



Article

From Mind to Plate to Pillow: Examining the Interplay of Mental Health, Eating Disorders, and Sleep Quality

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Abstract: In the context of the contemporary accelerated pace of life, emphasizing the importance of sleep quality is essential for enhancing overall well-being and health. Historically underestimated, recent studies highlight sleep's vital importance for physical, mental, and emotional well-being. Chronic sleep deprivation is connected to numerous health problems such as cardiovascular disease, diabetes, and weakened immune response. Additionally, lack of sleep can worsen stress, depression, and anxiety, impairing daily life and overall quality of life. This study investigates the link between poor sleep quality and key factors affecting wellness, such as mental health and eating disorders. Through a cross-sectional analysis involving 407 participants, utilizing established measures including the Depression Anxiety Stress Scale (DASS-21), the Eating Disorder Examination Questionnaire Short (EDE-QS), and the single-item Sleep Quality Scale (SQS), data were collected and analyzed using SPSS v28 and R-Statistics. The findings reveal a significant correlation ($p < 0.05$) between DASS-21, EDE-QS, and SQS, indicating that individuals experiencing poor sleep quality exhibit higher levels of depression, anxiety, and stress. Furthermore, multinomial logistic regression analysis highlights low sleep quality as a risk factor for both mental health (OR: 1.071, 95% CI: 1.042, 1.102, $p < 0.05$, low vs. high sleep quality) and eating disorders (OR: 1.047, 95% CI: 1.004, 1.092, $p < 0.05$, low vs. high sleep quality). Overall, these results underscore the critical role of sleep quality in mental health and suggest that insomnia is a predictive factor for both poor mental well-being and disordered eating habits. The main contribution of this study is its identification of poor sleep quality as a common risk factor linking mental health issues and eating disorders, which emphasizes the need for integrated treatment strategies focusing on sleep improvement. Further research through randomized controlled trials is warranted to validate the findings of this cross-sectional study.

Keywords: sleep quality; insomnia; mental health; eating disorders; well-being



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1. Introduction

In recent years, research examining the complex interrelationships between mental health, eating behaviors, and sleep quality has garnered increasing attention. The recognition of these interconnected domains not only elucidates the intricate nature of human behavior but also underscores the significance of addressing holistic well-being. The present study delves into this multifaceted nexus, aiming to shed light on the intricate dynamics that transpire “from mind, to plate, to pillow”. The research question we aim to address is as follows: how do mental health, eating behaviors, and sleep quality interrelate and influence each other among individuals? This question is critical to understanding the cyclical nature of these relationships and identifying potential intervention points for improving overall well-being.

The correlation between mental health and eating disorders has been extensively investigated, with numerous studies clarifying the bidirectional relationship between them [1–4]. Individuals grappling with mental health issues, such as depression, anxiety, or stress, often exhibit alterations in eating behaviors, ranging from excessive consumption

to disordered eating patterns like binge eating or restrictive dieting [5]. Conversely, the onset or exacerbation of mental health issues can stem from the distress associated with disordered eating habits, creating a cyclical pattern that perpetuates both conditions [6].

Moreover, the role of sleep quality in this triad cannot be overstated. Sleep disturbances have been linked to a plethora of mental health disorders and eating disturbances, with evidence suggesting a bidirectional association [7]. Poor sleep quality not only intensifies symptoms of mental health disorders and disrupts eating patterns but also independently contributes to the development of disordered eating behaviors [8].

While considerable research has explored each component individually, there remains a dearth of comprehensive studies examining the interplay between mental health, eating behaviors, and sleep quality within a single framework. To our knowledge, this is the first study that combines these parameters, particularly in a Greek population, which is known for its unique dietary habits and social behaviors that significantly influence health outcomes. This is particularly crucial as diverging hypotheses exist regarding the cultural influences, directionalities and mechanisms underlying these associations. Some theories propose that mental health disorders precipitate disordered eating and sleep disturbances [9], while others suggest that alterations in eating patterns or poor sleep quality serve as precursors to mental health issues. The logical connection between these variables is grounded in a bio-psycho-social model of health, which posits that psychological conditions (mental health), biological factors (eating behaviors), and social/environmental factors (including sleep quality) interact dynamically to influence overall health [10].

