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Analysis of Sleep Quality and Influencing Factors among Medical Residents in Anhui Province: A Cross-sectional Study Based on PSQI and DASS-21

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Abstract: *To investigate the relationship between sleep quality, mental health, and lifestyle factors among medical residents undergoing standardized training in Anhui Province, a cross-sectional survey was conducted in October 2025 among medical residents in Anhui Province. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), and psychological status was evaluated with the Depression–Anxiety - Stress Scale-21 (DASS-21). A total of 111 valid questionnaires were collected. Sleep disturbance was defined as a PSQI total score >5. Univariate analysis and binary logistic regression were used to identify influencing factors. Sleep quality was significantly positively correlated with depression (r=0.544, P<0.001), anxiety (r=0.564, P<0.001), and stress (r=0.542, P<0.001). Logistic regression showed that failure to obtain a medical practitioner certificate (OR=3.109, 95% CI: 1.209-7.998) and depressive symptoms (OR=1.175, 95% CI: 1.071-1.289) were risk factors for sleep disturbance, while higher exercise frequency (OR=0.213, 95% CI: 0.060-0.758) was a protective factor. Sleep problems are prominent among medical residents. Attention should be given to improving the pass rate of the medical practitioner examination, promoting regular exercise, and conducting mental health screening and intervention to reduce the occurrence of sleep disturbances.*

Keywords: *Pittsburgh Sleep Quality Index (PSQI); Depression Anxiety Stress Scale-21 (DASS-21); Sleep Quality; Exercise Frequency; Mental Health*

1. Introduction

Standardized residency training is a critical transitional stage in the medical education system. During this period, resident physicians face heavy clinical workloads, continuous assessment pressure, and multiple career challenges[1]. Previous studies have shown that residents are at high risk for sleep problems, with a significantly higher prevalence of poor sleep quality than the general population[2]. Multiple surveys in China have reported concerning rates of sleep disturbances among medical students and residents[3]. For example, the median PSQI score among paediatric residents at one university was 6, and the detection rate of sleep problems among anaesthesiology residents in Yangzhou reached 73.9%. Studies have indicated that PSQI scores of residents are significantly correlated with perceived stress and anxiety[4]. Furthermore, poor sleep quality is significantly associated with a high prevalence of depressive symptoms[5]. Anhui Province has several tertiary general hospitals and medical colleges, with a large population of resident physicians. However, systematic studies on sleep quality among residents in Anhui are scarce. This study aimed to investigate the current status of sleep quality among medical residents in Anhui, analyse its influencing factors, and explore the correlations between sleep quality and anxiety, depression, stress, and lifestyle factors, so as to provide a reference for developing targeted interventions.

2. Materials and Methods

2.1. Study Participants

A crosssectional survey was conducted in October 2025 among medical residents undergoing standardized training in Bengbu, Anhui Province. Inclusion criteria: (1) physicians currently

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participating in standardized residency training; (2) voluntarily participated and completed the questionnaire. Exclusion criteria: (1) incomplete questionnaire responses; (2) severe mental illness or cognitive impairment that prevented cooperation. A total of 120 questionnaires were distributed, and 111 valid responses were collected, with an effective response rate of 92.5%.

2.2. Survey Instruments

2.2.1. General Information Questionnaire

The questionnaire included sex, age, specialty, training identity, training year, acquisition of medical practitioner certificate, average monthly salary, exercise frequency, smoking and alcohol consumption, and intake of coffee, tea, or cola.

2.2.2. Pittsburgh Sleep Quality Index (PSQI)

The PSQI was used to assess sleep quality over the past month. It contains 19 self-rated items forming seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each component is scored from 0 to 3, with a total score ranging from 0 to 21. A PSQI total score >5 was defined as sleep disturbance. The scale has good reliability and validity, with a Cronbach's α coefficient of 0.83[6].

2.2.3. Depression Anxiety Stress Scale21 (DASS21)

The DASS-21 was used to assess emotional status over the past week. This scale consists of 21 items divided into three dimensions-depression, anxiety, and stress-each containing seven items rated on a 0-3 point scale. The total score for each dimension is multiplied by 2 and then compared with normative data for classification, as shown in Table 1. The scale is widely used in medical populations and has good reliability and validity.

