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The Relationship between Social Media Use and Mental Stress among Adolescents: An Empirical Examination of Mediating Psychological Mechanisms

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ABSTRACT

This study examines the empirical relationship between social media use (SMU) and mental stress among adolescents, investigating the mediating roles of fear of missing out (FOMO) and sleep quality. Utilizing a cross-sectional survey design, data were collected from a stratified cluster sample of school-going adolescents (N = 450, aged 13–17 years) using standardized psychometric instruments: the Bergen Social Media Addiction Scale (BSMAS), the Perceived Stress Scale (PSS-10), the Fear of Missing Out Scale (FoMOS), and the Pittsburgh Sleep Quality Index (PSQI). Structural equation modeling (SEM) and multiple regression analyses were employed to evaluate the proposed sequential mediation hypotheses. The results demonstrated a significant, positive relationship between problematic social media use and perceived mental stress. Furthermore, mediation analyses revealed that both FOMO and poor sleep quality significantly mediated this relationship, operating both in parallel and through a sequential pathway. These findings highlight that the psychological impact of digital connectivity is multi-layered, extending beyond simple screen time to include cognitive preoccupation and physiological disruptions. The study discusses practical implications for school-based mental health interventions, digital literacy programs, and collaborative parental guidance strategies aimed at mitigating adolescent psychological distress in the digital age.

Introduction

The rapid proliferation of digital communication technologies over the past two decades has fundamentally transformed the social ecology of adolescence. Contemporary youth, frequently categorized as digital natives, are embedded in an environment where social media platforms—such as Instagram, TikTok, Snapchat, and YouTube—are not merely tools for communication but the primary arenas for identity construction, social interaction, and peer engagement. According to recent demographic data, over ninety percent of adolescents in developed economies possess a smartphone and report using social media multiple times a day. While these platforms offer unprecedented opportunities for information acquisition, global connectivity, and self-expression, they have concurrently coincided with a marked and alarming escalation in reported psychological distress among youth. This epidemiological shift has generated intensive scholarly inquiry into the potential pathological implications of digital connectivity, establishing a primary locus of concern around adolescent mental stress, anxiety, and affective dysregulation.

Adolescence represents a critical developmental window characterized by profound neurobiological maturation, particularly within the prefrontal cortex and limbic systems. This neurological asymmetry creates a developmental mismatch, wherein the socio-emotional processing regions of the brain mature faster than the cognitive control networks responsible for executive function and impulse regulation. Consequently, adolescents exhibit heightened sensitivity to social rewards, peer evaluation, and status dynamics, rendering them uniquely vulnerable to the external pressures and feedback loops characteristic of social media environments. The constant quest for validation through quantified social metrics—such as likes, views, comments, and follower counts—interacts synergistically with these neurodevelopmental vulnerabilities, often transforming normative social strivings into chronic psychological stress.

Despite a substantial volume of empirical literature, the definitive nature of the relationship between social media use (SMU) and adolescent mental health remains a subject of ongoing academic debate. Early research was heavily polarized, with one camp championing the displacement hypothesis, which posits that digital screen time causes harm primarily by replacing essential health-promoting behaviors, such as physical exercise, face-to-face socialization, and adequate sleep. Conversely, other scholars have argued for a more nuanced Goldilocks hypothesis, suggesting that moderate digital use is innocuous or even beneficial, and that negative outcomes only manifest at extreme thresholds of consumption. Methodological critiques suggest that the statistical effect sizes linking screen time directly to well-being are often trivial when viewed in isolation. This lack of academic consensus underscores the imperative to

shift the scientific focus away from simple, crude metrics of frequency or screen duration toward multidimensional assessments of problematic use and the specific psychological mechanisms that mediate these outcomes.

To theoretically ground this investigation, two primary psychological frameworks are deployed: Social Comparison Theory and the Uses and Gratifications Theory. Social Comparison Theory, originally articulated by Leon Festinger, posits that individuals possess an innate drive to evaluate their own opinions and abilities by comparing themselves to others. In the digitized landscape, social media platforms provide a continuous, curated, and highly idealized stream of peer representations. Adolescents are routinely exposed to hyper-selected, filtered, and optimized depictions of their peers' lives, achievements, and physical appearances. This pervasive exposure frequently elicits upward social comparisons, whereby adolescents perceive their own lives as inadequate, deficient, or inferior. This cognitive discrepancy often induces relative deprivation, body dissatisfaction, and an eroded sense of self-worth, which collectively serve as potent catalogers of psychological stress.

