

Bidirectional Association Between Sleep Quality and Mental Health: Correlation Analysis of DASS and MHC Indicators Among College Students

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Abstract

Objective: Based on the dual-continua model of mental health, this study aimed to explore the relationship between sleep quality and college students' mental health, while examining differences in association strength with negative psychological symptoms and positive mental health indicators. **Methods:** The study included 948 college students, with 832 valid samples after data cleaning. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), negative psychological symptoms were measured with the Depression-Anxiety-Stress Scale (DASS), and positive mental health was evaluated using the Mental Health Continuum-Short Form (MHC-SF). Spearman's correlation analysis was employed to examine variable relationships. **Results:** PSQI total scores showed significant positive correlations with all DASS dimensions: DASS total score ($\rho = 0.50, p < 0.001$), DASS stress ($\rho = 0.51, p < 0.001$), DASS anxiety ($\rho = 0.49, p < 0.001$), and DASS depression ($\rho = 0.47, p < 0.001$), indicating that poorer sleep quality was associated with higher psychological distress. Conversely, PSQI scores exhibited significant negative correlations with MHC dimensions: MHC emotional well-being ($\rho = -0.398, p < 0.001$), MHC total score ($\rho = -0.395, p < 0.001$), MHC psychological well-being ($\rho = -0.392, p < 0.001$), and MHC social well-being ($\rho = -0.31, p < 0.001$), suggesting that worse sleep quality correlated with lower positive mental health levels. The study found that PSQI correlations with DASS dimensions were slightly stronger than those with MHC dimensions. Among DASS subscales, stress showed the strongest association with sleep quality, while in MHC, emotional well-being had the strongest link, and social well-being the weakest. **Conclusion:** The quality of sleep exhibited a bidirectional relationship with the mental health of college students, showing a positive correlation with negative psychological symptoms and a negative correlation with indicators of positive mental health, with varying degrees of strength across different dimensions. These results lend support to the dual-continua model of mental health, underscoring the significant role of sleep quality in the overall mental well-being of college students. This evidence provides a vital foundation for mental health education and intervention strategies on college campuses. In efforts to promote mental health, it is essential to focus on sleep-related issues, particularly their connection to stress and emotional well-being, as enhancing sleep quality may reciprocally improve the mental health of college students.

Keywords

Sleep quality; College students; Dual-factor model of mental health; Psychological distress; Positive mental health; PSQI; DASS; MHC-SF.

1. Introduction

Sleep is a vital component of human health, occupying nearly one-third of human life. With the accelerated pace of modern life and increased use of electronic devices, sleep issues have become increasingly prevalent and a global public health concern. Statistics indicate that approximately 150 million people worldwide suffer from sleep problems, with about 17% of the population in developing countries and 20% in developed countries experiencing sleep-related issues ^[1]. Sleep quality not only impacts physiological functions but is also closely linked to mental health. In recent years, researchers have adopted a more holistic perspective to explore the bidirectional relationship between sleep quality and mental health, examining both its connections to negative psychological symptoms and its associations with positive mental health indicators.

The relationship between sleep quality and negative mental health symptoms has been extensively studied. Experimental research demonstrates that improving sleep significantly alleviates symptoms of depression and anxiety, with the effect size proportional to the degree of sleep quality enhancement (a dose-response relationship), suggesting a causal link between sleep and mental health ^[2]. Systematic reviews indicate that sleep disorders (e.g., insomnia) are potential contributing factors to various psychological disorders, and sleep interventions can not only independently improve sleep issues but also effectively alleviate other psychological symptoms ^[3]. Notably, studies reveal that distinct types of sleep problems (e.g., difficulty falling asleep and sleep maintenance disorders) are strongly associated with depressive symptoms ^[4]. However, prior research has primarily focused on clinical populations, leaving a relative gap in understanding the differential associations between sleep quality and dimensions such as stress, anxiety, and depression in the general population.

