International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Exploring Sleep Quality, Exercise Adherence, and Mental Health in College Students

Rui Yin[1], Mei Li[2]

[1]School of Physical Education and Health, Zhaoqing University, Zhaoqing, Guangdong Province, China

[2]College of Physical Education ， Hubei University of Science and Technology, Xianning, Hubei Province, China (Corresponding Author)

Abstract: ***This study examines the interplay between sleep quality, exercise adherence, and mental health among college students. Utilizing the Pittsburgh Sleep Quality Index, General Health Questionnaire-12, and Exercise Adherence Scale, data from 2,380 participants were analyzed. Results reveal significant relationships, with exercise adherence mediating the effect of sleep quality on mental health. Findings underscore the importance of fostering good sleep habits and consistent physical activity to enhance mental health in the college demographic.***

Keywords: sleep quality, mental health, exercise adherence, college students, psychological well-being

1. Introduction

In order to implement the guidelines put forward by the 20th Party Congress and the implementation of China Education Modernization 2035 and the Healthy China Initiative, the Ministry of Education (MOE) and sixteen other departments jointly issued the Action Plan for Strengthening and Improving Students' Mental Health in the New Era (2023-2025). The plan aims to comprehensively enhance students' mental health services and education, take health education as the core of the teaching philosophy, emphasize the cultivation of students' moral qualities, intellectual development, physical health, aesthetic interests and the ability to combine work and leisure, and strive to improve the mental health of students through the participation of all members and the implementation of the whole process, and with the strategy of whole-person education, aptitude cultivation, and mindfulness care as an integrated whole, and work to enhance the Students' mental health literacy [1].

WHO (2001) defines mental health as a sustained, effective, and satisfying psychological state, which is reflected in stable emotions, moderate behaviors, and the ability to coordinate relationships and adapt to the environment. In this state, individuals recognize their own potential and are able to cope with life's stresses, engage in work effectively, and contribute to society [2].

On World Sleep Day 2023, the China Sleep Research Report 2023 was released, again highlighting profound sleep problems, especially for the college student population. The report reveals that the proportion of college students with sleep disorders ranges from 36.1% to 50.1%, a figure that highlights the prevalence and severity of sleep problems and emphasizes the indispensable concern for college students, the future pillars of society. China Sleep Study Report 2023 was officially released, China Sleep Study Report_Sina News (sina.com.cn))[3]. Domestic studies have pointed out that sleep quality problems of college students have become one of the most important problems threatening physical and mental health (Cui Yuling, Ni Shoujian, Liu Pengfei, et al, 2014) [4].

The mechanism of the relationship between sleep quality and mental health has received much attention in the fields of psychology and medicine (Kuang Pei Zi, 1987) [5]. As a basic indicator of health, sleep quality is closely related to physiological and psychological functions (Li Deming, 1987) [6], and the two may have a causal relationship (Tong Ping, Wu Chenghong, 2010) [7]. Domestic studies have focused on the relationship between sleep and traditional stressors, such as study, work, and society [8-14], while foreign studies have confirmed that sleep quality is closely related to mental health [15-22]. Recent studies have shown that sleep quality is an important factor affecting mental health and may lead to various psychological problems [18]. Therefore, we propose hypothesis H1: sleep quality has a positive predictive effect on college students' mental health.

Scanlan et al. found that it is closely related to the persistence of its participation in sports through the study of sports commitment model. Studies have shown that adolescents who experience a high level of athletic enjoyment and devote enough time and energy to participate wholeheartedly will show greater commitment to physical activity. An important way to increase commitment to physical activity and promote individuals' sustained participation in physical activity is to increase awareness of the benefits of physical activity so that individuals who have a more positive experience of the effects of physical activity will show higher levels of commitment to exercise (Scanlan et al., 1993). During the sustained participation phase of physical activity, the main way to increase commitment to physical activity and encourage determination to persist in exercise is to persist in exercise to improve the effectiveness of exercise behaviors so that individuals have a more positive experience of the effects of exercise [23].