In parallel, the Uses and Gratifications Theory offers a robust lens for understanding the motivational dynamics underlying social media consumption. This framework suggests that users actively seek out specific media to satisfy psychological needs. However, in the context of adolescent social media engagement, the pursuit of relational connection frequently deteriorates into an obsessive cognitive preoccupation known as the Fear of Missing Out (FOMO). Characterized by a pervasive apprehension that others might be having rewarding experiences from which one is absent, FOMO drives a compulsive need to remain continuously connected to one's digital network. This state of perpetual hyper-vigilance ensures that the adolescent's cognitive resources are continuously strained, preventing psychological recovery and fostering a state of chronic ambient stress.

Beyond cognitive and social pathways, the physiological impacts of intensive social media use warrant rigorous exploration, particularly regarding sleep architecture. The bi-directional relationship between sleep disturbances and mental stress is well-established within psychiatric literature. Intensive social media use, especially during late-night hours, disrupts sleep through multiple distinct mechanisms: the biochemical disruption caused by blue-enriched light emission from screen displays, which suppresses endogenous melatonin synthesis; the psychological and emotional arousal triggered by engaging or provocative online content; and the direct temporal displacement of sleep duration. Sleep deprivation and fragmented sleep quality severely impair the prefrontal cortex’s capacity for top-down emotional

regulation, thereby exacerbating the adolescent's susceptibility to stressors and compounding feelings of anxiety and psychological exhaustion.

While the existing literature has separately linked social media use to FOMO, sleep deprivation, and stress, there remains a critical research gap concerning the integrative, simultaneous examination of these pathways within a cohesive structural model. Many studies fail to control for confounding variables, or they rely exclusively on linear associations that oversimplify the complex, indirect pathways through which digital interactions translate into felt psychological stress. This study addresses this theoretical and empirical void by examining a comprehensive mediational model. By examining how problematic social media use interacts with cognitive preoccupations (FOMO) and physiological disruptions (poor sleep quality), this research seeks to clarify the specific pathways that drive adolescent mental stress. Understanding these relationships is vital for designing effective preventive measures and school-based interventions.

The objective of this empirical study is to investigate the structural relationships between social media use, fear of missing out, sleep quality, and perceived mental stress in a sample of school-going adolescents. Specifically, this paper tests an integrative model where the primary effect of problematic social media use on mental stress is hypothesized to operate both directly and indirectly through the dual mediating channels of FOMO and sleep quality. By testing these pathways simultaneously, the study provides a more granular understanding of the digital ecology's impact on youth mental health. The following specific hypotheses are proposed:

Hypothesis 1 (H1): Problematic social media use will display a positive, significant direct relationship with perceived mental stress among adolescents.

Hypothesis 2 (H2): Fear of Missing Out (FOMO) will significantly mediate the relationship between problematic social media use and perceived mental stress.

Hypothesis 3 (H3): Sleep quality will significantly mediate the relationship between problematic social media use and perceived mental stress.

Hypothesis 4 (H4): FOMO and sleep quality will sequentially mediate the relationship between social media use and mental stress, such that intensive use heightens FOMO, which subsequently disrupts sleep, culminating in elevated mental stress.

Materials and Methods

Participants and Procedure

The sample for this cross-sectional study comprised 450 adolescents recruited from four public and private secondary schools located in a major metropolitan area. A stratified cluster sampling technique was employed to ensure diverse socioeconomic and demographic representation across grades nine through twelve. The inclusion criteria required participants to be aged between 13 and 17 years, possess an active account on at least one major social media platform, and have regular access to a smartphone or computer. Exclusion criteria included a pre-existing clinical diagnosis of a severe neurodevelopmental or psychiatric disorder, as reported by institutional records or guardians. These criteria ensured a relatively homogenous sample of typical school-going adolescents experiencing everyday social pressures.