In contrast, research on the relationship between sleep quality and positive mental health indicators remains relatively limited. In recent years, with the development of positive psychology, researchers have begun investigating the connection between sleep and positive aspects of mental health. Large-scale studies show that circadian rhythm stability (reflecting sleep quality) is significantly correlated with subjective well-being, independent of mood disorder symptoms such as depression or anxiety ^[5]. Daily tracking studies reveal that good sleep quality significantly enhances positive emotions the following day, with this effect stronger than the reverse influence of emotions on sleep ^[6]. Further research confirms that high-quality sleep may reduce anxiety and depression, thereby improving subjective well-being ^[7]. Nonetheless, there remains a lack of systematic investigation into the differential associations between sleep quality and emotional, psychological, and social dimensions of well-being.

Despite the valuable insights provided by previous studies, several critical limitations remain. First, most research has either focused on the relationship between sleep and negative psychological symptoms or examined its connection to positive mental health, lacking attempts to integrate both within a unified research framework. This fragmented approach hinders the revelation of a holistic picture of sleep quality across the mental health continuum. Second, relatively small sample sizes have reduced the statistical power and generalizability of findings. Finally, few studies have explored the differential strengths of associations between sleep quality and distinct dimensions of mental health, limiting deeper mechanistic understanding of the sleep-mental health relationship.

The dual-factor model of mental health provides a theoretical framework for synthesizing various research perspectives. This model asserts that mental health is characterized not merely by the absence of negative symptoms but also by the presence of positive emotions and effective functioning ^[8]. In support of this theory, a meta-analysis has indicated that enhancements in sleep quality have a significant moderate impact on mental health outcomes.

Specifically, improvements in sleep quality are associated with reductions in symptoms of depression, anxiety, and stress, as well as an increase in overall mental well-being, thereby underscoring the essential role of sleep quality in both dimensions of mental health [9].

This study aims to address the limitations of prior research by employing a large-sample design ($n = 832$) to explore the comprehensive relationship patterns between sleep quality and mental health. Grounded in the dual-factor model, the investigation simultaneously examines sleep quality's associations with negative psychological symptoms (DASS: Depression, Anxiety, Stress Scales) and positive mental health indicators (MHC: Mental Health Continuum), while comparing differences in association strengths across dimensions. Specifically, the study hypothesizes: (1) Sleep quality will show significant positive correlations with all DASS dimensions (depression, anxiety, stress); (2) Sleep quality will demonstrate significant negative correlations with all MHC dimensions (emotional, psychological, and social well-being); (3) The strength of associations between sleep quality and distinct DASS/MHC dimensions will vary. Through this integrative approach, we aim to provide more comprehensive evidence supporting the multifaceted value of sleep interventions in mental health promotion.

2. Organization of the Text

2.1. Research subject

This study collected data through questionnaire surveys from 948 Chinese college student participants. During data cleaning, missing values and outliers were addressed, resulting in a final valid sample of 832 participants.

2.2. Research tools

2.2.1. Pittsburgh Sleep Quality Index(PSQI)

The PSQI was employed to evaluate the sleep quality of participants. This instrument assesses various dimensions related to sleep, encompassing subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, the utilization of sleep medication, and daytime dysfunction. Elevated total PSQI scores are indicative of diminished sleep quality.

2.2.2. Depression-Anxiety-Stress Scales(DASS)

The DASS was used to evaluate participants' negative emotional states, comprising three subscales: depression, anxiety, and stress. This scale distinguishes the core symptoms of these three negative emotional states and provides total scores as an indicator of overall psychological distress. Higher total DASS scores and subscale scores reflect greater levels of the corresponding psychological distress.

2.2.3. Mental Health Continuum-Short Form(MHC-SF)

The MHC-SF was used to measure participants' positive mental health, comprising three dimensions: emotional well-being, psychological well-being, and social well-being. Higher total MHC-SF scores and subscale scores indicate better mental health levels.

