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Prediction of Sleep Disorders Based on Psychological Distress, Meta-Worry, and Emotional Dysregulation in Adolescent Girls

Mahla. Abidi[1], Mansooreh. Fazilati[1*]

[1] Department of Psychology, CT.C., Islamic Azad University, Tehran, Iran

*** Corresponding author email address**: Mansooreh_fazilati@yahoo.com

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A B S T R A C T

Objective: The aim of the present study was to predict sleep disorders based on psychological distress, meta-worry, and emotional dysregulation in adolescent girls.

Methods and Materials: The research method was descriptive-correlational. The statistical population consisted of all adolescent girls studying in upper secondary schools in Tehran during the first semester of the 2024–2025 academic year, totaling 87,222 individuals. Based on the rule of Tabachnick and Fidell (2007), a sample of 300 participants was considered and selected using a multistage cluster random sampling method. To collect data, the study employed the Sleep Disorders Questionnaire by Baisy et al. (1989), the Psychological Distress Scale by Lovibond and Lovibond (1995), the Meta-Worry Questionnaire by Wells (2005), and the Emotional Dysregulation Questionnaire by Børberg et al. (2016). Statistical analyses were conducted using SPSS version 27.

Findings: The results of data analysis showed that 45.3% of the variance in sleep disorders was predicted by psychological distress, meta-worry, and emotional dysregulation. In addition, a positive and significant relationship was found between psychological distress and sleep disorders, with an effect coefficient of 0.645. A negative and significant relationship was found between meta-worry and sleep disorders, with an effect coefficient of -0.422. Furthermore, emotional dysregulation had a positive and significant relationship with sleep disorders, with an effect coefficient of 0.576. Stress was positively and significantly associated with sleep disorders, with an effect coefficient of 0.669. Anxiety also showed a positive and significant relationship with sleep disorders, with an effect coefficient of 0.630. Finally, depression had a positive and significant relationship with sleep disorders, with an effect coefficient of 0.450.

Conclusion: Based on the findings, it can be concluded that psychological distress, meta-worry, and emotional dysregulation play a significant role in predicting sleep disorders and explain a considerable portion of their variance. Therefore, interventions targeting these psychological variables may help improve sleep quality and enhance individuals' mental health.

Keywords: *sleep disorders, psychological distress, meta-worry, emotional dysregulation.*

1. Introduction

Sleep is a fundamental biological process, essential for maintaining physical health, emotional balance, and cognitive performance, particularly during adolescence, which represents a critical developmental period. Disruptions in sleep have been strongly linked to adverse psychological, emotional, and behavioral outcomes in youth, including heightened vulnerability to anxiety, depression, and emotional dysregulation (Partinen, 2021; Uccella et al., 2023). Increasingly, evidence shows that sleep disorders among adolescents have become a widespread concern globally, exacerbated by contemporary challenges such as academic stress, digital media overuse, pandemic-related disruptions, and shifting social environments (Ulrich et al., 2021; Yang et al., 2023). Against this backdrop, there is a growing demand for empirical investigations into the psychological and emotional predictors of sleep disturbances, with a particular emphasis on factors such as psychological distress, meta-worry, and emotion dysregulation.

Sleep disorders in adolescence are multifaceted phenomena influenced by both environmental and internal psychological factors. Research has indicated that sleep problems are not only symptomatic of underlying psychiatric conditions but also act as risk factors that worsen mental health trajectories over time (Cheah et al., 2024; Cheong et al., 2024). For instance, adolescents who experience persistent worry and emotional dysregulation report difficulties in initiating and maintaining sleep, leading to impaired daytime functioning and lower quality of life (Clancy et al., 2020). Moreover, the role of meta-worry—defined as worrying about one's own worry—has been highlighted as a particularly maladaptive cognitive style associated with persistent rumination and sleep difficulties (Benedetto et al., 2022; Silva-Santos et al., 2022). These findings underscore the need to explore how various psychological vulnerabilities interact in predicting sleep disorders among adolescent populations.