Adherence to physical activity reflects an individual's ability and willingness to engage in physical activity on a consistent basis. This persistent exercise habit is crucial for promoting an individual's physical and mental health, which not only enhances physical fitness and improves psychological status, but also promotes social interaction and teamwork. Research has shown that regular participation in physical activity improves an individual's

quality of life, increases self-confidence, and reduces stress and anxiety, while the social connections and sense of belonging formed during team sports have a positive impact on social adaptation and the development of interpersonal relationships. Regular and sustained physical activity is necessary for good and lasting physical and psychological benefits for individuals, and insufficient exercise adherence may be closely related to mental health problems among college students. Based on this view, Hypothesis H2: Exercise adherence mediates the significant effect of sleep quality on college students' mental health.

2. Research Objects and Methods

2.1 Research Object

Convenient sampling method was used to select nearly 20 colleges and universities in Guangdong, Hubei, Henan, Anhui, Shandong, Zhejiang and other provinces of college students as the object of the survey, on November 24-30, 2023, through the questionnaire star link form of online distribution of fill in the answer, a total of 2,560 questionnaires were recovered, and 2,380 valid questionnaires were sorted out, questionnaire validity rate was 92.82%. The average age of the subjects was 19.37±1.3 years old, of which 836 (35.1%) were male and 1544 (64.9%) were female. There were 990 (41.6%) freshmen, 1116 (46.9%) sophomores, 171 (7.2%) juniors, and 103 (4.3%) seniors.

2.2 Research tools

2.2.1 Pittsburgh sleep quality index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI) is a widely used assessment tool to measure sleep quality and sleep patterns in adults. By assessing seven different domains of sleep characteristics: sleep quality, time to fall asleep, actual sleep time, sleep efficiency (i.e., the ratio of actual sleep time to time spent in bed), frequency of sleep disorders, frequency of hypnotic medication use, and degree of impaired daytime functioning, the PSQI provides a composite score reflecting a subject's overall sleep quality. Each factor has its own scoring system, and these scores are ultimately totaled to arrive at a total score.The total PSQI score ranges from 0 to 21, with lower scores indicating better sleep quality. Typically, a score greater than 5 is considered to be indicative of impaired sleep quality. Thus, the PSQI is a useful tool to help physicians and researchers identify sleep problems, as well as to assess the effectiveness of sleep interventions [24]. In this study, the Cronbach a coefficient for the Pittsburgh Sleep Quality Index (PSQI) scale was 0.821.

2.2.2 The 12-Item General Health Questionnaire (GHQ-12)

The scale consists of 12-item sentences describing the state of an individual's life, and subjects are asked to report the degree of conformity based on the past four weeks using a Liken 4-point scale (0=never, 1=occasionally, 2=frequently, 3=almost always). Six of the entries were positive statements (e.g., I am interested in daily pastimes) and were scored on a reverse scale, and the other six entries were negative statements (e.g., I have insomnia due to anxiety) and were scored on a positive scale. The GHQ-12 scores ranged from 0-36, with higher scores indicating poorer mental health [25]. In this study, the Cronbach a coefficient of the GHQ-12) scale was 0.785.

2.2.3 Exercise Adherence Scale (EAS)

This scale was compiled by Wang Shen et al [10] in 2016. A total of 14 entries, totaling three dimensions “exercise behavior”, “effort commitment” and “emotional experience”. A Liken-5 scale was used, ranging from 1 point for “not at all” to 5 points for “completely”. With good reliability, the scoring method is to count the total score at the end, and the higher the score, the stronger the exercise adherence [26]. In this study, the Cronbach a coefficient of the Exercise Adherence Scale was 0.957.

2.3 Data processing

Data were processed using SPSS 26.0 software, and the analytical methods covered the basic description of the data, correlation tests between variables, assessment of the reliability and validity of the measurement instruments, analysis of variance (ANOVA) for between-group differences, as well as regression analyses of the relationships between variables and tests for mediating effects, using the percentile Bootstrap method of bias correction. These steps helped to ensure the comprehensiveness and accuracy of the data analysis when validating the study's presuppositions, mainly based on the latest process of mediation effects testing proposed by Wen Zhonglin et al [27]. The mediation model testing tool used SPSS 26.0 in conjunction with the SPSS macro program PROCESS developed by Hayes (2013).

