

Latent profile analysis of sleep quality among newly employed nurses: a cross-sectional study

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Abstract

Background

Newly employed nurses face unique challenges during role transition, making them particularly vulnerable to sleep disturbances. However, traditional assessments overlook the heterogeneity of sleep problems in this population. This study employed latent profile analysis (LPA) to identify distinct sleep quality subgroups and explore factors influencing profile membership.

Methods

A cross-sectional study was conducted from July to September 2024, recruiting 398 newly employed nurses from a tertiary hospital in China. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), and psychological status was evaluated with the Depression Anxiety Stress Scales-21 (DASS-21). LPA was performed based on seven PSQI dimensions, followed by chi-square tests, ANOVA, and multinomial logistic regression to identify influencing factors.

Results

Three latent profiles were identified: healthy sleep (19.6%), suboptimal sleep (48.5%), and sleep disorder (31.9%) groups. The suboptimal sleep group was characterized by prolonged sleep latency and insufficient duration, while the sleep disorder group exhibited elevated scores across all dimensions. Regular physical activity was protective for both suboptimal (OR = 0.528, 95%CI: 0.295–0.945) and sleep disorder groups (OR = 0.432, 95%CI: 0.222–0.843). Anxiety was a risk factor for both groups (OR = 1.141–1.169). Neurotic personality (OR = 11.837, 95%CI: 1.398–100.236) and avoidant coping style (OR = 4.995, 95%CI: 1.026–24.313) were significant risk factors specifically for the sleep disorder group.

Conclusion

Sleep quality among newly employed nurses demonstrates significant heterogeneity, with over 80% experiencing sleep problems. Targeted interventions focusing on physical activity promotion, anxiety management, and adaptive coping strategies are recommended.

Background

Nursing professionals constitute the cornerstone of global healthcare systems. In China, the number of registered nurses reached 5.63 million by the end of 2023 (1). Newly employed nurses are in a critical period of professional adaptation, often experiencing "transition shock" characterized by insufficient professional skills, role adaptation difficulties, and excessive work stress (2, 3). Research indicates that over 60% of newly employed nurses report moderate to high levels of work stress during their first year,

which not only affects their physical and mental health but may also lead to decreased nursing quality and increased patient safety risks (4–6).

Sleep quality is a critical factor affecting nurses' physical and mental health as well as work performance. A meta-analysis including 53 studies showed that the pooled prevalence of poor sleep quality among nurses was 61.0% (7), with Chinese newly employed nurses reporting even higher incidence rates of approximately 55–64% (8). Insufficient sleep not only impairs nurses' physiological and psychological health (9) but also directly affects clinical performance, 82% of studies confirm that fatigue is a significant contributing factor to medication errors (10). Sleep problems are also significantly associated with job burnout and turnover intention (11). Therefore, attention to sleep quality among newly employed nurses is of great significance for ensuring nursing workforce stability and patient safety.

Existing research on nurses' sleep quality predominantly employs variable-centered analytical methods, comparing differences in Pittsburgh Sleep Quality Index (PSQI) total scores among different groups. However, this approach assumes all individuals are homogeneous in terms of sleep problems and neglects the heterogeneity of sleep problem patterns (12). Latent profile analysis (LPA), as a person-centered statistical method, can identify subgroups with similar characteristics based on individuals' performance patterns across multiple sleep dimensions, providing a basis for precision interventions (13).

In recent years, LPA has been applied to research on nurses' sleep problems, identifying different sleep quality subtypes with significant differences in health risks among subgroups (14–16). However, existing studies have primarily focused on practicing nurses or nurses in specific departments, and LPA research on newly employed nurses remains scarce. Given that sleep problem patterns of newly employed nurses may differ from those of experienced nurses, this study aimed to use LPA to identify latent profiles of sleep quality among Chinese newly employed nurses, examine characteristic differences among profiles, and explore factors influencing profile membership.

Methods

Study design

This cross-sectional study was conducted from July to September 2024 at a tertiary general hospital in China. This study is reported following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Additional file 1).