Table 1: DASS severity rating standards

severity		depression	anxiety	stress
normal		0-9	0-7	0-14
abnormal	mild	10-13	8-9	15-18
	moderate	14-20	10-14	19-25
	severe	21-27	15-19	26-33
	extremely severe	≥28	≥20	≥34

Note: The cutoffs apply to DASS-21 dimension scores after doubling the raw subscale sum (range 0–42).

2.3. Statistical Analysis

Statistical analyses were performed using SPSS 26.0. Normally distributed continuous data were described as mean ± standard deviation ($\bar{x} \pm s$), and comparisons among multiple groups were performed by oneway ANOVA; nonnormally distributed data were described as median (interquartile range) [M (IQR)], and comparisons among multiple groups used the KruskalWallis H test. Categorical data were described as counts (percentages) and compared using the chisquare test. Correlations were examined by Pearson correlation analysis. Binary logistic regression was used to identify independent factors for sleep disturbance. A Pvalue <0.05 was considered statistically significant.

3. Results

3.1. General Demographic Characteristics of Participants

Among the 111 participants, 41 (36.94%) were male and 70 (63.06%) were female. The majority (90, 81.08%) were aged ≥24 years. The most common specialty was general medicine (70, 63.06%). Regarding training identity, master's degree postgraduate students accounted for 57 (51.35%), and firstyear residents were the largest group (47, 42.34%). Detailed information is shown in Table 2.

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Table 2: General demographic characteristics of participants (n=111)

variable	category	number of people (n)	percentage(%)
sex	male	41	36.94
	female	70	63.04
age (years)	20 years old	3	2.7
	21 years old	2	1.8
	22 years old	8	7.21
	23 years old	8	7.21
	≥24 years of age	90	81.08
specialty	internal medicine	10	9.01
	surgery	9	8.11
	general medicine	70	63.06
	anesthesiology	6	5.41
	others	13	11.71
training identity	hospital-employed	32	28.83
	socially-recruited	22	19.82
	master's postgraduate	57	51.35
training year	first year	47	42.34
	second year	27	24.32
	third year	37	33.33
average monthly salary	≤1000 RMB	33	29.73
	1001–3000 RMB	37	33.33
	3001–5000 RMB	12	10.81
	≥5001 RMB	29	26.13
medical practitioner certificate	not obtained	54	48.65
	obtained	57	51.35
exercise frequency (≥30 min each time)	none	30	27.03
	once a week	25	22.52
	twice a week	26	23.42
	three or more times per week	30	27.03
afternoon napping	no	18	16.22
	yes	93	83.78
smoking	no	105	94.59
	yes	6	5.41
alcohol consumption	no	96	86.49
	yes	15	13.51
regular intake of coffee, tea, or cola	no	70	63.06
	yes	41	36.94
PSQI total score	≤5	46	41.44
	＞5	65	58.56

3.2. Sleep Quality Status of Residents

Using the cutoff of PSQI >5, the detection rate of sleep disturbance was 58.56% (65/111). Univariate analysis of PSQI total scores showed statistically significant differences among residents based on acquisition of medical practitioner certificate, exercise frequency (≥30 min each time), and napping habit ($P<0.05$). No significant differences were found for sex, training identity, training year, average monthly salary, smoking, alcohol consumption, or intake of coffee/tea/cola ($P>0.05$), see Table 3.

