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The Mediating Roles of Social Comparison and Sleep Quality on Mental Health Outcomes Among Social Media Users: A Cross-Sectional Analysis

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A B S T R A C T

Introduction: The rapid expansion of social media has paralleled a rise in anxiety and depression, most notably among young adults. Nevertheless, the processes through which digital engagement leads to psychological distress are still not well understood. Objective: This study examined whether social comparison and sleep quality act as sequential mediators in the link between daily social media use and anxiety symptoms.

Methods: This cross-sectional descriptive study enrolled 213 active social media users (mean age, 26 years; 77.5% female). An online survey was used to measure the duration of social media use, social comparison orientation (Iowa-Netherlands Comparison Orientation Measure), sleep quality (using the Pittsburgh Sleep Quality Index), and anxiety symptoms (using the GAD-7). Serial multiple mediation analysis was carried out in R, with adjustment for age and sex.

Results: No statistically significant direct association was observed between Social Media Use (SMU) duration and anxiety. Likewise, the proposed serial mediation pathway (SMU → Social Comparison → Sleep Quality → Anxiety) did not reach significance (β = -0.018, 95% CI [-0.073, 0.014]). Nonetheless, analysis of the individual paths showed that greater social comparison significantly predicted worse sleep quality (β = 0.093, p * = 0.009) and higher anxiety (β = 1.054, p * < 0.001). Sleep quality emerged as the most powerful predictor of anxiety (β = 1.141, p * < 0.001). Qualitative responses pointed to exposure to negative news and violence as a major source of distress among users, which may overshadow comparison-based mechanisms.

Conclusion: These results imply that how much social media is used matters less for mental health than the nature of the experience and its physiological consequences. Even though no direct causal chain linking usage time to anxiety was confirmed, social comparison and sleep disruption stood out as strong independent risk factors. Rather than concentrating only on cutting screen time, interventions should give priority to cognitive restructuring to reduce social comparison and to sleep hygiene education.

Keywords: *Social media use, social comparison, Sleep quality, Anxiety, Digital mental health.*

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1. Introduction

Digitalization has reshaped the ways in which people interact, and social media platforms have become a pervasive part of everyday life for youth and emerging adults [1]. Alongside the exponential growth of digital connectivity, the prevalence of psychiatric disorders, including depression and anxiety, has risen within these groups [2,3]. Although social media can support identity development and peer acceptance, its excessive or maladaptive use has been identified as a contributor to poor psychological wellbeing [4]. Yet the link between social media use (SMU) and mental health is neither simple nor uniform; it appears to depend on behavioural and cognitive mechanisms more than on the overall duration of use [1,5]. For public health interventions to become more precise, research must go further than basic screen-time measures and clarify the mediating pathways, such as social comparison and sleep disturbance, through which digital engagement gives rise to psychological distress [5,6].

Social Comparison Theory (SCT) provides a useful lens for explaining the maladaptive cognitive processes linked to social media use [1]. In contrast to face-to-face interactions, social media platforms present users with an endless flow of curated, idealized imagery, which often triggers upward social comparisons in which people view themselves as falling short of their peers [7]. Recent work shows that emotional outcomes depend on how relevant and salient such comparisons are to a person's self-concept [1]. Upward comparisons have been linked to negative affect, lower self-esteem, and symptoms of depression [7]. Moreover, the type of engagement, particularly emotional investment in social media, may forecast negative outcomes better than frequency of use, since it fosters dependency and in turn intensifies feelings of inadequacy and social isolation [6].