Participants and sample size

Convenience sampling was used to recruit participants through online questionnaire recruitment notices. Inclusion criteria were: (1) newly employed nurses within their first year of employment; (2) aged

18 years or older; (3) able to independently complete the questionnaire; and (4) willing to participate voluntarily. Exclusion criteria were: (1) self-reported history of psychiatric disorders or cognitive impairment diagnosed by medical institutions; (2) inability to complete the survey; and (3) unwillingness to provide informed consent.

According to methodological requirements for latent profile analysis, each latent class requires at least 50 cases (17), with an anticipated 3–4 classes, necessitating a minimum sample size of 200–300. Considering a 10% invalid questionnaire rate, the final target sample size was set at 330. A total of 420 electronic questionnaires were distributed to newly employed nurses meeting the inclusion criteria, with 398 valid questionnaires returned, yielding an effective response rate of 94.8%. Of the 22 excluded questionnaires, 20 were incomplete and 2 were excluded due to excessively short completion time (< 5 minutes) or abnormal response patterns.

Research instruments

Demographic questionnaire. A self-designed general information questionnaire was developed based on literature review to collect basic participant information, including: demographic characteristics (gender, age, family origin, highest education level, marital status, only-child status, parental status); work-related information (medical work experience, employment contract type, occurrence of nursing errors during internship); and lifestyle and behavioral characteristics (study time arrangement, physical activity participation). Additionally, this study referenced the five dimensions of Big Five personality theory, using a single-choice question to assess participants' self-rated personality type, with options including extraversion, agreeableness, conscientiousness, neuroticism, and openness. Stress coping style was similarly assessed using a single-choice question asking about typical coping approaches when facing work stress, with options including "actively seeking solutions," "releasing emotions through various channels," "passive avoidance," and "seeking help from others."

Pittsburgh Sleep Quality Index (PSQI). The PSQI, developed by Buysse et al. in 1989, is a 19-item self-report questionnaire measuring sleep quality over the past month. The scale comprises seven component scores: subjective sleep quality (C1), sleep latency (C2), sleep duration (C3), habitual sleep efficiency (C4), sleep disturbances (C5), use of sleeping medication (C6), and daytime dysfunction (C7). Each component is scored from 0 to 3, with total scores ranging from 0 to 21; higher scores indicate poorer sleep quality. A total score > 5 indicates poor sleep quality. The Chinese version has been widely used in Chinese populations with good reliability and validity (18). In this study, Cronbach's α coefficient was 0.84.

Depression Anxiety Stress Scales-21 (DASS-21). The DASS-21, developed by Lovibond and Lovibond in 1995, was used to assess psychological health status. This scale contains three subscales—depression, anxiety, and stress—each with 7 items. Each item is scored on a 4-point Likert scale (0 = did not apply to me, 1 = applied to me to some degree, 2 = applied to me a considerable degree, 3 = applied to me very much), based on experiences over the past week. Subscale scores are the sum of respective item

scores. This study reports raw scores (range 0–21) without multiplication by 2 for conversion to DASS-42 equivalent scores; higher scores indicate more severe symptoms. The Chinese version has demonstrated good reliability and validity in Chinese populations (19). In this study, Cronbach's α coefficients for the three subscales were 0.828 (depression), 0.897 (anxiety), and 0.880 (stress).

Data collection

Data were collected from July to September 2024 through the secure online survey platform "Wenjuanxing." Prior to study initiation, researchers contacted nursing department directors at each hospital to secure their support and cooperation. Before questionnaire distribution, head nurses or relevant personnel distributed QR codes for electronic questionnaires along with standardized instructions (including study purpose, questionnaire completion guidelines, and estimated completion time of approximately 15–20 minutes). Consent was confirmed by checking an agreement box at the top of the electronic questionnaire before proceeding. Nurses completed questionnaires independently, with all items set as mandatory. To ensure data quality, each electronic device was limited to one response. All questionnaires completed in less than 5 minutes or with identical responses to all items were excluded from analysis to maintain data integrity and authenticity.