The current state of the research field reflects a growing consensus on the need for holistic approaches that consider the interconnectedness of mental health, eating behaviors, and sleep quality [11]. However, a nuanced understanding of the underlying mechanisms and directional relationships remains elusive, necessitating further investigation.

With this backdrop, the primary aim of this cross-sectional study is to examine the intricate interplay between mental health, eating behaviors, and sleep quality among a diverse sample population. Specifically, we hypothesize that mental health, eating disorders and sleep quality will be intercorrelated, and that poor sleep quality will predict poorer mental health outcomes and disordered eating.

By elucidating these relationships, this study endeavors to contribute to the development of targeted interventions and holistic treatment approaches that address the interconnected nature of mental health, eating behaviors, and sleep quality. Ultimately, a comprehensive understanding of “from mind, to plate, to pillow” dynamics holds promise for enhancing overall well-being and quality of life. This research is thus warranted and vital, given the potential to substantially impact public health policy and clinical practices by providing insights that could lead to more effective, integrative treatment and prevention strategies.

2. Materials and Methods

2.1. Study Design and Methodology

This investigation employed a cross-sectional approach, utilizing an online survey administered in both the Greek and English languages via the Sogolytics online survey platform (2291 Wood Oak Drive Suite 300 Herndon, VA 20171, USA) [12]. The initial two survey queries served as inclusion and exclusion criteria, ensuring participants' acknowledgment of the study's terms and conditions, as well as confirming their age fell within the 18 to 65 range. In order to reduce the likelihood of survey abandonment [13], demographic questions covering areas such as education, employment status and gender were placed towards the end of the survey. The survey was distributed via direct messaging across various social media platforms, accompanied by follow-up reminders to enhance participant engagement and facilitate addressing any inquiries or concerns pertaining to the study. This blended methodology leverages the benefits of both online and mailed questionnaires [14,15].

Prior to commencing data collection, the study's objectives and hypotheses were explicitly outlined, furnishing a comprehensive framework for research analysis and interpretation. The survey included 497 participants. Prior to data analysis, thorough data cleaning and preprocessing were conducted to ensure data integrity. We validated response formats and value ranges, particularly verifying that age entries fell within the 18 to 65 range. Incomplete surveys, especially those missing over 50% of responses, were removed, while missing values in partially completed surveys were assessed for potential imputation. Outliers in quantitative measures were examined and removed if found to be errors or excessively skewing data. Responses were checked for consistency, particularly in linked questions that should corroborate each other, and duplicate entries were identified by checking key identifiers like timestamps. Finally, necessary data transformations, including converting categorical data into numerical scores and normalizing scales, were performed to prepare the data for robust analysis. These preprocessing steps refined the dataset, minimizing the influence of potential errors and ensuring the reliability of the subsequent statistical analysis. The final sample size was 407 adults, comprising 68.3% women, 31% men, and 0.7% identifying as non-binary. The vast majority (98.8%) of the participants, completed the survey in Greek.

2.2. Scales

2.2.1. Depression Anxiety Stress Scale (DASS-21)

The DASS-21 is a widely recognized self-report measure used to gauge the severity of symptoms associated with depression, anxiety, and stress. Comprising 21 items, the scale is divided into three sub-scales, each focusing on specific psychological constructs: depression, anxiety, and stress. Respondents rate the frequency and intensity of their experiences over the past week using a 4-point Likert scale, with higher scores indicating greater severity of symptoms [16]. An example question is "Over the past week, how often have you felt downhearted and blue?" Participants select a response ranging from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time).

Employing a standardized scoring system, the DASS-21 enables the computation of individual sub-scale scores as well as a total combined score, offering a comprehensive assessment of emotional well-being. Renowned for its reliable and valid psychometric properties, it serves as an invaluable tool for both clinical and research purposes in assessing and monitoring mental health conditions [17].