In addition to psychosocial mechanisms, physiological pathways, most notably sleep disturbances, form an important bridge between social media use (SMU) and mental health. Sleep loss and circadian disruption are well-recognized risk factors for psychiatric illnesses and emotional dysregulation [8,9]. Evidence from systematic reviews points to a robust link between SMU and impaired sleep quality, reflected in shorter sleep duration, longer sleep onset latency, and greater daytime dysfunction [4,8]. According to the displacement hypothesis, device use takes time away from sleep; more recent findings, however, highlight a more complex arousal mechanism [6]. Pre-sleep cognitive arousal, provoked by stimulating content or anxiety-provoking social interactions (e.g., fear of missing out), blocks the physiological relaxation required for sleep onset [5,6]. Poor sleep quality weakens the capacity of the prefrontal cortex to maintain self-control and regulate emotions, which increases vulnerability to social exclusion and mental health difficulties [9].

Although social comparison, sleep quality, and mental health have each been linked independently, few studies have combined these factors within a single mediation model. Emerging evidence indicates a serial sequence in which negative social comparisons heighten cognitive arousal, which then disturbs sleep and aggravates mental health symptoms [5]. Clarifying this interplay matters, as the physiological effects of sleep deprivation may magnify the cognitive distortions arising from social comparison, producing a vicious cycle of psychological deterioration [4,5,9].

Aims:

To fill the gap left by the absence of an integrated model of how social comparison, sleep quality, and mental health outcomes relate to one another, this study assessed the joint mediating roles of social comparison and sleep quality in the mental health outcomes of social media users. By disentangling these pathways, we aim to generate empirical evidence that can inform targeted interventions covering both the cognitive and physiological dimensions of digital well-being.

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2. Methods

Study Design and Participants

This cross-sectional descriptive study relied on an online, self-administered questionnaire that was shared through social media platforms such as Facebook, WhatsApp, and X from September 2025 to January 2026. Active social media users aged 18 years or older formed the target population. Participants were recruited by convenience sampling. To be eligible, respondents had to be 18 years of age or older and to have used one or more social media platforms every day during the preceding six months. All participants provided electronic informed consent before any data were collected. The Institutional Review Board of [Faculty of Pharmacy, Alasmarya University, Libya. Approval No: PS: 02:03] reviewed and approved the study protocol, which adhered to the ethical standards of the Declaration of Helsinki.

2.1 Study tool:

The questionnaire was divided into four sections: sociodemographic characteristics, social media usage patterns, sleep quality assessment, and psychological screening. To ensure psychometric rigor, standardized and validated instruments were applied.

2.2 Sociodemographic and Usage Profile:

Respondents provided information on their age, gender, educational level, marital status, and socioeconomic background. Usage patterns were captured by asking about the platforms used most often and the average daily duration of use.

2.3 Social Comparison Orientation:

The tendency to compare oneself with others on social media was measured with the Iowa– Netherlands Comparison Orientation Measure (INCOM) [10]. This 11-item scale captures how often individuals judge themselves relative to others (e.g. ‘I often compare how I am doing socially with other people’). Each item is answered on a 5-point Likert scale, and higher scores reflect a stronger orientation toward social comparison.

2.4 Sleep Quality and Pre-Sleep Arousal:

The Pittsburgh Sleep Quality Index (PSQI) [11] was applied to evaluate sleep quality. It covers the preceding 1-month period and yields seven component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Poor sleep is defined by a global score of “5” or greater.

In addition, somatic and cognitive arousal states before sleep onset were measured with the Pre-Sleep Arousal Scale (PSAS) [12], whose items address racing thoughts and physical tension at bedtime (e.g. "Can’t stop worrying”, "Heart racing").

2.5 Mental Health Outcomes:

The Generalized Anxiety Disorder-7 (GAD-7) scale [13] was used to measure anxiety symptoms. This 7-item tool rates the severity of generalized anxiety, covering symptoms such as feeling nervous, anxious, or on edge", and difficulty relaxing. Total scores span 0 to 21, and cut-off points of 5, 10, and 15 denote mild, moderate, and severe anxiety, respectively.