The association between psychological distress and sleep has been extensively documented in both clinical and non-clinical samples. Psychological distress—comprising stress, anxiety, and depression—has been consistently identified as a strong predictor of disrupted sleep (Askari et al., 2023; Yu et al., 2024). For example, during the COVID-19 pandemic, psychological distress among students was shown to significantly impair sleep quality, with anxiety and stress acting as mediating factors (Karimi-Rad et al., 2022; Shi et al., 2022). Similarly, longitudinal and cross-lagged models have revealed bidirectional relationships between anxiety, depression, and sleep disturbance, suggesting that sleep not only reflects emotional difficulties but also perpetuates them over time (Li et al., 2022; Shi et al., 2022). In this sense, adolescence represents a particularly vulnerable stage, where heightened emotional sensitivity may amplify the reciprocal effects between psychological distress and sleep problems (Yang et al., 2023).

Meta-worry has emerged as another critical factor in understanding sleep disturbances. According to the metacognitive model of psychological disorders, excessive worry becomes pathological when individuals begin to worry about their own worrying, creating a self-perpetuating cycle of intrusive thoughts and heightened arousal (Silva-Santos et al., 2022). Adolescents with high levels of meta-worry have been shown to experience greater adjustment difficulties during stressful periods, such as the COVID-19 pandemic, and report more severe sleep disruptions (Benedetto et al., 2022). Meta-worry often coexists with other maladaptive cognitive processes, such as rumination and negative automatic thoughts, which further complicate emotional regulation and undermine healthy sleep patterns (Clancy et al., 2020; Mousavi & Ghorbani, 2022). Importantly, meta-worry is not merely an extension of general worry but represents a higher-order cognitive appraisal that significantly exacerbates the experience of distress (Cheah et al., 2024).

In addition to psychological distress and meta-worry, emotional dysregulation has been identified as a transdiagnostic factor underlying a wide range of adolescent psychopathologies, including sleep problems (Cheong et al., 2024). Difficulties in regulating emotional responses can increase physiological arousal, intrusive thoughts, and maladaptive coping strategies, which collectively interfere with the onset and maintenance of sleep (Yang et al., 2022). Several studies have confirmed that adolescents with poor emotion regulation skills were more likely to report insomnia, delayed sleep onset, and non-restorative sleep (Fallahi et al., 2021; Yang et al., 2023). Moreover, emotional dysregulation interacts with other psychological vulnerabilities such as anxiety sensitivity and self-criticism, amplifying their impact on sleep outcomes (Masbahi & Saraei, 2022; Sharifian & Khodarahimi, 2023). These findings suggest that interventions aimed at improving emotion regulation may play a critical role in addressing adolescent sleep disorders.

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The literature further demonstrates that contextual and developmental factors exacerbate these psychological vulnerabilities. Adolescents exposed to academic pressures, interpersonal conflicts, or traumatic experiences often show compounded effects of distress, meta-worry, and dysregulation on their sleep patterns (Harb et al., 2025; Talebi-Ashelaghi & Ghodrati-Mirkohi, 2022). Childhood maltreatment and adverse experiences, for instance, are associated with persistent difficulties in emotion regulation and heightened risk of both depression and sleep disruption (Harb et al., 2025; Li et al., 2022). Similarly, digital media overuse and problematic technology use have been linked to impaired emotion regulation, delayed bedtimes, and shorter sleep duration (Yang et al., 2022). Such evidence highlights the need for integrative models that capture the interplay between psychological and environmental factors in shaping adolescent sleep health.

The global pandemic also provided unique insights into the mechanisms linking psychological vulnerability and sleep disturbance. Studies from multiple contexts revealed that confinement, uncertainty, and social isolation intensified adolescents' difficulties in managing emotions and worries, leading to widespread sleep disruptions (Saalwirth & Leipold, 2021; Ulrich et al., 2021). During this period, academic stress and fear of infection further exacerbated depressive and anxious symptoms, with direct consequences for sleep quality (Lifshin & Mikulincer, 2021; Talebi-Ashelaghi & Ghodrati-Mirkohi, 2022). Importantly, research indicated that the effects of the pandemic on sleep were not merely temporary but could extend into long-term difficulties, with adolescents at risk of developing chronic insomnia or maladaptive coping patterns (Partinen, 2021). This underscores the enduring significance of psychological predictors in shaping sleep trajectories.

