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The Connection Between Undergraduates' Academic Self-efficacy, Anxiety, and Sleep Quality

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Abstract: The increasing pressure on university students has led to gradually higher levels of sleep problems and anxiety, which adversely affects the development of their self-efficacy. This study applied anxiety as a mediating variable to examine the intrinsic link between sleep quality and academic self-efficacy. Questionnaires were collected from 245 university students based on the Pittsburgh Sleep Quality Indicator Scale(PSQI), Generalized Anxiety Disorder Scale(GAD-7) and Academic Self-efficacy Scale(ASE). There were no gender significant differences in all three areas from the result. Academic self-efficacy was negatively correlated with anxiety and sleep quality significantly. Anxiety acted as a partial mediator between sleep quality and academic self-efficacy, with an effect size of 33.9%. As a result, sleep quality can be influential in academic self-efficacy, both directly and indirectly through anxiety. The contribution of this paper is to inspire schools to set their sight on the sleep and psychological situation of university students and diversify activities on campus to relieve stress.

Keywords: sleep quality, anxiety, academic self-efficacy, university students

1. Introduction

Sleep is an essential and fundamental need for each individual. With the backdrop of increasing awareness of healthy living, people gradually pay more attention to the importance of sleep quality. The university period is a significant stage in life because it means independence and socialization. Despite the more liberal living environment at college, students' sleep quality has not improved with the change in this circumstance, and they have continued to be under pressure from multiple aspects such as studies, careers, and families. One survey revealed that the percentage of undergraduates who had inferior sleep quality is 40.57% [1]. As a result, focusing on youth sleep quality is an urgent task because it also serves as a critical predictive Index of mental health. It has been demonstrated that there is a two-way relationship between mental health and sleep quality. Sleep disturbances can be caused by mental health issues, and inadequate sleep can lead to anxiety, depression, and stress [2]. Anxiety and depression are symptoms of psychological health problems [2]. University students' sleep patterns and anxiety symptoms were analyzed using the Pittsburgh Sleep Quality Index and the Self-Rating Anxiety Scale by Daoyang Wang et al.. They discovered that the PSQI score was positively associated with the SAS score, with an explanatory rate of 22.1% [3]. The PSQI scores

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displayed by students who were more anxious were higher than those who had no anxiety symptoms [3].

The definition of self-efficacy is the conviction that people have the capability to accomplish a behavior or achieve a goal. The experiences of personal success or failure, alternative experiences, verbal persuasion, and physical and emotional states are the channels by which self-efficacy beliefs are acquired [4]. As a result, emotions shape self-efficacy beliefs by influencing behavioral performance [4]. This means that negative emotions like anxiety and depression can impair judgments of one's own abilities, resulting in a lower level of self-efficacy. Simultaneously, self-efficacy had a significant impact on anxiety and sleep disorders, both of which had negative correlations with it [5]. The available research suggests that sleep quality can affect learning. High-quality and sufficient sleep with optimal duration is beneficial for learning, as it contributes to concentration, cognitive functions, sensorimotor integration and memory processing [6]. In the sphere of learning, self-efficacy is specified as academic self-efficacy. These indirectly indicate that sleep quality is one of the key factors in studying academic self-efficacy, but further explorations of their relationship are needed. Discussing the relationship between them can offer a timely understanding of university students' learning and guide attention to the impact that sleeps quality and anxiety may have on learning.

2. Research Hypothesis

Although the relevance between anxiety and sleep quality, self-efficacy and sleep quality have been explored by previous researchers separately, the studies about whether sleep quality can directly affect academic self-efficacy and about the interactions between sleep quality, anxiety and academic self-efficacy are less. Therefore, the author created a hypothetical model to uncover the intrinsic mechanism connecting sleep quality and academic self-efficacy, using anxiety as a mediating factor (Figure 1). This will help people comprehend the sleep status and psychological well-being of university students effectively. Schools and families can enhance students' academic self-efficacy through positive interventions to help them complete their studies well. For this purpose, the following hypotheses were proposed for this research:

Hypothesis 1: Academic self-efficacy was significantly and negatively related to sleep quality and anxiety.