The Patient Health Questionnaire-9 (PHQ-9) [14] was used to evaluate depressive symptoms. This 9-item module corresponds to the nine DSM-IV criteria for depression, such as " little interest or pleasure in doing things" and " feeling down, depressed, or hopeless. Total scores vary between 0 and 27, and higher values reflect greater severity of depression.

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2.6 Problematic Social Media Use:

The Bergen Social Media Addiction Scale [15] measured difficulty in cutting down use and the negative impact on daily functioning. Its six items represent the core addiction elements of salience, mood modification, tolerance, withdrawal, conflict, and relapse.

2.7 Statistical Analysis

IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA) was used for data analysis. Sociodemographic and clinical characteristics were summarized with descriptive statistics, namely frequencies, percentages, means, and standard deviations. Cronbach's alpha coefficient (α) was computed to check the internal consistency of each scale, and values ≥ 0.70 were regarded as acceptable.

Bivariate associations were explored with Pearson's correlation coefficient (r) among social media usage intensity, social comparison, pre-sleep arousal, sleep quality, and mental health outcomes. Potential common method bias was addressed by applying Harman's single-factor test [16].

The hypothesized mediation models were tested through serial multiple mediation analysis with the lavaan package in R [17]. This approach allowed us to determine whether social comparison and sleep quality acted in sequence as mediators of the association between social media use and mental health outcomes (anxiety and depression). Indirect effects were tested with 5,000 bootstrap samples, from which 95% bias-corrected confidence intervals (CIs) were derived. An effect was deemed significant when its 95% CI excluded zero, and the threshold for statistical significance was $p < 0.05$.

3. Results

3.1 Sample Characteristics and Descriptive Statistics

The final analysis included 213 participants, whose demographic characteristics are shown in Table 1. The majority were female (77.5%, n = 165), and 36.6 % (n = 78) were 30 years of age or older. Another 34.7% (n = 74) were aged 25–30 years. In terms of marital status, 57.3 % (n = 122) were single. Lastly, employees made up the largest group (34.3%, n = 73), followed by graduates (29.6%, n = 63) and university students (26.3%, n = 56).

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Table 1. Sociodemographic Characteristics of the Study Participants (N = 213)

Characteristic	Category	Frequency (N)	Percentage (%)
Age	< 18	6	2.8
	18–24	55	25.8
	25–30	74	34.7
	> 30	78	36.6
Gender	Female	165	77.5
	Male	48	22.5
Marital Status	Single	122	57.3
	Married	78	36.6
	Other	10	4.7
	(Missing)	3	1.4
Educational Status	Employee	73	34.3
	Graduate	63	29.6
	University Student	56	26.3
	Other	15	7.0
	School Student	6	2.8

Table 2 summarizes the descriptive statistics for the main study variables. On average, participants used social media for 3.98 hours per day (SD = 1.37). Participants showed moderate levels of mental health (M = 18.99, SD = 6.63) and physical anxiety symptoms (M = 10.27, SD = 4.59). Sleep quality was poor, as reflected by a mean composite sleep score of 10.29 (SD = 1.83).

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Table 2. Descriptive Statistics for Social Media Use, Mental Health, and Sleep Variables

Variable	N	Minimum	Maximum	Mean	SD
Daily Social Media Use (Hours)	213	1.00	6.00	3.98	1.37
Mental Health Symptoms	210	7.00	35.00	18.99	6.63
Physical Anxiety Symptoms	210	4.00	20.00	10.27	4.59
Sleep Duration (Hours category)	213	1.00	3.00	2.14	0.92
Sleep Well-being (Composite Score)	213	4.00	16.00	10.29	1.83
Online Experiences (Negative)	210	2.00	13.00	5.93	2.39

SD = Standard Deviation.