Statistical analysis

Latent profile analysis was performed on the seven PSQI dimensions using Mplus 8.3 software. The primary reference indicators for LPA model comparison included: (1) information criteria—Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and adjusted Bayesian Information Criterion (aBIC), with smaller values indicating better model fit; (2) classification indicator—entropy, with values > 0.8 indicating higher classification accuracy; (3) likelihood ratio test indicators—Lo-Mendell-Rubin adjusted likelihood ratio test (LMRT) and Bootstrap likelihood ratio test (BLRT), with $p < 0.05$ indicating that the k -class model is superior to the $k-1$ class model; and (4) practical considerations including interpretability and minimum class size $> 5\%$.

After determining the optimal profile, univariate and multivariate analyses were conducted using SPSS 26.0. Count data were expressed as frequencies (percentages) and compared between groups using chi-square tests (χ^2). Normality of measurement data was assessed using skewness and kurtosis. According to Kline's criteria [18], data with absolute skewness < 3 and absolute kurtosis < 10 can be considered approximately normally distributed. Normally distributed measurement data were expressed as mean $\pm$ standard deviation ($M \pm SD$), with intergroup comparisons using one-way ANOVA and pairwise comparisons using LSD method. Non-normally distributed measurement data were expressed as median (interquartile range) and compared between groups using Kruskal-Wallis H test. Variables with $p < 0.05$ in univariate analysis were included in multivariate analysis. Multivariate analysis employed multinomial logistic regression, using the healthy sleep group as reference for comparison with suboptimal sleep and sleep disorder groups. Statistical significance was set at $p < 0.05$.

Ethical considerations

This study was approved by the Research Ethics Committee of the researcher's affiliated hospital (Approval No.: 2024 – 0567). All procedures adhered to the standards of the Declaration of Helsinki. Prior to questionnaire distribution, participants were informed that survey participation was entirely voluntary, questionnaires would be completed anonymously, withdrawal at any time would incur no penalty, and collected data would be used solely for academic research. No compensation or incentives were provided for participation. To ensure data confidentiality and anonymity, all collected materials were accessible only to the principal investigator.

Results

General characteristics of newly employed nurses

A total of 398 newly employed nurses were included in this study. Participants were predominantly female (91.5%, $n = 364$), unmarried (96.2%, $n = 383$), and held bachelor's degrees (94.5%, $n = 376$), with a mean age of 22.0 ± 1.2 years. Regarding behavioral characteristics, only 36.9% ($n = 147$) regularly participated in physical activity. Personality types were predominantly agreeable (35.9%) and conscientious (24.4%), with neurotic personality accounting for 10.8%. In terms of stress coping styles, 60.3% tended to actively seek solutions while 9.8% adopted passive avoidance. Details are presented in Table 1.

Table 1
Baseline characteristics of study participants (n = 398)

Variable	Category	Frequency	Percentage (%)
Sex	Male	34	8.50
	Female	364	91.50
Age	≤ 22 years	232	58.3
	23–24 years	127	31.9
	≥ 25 years	39	9.8
Place of origin	Rural	272	68.30
	Urban	126	31.70
Highest education level	Associate degree	4	1.00
	Bachelor's degree	376	94.50
	Master's degree or above	18	4.50
Plans for further education	No	122	30.70
	Yes	276	69.30
Only child	No	277	69.60
	Yes	121	30.40
Marital status	Married	15	3.80
	Unmarried	383	96.20
Having children	No	388	97.50
	Yes	10	2.50
Nursing errors during internship	No	364	91.50
	Yes	34	8.50
Prior healthcare experience	No	322	80.90
	Yes	76	19.10
Employment contract type	Permanent position	34	8.50
	Dispatched employment	360	90.50
	Hospital-employed	4	1.00
Study time arrangement	Fixed time daily	29	7.30