Hypothesis 2: Sleep quality directly affects academic self-efficacy.

Hypothesis 3: Anxiety is a mediator between sleep quality and academic self-efficacy.

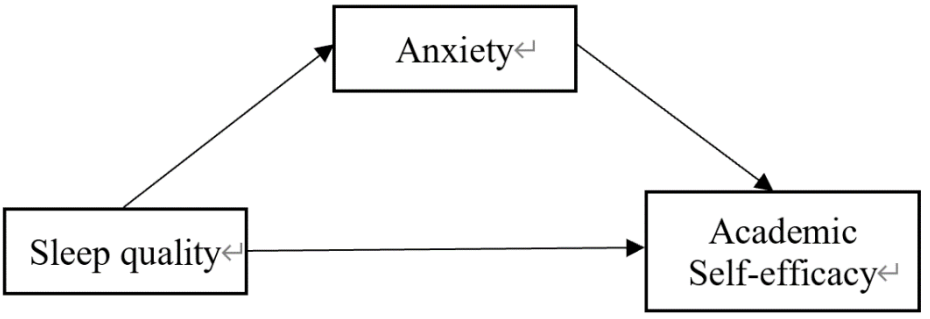

Figure 1: Intermediary model.

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3. Methods

3.1. Participants

University students in the China region were the subjects of the current investigation. The online collection yielded 245 valid questionnaires, with an effective rate of 61%. The average time taken to complete the questionnaire was approximately 4 minutes. There were 101 male students (41.22%), 144 female students (58.78%), 22 freshmen (8.98%), 59 sophomores (24.08%), 77 juniors (31.43%), and 87 seniors (35.51%).

3.2. Materials

The Pittsburgh Sleep Quality Index(PSQI) Scale measures the quality of sleep of people with sleep disorders and mental disorders in the last month. It is also applicable to the assessment of general public sleep. The scale was compiled by Buysse et al. in 1989 and revised by Xianchen Liu in 1996 [7]. The 18 self-evaluation items involved in the scoring comprise seven components, including subjective sleep quality, sleep latency, sleep efficiency, sleep duration, sleep disruptions, usage of hypnotic medicine, and daytime dysfunction. The total PSQI score is obtained by adding up the individual components, with a maximum score being 21. Higher scorers get lower-quality sleep than lower scorers. Scale reliability measures include split-half reliability, retest reliability, and internal consistency coefficient, all of which are, respectively, 0.84, 0.87, and 0.81 [7].

The scale of academic self-efficacy created by Yusong Liang and Zongkui Zhou of Huazhong Normal University was selected for this study [8]. The scale comprises two dimensions, learning ability and learning behavior, which represent judgments of one's ability to acquire knowledge and estimates of whether one can take actions to achieve learning goals, respectively. Each dimension has 11 questions, totaling 22 questions. The measure is graded on a Likert scale of 1 to 5, with 1 being a complete non-conformity and 5 being a complete conformity. The sense of self-efficacy increases with the score. For the two dimensions, the internal consistency coefficients were 0.820 and 0.752, respectively [9].

To gauge the respondents' anxiety over the previous two weeks, the Chinese translation of the Generalized Anxiety Disorder (GAD-7) Scale was employed. The scale includes 7 items; each with a Likert scale format of four points (0 means hardly ever and 3 means virtually daily). Higher values signify more acute anxiety, with the maximum being 21, depending on the individual. Its reliability and validity are positive, and Cronbach's alpha of 0.90 [10].

3.3. Statistical Methods

SPSS 26.0 was utilized for statistics and analysis of data. Differences in sleep quality, academic self-efficacy and anxiety by gender were analyzed using independent samples t-tests. The relationship between various variables was examined using Pearson correlation. $P<0.05$ indicates that the results have statistical significance. Intermediation effects were examined by the macro program PROCESSv4.1.

4. Results

4.1. Descriptive Statistical Analysis and Difference Analysis

Comparison of differences in university students' sleep quality, anxiety and academic self-efficacy of both genders using independent samples t-test (Table 1). The results showed that boys and girls did not differ significantly in their total PSQI scores, total GAD-7 scores and academic self-efficacy.