2.3. Statistical Analysis Methods

Given the distributional characteristics of the study variables, Spearman's rank correlation analysis was employed to examine the relationships between PSQI scores and dimensions of DASS and MHC-SF. All statistical analyses adopted a significance level of $\alpha = 0.05$. Correlation strength was interpreted based on the magnitude of the correlation coefficient (ρ): $|\rho| < 0.3$ indicated weak correlations, $0.3 \leq |\rho| < 0.5$ indicated moderate correlations, and $|\rho| \geq 0.5$ indicated strong correlations. Significance levels were denoted using asterisks, with representing *** $p < 0.001$.

3. Results

3.1. Relationship Between Sleep Quality and Psychological Distress

As illustrated in Figure 1, the results of Spearman's correlation analysis demonstrated significant positive correlations between the total scores of the Pittsburgh Sleep Quality Index (PSQI) and each of the subscales of the Depression, Anxiety, and Stress Scales (DASS). This suggests that diminished sleep quality is linked to elevated levels of psychological distress. The specific findings are detailed as follows:

The PSQI showed a strong positive correlation with total DASS scores ($\rho = 0.50, p < 0.001$), demonstrating a significant association between sleep quality and overall psychological distress.

The strongest positive correlation was observed between the PSQI and the DASS stress subscale ($\rho = 0.51, p < 0.001$), highlighting sleep quality's close relationship with perceived stress.

A moderately strong positive correlation emerged between the PSQI and the DASS anxiety subscale ($\rho = 0.49, p < 0.001$), suggesting poorer sleep quality correlates with more pronounced anxiety symptoms.

Similarly, a moderately strong positive correlation was found between the PSQI and the DASS depression subscale ($\rho = 0.47, p < 0.001$), linking worse sleep quality to heightened depressive symptoms.

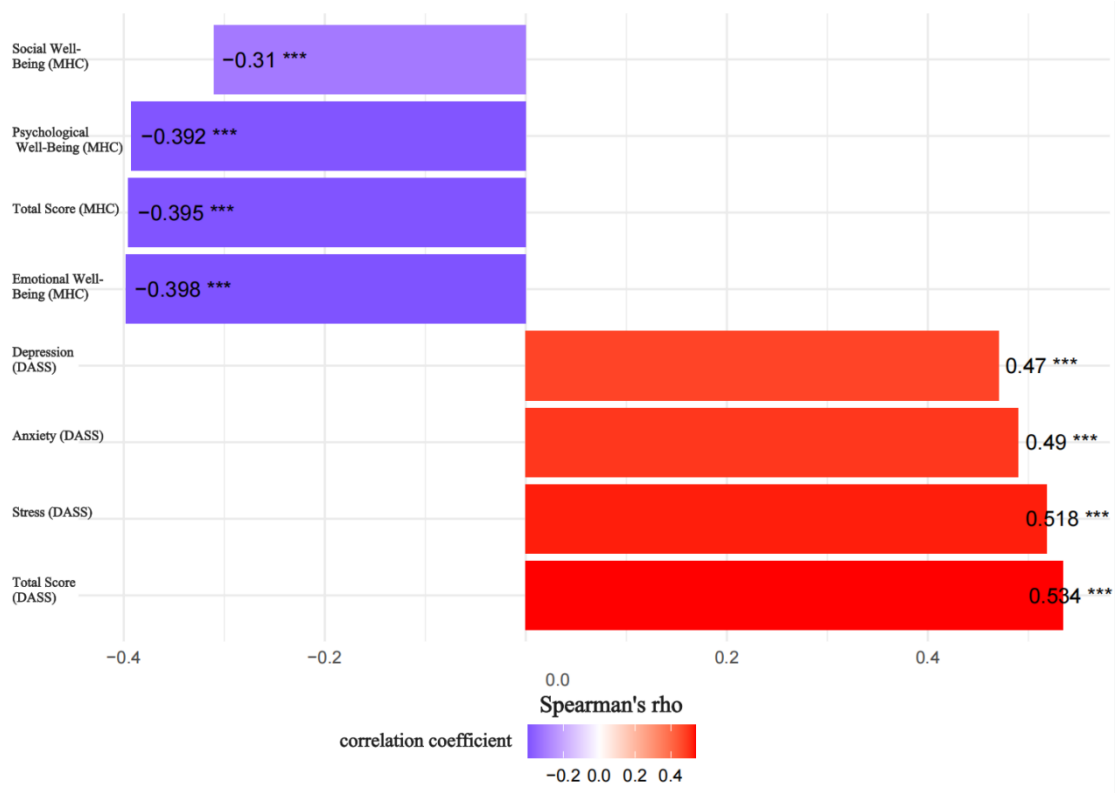


Figure. 1 Spearman correlation coefficients between PSQI total scores and different mental health variables