Variable	Category	Frequency	Percentage (%)
	Concentrated on weekends	66	16.60
	Fragmented time	238	59.80
	As scheduled by others	65	16.30
Regular physical activity	No	251	63.10
	Yes	147	36.90
Exercise to relieve work stress	No	121	30.40
	Yes	277	69.60
Willingness to exercise with colleagues	Unwilling	55	13.80
	Willing	343	86.20
Willingness to start exercising	Unwilling	24	6.00
	Willing	374	94.00
Personality type	Extraversion	77	19.30
	Agreeableness	143	35.90
	Conscientiousness	97	24.40
	Neuroticism	43	10.80
	Openness	38	9.50
Stress coping style	Actively seeking solutions	240	60.30
	Venting emotions through various ways	67	16.80
	Passive avoidance	39	9.80
	Seeking help from others	52	13.10

PSQI and DASS-21 scores of newly employed nurses

The mean PSQI total score was 12.62 ± 5.13 , with 80.4% (n = 320) of participants scoring > 5, indicating poor sleep quality. Mean scores for depression, anxiety, and stress were 11.33 ± 2.69 , 13.10 ± 3.72 , and 11.75 ± 2.99 , respectively (Table 2).

Table 2
PSQI and DASS-21 scores of newly recruited nurses (n = 398)

Variable	M ± SD (item)	M ± SD (total score)
Depression	1.62 ± 0.38	11.33 ± 2.69
Anxiety	1.87 ± 0.53	13.10 ± 3.72
Stress	1.68 ± 0.43	11.75 ± 2.99
Sleep quality	1.80 ± 0.73	12.62 ± 5.13
<i>Note: DASS-21 subscale scores are reported as raw scores (range: 0–21); higher scores indicate greater symptom severity. PSQI total scores range from 0–21, with scores > 5 indicating poor sleep quality.</i>		

Latent profile analysis of sleep quality

Latent profile analysis was conducted based on the seven PSQI dimensions: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Models with 1 to 5 latent classes were sequentially established. Results showed that as the number of classes increased, AIC, BIC, and aBIC values decreased progressively. Notably, the LMR values for both 4-class ($p = 0.230$) and 5-class ($p = 0.573$) models did not reach statistical significance, while the 3-class model demonstrated good classification accuracy with an entropy value of 0.845. Through comprehensive comparison of model fit indices, the 3-class model was determined to be optimal. The three latent profiles were identified as follows: Class 1, healthy sleep group ($n = 78$, 19.6%); Class 2, suboptimal sleep group ($n = 193$, 48.5%); and Class 3, sleep disorder group ($n = 127$, 31.9%). Model fit indices are presented in Table 3, and the profile characteristics are visualized in Fig. 1.

Based on the sleep quality dimension score characteristics of the three-class model, each latent class was named and described as follows: Class 1, the healthy sleep group (19.6%, $n=78$), exhibited low scores across subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, and use of sleeping medication dimensions, with good daytime functioning, demonstrating overall good sleep quality. Class 2, the suboptimal sleep group (48.5%, $n=193$), showed moderate scores in subjective sleep quality, sleep latency, and sleep duration dimensions, with certain degrees of sleep problems and notable manifestations in sleep disturbances and daytime functioning. Class 3, the sleep disorder group (31.9%, $n=127$), had elevated scores across all sleep dimensions, particularly prominent in subjective sleep quality, sleep efficiency, and sleep disturbances, indicating significant sleep problems.

Univariate analysis of different sleep latent profiles

Chi-square tests revealed statistically significant differences among the three groups in only-child status, nursing errors during internship, medical experience, physical activity participation, personality type, and stress coping style (all $P < 0.05$). Notably, the sleep disorder group showed the highest proportion of

neurotic personality (22.8%) and passive avoidance coping (20.5%), while the healthy sleep group had the highest rates of regular physical activity (55.1%) and active problem-solving (73.1%).

One-way ANOVA revealed significant differences in anxiety scores among the three groups ($F=18.822$, $P<0.001$). Post-hoc tests showed anxiety scores were significantly higher in the sleep disorder group (14.26 ± 3.43) than in the suboptimal sleep (13.15 ± 3.67) and healthy sleep groups (11.12 ± 3.51). No significant differences were found for depression, stress, or age ($P>0.05$). Detailed results are presented in Table 4 and Table 5.