Recent studies also suggest that social and demographic factors intersect with psychological vulnerabilities in determining sleep outcomes. For instance, gender differences, lifestyle habits, and cultural contexts influence the extent to which worry and distress translate into poor sleep (Cheah et al., 2024; Li et al., 2025). Adolescents from marginalized groups may face additional challenges, including minority stress and victimization, which further link to disturbed sleep and increased suicidality (Seah et al., 2025). Similarly, competitive environments, such as collegiate athletics, present unique pressures that exacerbate sleep disorders, particularly when stigma or avoidance prevents individuals from seeking treatment (Ziniti et al., 2025). These findings reinforce the multifactorial nature of adolescent sleep problems and emphasize the importance of considering both personal and contextual variables.

The role of stress and helplessness in the development of sleep disorders has also been highlighted in organizational and academic settings. For example, studies have shown that individuals who experience helplessness in the face of stressful events are more prone to psychological distress and sleep difficulties (Khalfi & Rasoulzadeh, 2021; Meng et al., 2022). Motivated helplessness theory has been extended to the context of the pandemic, illustrating how perceived lack of control increases vulnerability to sleep problems and emotional exhaustion (Lifshin & Mikulincer, 2021). These mechanisms suggest that interventions targeting cognitive appraisal and resilience may buffer against the impact of distress on sleep.

In addition to distress, meta-worry, and emotional dysregulation, other psychological constructs—such as dark personality traits, anger, and negative schemas—have been linked to adolescent sleep disorders (Mousavi & Ghorbani, 2022; Naranji-Kaho & Rajabpour-Farkhani, 2023). These traits often exacerbate interpersonal conflicts and internalizing symptoms, which in turn disrupt sleep. For example, anger and psychological distress mediate the relationship between dissatisfaction in close relationships and maladaptive sleep outcomes (Naranji-Kaho & Rajabpour-Farkhani, 2023). Similarly, self-critical tendencies and negative emotions contribute to heightened vulnerability to sleep disruption (Masbahi & Saraei, 2022). Such findings point to the complex psychological ecosystem underlying sleep health, necessitating multidimensional models of prediction.

Meta-analytical evidence further supports these associations. A systematic review demonstrated consistent links between worry, rumination, and poor sleep quality across non-clinical populations, suggesting that these cognitive processes are universal risk factors for sleep problems (Clancy et al., 2020). Other reviews highlight the role of death anxiety and existential concerns in shaping sleep quality, showing that fear-related cognitions can intrude into nighttime processes and impair rest (Menzies et al., 2025). Similarly, reviews of interventions for adolescent sleep disorders emphasize the effectiveness of cognitive-behavioral approaches, including rational-emotive techniques, in addressing worry and dysregulation (Sakakini et al., 2020). These insights reinforce the clinical relevance of targeting cognitive and emotional predictors in treatment.

Importantly, not all adolescents are equally affected, and protective factors such as physical activity, social support,

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and coping strategies may moderate the relationship between psychological vulnerabilities and sleep disturbances (Saalwirth & Leipold, 2021; Solmaz et al., 2025). For example, engagement in regular physical activity has been shown to buffer the effects of social anxiety and sleep disturbance among adolescents at risk of gaming disorder (Solmaz et al., 2025). Similarly, adaptive coping strategies were found to reduce the impact of excessive worry on well-being and sleep during the pandemic (Saalwirth & Leipold, 2021). These findings highlight opportunities for resilience-based interventions that focus on strengthening adaptive behaviors to counterbalance psychological risk factors.