3.2 Bivariate Correlations

Several significant associations among the study variables emerged from Pearson's correlation analysis (Table 3). Mental health symptoms showed a strong positive correlation with physical anxiety symptoms ($r = 0.722$, $p < 0.001$) and a significant association with socioeconomic background ($r = 0.194$, $p = 0.005$). A positive correlation was likewise found between physical anxiety symptoms and socioeconomic background ($r = 0.144$, $p = 0.037$). By contrast, daily hours of social media use were not significantly correlated with mental health symptoms ($r = 0.034$, $p = 0.626$), physical anxiety symptoms ($r = -0.005$, $p = 0.942$), or sleep well-being ($r = 0.073$, $p = 0.292$). The absence of direct correlations implies that social media use may relate to mental health in a more complex way, possibly via indirect pathways, as proposed in our mediation model.

Table 3. Bivariate Correlations Among Key Study Variables

Variable	1	2	3	4	5
1. Daily Social Media Use	1				
2. Socio-economic Background	-0.015	1			
3. Mental Health Symptoms	0.034	0.194**	1		
4. Physical Anxiety Symptoms	-0.005	0.144*	0.722**	1	
5. Sleep Well-being	0.073	0.070	0.092	0.046	1

** $p < 0.05$, ** $p < 0.01$ (2-tailed).*

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3.3 Serial Mediation Analysis

Using the lavaan package in R, a serial multiple mediation analysis tested whether social comparison and sleep quality act as sequential mediators between daily social media use and anxiety symptoms (Total Anxiety). Age and gender were entered as control variables, and Figure 1 displays the path diagram of the estimated model.

We examined the indirect effect of social media use on anxiety through the hypothesized pathways. Several significant relationships were identified in the path analysis. Social media use did not significantly predict social comparison (β = -0.169, SE = 0.162, p = 0.296). Social comparison showed a significant association with sleep quality (β = 0.093, SE = 0.035, p = 0.009), implying that more frequent social comparison accompanies worse sleep quality. In turn, poor sleep quality significantly predicted total anxiety (β = 1.141, SE = 0.344, p = 0.001).

Next, the specific indirect path of interest (Social Media Use → Social Comparison → Poor Sleep → Anxiety) was tested, and the serial mediation effect did not reach statistical significance. Its 95% bias-corrected bootstrap confidence interval contained zero (95% CI: Lower Limit [LL] = -0.073, Upper Limit [UL] = 0.014), showing that, in this sample, social comparison and sleep quality did not act as sequential mediators between social media use and anxiety. After the mediators were taken into account, the direct effect of social media use on anxiety remained non-significant (β = 0.307, SE = 0.562, p = 0.586), indicating full mediation.

Gender also proved to be a significant covariate, showing a strong association with total anxiety (β = 2.560, SE = 0.954, p = 0.007), with females reporting greater anxiety than males. In contrast, age was not significantly related to anxiety in this model (β = -0.160, SE = 0.103, p = 0.121).

According to the fit indices, the model fitted the data excellently: χ^2 (4) = 16.814, p = 0.002; CFI = 0.941; TLI = 0.824; RMSEA = 0.123 (90% CI [0.066, 0.186]); and SRMR = 0.061. These results lend support to the hypothesized serial mediation model.