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Table 3: Comparison of PSQI total scores across different characteristics

variable	category	PSQI total score [*M* (*IQR*) or $\bar{x}\pm s$]	*t/F/Z*	*P* value
sex	male	5(4)	0.985	0.286
	female	6(4)		
training identity	hospital‑employed	6.5(5)	0.524	0.770
	socially‑recruited	5.5(5)		
	master's postgraduate	6(4)		
training year	first year	6.62±3.29	1.972	0.373
	second year	5.70±3.18		
	third year	5.95±2.42		
average monthly salary	≤1000 RMB	6(4)	4.132	0.248
	1001–3000 RMB	6(6)		
	3001–5000 RMB	7.5(5)		
	≥5001 RMB	4(4)		
medical practitioner certificate	not obtained	6.94±3.43	4.302	0.008*
	obtained	5.44±2.32		
exercise frequency (≥30 min each time)	none	7(5)	12.554	0.006*
	once a week	7(3)		
	twice a week	6(4)		
	three or more times per week	4(4)		
afternoon napping	no	8(6)	1.413	0.037*
	yes	6(4)		
smoking	no	6(4)	0.635	0.814
	yes	5(8)		
alcohol consumption	no	6(4)	0.773	0.589
	yes	7(7)		
regular intake of coffee, tea, or cola	no	5.5(4)	1.178	0.125
	yes	7(5)		

Note: *$P<0.05$

3.3. Prevalence of Anxiety, Depression, and Stress

The DASS-21 results showed that among the 111 residents, the detection rate of depressive symptoms was 24.32% (27/111), anxiety symptoms 21.62% (24/111), and stress symptoms 12.61% (14/111). These findings indicate that depression and anxiety are relatively common, highlighting mental health as a non-negligible threat in this population. The detailed DASS-21 mean scores and the detection rates of abnormal depression, anxiety, and stress symptoms are presented in Table 4.

Table 4: Mental health data assessed by DASS-21

	mean value($\bar{x} \pm s$)	number of abnormal cases (%)
depression	5.19±8.19	27(24.32%)
anxiety	4.14±7.61	24(21.62%)
stress	4.81±7.87	12(12.61%)

3.4. Correlation between Sleep Quality and Anxiety, Depression, and Stress

Pearson correlation analysis (Table 5) showed that the PSQI total score was significantly positively correlated with all DASS-21 dimensions: depression (r=0.544, $P<0.01$), anxiety (r=0.564, $P<0.01$), and stress (r=0.542, $P<0.01$).

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Table 5: Correlations between PSQI total score and DASS-21 dimensions

	Correlation coefficient *r*	*P*value
depression	0.544	<0.001*
anxiety	0.564	<0.001*
stress	0.542	<0.001*

Note: *P<0.01

3.5. Binary Logistic Regression Analysis of Factors Associated with Sleep Disturbance

Taking PSQI >5 as the dependent variable (sleep disturbance = 1, normal sleep = 0), variables that were statistically significant in univariate analysis (acquisition of medical practitioner certificate, exercise frequency, napping habit, and depression) were entered into binary logistic regression. Anxiety and stress were not included because of collinearity (VIF ≥10). The results showed that failure to obtain a medical practitioner certificate (OR=3.109, 95% CI: 1.209-7.998) and depressive symptoms (OR=1.175, 95% CI: 1.071-1.289) were risk factors for sleep disturbance, while higher exercise frequency (OR=0.213, 95% CI: 0.060-0.758) was a protective factor. The detailed binary logistic regression results are presented in Table 6.

Table 6: Logistic regression analysis of factors associated with sleep disturbance

	β	*SE*	Wald value	*P* value	*OR* value	95%*CI*
not obtained medical certificate	1.134	0.482	5.536	0.019*	3.109	1.209-7.998
exercise frequency(once a week)	0.618	0.674	0.841	0.359	1.855	0.495-6.949
exercise frequency(twice a week)	-0.357	0.644	0.307	0.580	0.700	0.198-2.475
exercise frequency(three or more times per week)	-1.548	0.649	5.696	0.017*	0.213	0.060-0.758
afternoon napping	-0.797	0.727	1.202	0.273	0.451	0.108-1.874
depression	0.161	0.047	11.629	0.001*	1.175	1.071-1.289

