Asia Pacific
Academy of Science Pte. Ltd.

Research Article

The relationships between sleep-wake type, resilience, and depression in Chinese minority college students

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ABSTRACT

The purpose of this study was to explore the relationships between sleep-wake type, resilience, and depression in minority college students. Through the method of cluster sampling, 791 first-year students of a college in Hunan Province participated in a survey using the Questionnaire Star software, and chi-square tests and logistic regression analysis were performed using the IBM SPSS Statistics 26 software. The results showed that the depression-detection rate among girls was significantly higher than that among boys; the depression-detection rate among students who did not like the current major was higher than that among those who did; while the depression-detection rate among students with the intermediate-sleep type was higher than that among those with the night-sleep (late to bed and late to rise) and early-morning sleep (early to bed and early to rise) types. The depression-detection rate among students with low resilience was higher than that among those with medium and high resilience. In addition, the night- and intermediate-sleep types were more likely to predict students' depression than the morning-sleep type, and low and medium resilience were more likely to predict students' depression than high resilience.

Keywords: minority college students; sleep wake type; resilience; depressed

1. Introduction

The global disease survey showed that mental illness was the second leading cause of lifelong disability in 2010, and moderate and severe depression in mental illness was the main cause of lifelong disability[1]. Relevant studies have shown that depression has an increasing impact on people and may become the second-most lethal disease after acute myocardial infarction[2]. Investigations in different countries and regions have found that depression has gradually become a major psychological disease endangering human physical and mental health in the 21st century[3]. Various mental-health documents in China have explained screening for depression[4]; these require schools at all levels to include screening for depression as an important component of students' psychological screening. Sleep-wake type and resilience are two important factors in mental health. Many studies have shown a significant correlation between sleep problems and depression[5]. Meanwhile, resilience, which refers to an individual's ability to deal with stress and frustration, is also closely related to the occurrence and development of depression.

Sleep-wake type refers to an individual's biological clock and daily work and rest habits. Studies have

shown that irregular sleep-wake patterns may lead to emotional instability and anxiety symptoms, thereby increasing the risk of depression. For example, a study on college students found that[5] the two sleep types of night sleep (late to bed and late to rise) and intermediate sleep (normal type) were more likely to predict students' depression than the early-morning sleep type (early to bed and early to rise). In addition, another study on the elderly found that[6] those who slept in the morning had a lower proportion of depressive symptoms. Therefore, sleep-wake type has a significant impact on depression.

Resilience refers to individuals' adaptability and self-regulation ability in the face of setbacks and pressure. Research shows that psychological resilience is an important protective factor for depression[7]. Individuals with low resilience may lack the ability to cope with stress and difficulties and are more likely to fall into depression. In contrast, individuals with high resilience have better coping and self-regulation abilities and thus have less depression. For example, a study on patients with cancer found that those with high resilience had a lower incidence of depressive symptoms[8]. In addition, another study on earthquake survivors found that those with high resilience had a lower proportion of depressive symptoms after the earthquake. These studies show that resilience has a significant impact on depression.

Relevant studies have shown[9] a correlation between sleep-wake type and psychological resilience. For example, a study on the elderly found that[10] regular sleep-wake types could predict the level of individual resilience. In addition, another study on patients with cancer found that[10] maintaining a regular sleep-wake type could enhance patients' psychological resilience and quality of life. These studies show that sleep-wake type has a significant impact on resilience.

In conclusion, there are complex interactions between sleep-wake type, resilience, and depression. Sleep-wake type and resilience can predict the risk of depression. However, there are still deficiencies in the current research on these three factors. This study mainly discusses the relationships between the three factors in minority college students and provides a more theoretical basis for the prevention and treatment of depression.

Assumptions of this study

Hypothesis 1: There are differences in the depression-detection rate depending on demographic variables such as students' gender, their socio-economic status, whether a student is an only child, their family structure, and whether they like their major.

Hypothesis 2: Sleep-wake type and resilience level can predict the depression-detection rate.

2. Object and method

2.1. Object

Using cluster sampling, a survey was conducted among freshmen in a university in Hunan Province in November 2022. The subjects voluntarily participated in the survey. The data were collected through the Questionnaire Star website. A total of 791 valid questionnaires were collected from 980 minority university freshmen aged 17–19 years. The survey rate was 80.7%, including 194 males (24.5%) and 597 females (75.5%); 147 poor (18.6%) and 644 non-poor (81.4%) students; 89 only-child (11.3%) and 702 multi-child (88.7%) families; 81 single-parent (10.2%) and 710 two-parent (89.8%) families; and 312 (39.4%) who liked specialty and 465 (58.8%) who did not.