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Table 1: Gender differences in sleep quality, anxiety and academic self-efficacy.

	group	M±SD	t	P
PSQI	males	6.72±3.54	-1.223	0.222
	females	7.26±3.24		
GAD-7	males	7.12±4.89	-0.299	0.765
	females	7.31±4.77		
ASE	males	76.76±16.21	0.816	0.415
	females	75.18±12.89		

4.2. Correlation Analysis of Sleep Quality, Anxiety, and Academic Self-efficacy

Students' PSQI total score and each component score, GAD-7 total score, academic self-efficacy and its dimensions were evaluated by Pearson correlation analysis (Table 2).

According to the results, the score of PSQI and GAD-7 was negatively related to academic self-efficacy and its two dimensions. Subjective sleep quality, sleep efficiency and daytime dysfunction components of the PSQI were significantly and negatively linked to academic self-efficacy and its dimensions.

Table 2: Correlation of the PSQI, GAD-7 and ASE scores among college students.

	1	2	3	4	5	6	7	8	9	10	11	12
1.ASE	1											
2.Learning ability	0.951**											
3.Learning behavior	0.943**	0.793**										
4.GAD-7	-0.304**	-0.322**	-0.252**									
5.PSQI	-0.292**	-0.291**	-0.260**	0.456**								
6.Subjective sleep quality	-0.264**	-0.263**	-0.236**	0.389**	0.748**							
7.Sleep latency	-0.144*	-0.121	-0.152*	0.318**	0.723**	0.546**						
8.Sleep duration	-0.084	-0.098	-0.059	0.174**	0.574**	0.358**	0.260**					
9.Sleep efficiency	-0.198**	-0.200**	-0.174**	0.286**	0.714**	0.406**	0.408**	0.345**				

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Table 2: (continued).

10.Sleep disturbances	-0.113	-0.145*	-0.066	0.336**	0.564**	0.359**	0.312**	0.192**	0.286**			
11.Hypnotic drug use	-0.076	-0.050	-0.095	0.085	0.296**	0.097	0.092	0.083	0.161*	0.252**		
12.Daytime dysfunction	-0.336**	-0.339**	-0.295**	0.369**	0.667**	0.409**	0.340**	0.225**	0.344**	0.343**	0.069	1

*p<0.05, ** p<0.01. ASE: Academic Self-Efficacy score, GAD-7: Generalized Anxiety Disorder score, PSQI: Pittsburgh Sleep Quality Index Score.

4.3. The Mediating Role of Anxiety Between Sleep Quality and Academic Self-efficacy

For the purpose of confirming the mediating role of anxiety, the study applied Bootstrap (N=5000). Results showed that sleep quality is a negative predictor of academic self-efficacy (β=-0.19, P<0.05). Sleep quality can positively predict anxiety (β=0.46, P<0.01). Anxiety can negatively predict academic self-efficacy (β=-0.22, P<0.05). Regression analysis showed confidence intervals for the indirect and direct effect paths were [-0.74, -0.11], [-1.39, -0.26] respectively, neither of which contained 0. The contribution of the indirect effect to the total effect was 33.9% (Table 3). This is evidence that anxiety partially mediates how sleep quality affects academic self-efficacy.

Table 3: Analysis of the mediating effect of anxiety.

Paths	Effect	BootSE	Effect rate	95%CI	
				Low	High
Total effect：sleep quality→ academic self-efficacy	-1.24	0.26		-1.76	-0.73
Direct effect：sleep quality→ academic self-efficacy	-0.82	0.29	66.1%	-1.39	-0.26
Indirect effect：sleep quality→ anxiety→ academic self-efficacy	-0.42	0.16	33.9%	-0.74	-0.11