Multinomial logistic regression analysis

Multinomial logistic regression was conducted with sleep quality latent profile as the dependent variable (healthy sleep group as reference). Variable assignments are shown in Table 6.

For the suboptimal sleep group, regular physical activity was a protective factor ($OR=0.528$, 95%CI: 0.295–0.945, $P=0.032$), while anxiety was a risk factor ($OR=1.141$, 95%CI: 1.046–1.245, $P=0.003$). For the sleep disorder group, regular physical activity remained protective ($OR=0.432$, 95%CI: 0.222–0.843, $P=0.014$). Risk factors included neurotic personality ($OR=11.837$, 95%CI: 1.398–100.236, $P=0.023$), passive avoidance coping style ($OR=4.995$, 95%CI: 1.026–24.313, $P=0.046$), and anxiety ($OR=1.169$, 95%CI: 1.062–1.287, $P=0.001$). The wide confidence interval for neurotic personality should be interpreted with caution due to limited cases in the reference group. Other variables did not reach statistical significance ($P>0.05$). Full results are presented in Table 7.

Discussion

This study employed latent profile analysis to identify three latent profiles of sleep quality among newly employed nurses based on seven PSQI dimensions: healthy sleep group (19.6%), suboptimal sleep group (48.5%), and sleep disorder group (31.9%). Results indicate that over 80% of newly employed nurses experience varying degrees of sleep problems. Multinomial logistic regression analysis revealed that regular physical activity is a protective factor for sleep quality, while anxiety, neurotic personality, and passive avoidance coping style are risk factors for sleep disorders.

The proportion of sleep problems among newly employed nurses in this study is higher than that reported in previous studies of nursing populations. Pan et al. (14), using the same LPA method to study psychiatric nurses, found that 36.9% had good sleep quality; Li et al. (15), studying ICU nurses, identified four sleep profiles with 66.09% having PSQI total scores ≥ 7 ; Slavish et al. (16), using sleep diary-based research, found 80.4% of nurses had "overall good sleep." In this study, the healthy sleep group comprised only 19.6%, which may be related to the unique professional stage of newly employed nurses. They are undergoing role transition from students to clinical nurses, facing multiple challenges including insufficient professional skills, work environment adaptation, and interpersonal relationship establishment—this "transition shock" may significantly impact their sleep quality (20–22). Regarding sleep characteristics across the three profiles, the sleep disorder group had elevated scores across all dimensions, particularly prominent in subjective sleep quality, sleep efficiency, and sleep disturbances;

the suboptimal sleep group mainly manifested as prolonged sleep latency and insufficient sleep duration, accompanied by certain degrees of daytime dysfunction. This differentiated pattern of sleep problems is consistent with Pan et al.'s research (14), suggesting that differentiated intervention strategies should be adopted for newly employed nurses in different profiles rather than uniform sleep improvement programs.

This study found that regular physical activity is an important protective factor for sleep quality among newly employed nurses, demonstrating significant protective effects in both the suboptimal sleep group (OR=0.528) and sleep disorder group (OR=0.432). This finding is consistent with multiple previous studies. Alnawwar et al.'s (23) systematic review comprehensively evaluated the impact of physical activity on sleep quality, showing that regular moderate-intensity physical activity can significantly improve sleep quality, shorten sleep latency, and enhance overall sleep quality. Chen et al.'s (24) study of Chinese healthcare workers found that leisure-time physical activity is a significant protective factor for sleep disorders (OR=0.770, 95%CI: 0.651-0.911). According to Oluşum et al.'s (25) review, moderate exercise can improve sleep through the following pathways: first, exercise promotes the release of neurotransmitters such as endorphins, alleviating anxiety and stress; second, exercise regulates circadian rhythms and enhances sleep drive; additionally, regular exercise can improve cardiopulmonary function and metabolic levels, indirectly promoting sleep quality improvement. Sleep deprivation is associated with elevated cortisol levels and decreased testosterone and growth hormone levels, suggesting that exercise has potential protective effects for sleep-deprived individuals. However, this study shows that only 36.9% of newly employed nurses regularly participate in physical activities, with this proportion even lower in the sleep disorder group (29.9%). Newly employed nurses face heavy clinical work and continuous learning pressure with limited disposable leisure time, which may be an important reason for their low physical activity participation.