2.2. Investigation contents and methods

2.2.1. Sleep-wake type

The Chinese version of the sleep-wake pattern self-assessment questionnaire (MEQ) was used in the

survey. In 1976, Horne and Stberg[11], two British and Swedish scholars, first reported MEQ (a self-assessment questionnaire used to determine the rhythm of the human biological clock) in the International Journal of Chronobiology. This method has been translated into many languages and widely used. In 2001, with NIH funding, the State Institute of Psychiatry in New York revised the questionnaire into an American English version[12]. Researchers from the Chinese University of Hong Kong have translated the questionnaire into Chinese versions of the Morning and Night Self Rating Questionnaire (MEQ-SA)[12]. In 2006, Zhang et al.[13]successfully completed the introduction of MEQ in Chinese. The questionnaire is a sleep-wake self-rating scale. According to individual sleep-wake habits or natural tendencies, patients are divided into the early-morning (the early-to-bed and early-to-rise type), night (the late-to-bed and late-to-rise type), and intermediate (normal) types. The questionnaire table contains 19 questions to determine the natural tendency of the daily sleep-wake time span over the previous few weeks. The answers to each question are on a scale of 0 to 6 points, with a total score of 16 to 86 points. Among them, a score in the range 16–41 points indicates the night type, one in the range 42–58 points indicates the middle type, and one in the range 59–86 points indicates the morning type. MEQ is widely used to assess the sleep-wake diurnal tendency of healthy people and patients. Cronbach's' alpha coefficient for the Chinese version of the questionnaire reached 0.736, and the split-half reliability was 0.592. The scale had good homogeneity reliability. The variance interpretation value of the one-way model was 51.58%, and each item load was in the range 0.527–0.706. The scale had good structural validity. In this study, Cronbach's alpha coefficient reached 0.740, indicating good reliability.

2.2.2. Psychological resilience

The Connor Davidson Resilience Scale (CD-RISC) was used in the survey, which was a tool for assessing resilience jointly created by Catherine M. Connor and Jonathan R. T. Davidson. The scale is based on their definition of resilience, that is, the ability to "thrive in adversity." Since its release in 2003, the CD-RISC has been tested in various environments and modified in different versions. Gao et al.[14] of the Chinese University of Hong Kong revised the original CD-RISC. The revised scale contains 25 items and is divided into three dimensions: resilience, strength, and optimism. The reliability of the whole scale and the three subscales is good, and Cronbach's' alpha coefficient is 0.890. All questions were scored on a five-point scale: 1 (never), 2 (rarely), 3 (sometimes), 4 (often), and 5 (almost always). In this study, a total score $\leq P_{33}$ is determined as the low-level group, one between P_{33} and P_{67} as the medium-level group, and one greater than P_{67} as the high-level group. In the current study, Cronbach's coefficient is 0.940, indicating good reliability.

2.2.3. Depression

The survey used the PHQ-9 self-rating depression scale, which is a self-test tool for depression developed by Columbia University based on DSM-IV depression's nine symptom criteria, and it comprises nine items. The PHQ-9 is a simple self-assessment tool used to detect symptoms of depression in the previous two weeks. It was developed by Columbia University and is widely used in clinical and scientific research work. The scale contains 9 items, each of which describes a symptom of depression. Based on the severity of symptoms, each item has four options: "no," "a few days," "more than half the time," and "almost every day." The corresponding scores for each option are 0, 1, 2, and 3. A total score of 0 to 4 indicates no depression, one of 5 to 9 indicates mild depression, one of 10 to 14 indicates moderate depression, one of 15 to 19 indicates moderate to severe depression, and one of 20 to 27 indicates major depression. In this study, the depression score was greater than 5. Cronbach's alpha coefficient for the PHQ-9 ranges from 0.88 to 0.89. In this study, Cronbach's alpha coefficient is 0.853, indicating good reliability.

2.3. Statistical methods

The IBM SPSS Statistics 26 software was used to process and analyze the data. A chi-square (X^2) test was

conducted to compare the depression-detection rates among college students with different demographic characteristics. A logistic regression-analysis model was adopted using sleep-wake type and psychological-resilience level. The difference in depression-detection rate was statistically significant ($p < 0.05$).