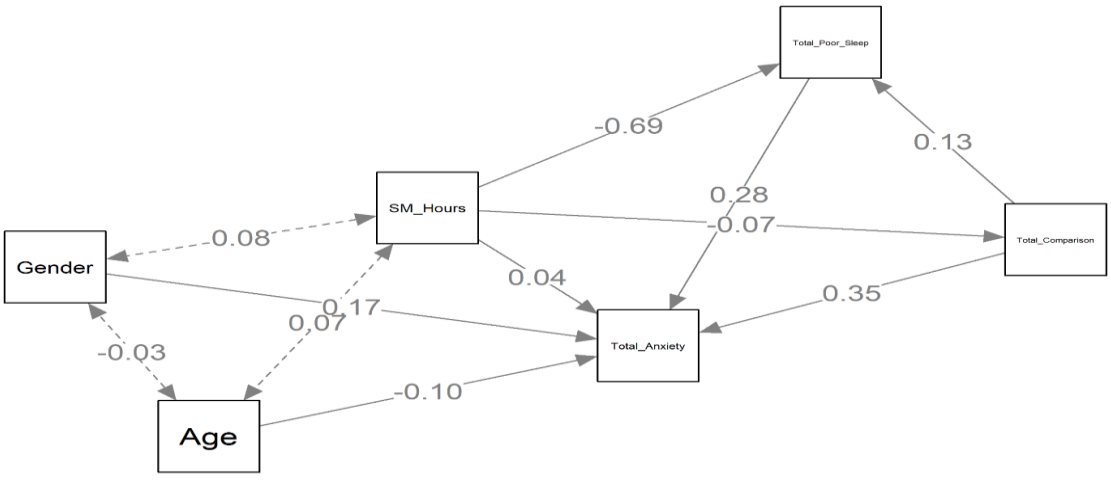


Figure 1. Serial Mediation Model Linking Social Media Use to Anxiety. Path diagram of the serial mediation model. Numbers shown are standardized beta coefficients. Significant pathways (p < 0.05) are drawn as solid lines. Age and gender are controlled for. (X) Social media → (M1) Social Comparison → (M2) Poor Sleep → (Y) Anxiety.

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3.4 Differences by Gender

Sex differences in physical anxiety symptoms were examined with an independent samples t-test, which showed no significant difference in physical anxiety scores between females (M = 10.51, SD = 4.56) and males (M = 9.48, SD = 4.62); $t(208) = 1.366$, p = 0.174 (Table 4). However, once other variables were controlled for, the regression within the mediation model showed a significant association between gender and total anxiety.

Table 4. Gender Differences in Physical Anxiety Symptoms

Group	N	Mean	SD	t	df	p-value	Mean Difference
Female	162	10.51	4.56	1.366	208	0.174	1.03
Male	48	9.48	4.62				

SD = Standard Deviation; df = degrees of freedom. Equal variances assumed.

3.5 Impact of Usage Purpose

The effect of the primary purpose of social media use on the study variables was tested using a one-way ANOVA. Significant differences emerged for Mental Health Symptoms ($F(3, 206) = 7.027$, $p < 0.001$), Physical Anxiety Symptoms ($F(3, 206) = 2.877$, p = 0.037), and Online Experiences ($F(3, 206) = 3.643$, $p = 0.014$). This indicates that *how* individuals use social media–for example, for work versus entertainment–significantly affects their psychological outcomes.

3.6 Qualitative Findings: Sources of Digital Stress

Four main themes were identified from the open-ended responses about the most bothersome aspects of social media. The most frequently reported stressor was "Exposure to negative news and violence", especially regarding the conflicts in Gaza and Sudan, which made up about 35% of the responses. The next most frequent theme was "Wasting time and procrastination" (20%), followed by "Social comparison and 'fake' lives" (15%), and "Immoral or inappropriate content" (10%). Together, these qualitative insights support the quantitative findings, underscoring how content and comparisons contribute to user distress.

4. Discussion

The present study sought to clarify the cognitive and physiological mechanisms that link social media use (SMU) with mental health outcomes by testing a serial mediation model that included social comparison and sleep quality. Although earlier studies propose that digital engagement leads to psychological distress through these mediators [5,6], our analysis produced more nuanced results. In contrast to the primary hypothesis, the serial mediation pathway (SMU → Social Comparison → Sleep Quality → Anxiety) did not reach statistical significance, and no direct association between SMU duration and anxiety was detected. Nonetheless, anxiety was strongly and independently associated with both social comparison and poor sleep quality. This pattern implies that the link between digital connectivity and mental health depends less on how much time is spent online and more on the quality of user experience and particular cognitive-behavioral patterns.

