreover, the social jet lag of college students is different from that of other groups, so it is difficult to investigate because university students often live in a close environment.

Keywords: Sleep procrastination, anxiety, college students, circadian rhythm.

1. Introduction

1.1. Research Background

It must be acknowledged that due to the intense competition in the workplace in recent years, current college students are facing significant academic pressure, and a large proportion of them are experiencing sleep problems. According to the China Sleep Research Report, college students nowadays typically stay up late. Just 3.07% of college students do not stay up late, compared to 57.96% who do so frequently and 38.97% who do so occasionally. At 52.06%, the most frequent excuse for staying up late is having too many thoughts that interfere with falling asleep, becoming the main cause of students staying up late and having the biggest effects on the quality of their sleep (China Daily Network, 2023).

According to reports, sleep problems among college students account for half. Fewer than 5% of college students maintain a regular sleep schedule, which significant impacts on the physical and mental health of students. Whether sleep problems thoughts are related to academic pressure is the issue that this paper will investigate.

1.2. Definitions

Academic anxiety: Academic anxiety is a broad concept that mainly focuses on the pre-clinical anxiety experienced by learners in various educational scenarios. This is an experience of negative emotional reactions that occur in the presence of perceived academic stressors. The individualized manifestations of learners' anxiety are generated through the interaction of environmental stimuli (such as academic expectations, task perception) and personal factors (such as anxiety trait tendencies, perceived efficacy, and previous experiences) (Finch, Cassady, & Helsper, 2024).

Biological rhythms: Biological rhythms are any biological processes that display an approximately 24-hour oscillation. h. These 24-hour rhythms are driven by the circadian clock, which is an internal pacemaker observed in plants, animals, even fungi and cyanobacteria (Pines, 2016).

2. Research Review

According to the American Psychological Association, Anxiety is characterized by tenseness, intrusive thoughts, and physical symptoms like high blood pressure. Anxiety can be detrimental because it can result in maladaptive behaviors like avoidance, excessive fear, and sadness that interfere with day-to-day functioning (Collie, Ginns, Martin, & Papworth, 2017). Severe academic anxiety in students can result in a series of physical and mental health problems, even self-harm, self-mutilation, and suicide (Meng, Ma, & Shi, 2023).

Academic pressure, economic pressure, and interpersonal relationships are the main reasons affecting sleep quality (Gideon & Bayray, 2025). Another literature indicates that engineering colleges and education colleges face more severe anxiety problems, and this belief often stems from catastrophic thinking, such as catastrophic employment difficulties (Chan & Sun, 2021). It can be seen that academic pressure has a negative correlation with the sleep quality of college students and is one of the main influencing factors.

Regarding the research on college students' sleep anxiety, some studies have pointed out that social media and sleep procrastination may also trigger anxiety (Huang, Zhang, Li, et al., 2024). Poor sleep quality and high social jet lag increase the risk of co-occurrence of anxiety and depression symptoms among college students (Xiang, Niu, Li, et al., 2024). It can be seen that not only does academic pressure lead to sleep problems, but irregular sleep also easily leads to increased stress.

Current pressure issues are closely related to the COVID-19 and social transformation. The report shows that in the early stage of the pandemic, 60% of students in the United States had poor sleep quality, and a major reason was traumatic events (Ulrich, Full, Cheng, Gravagna, Nederhoff, & Basta, 2023). Therefore, in this period, college students' anxiety is a very worthy topic for research. Another study indicates that during the social transformation stage, internal competition has become an inevitable factor in psychological and social development, and college students generally have this mentality (Fang & Ma, 2025). This is not only because of the COVID-19 pandemic but also because of the mental problems of college students and the phenomenon of internal competition in today's rapidly developing technology society.

Therefore, academic pressure and sleep constitute a highly relevant research topic. Will academic pressure become a major factor affecting college students' sleep? If so, to what extent does the academic anxiety of freshmen, sophomores, and juniors affect sleep?

The current research gap is the extent to which academic anxiety affects sleep among freshmen, sophomores, and juniors. This research question can provide a clearer picture of the status of college students at different grades, thereby implementing different intervention measures for different grades.