Due to its robust assessment framework and sensitivity to changes in symptom severity, the DASS-21 is indispensable for identifying and evaluating individuals experiencing symptoms of depression, anxiety, and stress. Its systematic approach and thorough measurement contribute to a deeper understanding of psychological distress, enabling targeted interventions and improved mental health outcomes [18]. In our study, the DASS-21 demonstrated excellent internal consistency, with a Cronbach's alpha of $\alpha = 0.953$.

2.2.2. Eating Disorder Examination Questionnaire Short (EDE-QS)

The EDE-QS, a shortened version of the 28-item Eating Disorder Examination (EDE-Q), is a validated self-report tool consisting of 12 items, designed to assess symptoms of eating disorders. It evaluates various aspects of disordered eating behaviors, including dietary restraint, eating concerns, shape concerns, and weight concerns. Respondents rate the frequency and severity of these behaviors over the past week using a 4-point scale, where higher scores indicate a higher level of pathology [19]. An example question is "How dissatisfied have you been with your weight or shape?"

Recognized widely and utilized extensively, the EDE-QS plays a crucial role in identifying individuals at risk of eating disorders, allowing for early intervention and tailored treatment strategies. Its standardized scoring system and comprehensive assessment approach contribute to a thorough understanding of eating disorder pathology, aiding clinicians and researchers in effectively managing and studying these complex conditions [20].

In our study, the EDE-QS exhibited strong internal consistency, with a Cronbach's alpha of $\alpha = 0.885$.

2.2.3. Single-Item Sleep Quality Scale (SQS)

The SQS is a validated tool specifically designed to evaluate sleep quality using a single-item approach. This scale offers a straightforward and convenient method for individuals to assess their own sleep quality. Participants are asked to rate their sleep quality over a period of seven days using a visual analogue scale ranging from 0 to 10. The incorporation of a discretizing visual analogue scale enhances the sensitivity of the measurement, allowing for more nuanced responses [21]. It is important to note that this scale has been validated for use in assessing sleep quality among healthy adults [22].

2.3. Data Analysis

A comprehensive review of the data was undertaken to identify any potential omissions. Instances where participants abruptly ceased the questionnaire (classified as Missing Completely at Random) led to the exclusion of the corresponding data from the analysis [23]. In cases of inadvertent omissions (classified as Missing at Random), missing data points were substituted with the mean value derived from all respondents' answers.

The data were exported in a format compatible with SPSS v28 for import and processing. Statistical analysis and visualization were conducted using SPSS v28. Before subjecting the data to statistical tests, a regularity check was performed to ensure compliance with established criteria. To ensure the most accurate and reliable assessment of regularity, a combination of visual examination and the Shapiro–Wilk test was employed [24].

Statistical analysis involved Pearson's correlation, an independent samples t-test, and one-way ANOVA for continuous variables found to adhere to normal distribution, as determined by the Kolmogorov–Smirnov test. Additionally, multinomial logistic regression analysis was conducted to evaluate the impact of sleep quality on eating disorders, adjusting for possible confounders. The predetermined level of statistical significance was set at $p < 0.05$.

3. Results

3.1. Subjects

Among the final sample of 407 adults, there was a significant difference ($p < 0.05$) in the means of DASS-21 and EDE-QS, and BMI across genders, with women having higher scores. The majority of participants (61.6%) were aged between 18 and 29 years old. This age group had also statistically significant ($p < 0.05$) higher scores of DASS-21, and lower sleep quality than individuals 60–65 years of age.

3.2. Correlations between Sleep Quality, Mental Health, and Eating Disorders

In order to investigate the potential associations between SQS, DASS-21, and EDE-QS in healthy individuals, Pearson's correlation coefficients were calculated. The statistical analysis unveiled a significant correlation between SQS with DASS-21 and EDE-Q. Additionally, a positive correlation was observed between DASS-21 and EDE-QS (Table 1).

Table 1. Pearson's correlations (r) between SQS (sleep quality), DASS-21 (mental health), and EDE-QS (eating disorders).

	SQS	DASS-21	EDE-QS
SQS	1	−0.281 **	−0.127 *
DASS-21	−0.281 **	1	0.459 **
EDE-QS	−0.127 *	0.459 **	1

* Correlation is significant at the $p < 0.05$ level. ** Correlation is significant at the $p < 0.001$ level.