This study's results indicate that anxiety is an important risk factor affecting sleep quality among newly employed nurses, with statistical significance in both the suboptimal sleep group (OR=1.141) and sleep disorder group (OR=1.169). Univariate analysis also showed that anxiety scores exhibited an increasing trend of "healthy sleep group < suboptimal sleep group < sleep disorder group," with statistically significant differences ($F=18.822$, $P<0.001$). A bidirectional relationship exists between anxiety and sleep problems. Zhang et al.'s (26) study of Chinese nurses found that sleep quality, anxiety, and high stress have bidirectional associations, with anxiety significantly negatively correlated with sleep quality. Peng et al.'s (27) longitudinal study based on 16,699 community residents further confirmed that sleep disorders can increase anxiety risk by 1.89 times (95%CI: 1.43-2.48), while anxiety also increases sleep disorder risk by 1.20 times (95%CI: 1.03-1.39), although sleep disorders' impact on anxiety appears more pronounced. This study indicated that individuals with poor sleep quality may develop maladaptive cognitive patterns such as excessive worry and rumination, which exacerbate anxiety and depressive symptoms. These psychological factors are associated with worsening sleep disorders, forming a bidirectional relationship. This study's results suggest that interventions to improve newly employed nurses' sleep quality should emphasize mental health assessment and intervention. Zhang et al.'s (26) research indicates that stress and negative emotions may activate physiological arousal systems,

including the hypothalamic-pituitary-adrenal (HPA) axis, further disrupting sleep patterns. The interaction between cognitive, emotional, and physiological factors often leads to a vicious cycle between sleep disorders and mental health problems. Nursing administrators can help newly employed nurses alleviate anxiety through establishing mentorship systems, conducting mental health education, and providing psychological counseling services, thereby indirectly improving their sleep quality.

Neurotic personality is a significant risk factor for the sleep disorder group (OR=11.837, $P=0.023$), consistent with previous research. It should be noted that the sample size for neurotic personality in the healthy sleep group was only 1 (1.3%), while in the sleep disorder group it was 29 (22.8%). The small reference group sample size leads to unstable OR estimation with a wide 95% confidence interval (1.398-100.236), and therefore this result should be interpreted with caution. Nevertheless, Stephan et al.'s (28) longitudinal study of over 22,000 middle-aged and older adults found that lower neuroticism scores were associated with better sleep quality, with effect sizes larger than demographic factors. Regarding mechanisms, Zamani et al. (29) pointed out that the relationship between neuroticism and sleep quality may be mediated by metacognitive, cognitive, and emotional factors; Zhang et al. (30) further found that high neuroticism is associated with more rumination and anxiety about sleep problems in insomnia patients. In this study's context, newly employed nurses with neurotic personalities may have greater difficulty effectively regulating emotions when facing various challenges in the early employment period, thereby affecting sleep quality.

Passive avoidance stress coping style is also a risk factor for the sleep disorder group (OR=4.995, $P=0.046$). This finding is consistent with previous research. Kowalczyk et al.'s (31) cross-sectional study of 448 Polish nurses found that avoidant coping strategies were closely associated with sleep problems; Otsuka et al.'s (32) two-year longitudinal study of Japanese workers also confirmed that individuals with insomnia symptoms are more inclined to use maladaptive coping strategies. According to Folkman and Lazarus's stress-coping interaction model (33), individuals adopting passive avoidance strategies tend to escape problems rather than actively solve them. While this coping style may reduce psychological stress in the short term, long-term problem accumulation increases psychological burden, thereby affecting sleep quality. This study shows that the proportion of passive avoidance coping in the sleep disorder group (20.5%) is significantly higher than in the healthy sleep group (2.6%), further confirming the importance of active coping strategies for maintaining sleep health.