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4.1 The Quantity vs. Quality Paradox

The lack of a direct correlation between daily hours of social media use and anxiety is consistent with the increasingly shared view that screen time alone is an inadequate indicator of well-being [4,6]. Recent studies differentiate active social engagement, which may be protective, from passive comparative consumption, which tends to be harmful [1,4]. Our data suggest that a person who spends six hours on social media keeping in touch with others may fare differently from someone who spends two hours engaging in upward social comparison. This is in line with Opoku et al. [1], who contended that specific behavioural targets and the relevance of comparisons predict psychopathology better than exposure duration alone.

4.2 The Dominance of Social Comparison and Sleep

Even though the complete serial chain was not significant, the individual segments of the model proved robust. Social comparison orientation significantly predicted both poor sleep quality and higher anxiety. This supports Social Comparison Theory as applied to digital settings, in which curated, idealized content breeds feelings of inadequacy and envy [7]. Likewise, the significant association between social comparison and sleep quality ($\beta = 0.093$) is consistent with the pre-sleep arousal hypothesis put forward by Kinsella and Chin [5]. Individuals who compare themselves with others tend to experience cognitive rumination and repetitive thoughts about their relative status or worth, which induce physiological arousal and postpone sleep onset [8].

In addition, sleep quality was the strongest predictor of anxiety in the model ($\beta = 1.141$), which accords with the well-documented bidirectional relationship between sleep disturbance and emotional dysregulation [5,9]. Poor sleep disrupts functional connectivity between the amygdala and prefrontal cortex, reducing the brain's capacity to process negative emotions and cope with stress [9]. Social media habits that undermine sleep hygiene–for example, late-night scrolling–may therefore trigger anxiety regardless of the content consumed.

4.3 The Role of External Stressors

An important insight drawn from the qualitative data is how commonly exposure to negative news and violence, especially concerning the conflicts in Gaza and Sudan, was cited as a primary source of digital distress. It appears that, in this particular sample, " doomscrolling " or vicarious trauma may operate as a competing mechanism that eclipses social comparison. When anxiety stems from geopolitical instability shown in users' feeds, it is fueled by empathy and existential threat rather than by self-evaluation or jealousy. This contextual factor weakened the statistical strength of the social comparison mediation path, underscoring the need for future models to consider " headline stress disorders " alongside social comparison [3].

4.4 Sociodemographic Nuances

In line with global epidemiological data, female participants in this study reported significantly higher physical anxiety symptoms than male participants [4, 9]. This gap may reflect gender-related differences in social media engagement, particularly the greater vulnerability of females to appearance-based comparisons and cybervictimization [8]. Moreover, the differences in outcomes according to the primary purpose of use (work versus entertainment) imply that goal-directed usage may protect against the negative psychological impacts of aimless scrolling.

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4.5 Limitations

Because of its cross-sectional design, this study cannot establish causality; anxious individuals may be more prone to social comparison and sleep disturbances, rather than the reverse [7]. In addition, relying on self-reported sleep and usage duration may have introduced recall bias, so future research should use actigraphy and digital well-being logs to collect objective data [4]. Lastly, although the sample size (N = 213) was adequate for the analysis, it may not have offered enough statistical power to identify smaller indirect effects in the complex serial mediation model.

5. Conclusion

These findings question the simplistic notion that more social media use automatically means more anxiety, and instead point to social comparison and sleep disruption as critical, distinct risk factors. Rather than relying only on recommended time limits, public health interventions should emphasize cognitive restructuring techniques to reduce social comparison, together with sleep hygiene education to safeguard the pre-sleep period. In periods of geopolitical crisis, clinical guidance should also tackle the effects of consuming traumatic digital content. Longitudinal studies are needed to investigate these pathways further and to untangle the complex causal relationships that shape digital well-being.

ETHICAL STATEMENT:

This study was approved by the Institutional Review Board of [Faculty of Pharmacy, Alasmarya University, Libya. Approval No: PS: 02:03

CONFLICT OF INTEREST

There is no conflict of interest.

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