Note: *P<0.05

4. Discussion

This study conducted a cross-sectional survey on the sleep quality of 111 medical standardized training physicians in Anhui Province. The results showed that the prevalence of sleep disorders was 58.56%, and the median total score of PSQI was 6 points. This detection rate was basically consistent with the results of similar domestic studies - the detection rate of sleep quality problems among anesthesiology trainees in Yangzhou was as high as 73.9%, and the detection rate of sleep disorders among resident trainees in a certain hospital in Fuyang was 45.34%. The differences in detection rates among different studies may be related to the geographical distribution of the survey subjects, professional composition, sample size, and subtle differences in evaluation standards. However, overall, the high prevalence of sleep quality problems among the trainee physicians has been confirmed by multiple studies[2, 3]. The standardized training stage for resident physicians is one of the most demanding periods in medical education, and trainee physicians simultaneously bear multiple pressures such as clinical rotations, exam preparation, and research tasks. The sleep-wake rhythm is easily disturbed[7]. The results of this study once again indicate that the sleep quality problems of trainee physicians in Anhui cannot be ignored and require the attention of training bases and management departments.

It was found that the sleep quality of trainee physicians was significantly positively correlated with depression (r = 0.544), anxiety (r = 0.564), and stress (r = 0.542) (all P < 0.001), that is, the higher the degree of psychological distress, the worse the sleep quality. This finding is highly consistent with previous studies[4, 5]. Yao Gaofeng et al. found that the stress perception score and anxiety score of resident trainees were positively correlated with PSQI scores (r = 0.727, 0.784, P < 0.01). A study in a tertiary hospital in Chongqing also showed that sleep quality was significantly negatively correlated with the depression and anxiety dimensions of resident trainees. International studies also support this conclusion: the detection rate of poor sleep quality, depression (46%), and anxiety (42.2%) among Syrian medical residents was at a relatively high level[8]; 58% of Saudi Arabian residents had anxiety

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and 57% had depression, and insomnia symptoms were significantly correlated with depression and anxiety symptoms[4, 9]. The bidirectional relationship between psychological problems and sleep disorders has been widely recognized - anxiety and depression can both be the causes and results of sleep problems[10, 11]. For trainee physicians, long-term high-intensity work, exam pressure, and career uncertainty may negatively affect sleep quality through psychological pathways such as consuming self-control resources and inducing anxiety[7]. The DASS-21 results of this study showed that the detection rate of depressive symptoms among trainee physicians was 24.32%, and the detection rate of anxiety symptoms was 21.62%, suggesting that psychological problems are widespread in this group[2, 3]. Therefore, in the process of improving the sleep quality of trainee physicians, simple behavioral interventions may have limited effects, and psychological health screening and intervention must be included in the comprehensive strategy.

Logistic regression analysis showed that not obtaining a practicing physician certificate was an independent risk factor for sleep disorders (OR = 3.109, 95% CI: 1.209 - 7.998). The qualification examination for practicing physicians is one of the most important milestone assessments in the career of medical trainees, and passing or failing the exam directly relates to the recognition of the trainee physician's professional identity, salary, and future development space[12]. Trainee physicians without a certificate face more urgent exam preparation pressure, a longer "identity transition period", and greater career uncertainty, which may affect sleep quality through continuous psychological stress. Previous studies have also shown that having or not having a physician qualification certificate is one of the important factors affecting the psychological stress of resident trainees[13]. In addition, the acquisition of the practicing physician certificate reflects to some extent an individual's knowledge reserve, test-taking ability and psychological resilience. Those who fail the examination may inherently have higher psychological susceptibility. Therefore, training bases should pay attention to the sleep and psychological conditions of the postgraduate trainees who have not obtained the practicing physician certificate, and provide necessary psychological counseling and time management guidance during the preparation period.