3. Results and Analysis

3.1 Sleep quality PSQI

Table 1: Gender and grade level differences in college students' total PQSI scores (N=2380)

	M±SD	Freshman	Sophomore	Junior	F
Freshman	4.62±3.41	1			
Sophomore	6.64±4.21	0.002***	1		
Junior	6.80±3.84	0.000***	0.802	1	
Male	5.06±3.49				10.338***
Female	6.65±4.06				
Total	5.92±3.89				9.020***

Table 1 shows that there were significant differences in sleep quality among college students by gender and grade level. The total PSQI score of college students averaged 5.92, reflecting moderate sleep quality, indicating generally lower sleep quality. Female students scored 6.65, which was significantly higher than male students' score of 5.06. Female students' relatively poorer sleep quality may be related to female physiological and psychological characteristics, life pressure and higher sensitivity to sleep. In terms of grades, students' sleep quality scores increased with the rise of grades, with the highest score for juniors (6.8) and the lowest score for freshmen (4.62), reflecting the increase in pressure on academics and future career planning leading to more sleep problems. Although there was no significant difference in sleep quality between

sophomores and juniors, they were both significantly worse than freshmen, which was related to the fact that freshmen had less pressure and sophomores and juniors had to face more academic and future planning pressure.

3.2 Analysis of mental health status

Table 2: Gender and grade differences in health status of college students (N=2380)

	M±SD	Freshman	Sophomore	Junior	F
Freshman	10.56±6.19	1			
Sophomore	13.13±7.14	0.026*	1		
Junior	12.82±6.87	0.022*	0.783	1	
Male	10.45±6.36				3.24***
Female	13.25±6.82				
Total	12.00±6.75				0.03**

Table 2 analyzes the differences in the health status of university students in terms of gender and grade. The average score of female students (13.25) was higher than that of males (10.45), indicating that women have more health problems, which are related to physical characteristics, psychological sensitivity and ways of coping with stress. In terms of grade level, sophomore had the highest score (13.13), junior had the third highest (12.82), and freshman had the lowest (10.56). This reflects the negative impact on health as academic stress and uncertainty about future plans increase with the school year. Sophomores are in a critical period and face greater psychological pressure and health challenges. Significant differences between freshmen and sophomores, juniors and between males and females suggest that colleges and universities should provide differentiated health promotion and psychological support services, such as career planning and time management guidance for sophomores and juniors, and enhanced mental health support for female students.

3.3. Analysis of physical activity adherence

Table 3: Descriptive statistics of dimensions of exercise adherence and correlation analysis between dimensions (N=2380)

	M±SD	Behavior	Effort Engagement	Emotional experience
Behavior	3.07±1.00	1		
Effort Engagement	3.41±0.91	0.77**	1	
Emotional experience	3.60±0.90	0.61**	0.79**	1

Table 3 illustrates exercise adherence among college students across behavioral habits, effort engagement, and emotional experience, along with their interrelationships. Overall, college students' exercise adherence was at a moderate to high level, with the highest score for behavioral habits (3.07±1.00), indicating a high frequency and participation in physical activity. Effort engagement (3.41±0.91) and emotional experience (3.60±0.90) scores were also high, but there were large individual differences in emotional experience. Correlation analysis showed that behavioral habits were significantly positively correlated with effort engagement (r=0.768) and emotional experience (r=0.611), implying that positive behavioral patterns promote effort engagement and emotional satisfaction. This positive correlation creates a positive feedback loop that promotes continued exercise, leading to better physical and mental health outcomes. Regular physical activity enhances mood, reduces stress anxiety, and increases self-efficacy and socialization. Establishing and maintaining good exercise habits in a university setting is not only beneficial to physical health, but also an important way to promote mental health and enhance quality of life.

Table 4: Differences in dimensions of exercise adherence among college students by gender (N=2380)

	Gender	N	M	SD	F
Behavior	Male	1153	4.22	0.86	1.668*
	Female	1227	4.03	0.88	
Effort Engagement	Male	1153	4.06	0.91	2.555*
	Female	1227	3.74	0.97	
Emotional experience	Male	1153	4.04	0.97	2.942**
	Female	1227	3.65	1.06	

Table 4 shows that there is a significant difference between genders in exercise adherence and its dimensions among college students. Male students generally scored higher than female students in all dimensions of behavioral habits, effort commitment, and emotional experience and confirmed by t-test. For behavioral habits, the mean score of male students (4.22 ± 0.86) was slightly higher than that of female students (4.03 ± 0.88), indicating that male students exercise slightly more frequently and with higher participation. On effort engagement, boys (4.06±0.91) scored significantly higher than girls (3.74±0.97), indicating that boys exercise harder and put in more effort. For emotional experience, boys (4.04±0.97) also scored significantly higher than girls (3.65±1.06), implying that boys derive more emotional satisfaction from exercise. These differences may be related to boys' higher interest in physical activity and greater physical ability. Overall, boys scored higher than girls on exercise adherence, reflecting boys' advantage in long-term adherence to physical activity.