5. Discussion

Based on a total PSQI score of ≥8 as having poor sleep quality, 37.55% of university students in this study experienced sleep quality problems. It denotes that sleep quality has become one of the major problems plaguing the university population. Besides, there are students with moderate or severe anxiety scoring 10 or more on the GAD-7, accounting for 28.98% of the total. In contrast to existing research, no significant gender discrepancies were witnessed in university students' sleep quality, anxiety and academic self-efficacy. Girls are found to have substantially more sleep problems than boys in research [11]. The quality of sleep can be influenced by behavioral and psychological factors [1]. Due to the inability of the data collection to exclude the different living circumstances of the subjects, it is likely to obtain non-significant results in this study. In terms of anxiety, the degree of it was generally greater in females than in males in two studies, which both used the State Trait Anxiety Inventory (STAI) [12][13]. However, the Generalized Anxiety Disorder Scale (GAD-7) was the instrument utilized in this investigation. Findings on gender differences in academic self-efficacy are

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scarce and inconsistent. Men have higher academic self-efficacy than women, according to one study [12]. Another study divided subjects into three groups based on their perceived self-efficacy scores using the Academic Behavioral Self-Efficacy Scale. Gender differences in the three domains of ideal, achievability, and rate of improvement were investigated. Women consistently had significantly higher levels of ideal self-efficacy than men, regardless of their perceived self-efficacy scores [13]. More research is needed to focus on the underlying causes of gender differences.

Significant relationships existed among academic self-efficacy, anxiety, and sleep quality. Except for the usage frequency of the hypnotic drug, anxiety was strongly and favorably correlated with sleep quality and its six components. In a cross-sectional study of undergraduates at the University of Ontario Institute of Technology, Reynolds reported the frequency of sleeping pill use was irrelevant to symptoms ranging from moderate to extremely severe anxiety [14]. Academic self-efficacy and its two dimensions were significantly and negatively related to anxiety, which is the same as previous research findings. Over the period of COVID-19, a study revealed a negative relationship between anxiety and perceived academic self-efficacy [12].

According to the survey, anxiety may play a role in mediating the relationship between sleep quality and academic self-efficacy. Anxiety positively predicted sleep quality, while anxiety negatively predicted academic self-efficacy. On the one hand, sleep quality influences academic self-efficacy. Poor sleep quality, on the other hand, increases anxiety, which has a knock-on effect on academic self-efficacy. This is because of the following factors: To begin, sleep deprivation has a significant impact on the brain system, which operates most durably and maturely during adolescence [15]. Although memory is not significantly related to sleep duration, excessive or scarce sleep duration can be detrimental to overall cognitive function, and inferential and linguistic functions [16]. Therefore, university students with poor sleep conditions experience cognitive problems that interfere with their subjective speculations about the ability to complete learning tasks and adopt learning methods to achieve their goals. Secondly, researchers discovered that students who had inadequate sleep were more prone to present negative feelings like fear and concern [2]. Meanwhile, boredom, frustration, and other emotional traits manifested by anxiety may have a harmful impact on self-efficacy and achievement motivation [12]. This causes university students to suffer from self-doubt and show pessimistic attitudes toward learning.

6. Conclusion

In summary, academic self-efficacy can be impacted by two pathways, one being sleep quality and the other through the intermediary of anxiety. Reducing anxiety in university students can increase their positive emotions and academic confidence. As a result, schools can reduce student anxiety in a variety of ways. Schools, for example, can provide a variety of free electives to help students develop their extracurricular skills; encourage campus clubs to help students improve their social skills; and actively launch mental health education activities such as social practices, lectures, and class meetings. This study systematically demonstrates the relationship between the three variables, allowing researchers to focus on the intrinsic effects of sleep on learning rather than academic performance. It pioneers a new approach to sleep research among university student groups. This investigation comes with a few drawbacks: In the first place, concerning the collection of data, this study investigated the situation of different universities in different regions, which is not conducive to excluding the influence of individual environmental factors on the results. Future studies could either focus scopes on a certain region or control respondents to a particular specialty. The second point is that this study did not consider whether other variables were also involved. Researchers often discuss the similarities and differences in the relationship that anxiety and depression have with sleep quality. Further research is advised to assess depression's mediation role and compare it with anxiety.

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