3.3. Correlations between Sleep Quality, Depression, Anxiety, and Stress

When the relationship between sleep quality and the DASS-21 scale's components was further examined, it was found that there was a statistically significant ($p < 0.05$) negative correlation between stress, anxiety, and depression and sleep quality (Table 2).

Table 2. Pearson's correlations (r) between sleep quality, depression, anxiety, and stress.

	SQS	Depression	Anxiety	Stress
SQS	1	−0.260 **	−0.255 **	−0.266 **
Depression	−0.260 **	1	0.757 **	0.826 **
Anxiety	−0.255 **	0.757 **	1	0.779 **
Stress	−0.266 **	0.826 **	0.779 **	1

** Correlation is significant at the $p < 0.001$ level.

3.4. Sleep Quality Categories, Mental Health and Disordered Eating

One-way ANOVA revealed a statistically significant ($p < 0.05$) difference in the means of both DASS-21 and EDE-QS scores in various sleep quality categories, with individuals with low sleep quality demonstrating higher DASS-21 and EDE-QS scores (Figure 1).

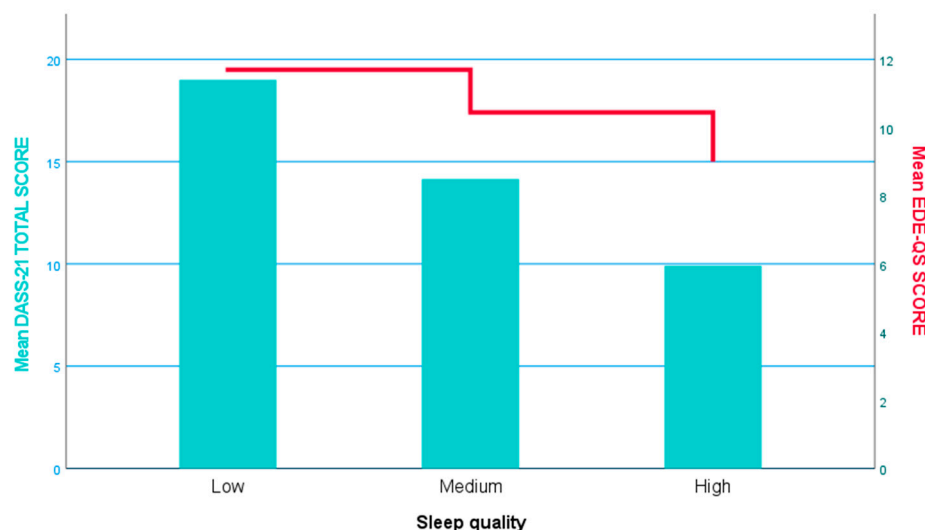


Figure 1. Dual Y axes demonstrating the difference between the means of DASS-21 and EDE-QS scores in various sleep quality categories.

Moreover, multinomial logistic regression analysis highlighted (Table 3) low sleep quality as a risk factor for both mental health (OR: 1.071, 95% CI: 1.042, 1.102, $p < 0.05$, low vs. high sleep quality) and eating disorders (OR: 1.047, 95% CI: 1.004, 1.092, $p < 0.05$, low vs. high sleep quality).

Table 3. Multinomial logistic analysis results.

		Sleep Quality (Low vs. High)	
	OR	95% CI	p-value
DASS-21	1.071	1.042–1.102	<0.05
EDE-QS	1.047	1.004–1.092	<0.05

4. Discussion

The current research marks the inaugural exploration of the relationships between sleep quality, mental health, and eating disorders in Greece. By delving into this intersection, our study contributes to the existing body of research on the significance of sleep quality in both mental and physical health [25]. While previous research has investigated various

aspects of well-being, to our knowledge, none has investigated the collective impact of sleep quality and factors affecting mental health, such as depression, anxiety, and stress. This study uniquely combines the investigation of sleep quality, mental health, and eating behaviors within a Greek context, marking it as the first of its kind. The choice of a Greek cohort is particularly novel, given the distinct socio-cultural and dietary patterns that influence health outcomes in Mediterranean populations. This approach not only fills a critical gap in the geographic diversity of research but also enhances our understanding of how cultural contexts modulate the interplay between these health domains.

