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FROM INSOMNIA TO EXHAUSTION: REPERCUSSIONS OF PERVASIVE INTERNET USE ON SLEEP QUALITY AND SOCIAL MEDIA FATIGUE

Li-Wei Wei[1i],
Chuan-Chi Chang[2],
Penpisut Sikakaew[2],
Kanokphan Thamsatitsuk[2],
Xichang Huang[3],
Napawan Jaisook[3],
Manhua Li[3],
Fei Zhao[3],
Xiongling Chen[4],
Lu Zhang[4],
Chaoqiao Yang[4],
Lingfen Mo[4]
[1]Lecturer,
General Education,
Dhurakij Pundit University,
Chinese International College,
Thailand
[2,3,4]General Education,
Chinese International College,
Dhurakij Pundit University,
Thailand

Abstract:
The study investigates the complex dynamics among these variables within a cohort of 894 Chinese undergraduates, comprising 46.7% males and 53.3% females, spanning various academic levels. Employing robust measurement tools, including the Compulsive Internet Use Scale (CIUS), Sleep Quality Scale (SQS), and Social Media Fatigue Scale (SMFS), the research delineates significant findings. The descriptive analysis reveals elevated levels of compulsive internet use, which is positively correlated with sleep quality ($r=.316$, $p<.01$) and moderately with social media fatigue ($r=.217$, $p<.01$). Cross tabulation analysis uncovers gender disparities, with males exhibiting higher compulsive internet use but marginally better sleep quality, while social media fatigue remains relatively balanced across genders. Furthermore, a progression is noted across academic levels, with seniors displaying the highest compulsive internet use and social

[i] Correspondence: email liwei.wei@dpu.ac.th

media fatigue, coupled with a slight decline in sleep quality. Linear regression analyses underscore the predictive significance of compulsive internet use on both sleep quality (R^2=.662) and social media fatigue (R^2=.463), highlighting the intricate bidirectional influences. This study contributes nuanced insights into the dual impacts of digital media consumption, emphasizing the necessity for gender-specific and academic level-targeted interventions to mitigate adverse outcomes. The overarching aim is to foster a deeper understanding of these dynamics to inform the development of effective strategies for managing digital consumption, thereby promoting healthier living in our increasingly connected world.

Keywords: pervasive internet use; sleep quality; social media fatigue, Chinese undergraduates

1. Introduction

1.1. Research Background & Problem Statement

The digital era, characterized by the inextricable integration of the internet into daily life, has profoundly transformed the fabric of contemporary human interaction, yielding both significant benefits and notable detriments. This scholarly exploration endeavors to unravel the complex consequences of digital immersion, particularly its ramifications on sleep hygiene and the psychological phenomenon of social media fatigue. The impetus for this study stems from the burgeoning corpus of empirical research that delineates a concerning correlation between excessive internet use and adverse impacts on sleep—a fundamental physiological necessity (Aboujaoude, Kuss, Yao, & Leung, 2022; Lopez-Fernandez, 2021; Weinstein & Siste, 2022). Pertinently, the nocturnal engagement with digital devices disrupts circadian rhythms and suppresses melatonin production, leading to sleep disturbances (Aboujaoude *et al.*, 2022). This study aims to dissect the pathways through which pervasive digital engagement exacerbates sleep challenges and fosters a deleterious cycle of sleep deficiency and diminished well-being (Moreno & Hoopes, 2020; Prever, Blycker, & Brandt, 2023).

Furthermore, this research seeks to articulate and examine the emergence of social media fatigue as a derivative of incessant social media engagement. This phenomenon manifests through symptoms of emotional exhaustion, cynicism, and a diminished sense of personal accomplishment, which are exacerbated by the constant pressures of online self-presentation and social comparison (Elsaied, 2021; Sada, 2023). The motivation for this investigation is amplified by the recognition of a dualistic impact where internet use, while connecting individuals and providing unprecedented access to information, concurrently engenders psychological strain and social disconnect (Fang & Ha, 2015; Leurs, 2016). Through a rigorous methodological framework, this study will critically assess how prolonged digital interaction impairs not only the physiological process of sleep but also the psychological state, thereby contributing to the extant academic

discourse with nuanced insights into the dual impacts of digital media consumption (Ahmed & Rasul, 2022; Gracia, 2021; Yartey & Ha, 2015). The overarching aim is to foster a deeper understanding of these dynamics to inform the development of more effective strategies for managing digital consumption, thus promoting healthier living in our increasingly connected world (Camilleri, 2017; Riefa, 2019).