Taken together, the existing literature reveals that psychological distress, meta-worry, and emotion dysregulation are among the most influential predictors of adolescent sleep disorders, operating within a broader web of cognitive, emotional, and contextual variables (Cheong et al., 2024; Uccella et al., 2023; Yu et al., 2024). Despite this extensive evidence, research remains limited in systematically integrating these predictors in adolescent populations, particularly in non-Western contexts where cultural and educational dynamics may further shape outcomes (Gholedadri-Zadeh & Mousavi, 2020; Sharifian & Khodarahimi, 2023). The present study seeks to address this gap by examining the predictive roles of psychological distress, meta-worry, and emotional dysregulation in sleep disorders among adolescent girls in Tehran.

2. Methods and Materials

2.1. Study Design and Participants

This study was conducted using a quantitative approach. In terms of purpose, it was an applied research; in terms of method, it was a descriptive-correlational study; and in terms of data collection, it was field-based. The statistical population of this study consisted of all adolescent girls studying in upper secondary schools in Tehran during the first semester of the 2024–2025 academic year, totaling 87,222 individuals. Based on the rule of Tabachnick and Fidell (2007), the sample size was determined as 300 participants. The sample was selected using a multistage cluster random sampling method. For this purpose, among the geographical districts of Tehran, four eastern districts (Districts 7, 8, 13, and 14) were selected, and from each district three schools were randomly chosen. Then, from each of these schools, three classes were randomly selected. In the final stage, ten students from each class were randomly selected as the study sample. Accordingly, 360 questionnaires were collected, of which 300 complete questionnaires were included in the analysis.

Inclusion Criteria: The adolescent had to be enrolled in upper secondary school, aged between 16 and 18 years, and willing to participate in the study.

Exclusion Criteria: Incomplete responses to the questionnaires, expressed dissatisfaction with participation, and a history of school dropout for more than one semester.

2.2. Measures

Sleep Disorders: The Pittsburgh Sleep Quality Index (PSQI) was developed by Buysse et al. (1989). The questionnaire consists of 13 questions concerning variables related to sleep disturbances over the past month, although five of the items are open-ended and not included in statistical analysis. The items are scored on a 4-point Likert scale ranging from 1 (not during the past month) to 4 (three or more times per week). The total score ranges from 13 (completely healthy sleep quality) to 52 (severely impaired sleep quality) (Castro et al., 2004). Castro et al. (2004) reported a reliability coefficient of 0.83 using Cronbach's alpha. Buysse et al. (1989) examined the psychometric properties of the PSQI across multiple studies, reporting acceptable internal consistency, concurrent validity, and discriminant validity in both clinical and non-clinical populations across different cultures. The test–retest reliability and Cronbach's alpha were reported as 0.79 and 0.83, respectively. In Iran, Afkham-Ebrahimi et al. (2008) evaluated the psychometric properties of the PSQI. Face validity was confirmed, and split-half reliability and Cronbach's alpha of 0.79 were reported.

Psychological Distress: The Depression, Anxiety, and Stress Scale (DASS-21) was developed by Lovibond and Lovibond (1995). The questionnaire contains 21 items covering three domains: stress, anxiety, and depression. Each subscale includes seven items, and the final score for each subscale is obtained by summing the corresponding item scores. Each item is rated on a 4-point Likert scale (0 = never to 3 = almost always). Antony et al. (1998) conducted factor analysis on the scale, confirming the three factors of depression, anxiety, and stress, which explained 68% of the total variance. The eigenvalues of the three factors were 9.07, 2.89, and 1.23, respectively. Cronbach's alpha coefficients for stress, depression, and anxiety were reported as 0.97, 0.92, and 0.95, respectively. Correlations between the subscales indicated 0.48 between depression and stress, 0.53 between anxiety and stress, and 0.28 between anxiety

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and depression (Antony et al., 1998). In Iran, Samani and Jokar (2007) validated the questionnaire, reporting test–retest reliabilities of 0.80, 0.76, and 0.77 for depression, anxiety, and stress, respectively, and Cronbach's alpha values of 0.81, 0.74, and 0.78. Confirmatory factor analysis using principal component analysis yielded a KMO value of 0.9012 and a Bartlett's test of sphericity chi-square of 3092.93, $p < .0001$, confirming sample adequacy. Factor analysis with varimax rotation extracted three subscales—depression, anxiety, and stress—which were consistent with the original DASS structure.