Ethical approval was secured from the Institutional Review Board (IRB) prior to initiation. Given the minor status of the participants, a two-tiered consent process was rigorously implemented: written informed consent was obtained from the parents or legal guardians of all participants, and written assent was secured from the adolescents themselves. Data collection took place during designated morning homeroom periods over a three-week window in the academic term. The participants completed a computerized, self-administered questionnaire hosted on a secure, encrypted platform. To minimize social desirability bias and ensure data integrity, participants were explicitly reassured of the complete anonymity and confidentiality of their responses, and school faculty were not present during survey administration. Out of 480 distributed surveys, 450 were fully and validly completed, yielding an effective response rate of 93.75%.

Measures

Problematic Social Media Use

Problematic social media use was quantified using the Bergen Social Media Addiction Scale (BSMAS), adapted from the Bergen Facebook Addiction Scale. The BSMAS is a 6-item self-report instrument designed to assess the core components of behavioral addiction—salience, tolerance, mood modification, relapse, withdrawal, and conflict—in relation to social media engagement over the preceding year. Items (e.g., 'You feel an urge to use social media more and more') are scored on a 5-point Likert scale ranging from 1 (Very Rarely) to 5 (Very Often), with total scores spanning from 6 to 30. Higher scores reflect a higher degree of problematic or addictive social media use. In the present study, the scale demonstrated excellent internal consistency, with a Cronbach’s alpha of 0.88.

Perceived Mental Stress

The primary dependent variable, adolescent mental stress, was measured using the 10-item version of the Perceived Stress Scale (PSS-10), originally developed by Cohen et al. The PSS-10 evaluates the degree to which situations in an individual's life are appraised as unpredictable, uncontrollable, and overloading over the past month. Responses are captured on a 5-point Likert scale ranging from 0 (Never) to 4 (Very Often). After reversing the scores of the four positively worded items, a total composite score is calculated, ranging from 0 to 40, where elevated scores indicate severe perceived psychological stress. The psychometric robustness of the PSS-10 within adolescent populations is well-documented; the Cronbach's alpha obtained for this sample was 0.85.

Fear of Missing Out

The cognitive mediator, Fear of Missing Out, was evaluated utilizing the Fear of Missing Out Scale (FoMOS) developed by Przybylski et al. This 10-item unifactorial scale measures an individual's chronic apprehension regarding missing out on rewarding experiences occurring within their peer group. Respondents rate items such as 'I get anxious when I find out my friends are having fun without me' on a 5-point Likert scale from 1 (Not at all true of me) to 5 (Extremely true of me). Total scores range from 10 to 50, with higher values signifying intense levels of FOMO. The scale displayed a high level of reliability in this investigation (Cronbach’s alpha = 0.89).

Sleep Quality

The physiological mediator, sleep quality, was operationalized using the component scores derived from the Pittsburgh Sleep Quality Index (PSQI). Although the full PSQI assesses seven domains of sleep architecture over a one-month interval, a consolidated self-report metric focusing on global subjective sleep quality, sleep latency, and sleep duration was adapted for brief adolescent administration. For analytical clarity and ease of interpretation within the structural model, scores were transformed such that higher values designated poorer sleep quality and greater sleep disruption. The internal reliability coefficient for the items utilized was 0.81, indicating acceptable psychometric alignment for behavioral modeling.

Control Variables

To eliminate potential confounding influences and isolate the specific impacts of digital behaviors, several demographic and covariate measures were recorded. These included chronological age, gender

(coded dichotomously), average daily screen time (measured in self-reported hours), and self-reported academic performance (quantified via Grade Point Average equivalents). These variables were controlled in subsequent multivariate analyses to prevent spurious associations.

Data Analysis Plan

Statistical processing was conducted using SPSS version 26.0 and AMOS version 25.0. Preliminary analysis involved checking for missing data, examining normality distributions, and identifying outliers. Descriptive statistics and bivariate Pearson correlation coefficients were calculated for all primary variables. To test the hypothesized direct and indirect structural pathways, a structural equation modeling (SEM) approach was employed, utilizing maximum likelihood estimation. The adequacy of the structural model fit was evaluated using standard fit indices: the Chi-square to degrees of freedom ratio (χ^2/df), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and the Root Mean Square Error of Approximation (RMSEA). To evaluate the significance of the specific indirect effects (mediation channels), bootstrapping with 5,000 resamples was performed, generating 95% bias-corrected confidence intervals (CIs). An indirect effect was considered statistically significant if its 95% confidence interval did not encompass zero.