Regarding this research, the subjects were first-year, second-year, and third-year students. The study focused on the relationship between sleep duration and academic anxiety.

Quantitative scales will be used in this research. A questionnaire survey will be conducted using stratified sampling from each of the first, second, and third years, with 60 people sampled from each year. Among these 60 people, 50 who answered seriously will be selected as the formal scale, divided into one questionnaire containing two scales. A standardized questionnaire will be used to measure the degree of academic anxiety among all college students, and a professional stratified questionnaire will be used to measure sleep quality. Firstly, the overall impact of academic pressure on sleep indicators will be statistically analyzed to verify whether academic anxiety is negatively correlated with sleep quality. The information will then be broken down by grade to determine how first-, second-, and third-year students differ in terms of their academic anxiety and sleep quality.

The Pittsburgh Sleep Quality Index (PSQI) was used to investigate the sleep quality of college students in the past month. This scale consists of 19 items and 7 dimensions. Each dimension is rated from 0 to 3, yielding a total score between 0 and 21. The higher the score, the worse the sleep quality. A PSQI score ≤ 7 is defined as good sleep quality, and a PSQI score > 7 is defined as poor sleep quality. The Cronbach's alpha coefficient of this scale is 0.91 (Liu, Tang, Hu, et al., 1996).

The Organisation for Economic Co-operation and Development (OECD) conducted a second round of international large-scale formal assessment of the Study for Social and Emotional Skills

(SSES) worldwide among adolescents. The academic anxiety as the dependent variable consists of 5 questions, such as "I often worry about encountering difficulties in exams" "Worried about not getting good grades at school" "I will feel anxious about academic failure" etc. The questions are scored using a five-point scale (1 = strongly disagree; 2 = disagree; 3 = generally; 4 = agree; 5 = strongly agree), and OECD combines them into a standard score. A student's degree of academic anxiety increases with their score. The alpha coefficient of this variable is 0.93, with high reliability (OECD, 2017).

College students will be the subjects of the survey. The PSQI and the anxiety section of the OECD scale will be used. The PSQI is used to measure sleep quality, and the anxiety index section of the OECD scale measures the anxiety levels of college students. Regarding the questionnaire survey:

Three schools will be surveyed, with research subjects and topics clearly stated. 50 copies for each grade.

The researchers write the introduction and allay the concerns of the respondents.

Regarding the collection of the respondents' basic information, such as gender, grade, major, the degree of importance attached to studies, and satisfaction with the major, those information will be collected.

Researchers use quantitative research, all using the Likert five-point scale method. It will be divided into the sleep index section and the anxiety section, with mixed questions to avoid the respondents knowing the purpose of the survey. A total of 65 questions, 28 of which are designed according to the PSQI, and 28 of which are designed according to the OECD anxiety scale. The PSQI has 7 dimensions, each with 3 questions, and the remaining 7 questions measure sleep frequency and sleep onset time.

Among the 9 questions, 5 are interference items not included in the standardized scale to avoid students deliberately answering, such as "Did you sleep well last night? ", 4 are reminder questions, such as "If you are answering seriously, choose A", to avoid students dozing off when answering and also to help people detect answer sheets filled out carelessly.

For pre-survey, 30 copies will be distributed using convenience sampling, and then statistical analysis will be conducted. If there are no problems, it will be included in the formal survey.

For formal survey (sampling and distributing questionnaires):

1. Questionnaire distribution: Stratified sampling by grade is conducted in three different universities, with stratified sampling by grade in each university, 60 copies for each grade, a total of 540 copies. The grade number will be sent by email.

2. Questionnaire collection: Discard 10 invalid questionnaires from the 60 copies, select 50 copies that were answered carefully, then collect, count, and analyze.

3. Data organization and analysis: First analyze the overall trend (the correlation between anxiety and sleep quality), then analyze the sleep quality and academic anxiety levels of each university's three grades.

The data analysis will include descriptive statistics, reliability and validity tests, correlation analysis, and regression analysis.

This study will employ descriptive statistics to conduct frequency statistics on the basic information of the respondents, including gender and grade.

Reliability: This study will analyze the Pittsburgh Sleep Index and the OECD scale separately, and conduct reliability tests for each.