3.2. Relationship Between Sleep Quality and Positive Mental Health

As illustrated in Figure 1, the results of Spearman's correlation analysis demonstrated significant negative correlations between the total scores of the Pittsburgh Sleep Quality Index (PSQI) and all dimensions of the Mental Health Continuum-Short Form (MHC-SF). This suggests

that diminished sleep quality is linked to reduced levels of positive mental health. The specific findings are detailed as follows:

The PSQI exhibited a moderate negative correlation with the MHC-SF emotional well-being subscale ($\rho = -0.398$, $p < 0.001$), representing the strongest association between sleep quality and any MHC-SF dimension.

A moderate negative correlation was observed between the PSQI and total MHC-SF scores ($\rho = -0.395$, $p < 0.001$), demonstrating that sleep quality significantly relates to overall positive mental health.

Similarly, a moderate negative correlation emerged between the PSQI and the MHC-SF psychological well-being subscale ($\rho = -0.392$, $p < 0.001$), suggesting that poorer sleep quality corresponds to diminished psychological well-being.

The weakest association was found between the PSQI and the MHC-SF social well-being subscale ($\rho = -0.31$, $p < 0.001$), though still statistically significant.

4. Conclusion

The findings of this study reveal a bidirectional association pattern between sleep quality and mental health:

Bidirectional Pattern: Sleep quality showed positive correlations with negative psychological symptoms (DASS) and negative correlations with positive mental health indicators (MHC-SF), indicating its critical role across both dimensions of mental health.

Strength Discrepancy: The correlation coefficients between PSQI and DASS subscales (0.47–0.51) were slightly higher than those between PSQI and MHC-SF subscales (0.31–0.398), suggesting that sleep problems may have a marginally stronger association with negative psychological symptoms than with positive mental health indicators.

Dimensional Differences: Among negative symptoms, the stress subscale exhibited the strongest association with sleep quality ($\rho = 0.51$).

Among positive mental health indicators, emotional well-being showed the strongest inverse link to sleep quality ($\rho = -0.398$), while social well-being had the weakest association ($\rho = -0.31$). These results underscore the value of sleep quality as a pivotal marker of mental health and highlight the potential of sleep interventions to improve distinct mental health dimensions.

The findings of this study carry significant implications for both clinical practice and public health policy. In the realm of clinical work, it is essential for mental health professionals to incorporate sleep assessment and intervention into standard treatment protocols, particularly in cases related to stress. Within the public health domain, there is a need to enhance sleep health education to elevate public awareness regarding the significance of sleep quality and to recognize sleep-related issues as a vital entry point for early mental health interventions. Furthermore, this research underscores the importance of conceptualizing mental health not only as the absence of negative symptoms but also as the presence of positive functioning, which is crucial for a thorough evaluation and enhancement of individual mental health.

5. Study limitations

There are several limitations to this study. First, the cross-sectional design cannot determine causality, and the relationship between sleep quality and mental health indicators may be bidirectional. Second, reliance on self-report measures may introduce common methodological biases. Third, potential confounding variables such as age, gender, physical health, etc., are not taken into account. Finally, the sample may not be fully representative, limiting the generalizability of the results. Future studies could use longitudinal designs to explore the time-series relationship between sleep quality and mental health indicators, use a variety of

measures (e.g., EEG, wrist kinemography) to obtain objective sleep data, examine possible moderating and mediating variables (e.g., coping strategies, social support, lifestyle), and develop and evaluate the impact of interventions for sleep improvement on mental health.

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