The findings of this study reveal significant associations between mental health status, disordered eating, and sleep quality among participants. Notably, individuals with higher levels of depressive symptoms, anxiety and stress reported poorer sleep quality, consistent with previous research linking psychological distress to sleep disturbances [26,27]. Furthermore, the presence of disordered eating behaviors was found to exacerbate these associations, with higher levels of disordered eating correlating with worse sleep outcomes. These findings support the notion of a bidirectional relationship between mental health and sleep, whereby disturbances in one domain can exacerbate issues in the other.

One of the strengths of this study is its examination of the role of eating behaviors in the mental health-sleep relationship. Previous research has primarily focused on either mental health or eating disorders separately [28,29], neglecting the potential interplay between these factors. By incorporating measures of disordered eating, this study underscores the importance of considering eating behaviors in understanding the complexities of mental health and sleep disturbances. Future research should continue to explore these interconnected pathways, perhaps employing longitudinal designs to elucidate temporal relationships and potential mechanisms underlying these associations.

The observed associations between depressive symptoms, eating disorders, and poor sleep quality raise important clinical implications. Given the bidirectional nature of these relationships, interventions targeting mental health, eating behaviors, and sleep quality may yield synergistic benefits. Cognitive behavioral therapy (CBT) has shown promise in addressing depressive symptoms, eating disorders, and insomnia [30–32]. Integrative approaches that incorporate mindfulness-based techniques, dietary interventions, and sleep hygiene education may also be beneficial in improving overall well-being among individuals with comorbid mental health and sleep disturbances [33].

Furthermore, the findings highlight the need for holistic assessments and interventions in clinical settings. Rather than treating mental health, eating disorders, and sleep disturbances as separate entities, healthcare professionals may adopt a comprehensive approach that addresses the interconnectedness of these factors. Collaborative care models involving multidisciplinary teams (e.g., psychologists, dietitians, sleep specialists) may also enhance treatment outcomes by addressing the diverse needs of individuals with comorbid conditions.

While this study provides valuable insights into the interplay between mental health, eating disorders, and sleep quality, several limitations warrant consideration. Firstly, the cross-sectional design precludes causal inferences, and the directionality of the observed relationships remains unclear. Longitudinal studies are needed to elucidate temporal sequences and potential mechanisms underlying these associations. Secondly, reliance on self-report measures introduces the possibility of response bias and social desirability effects [34]. Future research could utilize objective measures (e.g., actigraphy, polysomnography) to complement self-reported data and provide a more nuanced understanding of sleep patterns. Additionally, the sample predominantly comprised young adults from a single geographic region, limiting the generalizability of the findings. Replication studies involving more diverse populations are warranted to validate the current findings and ensure their applicability across different demographic groups. Despite the absence of sophisticated statistical analyses such as structural equation modeling in our study, its importance remains substantial within the field. This research is crucial because it bridges significant gaps in the understanding of how sleep quality interacts with mental health and

eating disorders. By simultaneously considering both mental health and eating disorders, our study enriches the existing literature, which often examines these factors in isolation, thereby offering a more holistic view of their combined effects on sleep quality.

Furthermore, the research serves as a foundational platform for future studies. By identifying the need for more advanced analytical techniques to fully explore these complex relationships, our study invites further inquiry and encourages the development of more nuanced research designs. As such, even in its current form, the research makes a meaningful contribution by setting the stage for more detailed investigations that could lead to more effective, evidence-based interventions in healthcare settings. Thus, our study stands as an important stepping stone in advancing the understanding of the dynamic interplay between sleep, mental health, and eating behaviors.

In conclusion, the findings of this study underscore the intricate connections between mental health, eating disorders, and sleep quality. By elucidating these interrelationships, this research contributes to a more comprehensive understanding of the multifaceted nature of psychological well-being. Moving forward, interdisciplinary collaborations and longitudinal investigations will be essential in further unraveling the complexities of these interactions and developing targeted interventions to improve the overall health and well-being of individuals affected by these interconnected issues.

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