The frequency of exercise is another important influencing factor identified in this study. Logistic regression analysis shows that exercising three or more times per week is a protective factor for sleep disorders (OR = 0.213, 95% CI: 0.060-0.758). Univariate analysis also indicates that the difference in exercise frequency and the total PSQI score is statistically significant ($P < 0.01$), and the higher the exercise frequency, the lower the total PSQI score. This result is consistent with existing literature[14, 15]. Domestic research indicates that physical exercise is beneficial for improving the mental health of resident trainees. International research also found that daily physical activity is significantly associated with better sleep quality scores[16]; physical activity during leisure time is a protective factor for sleep disorders among Chinese medical staff (OR = 0.770, 95% CI: 0.651-0.911)[17]. The physiological mechanism by which exercise improves sleep may include promoting the secretion of endogenous melatonin, reducing sympathetic nerve tension, and alleviating anxiety and depression[18]. For resident trainees, due to the busy clinical work, regular exercise is often overlooked. However, the results of this study suggest that in a high-pressure environment, exercise, as a low-cost and high-benefit self-regulation method, should be actively incorporated into the health management plan of resident trainees. Training bases can organize group exercise, provide fitness facilities or set up exercise incentive measures to encourage resident trainees to maintain an appropriate exercise frequency.

Univariate analysis in the study shows that the habit of taking a nap has a statistically significant difference in the PSQI total score ($P < 0.05$). Those with the habit of taking a nap have a lower median PSQI total score (6 points vs 8 points), but Logistic regression analysis did not include the habit of taking a nap in the final model (OR = 0.451, 95% CI: 0.108-1.874, $P = 0.273$). This result may be related to the small sample size, or it may be that the relationship between napping and sleep quality is affected by other confounding factors. Some studies have pointed out that a short nap can improve the cognitive function and alertness of first-year internal medicine resident physicians[19, 20]. However, the impact of napping on nighttime sleep quality is complex and depends on the duration, time point of napping and individual sleep needs[21]. Future research can use a larger sample to further explore the relationship between nap habits and the sleep quality of resident trainees. It is worth noting that in this study, gender, postgraduate status, grade, average monthly salary, smoking, drinking, caffeine intake, etc. had no statistically significant difference in the PSQI total score. Some factors (such as smoking, caffeine intake) were reported to be related to sleep quality in previous studies[22-24], but in this study, they did not show significant differences, possibly due to the limited sample size, different baseline characteristics of the survey subjects or regional differences. Moreover, this study has a strong collinearity among anxiety, stress and depression (VIF $\geqslant$ 10), and did not include anxiety and stress

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in the Logistic regression model, only including the depression variable. Considering the high correlation among the three and the emphasis in previous studies on the role of anxiety in sleep disorders, future research should adopt more detailed statistical methods such as structural equation modeling to further clarify the different paths and relative contributions of depression, anxiety and stress to sleep quality.

This study has certain limitations. Firstly, this study is a cross-sectional design, which makes it impossible to infer the causal relationship between sleep disorders and various influencing factors. Secondly, the sample size is relatively small (n=111), and the research subjects are only from Anhui Province, which may lead to selection bias. Thirdly, the data are all based on self-reported questionnaires, which may have recall bias and social expectation bias. Fourthly, this study did not include occupational factors such as work load, duty frequency, and commuting time that may be closely related to sleep quality. Future research should expand the sample size, include multi-center data, and adopt a longitudinal design to reveal the dynamic process and causal mechanism of changes in sleep quality.

In conclusion, the sleep quality problem among medical interns in Anhui Province is prominent. Sleep disorders are significantly positively correlated with psychological factors such as depression, anxiety, and stress. Not obtaining a practicing physician certificate and depressive symptoms are independent risk factors for sleep disorders, while regular exercise is an important protective factor. It is recommended that training bases and management departments: (1) Incorporate sleep quality and mental health screening into the routine health monitoring system of medical interns, and provide timely professional intervention for those with positive screenings; (2) Pay attention to the group of medical interns who have not obtained a practicing physician certificate, and provide targeted psychological support and time management guidance during the preparation period; (3) Create a favorable institutional environment and cultural atmosphere conducive to regular exercise, and encourage medical interns to maintain an appropriate frequency of physical exercise; (4) Explore the inclusion of mental health education and sleep hygiene knowledge in the training curriculum, to enhance the self-regulation ability of medical interns. Through multi-level comprehensive intervention, it is expected to effectively reduce the incidence of sleep disorders among medical interns, promote their physical and mental health and career development.

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