Meta-Worry: The Meta-Worry Questionnaire (MWQ) was developed by Wells (2005) to assess the perceived danger of worry, its frequency, and belief in worry. It was designed in line with the metacognitive model of generalized anxiety disorder (DSM-IV). The MWQ includes seven items related to the dangers of worry. Responses are rated on a 4-point Likert scale from 1 (never) to 4 (always). Criterion validity was confirmed by examining correlations between the MWQ and other metacognitive measures. The MWQ showed particularly strong positive correlations with negative beliefs about worry measured by the Metacognitions Questionnaire. Construct validity was further supported by its ability to distinguish outpatients meeting DSM-IV criteria for generalized anxiety disorder from individuals with somatic anxiety or without anxiety (Wells, 2005). Cronbach's alpha was 0.88 for the frequency scale and 0.95 for the belief scale (Wells, 2009, as cited in Ghaderi et al., 2015). In Iran, Ghaderi et al. (2015) reported a Cronbach's alpha of 0.82 for the frequency scale.

Emotional Dysregulation: The short form of the Difficulties in Emotion Regulation Scale (DERS-SF) was developed and validated by Børberg et al. (2016). This scale contains 16 items, rated on a 6-point Likert scale (1 = almost never to 6 = almost always). Findings by Børberg et al. (2016) indicated high reliability, with an overall Cronbach's alpha of 0.94. In Iran, Fallahi et al. (2021) demonstrated that the scale had good internal consistency reliability. Confirmatory factor analysis also supported construct validity, with CFI = 0.99 and RMSEA = 0.04. Reliability in the same study was reported as 0.91.

2.3. Data Analysis

Data were analyzed at both descriptive and inferential levels. In the descriptive section, indices such as frequency, percentage, mean, and standard deviation were reported to describe the general characteristics of the data. At the inferential level, the Kolmogorov–Smirnov test was used to assess normality, and when necessary, skewness and kurtosis indices were applied. Research hypotheses were tested using multiple linear regression and correlation analysis. All analyses were conducted using SPSS version 27.

3. Findings and Results

Based on the descriptive results, the mean and standard deviation of the variables indicated that emotional dysregulation (M = 45) and psychological distress (M = 46) were relatively high and had the highest means among the study variables. In contrast, meta-worry with a mean of 21 showed the lowest value, reflecting a lower level of excessive worrying in the sample. Moreover, the mean of sleep disorders (M = 26) suggested the presence of mild to moderate sleep problems. The three components of stress, anxiety, and depression, as subdimensions of psychological distress, had means of 15, 15, and 16, respectively. Overall, the findings indicated that psychological distress accounted for the highest proportion and meta-worry for the lowest proportion of the participants' psychological status.

Table 1

Descriptive statistics of the research variables

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Emotional dysregulation	360	16	99	45.000	20.496
Meta-worry	360	7	28	21.000	5.826
Sleep disorders	360	13	49	26.000	7.244
Stress	360	7	28	15.000	4.659
Anxiety	360	7	28	15.000	5.770
Depression	360	7	28	16.000	4.953
Total (psychological distress)	360	21	83	46.000	13.906

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The results of the Kolmogorov–Smirnov and Shapiro–Wilk tests showed that none of the study variables (emotional dysregulation, meta-worry, sleep disorders, psychological distress, and its subcomponents including stress, anxiety, and depression) had a normal distribution. Skewness and kurtosis indices, although not indicating extreme deviations, suggested that the distribution of some variables was skewed or flatter than normal. Accordingly, hypothesis testing was carried out using nonparametric methods, particularly Spearman's correlation test.