This study's results have the following implications for nursing management practice. First, nursing administrators should fully recognize individual differences in sleep quality among newly employed nurses and avoid "one-size-fits-all" intervention approaches. Person-centered analytical methods help identify nurse groups at higher sleep risk and deeply understand individual factors contributing to sleep problems. For the suboptimal sleep group, interventions should focus on improving sleep initiation difficulties and insufficient sleep duration; for the sleep disorder group, more comprehensive integrated interventions are needed. Second, given the protective effect of physical activity on sleep quality, healthcare institutions can create conditions for newly employed nurses to participate in exercise through reasonable scheduling, providing sports facilities, and organizing group physical activities.

Additionally, it is recommended to incorporate mental health screening into routine health management processes for newly employed nurses to identify individuals with anxiety early and provide corresponding psychological support. Timely intervention helps break the vicious cycle between sleep disorders and anxiety symptoms, thereby improving overall health levels. Finally, stress management and positive coping strategy education can be integrated into newly employed nurse training to help establish healthy stress coping patterns and avoid using passive avoidance and other approaches detrimental to physical and mental health.

This study has several strengths. It is the first to apply latent profile analysis to explore sleep quality heterogeneity among newly employed nurses in China, providing new perspectives for understanding sleep problems in this population. The study comprehensively examined multiple potential influencing factors including physical activity, personality traits, and coping styles, offering theoretical support for developing targeted interventions.

This study also has several limitations. First, the cross-sectional design cannot determine causal relationships among variables; future research could employ longitudinal designs to track dynamic changes in newly employed nurses' sleep quality. Second, the sample came from a single tertiary hospital in one region, and generalizability requires careful consideration. Third, some independent variables were unevenly distributed across profiles, particularly neurotic personality with only 1 case (1.3%) in the healthy sleep group, leading to unstable OR estimation with wide confidence intervals; this result should be interpreted with caution. Future studies should expand sample sizes to ensure more balanced distribution across profiles. Fourth, personality type and stress coping style were measured using single-item questions rather than standardized scales, which may not fully capture the complexity of these constructs. Fifth, self-reported data may introduce recall bias and social desirability bias; future research could incorporate objective sleep monitoring tools (such as actigraphy) for comprehensive assessment.

Conclusion

This study employed latent profile analysis to identify three latent profiles of sleep quality among newly employed nurses: healthy sleep group (19.6%), suboptimal sleep group (48.5%), and sleep disorder group (31.9%), revealing significant heterogeneity in this population. Regular physical activity was identified as a protective factor, while anxiety, neurotic personality, and passive avoidance coping style were risk factors for sleep disorders. These findings suggest that nursing administrators should develop differentiated intervention strategies for different sleep profiles, emphasizing physical activity promotion, mental health support, and positive coping strategy training to improve sleep quality and promote nursing workforce stability.

Declarations

Ethical approval

This study was approved by the Ethics Committee of Sir Run Run Shaw Hospital, Zhejiang University School of Medicine (Approval No.: 2024-0567). All procedures adhered to the Declaration of Helsinki. Participants were informed that participation was voluntary, questionnaires were anonymous, withdrawal would incur no penalty, and data would be used solely for academic research. No compensation was provided.

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Author contributions

Yunxia Shen and Jingbang Liu contributed equally to this work as co-first authors. Yunxia Shen performed the latent profile analysis and statistical analyses, and drafted the manuscript. Jingbang Liu designed and administered the survey instruments, coordinated participant recruitment, and managed data collection. Hong Zhu assisted with literature review. YeRu Xia assisted with data collection. Qinli Cao provided guidance on questionnaire instructions and participated in data interpretation. Lili Wu conceptualized and supervised the study, critically revised the manuscript, and served as the corresponding author. All authors read and approved the final manuscript.

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Data availability

The datasets generated and analyzed during the current study are not publicly available due to ethical restrictions but are available from the corresponding author upon reasonable request.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Table 3 To 7

Table 3 To 7 are available in the Supplementary Files section.