Table 5: Differences in Dimensions of Exercise Adherence among College Students by Grade Level (N=2380)

	M±SD	Freshman	Sophomore	Junior
Behavior	4.12±0.87	4.15±0.85	4.01±1.02	4.15±0.82
Effort Engagement	3.88±0.96	4.03±0.85	3.54±1.11	3.93±0.93
Emotional experience	3.82±1.04	3.93±0.98	3.53±1.18	3.88±0.99

Table 5 analyzes the differences in college students' exercise adherence and its dimensions across grades. On behavioral habits, freshmen, sophomores, and juniors scored similarly (4.15, 4.01, 4.15), indicating similar exercise frequency and participation. However, there was a significant difference between freshmen and sophomores in effort engagement and emotional experience, with freshmen scoring higher (4.03 vs. 3.54, 3.93 vs. 3.53), indicating that freshmen were more engaged and had a better emotional experience. There was also a significant difference between sophomores and juniors in effort engagement and exercise persistence, with juniors scoring slightly higher, indicating that engagement and willingness to stay engaged increases with grade level. Sophomores had the lowest scores on all indicators, possibly due to academic load and career

planning anxiety, and decreased motivation and emotional fulfillment.

3.4 Correlation analysis of sleep quality, exercise adherence and mental health

Table 6: Correlation analysis of variables

Variables	M	SD	Sleep quality	Exercise adherence	Mental health
Sleep quality	6.07	3.34	1		
Exercise adherence	3.38	0.85	-0.15**	1	
Mental health	12.24	5.75	-0.45**	-0.30**	1

As shown in Table 6, sleep quality mean 6.07, standard deviation 3.34, the data is more concentrated but fluctuating; exercise persistence mean 3.38, standard deviation 0.85, less fluctuating; mental health mean 12.24, standard deviation 5.75, a wide range of fluctuations, reflecting significant differences in loneliness. Physical activity was significantly positively correlated with exercise adherence (r=-0.149), indicating that improved sleep quality promotes exercise persistence. Sleep quality was significantly negatively correlated with mental health (r=-0.445), implying that quality sleep reduces loneliness. Exercise adherence was also significantly negatively correlated with psychological well-being (r=-0.295**), suggesting that those with high exercise adherence felt less loneliness. In conclusion, improving sleep quality enhances exercise adherence and improves mental health.

3.5 Tests of mediating effects of sleep, exercise adherence and health

Table 7: Regression analysis of the relationship of variables in the model

Item	Exercise adherence M		Mental health Y		Total effect	
	β	*t*	*β*	*t*	*β*	*t*
Sleep quality X	-0.15	-7.33**	0.44	2.65**	0.41	22.85**
Exercise adherence M			-0.23	-13.04**	0.25	399.14
R^2	0.02		0.20		0.64	
F	53.69**		586.63**		6.02**	

Bootdtrap was used to conduct the test and 95% confidence intervals were selected to further analyze the mediating effect of college students' exercise adherence between sleep status and mental health status.

Table 8: Analysis of mediating effects of sleep quality and health

Item	Effect	Boot SE	Boot LLCI	Boot ULCI	Effect Percentage
Total Effect	0.45	0.02	0.41	0.49	
Direct effect	0.41	0.18	0.37	0.45	88.34%
Mediating effect of exercise adherence	0.03	0.06	0.02	0.05	11.68%

In the study exploring the relationship between sleep, exercise adherence, and health among college students, Tables 7 and 8 demonstrate the results of the mediating effects test. The results showed that exercise adherence mediated the relationship between sleep and health. The total effect of sleep on health was 0.45, and the direct effect accounted for 88.34%, indicating that sleep directly and significantly affects health. The mediating effect of exercise adherence was 11.68%, implying that the relationship between sleep and health could be partially mediated by enhancing exercise adherence. Gender also had some effect on the three relationships, but was not the primary focus. Sleep had a significant effect on exercise adherence (β=-0.392, p<0.001), suggesting that improved sleep increases exercise frequency and persistence, which in turn promotes health. Therefore, improving the health of college students needs to consider improving sleep and increasing physical activity. In particular, college students should be encouraged to develop good sleep habits and increase exercise adherence through campus sports activities to maintain and promote overall health. In addition, the role of exercise adherence as a mediating variable between sleep and mental health was verified by the results of the regression analysis, see Figure 1.