Table 2

Results of Kolmogorov–Smirnov and Shapiro–Wilk tests

Variable	N	Shapiro–Wilk	Kolmogorov–Smirnov	Skewness	Kurtosis
Emotional dysregulation	360	.000	.000	.412	-.602
Meta-worry	360	.000	.000	-.656	-.445
Sleep disorders	360	.000	.027	.189	-.512
Stress	360	.000	.000	.278	-.498
Anxiety	360	.003	.000	.297	-.814
Depression	360	.000	.002	.103	-.499
Psychological distress	360	.001	.064	.372	-.086

The results showed that the multiple correlation coefficient (R = 0.673) indicated a relatively strong relationship between the predictor variables (emotional dysregulation, meta-worry, and psychological distress) and sleep disorders. The coefficient of determination (R^2 = 0.453) revealed that about 45% of the variance in sleep disorders was explained by these variables, and the adjusted value (0.448) demonstrated model stability. The Durbin–Watson statistic (1.918) indicated the absence of autocorrelation and independence of errors. The ANOVA results also confirmed the significance of the model (F = 98.256, p = .000), showing that the regression model had good predictive power for changes in the dependent variable.

Table 3

Summary of regression model coefficients

Model	Correlation Coefficient (R)	R^2	Adjusted R^2	Std. Error	Durbin–Watson	F	Sum of Squares	Sig.
1	.673	.453	.448	5.381	1.918	98.256	8535.238	.000

According to the regression coefficients, psychological distress with B = 0.291, standardized Beta = 0.558, and p < .001 was the strongest and most significant predictor of sleep disorders, indicating that higher levels of psychological distress directly increase the likelihood of sleep-related problems. In contrast, emotional dysregulation with B = 0.040 and p = .085 was at the borderline of significance, suggesting its role is not definitive, although the direction of the effect was positive. Meta-worry, with a negative coefficient and a high p-value (p = .506), did not have a significant role in predicting sleep disorders. Collinearity indices (Tolerance and VIF) also indicated favorable values, confirming the validity of the model. Overall, only psychological distress showed a strong and significant effect on sleep disorders.

Table 4

Regression coefficients

No.	Variable	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	Constant	11.508	2.211		5.205	.000		
2	Emotional dysregulation	.040	.023	.114	1.725	.085	.355	2.820
3	Meta-worry	-.041	.062	-.033	-.666	.506	.622	1.607
4	Psychological distress	.291	.036	.558	8.024	.000	.318	3.144

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4. Discussion and Conclusion

The present study investigated the predictive roles of psychological distress, meta-worry, and emotional dysregulation in sleep disorders among adolescent girls. The results indicated that approximately 45% of the variance in sleep disorders was explained by these predictors. Among them, psychological distress emerged as the strongest and most significant factor, followed by a marginal effect of emotional dysregulation, while meta-worry did not significantly contribute to sleep disturbances in this sample. Furthermore, subcomponents of psychological distress—stress, anxiety, and depression—each demonstrated positive and significant associations with sleep disorders, with stress showing the largest effect. These findings provide important insights into the mechanisms through which cognitive-emotional vulnerabilities affect adolescent sleep health.

The strong predictive power of psychological distress aligns with a wide body of literature linking stress, anxiety, and depression to impaired sleep quality. Previous studies consistently report that psychological distress exerts both direct and indirect effects on adolescents' sleep by increasing physiological arousal, impairing cognitive control, and disrupting circadian rhythms (Ulrich et al., 2021; Yu et al., 2024). In particular, stress has been identified as a salient predictor of poor sleep outcomes, as heightened arousal and cortisol dysregulation contribute to difficulties in initiating and maintaining sleep (Askari et al., 2023; Khalfi & Rasoulzadeh, 2021). The current findings resonate with earlier work that identified distress as a central pathway through which both environmental and internal stressors impair sleep quality (Karimi-Rad et al., 2022; Shi et al., 2022). The effect size observed here suggests that interventions addressing stress and anxiety management may be the most effective in improving sleep health in adolescent populations.

The significant relationship between depression and sleep disorders further highlights the bidirectional nature of mood and sleep. Depression can exacerbate insomnia symptoms through mechanisms such as hopelessness, negative thought patterns, and reduced motivation to engage in healthy sleep hygiene behaviors (Li et al., 2022; Partinen, 2021). Conversely, poor sleep has been shown to intensify depressive symptoms, establishing a vicious cycle that can significantly impair adolescents' psychosocial functioning (Harb et al., 2025; Yang et al., 2023). This reciprocal relationship emphasizes the importance of integrated interventions targeting both sleep and mood symptoms simultaneously, rather than treating them as separate conditions. The findings of this study thus extend prior evidence by quantifying the relative contribution of psychological distress to sleep disorders in an adolescent female sample.