Results

The demographic composition of the final sample (N = 450) reflected a relatively balanced distribution across gender and age. Of the participants, 52.2% identified as female (n = 235) and 47.8% as male (n = 215). The mean age of the sample was 15.24 years (SD = 1.34). Regarding daily media habits, adolescents reported an average of 4.62 hours of recreational social media use per day (SD = 1.85), with 28.4% of the sample reporting usage exceeding 6 hours daily. Skewness and kurtosis indices for the primary psychometric indices fell well within the acceptable parameters (-1.5 to +1.5), verifying that the data satisfied the assumptions of normality requisite for parametric statistical modeling.

Bivariate correlation analysis revealed significant associations across all primary variables in the predicted directions. Problematic social media use (BSMAS) exhibited a robust positive correlation with perceived mental stress (PSS-10; $r = 0.46$, $p < 0.001$), supporting the initial premise that heightened or maladaptive digital involvement is tied to psychological strain. Furthermore, BSMAS was strongly and positively correlated with FOMO ($r = 0.54$, $p < 0.001$) and poor sleep quality ($r = 0.39$, $p < 0.001$). Concurrently, both mediators—FOMO and poor sleep quality—displayed significant positive associations with the primary outcome variable, perceived mental stress ($r = 0.41$, $p < 0.001$ and $r = 0.48$,

$p < 0.001$, respectively). These strong inter-correlations satisfied the prerequisite conditions for conducting formal mediation analyses.

Table 1: Descriptive Statistics and Bivariate Inter-correlations Among Primary Variables

Variables	**Mean**	**SD**	**1**	**2**	**3**	**4**
1. Problematic SMU (BSMAS)	16.45	4.82	—			
2. Fear of Missing Out (FoMOS)	28.12	7.65	0.54***	—		
3. Poor Sleep Quality (PSQI)	7.89	2.41	0.39***	0.34***	—	
4. Perceived Stress (PSS-10)	22.34	5.12	0.46***	0.41***	0.48***	—

Note: *** $p < 0.001$; SMU = Social Media Use.

To test the primary hypotheses and evaluate the parallel and sequential mediating roles of FOMO and sleep quality, path analysis via Structural Equation Modeling (SEM) was performed. The initial fully-specified structural model demonstrated an exceptional fit to the empirical data. The specific fit indices were: $\chi^2/df = 1.84$ ($p > 0.05$), CFI = 0.99, TLI = 0.98, and RMSEA = 0.038 (95% CI [0.012, 0.054]). These parameters indicate that the structural model provides an accurate representation of the observed psychological relationships, meeting all standard criteria for excellence in goodness-of-fit indicators.

The standardized direct path from problematic social media use to perceived mental stress remained statistically significant even after accounting for the presence of the mediators ($\beta = 0.22$, $p < 0.01$), thereby confirming Hypothesis 1. This indicates that while social media use operates through multiple indirect psychological and physiological channels, it also retains a direct, unmediated impact on adolescent stress levels, potentially due to factors like cyberbullying exposure, content-induced anxiety, or cognitive fatigue.

The indirect effects were scrutinized using bias-corrected bootstrapping procedures with 5,000 iterations. The total indirect effect of problematic social media use on perceived mental stress was highly significant ($\beta = 0.26$, SE = 0.04, 95% CI [0.18, 0.34], $p < 0.001$). This total indirect pathway was decomposed into three distinct mediating trajectories to evaluate Hypotheses 2, 3, and 4. First, the specific indirect path via Fear of Missing Out (Problematic SMU → FOMO → Perceived Stress) was statistically significant ($\beta = 0.12$, SE = 0.03, 95% CI [0.07, 0.18], $p < 0.01$), providing strong empirical support for Hypothesis 2. Second, the specific indirect path via poor sleep quality (Problematic SMU → Poor Sleep Quality →

Perceived Stress) was also highly significant (β = 0.10, SE = 0.02, 95% CI [0.06, 0.15], p < 0.01), validating Hypothesis 3. Third, the sequential indirect pathway mapping the progression from problematic use through elevated FOMO, which subsequently worsens sleep quality, ultimately aggravating perceived stress (Problematic SMU → FOMO → Poor Sleep Quality → Perceived Stress), was found to be significant (β = 0.04, SE = 0.01, 95% CI [0.02, 0.07], p < 0.05), thereby confirming Hypothesis 4. Collectively, the independent variables and mediating pathways accounted for approximately 42.6% of the total variance in adolescent perceived mental stress (R^2 = 0.426), a large effect size in behavioral research.