The majority of participants were unanimous in their views on the difficulty of withdrawing from exercise and the impact of lack of exercise, with mostly neutral or disagreeing attitudes. However, attitudinal differences were evident on sleep quality desire, importance, and exercise adherence. Some strongly desired good sleep and believed they could adhere to exercise in the long term, whereas others negatively perceived low adherence and had mixed agreement on the importance of sleep. This difference was influenced by lifestyle habits, physical condition and work environment. In today's fast-paced life and stressful work environment, some people view exercise as a burden, while others see it as a means to good health. Therefore, understanding individual exercise attitudes and behavioral habits can help to develop appropriate health programs to maintain physical and mental health.

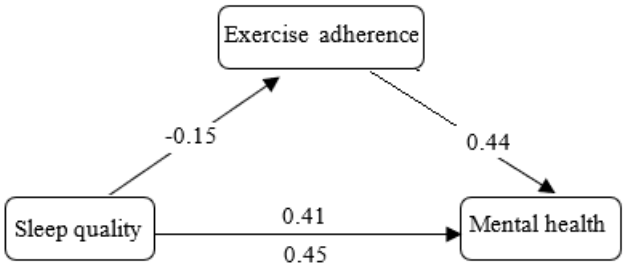

Figure 1: Model of the mediating effect of exercise adherence on the relationship between sleep status and health status among college students

4. Discussions

Focusing on a group of college students, this study explored

the relationship between sleep quality, physical activity persistence and mental health. The results showed that college students' sleep quality was directly and positively correlated with their mental health, i.e., the better the sleep quality, the better the mental health status. This finding is consistent with numerous previous studies and emphasizes the importance of good sleep in maintaining the mental health of college students. Meanwhile, the study also found a negative correlation between sleep quality and physical activity persistence, implying that college students with better sleep quality are more likely to persist in physical activity for a long period of time.

Further mediation effect analyses revealed that sleep quality had not only a direct effect on college students' mental health, but also an indirect effect by enhancing the persistence of physical activity. This suggests that good sleep quality not only directly promotes mental health, but also indirectly maintains mental health by encouraging college students to maintain a stable exercise habit. On the contrary, poor sleep quality may lead to a decrease in college students' exercise adherence, which in turn increases the risk of mental health problems.

When exploring the relationship between sleep quality and mental health of college students, the study found that good sleep quality is essential for relieving tension, regulating emotions, and improving the ability to cope with stress, as college students are facing multiple pressures, including academic, social, and career planning. In addition, the study also found a certain negative correlation between sleep quality and exercise adherence, which may be due to the fact that poorer sleep quality leads to a decrease in physical fitness and an increase in fatigue, thus affecting college students' willingness and ability to participate in physical activity. The positive effects of exercise on mental health have been widely confirmed, so the interaction between sleep quality and exercise adherence may have influenced the mental health status of college students to some extent.

On the other hand, the mediating role of exercise adherence between sleep quality and mental health among college students is also an important finding of this study. Exercise adherence, which refers to the extent and frequency with which an individual consistently engages in exercise, plays a key role in moderating the relationship between sleep quality and mental health. Individuals who exercise consistently may enjoy better sleep, which in turn promotes mental health. Conversely, college students with inadequate exercise adherence may face more mental health problems. Consistent exercise contributes to the release of endorphins that relieve stress, anxiety, and depression, thus serving as an important way to maintain mental health.

In summary, the results of this study emphasize the importance of improving sleep quality in enhancing the mental health of college students, while revealing the mediating role played by physical activity persistence. This finding provides useful insights for health management and psychological interventions for college students, i.e., improving sleep quality and encouraging physical activity should be used together to maintain college students' mental health.