Correlation analysis: The correlation between the two variables. This study will use correlation analysis to investigate whether there is a significant correlation between academic anxiety and sleep quality, whether it is positive or negative.

Regression analysis: This study will take the degree of academic anxiety as the independent variable and sleep quality as the dependent variable to verify whether the independent variable has a relationship with the dependent variable.

3. The Relationship between Psychological States, Sleep Quality, Anxiety, and Academic Engagement among College Students of Different Grades

Previous studies adopted a convenience sampling method, involving 3,143 male and 4,811 female participants. The International Physical Activity Questionnaire-Short Form (Chinese Version) was used to measure physical activity, and the Patient Health Questionnaire was used to measure feelings of anxiety and sadness, sleep quality was measured with the PSQI, and physical examinations were conducted using standardized instruments. Body Mass Index (BMI), carbonated beverage consumption, and fast food consumption were also investigated.

The detection rate of depressive symptoms among college students was 25.67% (2,042 individuals); the detection rate of anxiety symptoms was 35.39% (2815 individuals); and the coexistence rate of depressive and anxiety symptoms was 23.15% (1841 individuals). Among them, the number of freshmen was 1,014, sophomores 3,249, juniors 1,781, and seniors 1,910. The number of anxiety patients was 352 (34.7%) among freshmen, 1,088 (33.5%) among sophomores, 595 (33.4%) among juniors, and 412 (40.8%) among seniors. It can be concluded that anxiety is slightly higher among freshmen and the highest among seniors, about 7% higher than in other grades.

Regarding sleep and anxiety symptoms, 246 individuals (49.3%) slept less than six hours, 856 (43.0%) slept between six and less than seven hours, 1,635 (31.4%) slept between seven and nine hours, and 78 (29.7%) slept more than nine hours. It can be seen that most people sleep between seven and nine hours, and sleep duration directly affects anxiety symptoms, showing a negative correlation between sleep duration and anxiety symptoms. Additionally, it was mentioned that sleep quality directly affects anxiety. The detection rate of anxiety among those with poor sleep quality was 75.1%, while among those with good sleep quality, it was 31.7% (Zhu, Xiong, Tang, et al., 2025).

This study concludes that seniors have the most severe anxiety problems, followed by freshmen. Those who sleep less than six hours have the most severe anxiety, and sleep duration is negatively correlated with anxiety. Moreover, individuals with poor sleep quality are more likely to experience anxiety problems.

Another study used the General Information Questionnaire (including general information about students), the PSQI, and the Academic Engagement Scale: the Chinese version of the Academic Engagement Scale includes three dimensions: motivation, energy, and concentration. Finally, SPSS was used for statistical analysis. Compared with high sleep quality, severe sleep disorders, low sleep quality, and difficulty falling asleep were all negatively associated with academic engagement (Liu, Liu, Zhang, et al., 2025).

Other studies have shown that sleep procrastination not only delays an individual's sleep time, affects sleep quality, and leads to insufficient sleep time, but may also cause excessive compensatory sleep (Zhang, Song, Yang, et al., 2024). Across all stress perception groups, anxiety positively associated with sleep procrastination; in the medium-stress perception group, anxiety positively associated with sleep procrastination; and in the high-stress perception group, anxiety positively associated with sleep procrastination. This indicates that as stress perception increases, the impact of sleep procrastination on anxiety becomes stronger (Huang, Zhang, Li, et al., 2024).

Regarding the limitations of the research, the current study only mentioned the possible influence of anxiety and depression on academic pressure but did not specifically detect how they affect academic pressure.

4. The influence of circadian rhythms and social jet lag

The participants were 18- to 25-year-old college students from three universities in Jinzhou City. A convenience sampling method was adopted. A general situation questionnaire was used, which mainly included age, gender, major, grade, place of origin, height, weight, smoking status, drinking status, and physical exercise status. A sleep questionnaire, a depression self-rating scale, an anxiety self-rating scale, and body mass index were among the tools utilized. All the respondents filled out

the questionnaire anonymously and voluntarily. The data from the electronic questionnaire were imported into SPSS for statistical analysis.