3. Results

3.1. Basic information

The depression-detection rate among minority college students was 62.2% (492/791). Regarding sleep-wake type, the detection rates were 4% (74/791), 64.7% (512/791), and 25.9% (205/791) among the night-, intermediate-, and early-morning sleep types, respectively. For the resilience levels, the detection rates were 5% (265/791), 33.9% (268/791), and 32.6% (258/791) among the low-, medium-, and high-level types, respectively. From **Table 1**, the difference in depression-detection rate was statistically significant ($p < 0.05$) for gender, whether a student was an only child, family structure, whether a student liked their major, sleep-wake type, and psychological-resilience level. The depression-detection rate among girls was significantly higher than that among boys, while that among multi-child families was significantly higher than that among only-child families. The depression-detection rate among two-parent families was significantly higher than that among single-parent families, while that among students who did not like the current major was significantly higher than that among those who liked the current major. The depression-detection rate among students with intermediate sleep type was significantly higher than that among those belonging to the night-sleep and early-morning sleep types. The depression-detection rate among students with low resilience was significantly higher than that among those with medium and high resilience.

Table 1. Comparison of depression-detection rates among ethnic minority college students with different demographic characteristics.

Demography Variable	Variable	N	Depressed		
			No depression	Depression	X^2
Gender	Male	194	91 (46.9)	103 (53.1)	9.067**
	Female	597	208 (34.8)	389 (65.2)	
Poor students	Yes	147	56 (38.1)	91 (61.9)	0.007
	No	644	243 (37.7)	401 (62.3)	
Only child	Yes	89	43 (48.3)	46 (51.7)	4.715*
	No	702	256 (36.5)	446 (63.5)	
Family structure	Single parent	81	19 (23.5)	62 (76.5)	7.896**
	Parents	710	280 (39.4)	430 (60.6)	
Do you like your major	Like	312	156 (50.0)	156 (50.0)	35.778***
	Dislike	465	142 (30.5)	323 (69.5)	
Sleep wake type	Night type	74	15 (20.3)	59 (79.7)	43.864***
	Intermediate type	512	169 (33.0)	343 (67.0)	
	Early morning type	205	115 (56.1)	90 (43.9)	
Resilience	Low level	265	59 (22.3)	206 (77.7)	59.987***
	Medium level	268	98 (36.6)	170 (63.4)	
	High level	258	142 (55.0)	116 (45.0)	

Note: () is the detection rate %; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.2. Logistic regression analysis of sleep-wake type and resilience for depression

From the **Table 2**, the four independent variables of intermediate and early-morning sleep and moderate and high resilience clearly have a significant impact on the overall model significance test in the regression for the group with or without depression X 6069 ($p = 0.000$), reaching a significant level; The Hosmer-Lemeshow test value of 0.179 ($p = 0.999$) did not reach a significant level, indicating that the model fit was very ideal. From the significance index of individual parameters, the Wals index values for the independent variables of night- and intermediate-sleep types, low resilience, and centripetal elasticity were 14.245, 17.740, 38.974, and 10.282, respectively, which reached significant levels, indicating a significant correlation between the above independent variables and the group with or without depression, which could effectively predict and explain the group with or without depression. The odds ratios for the four significant variables were 3.503, 2.104, 3.475 and 1.257, respectively, indicating that the probability of "winning with or without depression" for minority college students increased by 250.3% when the measured value of the sample in night sleep increased by 1 point; when the sample's intermediate-sleep measurement value increased by 1 point, the probability of minority college students' winning with or without depression increased by 110.4%; when the sample's low-resilience measurement value increased by 1 point, the probability of minority college students' winning with or without depression increased by 247.5%; and when the measured value of resilience in the sample increased by 1 point, the probability of "winning with or without depression" for minority college students increased by 25.7%.

Table 2. Fitness test of the overall model and significance test for individual parameters.

Input variable	B	S. E	Wals	P	Or	95% C.I
Nocturnal sleep	1.254	0.332	14.245	0.000	3.503	1.827–6.718
Intermediate sleep	0.744	0.177	17.740	0.000	2.104	1.489–2.975
Low resilience	1.254	0.199	38.974	0.000	3.475	2.350–5.137
Centripetal elasticity	0.589	0.184	10.282	0.001	1.257	0.195–2.583
Constant	−0.663	0.166	16.006	0.000	0.515	-
Overall model fitness test	$X^2 = 84.606$*** Hosmer-Lemeshow test value = 0.179 N.S					

The study transformed sleep type into three virtual variables through virtual-variable coding: Forms 1, 2, and 3, representing night, intermediate, and early-morning sleep, respectively. At this time, the reference is early-morning sleep. Psychological elasticity is transformed into three virtual variables through virtual-variable coding: Forms 1, 2, and 3, respectively representing low, medium, and high psychological elasticity. At this time, the reference is high psychological elasticity. The regression test coefficients for night and intermediate sleep were greater than 0, and the p-value was significant, indicating that night and intermediate sleep were more likely to predict students' depression than morning sleep. The regression coefficients for low and medium resilience were greater than 0, and the p-value was significant, indicating that low and medium resilience were more likely to predict students' depression than high resilience.