5. Conclusions

This study revealed a complex relationship between sleep quality, mental health and exercise persistence. Specifically, there is a significant positive association between sleep quality and mental health, while a negative relationship with exercise persistence. This implies that good sleep quality not only directly positively affects mental health, but also indirectly promotes mental health by enhancing exercise persistence.

This finding provides a new perspective for understanding how sleep quality affects the internal mechanism of mental health, and also provides an important theoretical basis for the prevention and intervention of mental health problems among contemporary college students. It emphasizes the key roles of sleep quality and physical activity in maintaining mental health, suggesting that we should pay more attention to these two aspects in mental health education and practice.

Based on the results of the study, we suggest that college students should strengthen the monitoring of sleep quality in self-management and actively participate in regular physical activities. By improving sleep and enhancing exercise continuity, college students can not only directly improve their mental health, but also construct a healthier and more active lifestyle. These measures are important for preventing and alleviating mental health problems, as well as promoting overall well-being. Universities should prioritize initiatives that promote both sleep hygiene and physical activity, incorporating tailored interventions to address gender and academic year-specific challenges.

References

[1] www.moe.gov.cn/jyb_xwfb/s5148/202305/t20230519_1060438.html: Improving the Mental Health Work System for Students in the New Era - Government Portal of the Ministry of Education of the People's Republic of China (moe.gov.cn)
[2] https://wenku.baidu.com/view/40feba655c0e7cd184254b35eefdc8d377ee1433.html :WHO Definition of Mental Health - Baidu Wenku (baidu.com)
[3] https://news.sina.com.cn/sx/2023-03-20/detail-imymnsya3356918.shtml : “China Sleep Study Report 2023” officially released, China Sleep Study Report_Sina News (sina.com.cn)
[4] Cui YL, Ni SHJ, Liu PF, et al. Relationship between sleep quality and mental health and general well-being of medical students. [J]. Chinese Journal of Health Psychology, 2014, 22(6):943-945
[5] Kuang Pei Z, ed. Physiological Psychology. [M]. Beijing:Science Press, 1987:226-231,22
[6] Li, D.. A preliminary study of the relationship between sleep and mental health. [J]. Chinese Journal of Mental Health,1987,1(1):92-99.
[7] Tong Ping, Wu Chenghong. A study on the correlation between sleep quality and health status of college students. [J]. Chinese Journal of Health Psychology, 2010.18 (2):181-183.
[8] Liu Xianchen, Tang Maoqin, Hu Lei, et al. A study of the reliability and validity of the Pittsburgh Sleep