The average sleep duration of college students was 7.27 (6.80, 7. 79) h/d; The weekly sleep deprivation time was 1.43 (0.60, 2.50) hours; the social jet lag was 0.71 (0.25, 1.21) hours. Secondly, regarding the detection of anxiety symptoms, anxiety problems were more severe among the late risers among college students, followed by the early risers. The psychological issues of the fifth year of university were more severe among all the students. In this study, the phenomenon of social jet lag was not an independent influencing factor for depression and anxiety symptoms. Compared with other populations, college students have different sensitivity to social jet lag, which might be related to the suspension of classes. College students have more regular sleep schedules (Li, Cheng, Li, et al., 2022).

The second study was conducted from September to November in the autumn semester of 2018 to 2020 through online distribution of online questionnaires. The time for freshmen to fill out the assessment questionnaire was within 2 months; individuals with severe physical diseases (defined as chronic cardiovascular and cerebrovascular diseases, diabetes, hypertension, neurological diseases, infectious diseases, and cancer, etc.) and those previously diagnosed with mental disorders were considered for exclusion. Inclusion criteria included voluntary participation in this study and signing an informed consent form.

General demographic information was categorized into three groups: ≤17 years, 18 years, and ≥19 years. The research design route was that the researchers sent invitation links for assessment to 9,496 first-year undergraduate students who met the inclusion criteria, a total of 8,722 college students signed and participated in the assessment. After data quality control and screening of exclusion criteria, 8244 valid surveys in all were gathered, yielding an 86.82% valid response rate; among them, 3,007 participated in the first-year follow-up, and 1,354 college students participated in the follow-up for 2 consecutive years.

The scales included the depression scale, the circadian rhythm scale, the sleep index scale, the health questionnaire, and the frequency and intensity of life events were evaluated using the University Life Events Rating to assess the occurrence and intensity of stress. Statistical processing was performed using IBM SPSS 25.0 software for descriptive statistics, correlation, and logistic regression analysis; a mixed-effects model was established for longitudinal data using HLM 6.08 software and SPSS 25.0 software for analysis.

The number of college students with night-type circadian rhythm type was the highest (4,301, 52.1%), followed by the middle type (3,708, 45.0%), and the least was the morning type (235, 2.9%). Compared with the middle type, those with night-type circadian rhythm type were more likely to have depression; it is notable that compared with the middle type, the morning type had no statistically significant impact on depression. In addition, those with poorer sleep quality, more severe physical symptoms, and greater life event stress were more likely to have depression.

The circadian rhythm type has an impact on the depression of college students, compared with the middle type, those with the night-type circadian rhythm type were more likely to have depression (Lyu, Tang, Wang, et al., 2021).

5. Discussion and Suggestion

The overall conclusion of this study is that the graduating class experiences the greatest stress, and irregular sleep patterns can, in turn, lead to anxiety problems. People who sleep for less than 6 hours are particularly prone to anxiety disorders. The greater the difference in social jet lag, the higher the risk of depression and anxiety. This study offers the following suggestions. Firstly, college students need to ensure adequate sleep and maintain a good circadian rhythm. Secondly, a good circadian rhythm can reduce the risk of depression and anxiety and improve learning efficiency.

Schools and social systems should provide sufficient support systems for college students. For instance, popularizing training on circadian rhythm-related knowledge enables students to understand

such knowledge. It is best to establish regular psychological support and monitoring systems. Future research should examine the degree of academic anxiety among college students of different grades, the reasons for it, the ways it affects sleep, and the extent of its impact.

6. Conclusion

This article examines two issues: the impact of sleep quality on academic performance and mental state, and the influence of circadian rhythm on mental state and sleep. The results of Liu Mengting's article indicate a negative correlation between learning engagement and sleep difficulties. Huang Yu's article indicates that as perceived stress increases, the impact of sleep procrastination on anxiety becomes stronger. In the second part, the survey found that individuals with intermediate night types were more likely to experience depressive emotions, and college students generally have a night type circadian rhythm. This article suggests that college students need to ensure adequate sleep, maintain a good circadian rhythm, and try to go to bed early. Schools and social systems should provide college students with sufficient support systems. Future research directions should focus on the degree of academic anxiety among students of different grades, the reasons, and how it affects sleep, and the extent of the impact.

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