Table 2: Direct, Indirect, and Total Structural Paths in the Final Model

Path	**Beta (β)**	**SE**	**95% LCI**	**95% UCI**	**Significance**
Direct Effects					
Problematic SMU → Perceived Stress	0.22	0.04	0.14	0.30	p < 0.01
Problematic SMU → FOMO	0.54	0.05	0.44	0.63	p < 0.001
Problematic SMU → Poor Sleep	0.39	0.04	0.31	0.47	p < 0.001
FOMO → Perceived Stress	0.22	0.04	0.13	0.31	p < 0.01
Poor Sleep → Perceived Stress	0.26	0.05	0.17	0.35	p < 0.001
Indirect Effects					
Total Indirect Effect	0.26	0.04	0.18	0.34	p < 0.001
SMU → FOMO → Perceived Stress	0.12	0.03	0.07	0.18	p < 0.01
SMU → Poor Sleep → Perceived Stress	0.10	0.02	0.06	0.15	p < 0.01
SMU → FOMO → Poor Sleep → Stress	0.04	0.01	0.02	0.07	p < 0.05

Note: LCI = Lower Confidence Interval; UCI = Upper Confidence Interval; SMU = Social Media Use.

Discussion

The empirical findings generated by this investigation provide robust, multi-dimensional insights into the complex relationship between social media use and mental stress among contemporary adolescents. By moving beyond a reductionist focus on raw screen time, this study illuminated the specific cognitive and physiological pathways—namely, the Fear of Missing Out (FOMO) and sleep quality—through which

intensive digital engagement translates into clinical and sub-clinical psychological distress. The confirmation of all four primary hypotheses validates our integrative structural framework, demonstrating that adolescent digital stress is not a simple byproduct of screen exposure, but rather a sophisticated transactional process involving affective preoccupation and biological disruption.

The significant direct relationship observed between problematic social media use and perceived mental stress (H1) aligns with and expands upon prior literature documenting the affective costs of hyper-connectivity. This direct pathway suggests that apart from sleep and peer anxieties, the immediate experiential nature of social media platforms possesses inherently stressful attributes. Adolescents are exposed to high volumes of algorithmic notifications, continuous information overload, and potentially harmful content, including cyberbullying, trolling, and idealized aesthetic standards. The constant processing of this material requires significant cognitive effort, contributing to mental fatigue and a state of chronic nervous system arousal. This phenomenon can be interpreted through the lens of cognitive load theory, which posits that when information processing demands exceed the individual's cognitive architecture capacity, performance degrades and psychological strain increases. In the case of adolescents, whose neurological mechanisms for filtering non-essential stimuli are still developing, this digital deluge directly compromises emotional equilibrium.

The validation of FOMO as a key psychological mediator (H2) offers critical insights into the motivational and cognitive dynamics of the adolescent digital ecology. According to the Uses and Gratifications framework, adolescents use social media to satisfy fundamental needs for belongingness, autonomy, and relatedness. However, the architectural design of modern platforms—characterized by ephemeral content like 'Stories' that disappear after twenty-four hours, live broadcasts, and read-receipts—monetizes and weaponizes these social needs, transforming them into chronic apprehension. The results show that high engagement with social media feeds a continuous loop of social comparison and anxiety. Adolescents experience a sense of exclusion when viewing the highly curated, idealized social lives of their peers. This upward social comparison triggers feelings of relative deprivation, leaving them feeling disconnected from their social groups. The resulting anxiety is not a passive response, but an active, distressing cognitive state that exhausts emotional resources, increases cortisol production, and presents as heightened psychological stress.