3.3. Correct classification rate of sleep-wake type and psychological resilience for depression

From the cross table (**Table 3**) of the correct classification, the observed values of 299 students without depression were classified and predicted according to the logistic regression model: 100 students were classified as non-depression (correct classification) and 199 students as depression (wrong classification). The observation values of 492 students with depression were classified and predicted according to the logistic regression model. Of the students, 64 were classified as non-depression (classification error) and 428 as

depression (classification correct). The overall correct classification percentage was 66.8%.

Table 3. Cross table of prediction classification accuracy.

		Predicted value		
	Actual value	No depression	Depression	Accuracy
No depression	299	100	199	33.4
Depressed	492	64	428	87.0
Total forecast accuracy				66.8

4. Discussion

The depression-detection rate among minority university freshmen in this study is as high as 62.2%, which is close to the research results obtained by Peng and Zhang[15,16] and others; however, it is higher than the detection rate of 21.48% in the Chinese National Mental Health Report 2022[17] issued by the Chinese Academy of Sciences. There may be many reasons for this result. For example, ethnic minority students may face problems such as cultural adaptation, language barriers, and changes in family-support networks; the relatively low level of economic development in ethnic minority areas may lead to the low socio-economic status of ethnic minority students, which in turn affects their mental health. Some ethnic minority students may face discrimination and prejudice from society and schools, which may lead them to feel lonely, helpless, and anxious; after entering university, learning tasks and requirements may increase. In addition, adapting to the new learning environment and methods may have a certain impact on minority students' mental health. Although many universities provide mental-health services, these services may not be sufficient to meet all students' needs, especially those of minority students. In summary, cultural differences, socio-economic status, discrimination and prejudice, academic pressure, lack of psychological support, and other factors may increase their psychological stress and depression risk. These factors may interact with one another, resulting in a higher depression-detection rate among minority university freshmen. It should be pointed out that different research and sample-selection methods may also affect the difference in the depression-detection rate. In addition, there are differences among ethnic minorities. Different national cultures, lifestyles, and other factors may also affect the depression-detection rate.

The research results show that female students' depression-detection rate is significantly higher than that of male students, which is consistent with the research results obtained by Ma and Tang[18,19], and others. In October 2018, Germany released the German College Students' Health Survey[20], which showed that female students were more prone to anxiety and depression. Women's hormone levels are affected by physiological changes such as the menstrual cycle, pregnancy, and menopause, which may affect mood and increase the risk of depression[21]. Related studies have shown that changes in estrogen levels can affect women's emotional and cognitive abilities, while social expectations for women can also affect their emotional and cognitive abilities, where hormones and social expectations interact to influence women's behavior and performance[22]. Therefore, social expectations and pressures on women may affect the mental health of female college students[23]. Society often expects women to show such characteristics as gentleness, obedience, and quietness, which may bring pressure on them. In contrast, men are usually expected to show strong, independent, competitive, and other characteristics. Such different expectations and pressures may affect girls' mental health. There may be differences in employment opportunities and freedom of movement between male and female college students. According to the "2021 College Student Employability Survey Report" initiated by Zhaopin Recruitment[24], the job-search results show that the proportions of male fresh graduates receiving offers and signing contracts are 8.1 and 13.2 percentage points higher than those of women, respectively. The proportion

of males participating in more than three lectures is 43.7%, which is 10 percentage points higher than that of females. Consequently, males participate in interviews more frequently than females, thus gaining more opportunities. In some cultures, girls may feel a lack of emotional support and understanding, which may also lead to loneliness and helplessness in the face of pressure and difficulties, thus increasing the risk of depression.

The results showed that the depression-detection rate among two-parent families was significantly higher than that among single-parent families. This is consistent with the research results of Liu et al.[24], which may be due to the fact that in two-parent families, if there is conflict between parents, it may have a negative impact on the children's emotional and mental health. Children who have been exposed to conflict for a long time may feel stress, anxiety, and depression. In addition, in two-parent families, parents may have higher expectations of and requirements for their children, which may increase their children's sense of pressure. If children fail to meet these expectations, they may feel depressed, helpless, and guilty, which increases the risk of depression.