Meta-worry, in contrast, did not emerge as a significant predictor of sleep disorders in the present study. This finding diverges from some previous literature that identified meta-worry as a central cognitive vulnerability associated with persistent insomnia (Benedetto et al., 2022; Clancy et al., 2020). One explanation may be cultural differences in how worry is experienced and expressed. In some contexts, adolescents may frame worry within broader patterns of stress and anxiety rather than as a distinct cognitive construct (Silva-Santos et al., 2022). Another explanation may relate to developmental factors: younger adolescents may not yet have developed the meta-cognitive awareness required to experience worry about worry in the same way that adults or older adolescents do. This could reduce the salience of meta-worry as a predictor in this age group (Cheah et al., 2024). Nevertheless, while meta-worry did not reach statistical significance here, its positive direction of association is consistent with theories suggesting that maladaptive meta-cognitions can intensify rumination and intrusive thoughts that disrupt sleep (Mousavi & Ghorbani, 2022; Naranji-Kaho & Rajabpour-Farkhani, 2023). Future studies should examine whether meta-worry plays a more pronounced role in older adolescents or in clinical samples with diagnosed anxiety disorders.

Emotional dysregulation demonstrated a marginal and non-significant role in predicting sleep disorders, although the effect was positive. This finding partially supports existing evidence that difficulties in emotion regulation contribute to heightened physiological arousal and poor sleep quality (Cheong et al., 2024; Yang et al., 2023). One possible explanation for the weaker-than-expected effect is that emotional dysregulation may interact with other psychological vulnerabilities, such as anxiety sensitivity or negative cognitive schemas, to influence sleep. Prior studies suggest that the impact of emotional dysregulation on sleep may be most apparent when coupled with chronic stress or traumatic experiences (Fallahi et al., 2021; Harb et al., 2025). Additionally, emotion regulation difficulties may exert indirect effects by exacerbating depressive or anxious symptoms, which in turn disrupt sleep (Yang et al., 2022). The current results suggest that while emotional

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dysregulation is relevant, its independent predictive role may be less robust compared to psychological distress.

The finding that stress showed the strongest association among the distress components reinforces the centrality of acute and chronic stressors in disrupting adolescent sleep. This is consistent with research documenting how academic demands, interpersonal conflicts, and pandemic-related uncertainties have heightened stress and, consequently, sleep disturbances (Saalwirth & Leipold, 2021; Talebi-Ashelaghi & Ghodrati-Mirkohi, 2022). Stress-related hyperarousal is thought to interfere with the initiation of sleep, while intrusive thoughts prolong wakefulness and reduce sleep efficiency (Sakakini et al., 2020). Furthermore, prolonged stress exposure may disrupt circadian rhythms and neuroendocrine regulation, compounding the effects of distress on sleep (Uccella et al., 2023; Ulrich et al., 2021). The large effect size for stress in this study underscores its importance as a target for preventive interventions.

Anxiety also demonstrated a strong and significant relationship with sleep disorders, consistent with prior findings across diverse contexts. Worry and heightened arousal associated with anxiety can significantly impair sleep onset and maintenance, leading to chronic insomnia (Cheah et al., 2024; Gholedadri-Zadeh & Mousavi, 2020). In addition, adolescents with anxiety may engage in maladaptive coping behaviors, such as increased screen time or avoidance of bedtime routines, which further deteriorate sleep quality (Solmaz et al., 2025; Yang et al., 2022). This study's findings reinforce the robust link between anxiety and sleep, suggesting that interventions targeting generalized and social anxiety symptoms may yield improvements in adolescent sleep quality (Askari et al., 2023; Seah et al., 2025).