Quality Index[J]. Chinese Journal of Psychiatry,1996(02):103-107.
[9] CHEN Shan-Ping, LI Shu-Zhuo. Mechanisms of physical activity behavior adherence: theoretical exploration, measurement tools, and empirical studies [M]. Xi'an:Xi'an Jiaotong University Press, 2007: 7-150.
[10] WANG Shen,LIU Yiping,GU Chunqiang. Mechanisms of amateur sports team cohesion on members' exercise adherence:A moderated two-level mediation model[J]. Journal of Wu Sports College,2016,50(3):73-80.
[11] Chen Shanping, Men Zhenlong. A Review of Sport Commitment Theory and Related Research. [J]. Journal of Wuhan Institute of Physical Education and Sports, 2007,41:51-54
[12] Sun Derong, Liu Lijun, He Xiaozhen. Research on exercise commitment and exercise adherence in college students' physical activities. [J]. Journal of Tianjin Sports Institute.2011.26(6) 549-552
[13] Rusbult C E. A longitudinal test of the investment model: The development (and deterioration) of satisfaction and commitment in Heterosexual involvement [J]. Journal of Personality and Social Psychology, 1983, 45: 101 一 117
[14] Ruiz FJ, Garcia-Beltrcin DM, Sucirez-Falcbn JC. General health questionnaire-12 validity in colomia and factorial equivalence between clinical and nonclinical participants. Psychiatry Research, 2017, 256: 53-58
[15] Goldherg DP, William P. A user' s guide to the general health questionnaire. London: NFER-Nelson, 1988
[16] Romppel M, Braehler E, Roth M, et al. What is the general health questionnaire- 12 assessing? Dimensionality and psychometric properties of the general health questionnaire- 12 in a large-scale German population sample. Comprehensive Psychiatry, 2013, 54(4): 406-413
[17] Centofanti S, Lushington K, Wicking A, et al. Establishing norms for mental well- being in young people (7- 19 years) using the general health questionnaire- 12. Australian Journal of Psychology, 2019, 71(2): 117-126
[18] Li WH, Chung J0, Chui MM, et al. Factorial structure of the Chinese version of the 12- item general health questionnaire in adolescents. Journal of Clinical Nursing, 2009, 18 (23): 3253-3261
[19] Ye S. Factor structure of the general health questionnaire (GHQ-12): The role of wording effects. Personality and Individual Differences, 2009, 46(2): 197-201
[20] IRLLAND JL, CLLPIN V. The relationship between sleeping problems and aggression, anger, and impulsivity in a population of juvenile and young offenders. [J]. J Adoles Health, 2006, 38 (6):649--655.
[21] FISHER BL, RINEHAR S. Stress， arousal， psychopathology and temperament: A multidimensional approach to sleep disturbance in children. [J]. Person lndiv Diff, 1990,11 (5) :431-438.
[22] ROTH T, ROEHRS T, S1LVA JAC, et al. public health and insomnia: Consensus statement regarding its status and needs for future actions. [J]. Sleep, 1999,22(3) :417-420
[23] VGONTZAS AN, FERNANDEZ-MENDOZA J, Bixler EO, et al. Persistent insomnia: The role of objective short sleep duration and mental health. [J]. Sleep, 2012,35(1) :61-68.
[24] AKERSTED T, KNUTSSON A, WESTERHOLM P, et al. Mental fatigue, work and sleep. [J].J Psychosom Res, 2004, 57 (5) :415-416
[25] TANAKA H, SHIRAKAWA S. Sleep health, lifestyle and mental health in the Japanese elderly: Ensuring sleep to promote a healthy brain and mind. [J]. J Psychosom Res, 2004,56(5):465-477.
[26] ALFANO CA, K1M KL. Objective sleep patterns and severity of symptoms in pediatric obsessive-compulsive disorder: A pilot investigation. [J]. J Anx Dis, 2011, 25 (6): 835-839
[27] STORCH EA, MURPHY TK, LACK CW, et al. Sleep-related problems in pediatric obsessive-compulsive disorder. [J]. J Anx Disord, 2008,22(5) :877-885.
[28] Chen S.P., Men Z.L.. A Review of Motor Commitment Theory and Related Research. [J]. Journal of Wuhan Institute of Physical Education, 2007,41:51-54
[29] Scanlan T, Carpenter P, Schmidt G, et al. An introduction to the sport commitment model[J]. J Sport and Exercise Psychology，1993,15:1-15.
[30] Sun D R, Liu L J, He S Z. A Study of Exercise Commitment and Exercise Adherence in College Students' Physical Activity. [J]. Journal of Tianjin Sports Institute.2011.26(6) 549-552
[31] Ho KY, Lam Katherine KW, Xia W, et al. Psycho-metric properties of the Chinese version of the Pitts-burgh Sleep Quality Index (PSQI) among Hong Kong Chinese childhood cancer survivors [J]. Health Qual Life Outcomes,2021,19(1):176.
[32] Liu D, Kahathuduwa C, Vazsonyi AT. The Pittsburgh Sleep Quality Index (PSQI): Psychometric and clinical risk score applications among college students [J]. Psychol Assess, 2021,33(9): 816-826.
[33] Roche J, Vos AG, Lalla Edward ST, et al. Importance of testing the internal consistency and construct validity of the Pittsburgh Sleep Quality Index (PSQI) in study groups of day and night shift workers: Example of a sample of long-haul truck drivers in South Africa [J].Appl Ergon, 2022,98: 103557.

Funding

The authors declare that the research, writing and/or publication of this paper was funded and supported by the following research projects: the Ministry of Education's Industry-University Collaborative Education 2023 Project (No. 230829462807302); Guangdong Province Education Science Planning Project (Higher Education Special) (No:2024GXJK255); Zhaoqing Institute of Educational Development 2023 Key Project (No. ZQJYY2023030); Zhaoqing University Practice Teaching Project (No: zlgc202208); College Students' Innovative Training Project (No:202410580035) and (No. S202310580036) and (No. S2024010714)