The results show that the depression-detection rate among students who do not like the current major is significantly higher than that among those who do. This is consistent with the research results of Wang et al.[25], indicating that professional identity is negatively correlated with depression. College students' professional identity significantly and negatively predicts depression; that is, the more they identify with their major, the less likely they are to have depression. College students' professional identity means that they can recognize and accept the values and norms of their major and are willing to engage in professional careers, and it reflects their active cognition and positive emotional state in the process of professional learning. Whether you like your major is an important manifestation of professional identity. If students are not interested in or do not like their major, they may experience learning difficulties and academic pressure. Simultaneously, they may feel confused and may not know how to find their own direction. Such stress and confusion may lead to depression. In addition, students think that the employment prospects of their major are not good, and they may feel anxious and uneasy. This uncertainty may lead to depression, especially in the face of disliked learning tasks. In addition, students may feel frustrated and helpless if they feel that they have difficulties in learning, or that their ability is not sufficient to cope with the current professional learning. This may also lead to the emergence or aggravation of depression.

The results show that sleep type and resilience are significant factors in minority college students' depression, and the two sleep types of night (late to bed and late to rise) and intermediate (ordinary type) sleep are more likely to predict students' depression than the early-morning sleep type (early to bed and early to rise), and the two types of low and medium-level resilience are more likely to predict students' depression than the high-level resilience type. This may be because students with night and intermediate sleep may have difficulties in life rhythm and social adaptation, leading to emotional instability and depression. Students who sleep in the morning may be more likely to adapt to social life and have a more regular pace of daily life, thus reducing the risk of depression. Relevant studies have shown that[26] the early-morning type tends to make positive adjustments to the current state through adaptive adjustment strategies such as cognitive reappraisal and problem solving, which can effectively reduce the subjective experience and physiological reaction of negative emotions. In contrast, the night type is more inclined to adopt non-adaptive emotion-regulation strategies such as expression inhibition and rumination, and has been immersed in the causes and consequences of negative emotions, resulting in the maintenance of negative emotions, thus increasing the risk of depression. Other researchers[26] found that different sleep types also had significant differences in personality traits. For example, the morning type is more easygoing, cooperative, and conscientious, while the night type has higher scores in the neuroticism dimension. Therefore, night and intermediate sleep are more likely to predict students' depression than morning sleep.

The level of resilience is closely related to depression[27]. Resilience refers to individuals' adaptability and self-regulation ability in the face of setbacks and pressure. Individuals with low resilience may lack the ability to cope with stress and difficulties, and are more likely to fall into depression. Individuals with moderate resilience may have some psychological problems; however, they can still adjust themselves, while those with high resilience have better coping and self-regulation abilities, and thus they have less depression. Lee et al.[27] research results show that individuals with high and low resilience have attention bias toward negative information. Compared with individuals with high resilience, those with low resilience have more attention bias toward negative emotions, negative evaluation, and negative information. Therefore, low and medium resilience are more likely to predict students' depression than high resilience.

5. Conclusion

To sum up, this study shows significant differences in the depression-detection rate among minority college students depending on gender, whether a student is an only child, family structure, whether they like their major, sleep-wake type, and psychological-resilience level. Therefore, the above information should be considered for the prevention and treatment of depression among minority college students. In addition, the two sleep types of night and intermediate sleep are more likely to predict students' depression than the morning-sleep type, and the two types of low and medium resilience are more likely to predict students' depression than the high-resilience type. Therefore, changing minority college students' sleep-wake type and strengthening their resilience training can effectively prevent depression. Relevant studies have shown that physical exercise can promote the secretion of a substance called endorphin, which can make people feel happy and relaxed, and help to improve the quality of sleep and depression symptoms. Physical exercise can also improve people's self-confidence and self-esteem, reduce stress and anxiety, and thus help to improve sleep and mental health. Not all exercise can certainly improve sleep and depression symptoms. For individuals, it is important to find the right exercise style and intensity[28,29]. Meanwhile, if one has severe depressive symptoms or sleep problems, it is recommended that they seek the help of professional medical personnel to obtain more appropriate treatment.

Author contributions

Conceptualization, YY and LF; methodology, YY; software, YY; validation, LF, YY; formal analysis, YY; investigation, LF; resources, LF; data curation, YY; writing—original draft preparation, YY; writing—review and editing, YY; visualization, YY; supervision, LF; project administration, LF. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

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