Depression's significant relationship with sleep disorders also confirms prior observations that mood dysregulation is intricately linked to poor sleep (Karimi-Rad et al., 2022; Li et al., 2025). Adolescents experiencing depressive symptoms often show disturbances in sleep architecture, such as reduced slow-wave sleep and increased nighttime awakenings (Menzies et al., 2025). Moreover, depression often coexists with hopelessness and negative cognitive schemas, which may fuel ruminative thought patterns at bedtime (Masbahi & Saraei, 2022; Sharifian & Khodarahimi, 2023). By confirming the role of depression, this study adds to the evidence base advocating for integrated treatments that address both affective and sleep disturbances simultaneously.

Notably, while meta-worry and emotional dysregulation did not emerge as significant independent predictors, their theoretical importance remains well-supported. Studies demonstrate that meta-worry interacts with emotional dysregulation and distress to form a complex web of vulnerabilities that increase sleep disturbances (Cheong et al., 2024; Silva-Santos et al., 2022). Adolescents may also differ in how they conceptualize and report these constructs, which may explain some inconsistencies across cultural and methodological contexts (Saalwirth & Leipold, 2021; Yu et al., 2024). Taken together, the findings suggest that psychological distress is the most salient independent predictor, but meta-worry and dysregulation should not be dismissed, as they may exert indirect or moderating effects on sleep health.

The findings of this study also carry significant implications for adolescent development and well-being. Adolescents experiencing persistent sleep disturbances may be at higher risk of academic underachievement, emotional instability, and long-term psychiatric morbidity (Harb et al., 2025; Uccella et al., 2023). Furthermore, sleep problems during adolescence often track into adulthood, raising concerns about their cumulative impact on health outcomes across the lifespan (Partinen, 2021; Ziniti et al., 2025). By highlighting the predictive roles of psychological distress and related cognitive-emotional factors, this study contributes to a deeper understanding of adolescent sleep health and provides evidence for the design of targeted interventions.

5. Limitations & Suggestions

Several limitations must be acknowledged. First, the study employed a cross-sectional design, which limits the ability to infer causal relationships between psychological variables and sleep disorders. Although associations were identified, it cannot be determined whether distress causes sleep problems or vice versa. Second, the study relied exclusively on self-report questionnaires, which are subject to response biases such as social desirability and recall inaccuracies. Third, the sample was limited to adolescent girls in Tehran, which restricts the generalizability of the findings to other populations, including boys and adolescents from different cultural and socioeconomic backgrounds. Fourth, potential confounding factors such as physical health status, family dynamics, and environmental influences on sleep (e.g., technology use, noise, or household stress) were not controlled for. Finally, the lack

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of objective sleep measures such as actigraphy or polysomnography limits the precision of conclusions about actual sleep quality and quantity.

Future studies should adopt longitudinal designs to better capture the reciprocal and dynamic relationships between psychological distress, meta-worry, emotion regulation, and sleep over time. Expanding research to include both male and female adolescents, as well as culturally diverse samples, will help determine the generalizability of findings across contexts. It is also recommended that future research employ multi-method approaches, incorporating both self-report and objective sleep measures, to provide a more comprehensive picture of sleep health. Moreover, examining potential mediators and moderators—such as coping strategies, family support, physical activity, and digital media use—may clarify the pathways through which psychological vulnerabilities affect sleep. Finally, experimental and intervention-based studies could test the efficacy of treatments targeting stress, anxiety, and depression in improving sleep outcomes in adolescents.

In terms of practical implications, the findings highlight the importance of school-based and community-based interventions that focus on stress management, anxiety reduction, and depression prevention as pathways to improve adolescent sleep health. Mental health professionals working with adolescents should incorporate psychoeducation on sleep hygiene alongside therapeutic approaches for distress and emotion regulation. Schools can play a central role by implementing mindfulness, relaxation, and cognitive-behavioral programs that equip students with effective coping strategies. Families should also be engaged in promoting supportive home environments conducive to healthy sleep, including consistent routines and reduced exposure to late-night screen use. By addressing psychological distress and building resilience, practitioners can help adolescents achieve healthier sleep patterns, which in turn foster better academic performance, emotional stability, and long-term well-being.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed to this article.

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