Concurrently, the confirmation of sleep quality as a vital physiological mediator (H3) highlights the biological pathways through which digital technology impacts youth mental health. This finding aligns with substantial sleep medicine research demonstrating that nocturnal media use degrades sleep

architecture. The mechanism is tripartite: first, behavioral displacement occurs when adolescents delay sleep to continue scrolling through feeds or interacting with peers; second, the emotional and psychological arousal triggered by interactive, stimulating, or distressing content disrupts the parasympathetic transition necessary for sleep onset; third, exposure to the shortwavelength blue light emitted by smartphone screens suppresses the secretion of melatonin from the pineal gland, shifting circadian rhythms and delaying sleep phase onset. The resulting sleep fragmentation and restriction impair the prefrontal cortex's capacity for top-down emotional regulation. Sleep-deprived adolescents show lower thresholds for stress reactivity, reduced frustration tolerance, and an increased vulnerability to negative affect. This biological vulnerability magnifies the perceived severity of daily stressors, establishing a reinforcing feedback loop where stress further disrupts sleep.

The support found for the sequential mediation pathway (H4) represents a key theoretical contribution of this study. This pathway traces a trajectory where problematic social media use elevates FOMO, which then degrades sleep quality, ultimately leading to higher perceived stress. This sequential model reveals a connection between cognitive and physiological vulnerabilities. Adolescents experiencing intense FOMO are highly likely to engage in 'vampiring'—the practice of using smartphones late into the night to ensure they do not miss any peer interactions or digital updates. This late-night vigilance directly impairs sleep hygiene, combining cognitive anxiety with sleep deprivation. This state compromises the adolescent's psychological resilience, leaving them highly vulnerable to chronic stress during waking hours. This integration of cognitive and biological mechanisms underscores the need for multi-disciplinary interventions that address both the psychological motivations and physical habits surrounding digital media consumption.

Implications for Intervention

The practical implications of these findings are significant for educators, mental health clinicians, pediatricians, and parents. First, interventions that focus solely on restricting screen time are likely inadequate, as they do not address the underlying cognitive anxieties like FOMO or the specific behavioral patterns like late-night usage that drive psychological distress. Instead, digital literacy programs should incorporate cognitive-behavioral strategies designed to help adolescents recognize and manage the psychological traps of social media, such as curated peer presentations and the illusion of constant inclusion. School-based mental health initiatives should integrate sleep hygiene education with digital well-being modules, teaching students about the biological impacts of blue light and the importance of establishing device-free boundaries before bedtime. Clinicians assessing adolescent stress

should routinely screen for problematic social media patterns, FOMO levels, and sleep architectures to develop targeted, individualized therapeutic interventions. Furthermore, parents should be encouraged to transition from purely restrictive monitoring to collaborative boundary-setting, such as implementing household docking stations to keep smartphones out of bedrooms overnight, addressing a key pathway of risk identified in this study.

Limitations and Future Research Directions

Despite its contributions, several limitations of this study must be acknowledged. First, the cross-sectional design prevents the definitive establishment of causal trajectories. While the structural model was grounded in established developmental and psychological theory, it is plausible that the relationships are bi-directional; for instance, adolescents experiencing high baseline levels of stress may use social media more frequently as a maladaptive coping mechanism to escape real-world challenges. Future research should utilize longitudinal or cross-lagged panel designs to clarify the causal directions across these variables over time. Second, the reliance on self-report measures introduces potential vulnerabilities to social desirability and recall biases, particularly regarding estimated daily screen time and sleep quality. Future studies would benefit from incorporating objective, device-logged telemetry data for media usage and actigraphy or polysomnography for precise sleep evaluation. Finally, the sample was drawn from a single metropolitan region, which may limit the generalizability of the findings to rural populations or differing cultural contexts. Replicating this model across cross-cultural and socioeconomically diverse cohorts remains an important direction for future scholarship.

Conclusion

In conclusion, this study provides strong empirical evidence that the relationship between adolescent social media use and mental stress is heavily mediated by specific cognitive and physiological factors. The structural model demonstrates that problematic digital engagement increases perceived stress through both a direct path and indirect pathways involving the Fear of Missing Out (FOMO) and poor sleep quality. The validation of the sequential mediation model highlights how psychological anxieties regarding peer inclusion can disrupt physical recovery systems, creating a compound vulnerability that worsens adolescent stress. As digital platforms continue to embed themselves deeper into the daily lives of youth, addressing these issues requires moving beyond simple screen-time restrictions. Interventions must look to build cognitive resilience against digital anxieties, improve sleep hygiene, and foster healthier relationships with technology. Cultivating a balanced digital environment is essential for protecting the psychological and physiological well-being of the adolescent generation.

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