Figures

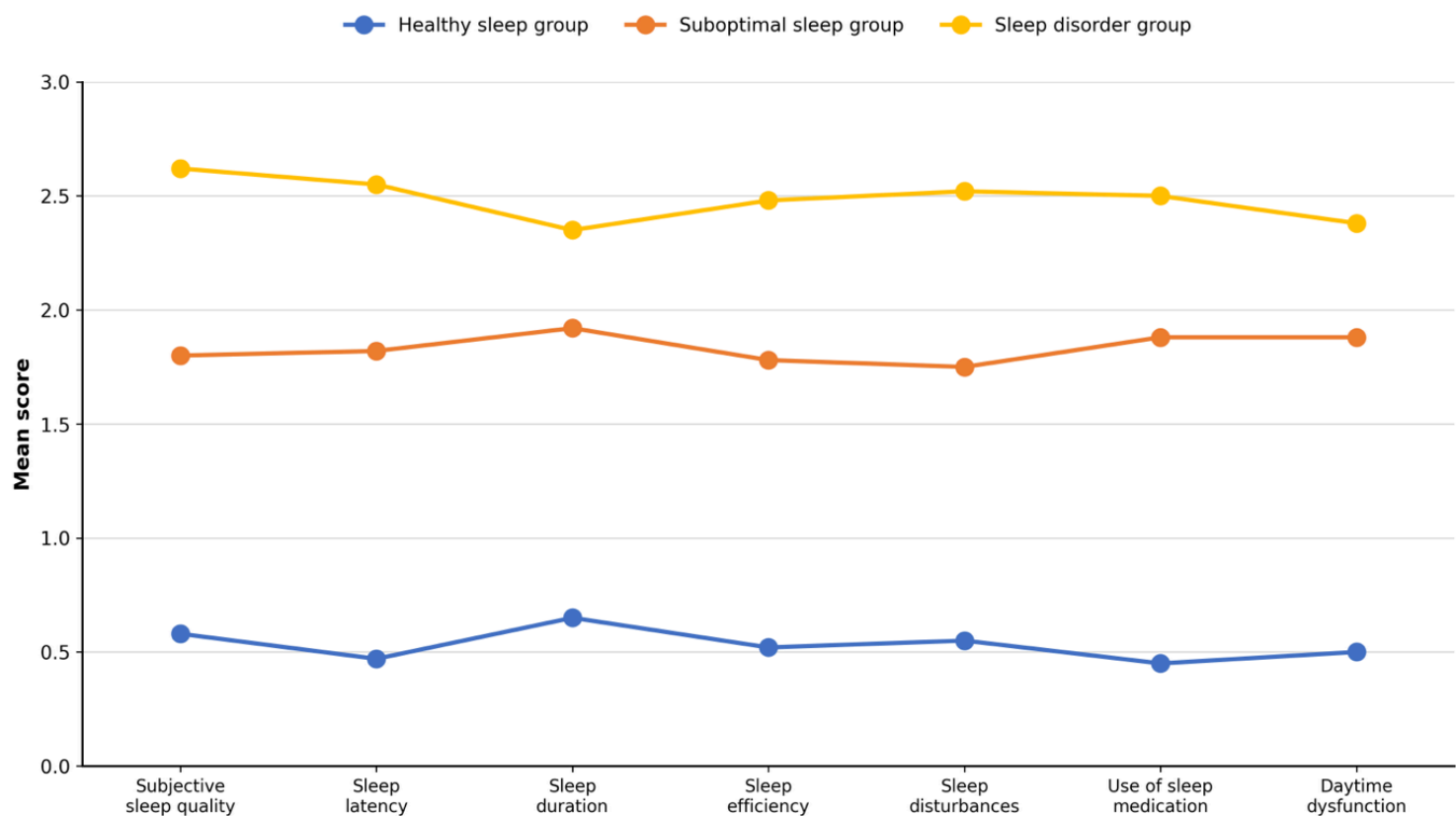


Figure 1
Mean scores of PSQI components across latent profile classes

Supplementary Files

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- [Table3To7.docx](#)