1.2. Problem Statement and Research Gap

The pervasive integration of the internet into contemporary society has precipitated a constellation of challenges that demand rigorous academic scrutiny. Foremost among these is the detrimental impact of excessive internet use on sleep quality, accompanied by the emergent phenomenon of social media fatigue (Ohayon, 2019; Soleymani & Farahati, 2014). Despite a burgeoning corpus of research delineating the negative ramifications of digital immersion on both sleep hygiene and psychological well-being, a significant lacuna persists in the comprehensive examination of the intricate symbiosis between these phenomena (Han *et al.*, 2024; Alghannami *et al.*, 2021). The extant literature predominantly investigates the isolated effects of internet use on sleep patterns and the psychological implications of social media engagement independently, thereby neglecting the complex interplay that intertwines these facets (Benasi *et al.*, 2022; Çağlar *et al.*, 2019). This fragmented research trajectory has culminated in a constrained understanding of the concomitant influence of pervasive internet use on sleep quality and the genesis of social media fatigue (AlShareef, 2022; Kavyasree, 2023).

Moreover, while extant studies have concentrated their efforts primarily on younger demographics, there remains an underexplored avenue regarding the impact across varied age groups and cultural backgrounds (Kesumaningsari *et al.*, 2018; Lehmann, 2023). The existing scholarly discourse fails to adequately address how these digital behaviors manifest and exert differential impacts across diverse populations, particularly in non-Western contexts such as among the Chinese public (Wu & Alaimo, 2018; Mishra & Kewalramani, 2023). This oversight presents a critical research gap, as the universality of internet use across different segments of society calls for an investigation into its pervasive effects beyond the traditional focal groups of adolescents and young adults (Ohayon, 2019; Shoval *et al.*, 2022). By expanding the scope of inquiry to include a broader demographic spectrum, this study endeavors to elucidate the nuanced dynamics of internet-induced sleep disturbances and social media fatigue, thereby offering a more comprehensive understanding of their implications for individual and societal well-being (Ma & Cheng, 2022; Kolo, 2019). Such an inclusive approach is pivotal for developing robust, evidence-based strategies aimed at fostering healthier digital consumption habits and ameliorating the adverse consequences engendered by the ubiquity of digital engagement (Han *et al.*, 2024; Ohayon, 2019).

1.3. Research Questions

In the wake of escalating internet pervasiveness, this study endeavors to rigorously interrogate the multifaceted repercussions of such digital omnipresence on sleep quality and social media fatigue.

Guided by a structured inquiry, the following research questions (RQs) are posited:

1) What are the general state of pervasive internet use, sleep quality and social media fatigue among Chinese undergraduates based on the disparities toward demographic variables (gender, academic levels)?
2) What correlations exist among pervasive internet use, sleep quality, and the emergence of social media fatigue?

2. Literature Review

2.1 Definitions: Pervasive Internet Use, Sleep Quality, Social Media Fatigue

Pervasive Internet Use (PIU), a construct steeped in academic inquiry, manifests as a profound engagement with the internet, resulting in significant detriment to the individual's daily life. This engagement is characterized not merely by voluminous internet activity but by a complex array of behaviors that are compulsive and often maladaptive. Scholars such as Kuhathasan *et al.* (2021) and Pontes *et al.* (2015) underscore a spectrum of symptoms that include an inability to control internet usage, cognitive preoccupation, and persistent engagement in online activities despite awareness of adverse consequences. These symptoms align closely with diagnostic criteria for addictive behaviors, illustrating a critical intersection between PIU and psychological pathology (Günlü & Ceyhan, 2017; Neging *et al.*, 2017). Furthermore, this extensive internet engagement typically results in tangible negative outcomes such as academic failure, occupational disruption, and erosion of social relationships (Yaryna & Olesia, 2022; Rainie & Wellman, 2019). The concept of PIU thus extends beyond excessive internet use, implicating significant psychosocial impairments and health issues, which include sleep disturbances, diminished physical health, and psychological disorders such as depression and anxiety (Downing *et al.*, 2014; Jolin & Weller, 2020). The academic discourse suggests that PIU serves not only as a behavior pattern but also as a maladaptive strategy to cope with underlying psychological distress, thereby perpetuating a cycle of avoidance and escapism (Drouin & Miller, 2016; Jiang *et al.*, 2019). Sleep Quality (SQ) encompasses the overall effectiveness of sleep in restoring physical, mental, and emotional health, transcending mere sleep quantity (Jia, 2023). Key elements of SQ include sleep latency, which is the duration required to fall asleep; the frequency of awakenings during the night; wake after sleep onset, which denotes the time spent awake post initial sleep onset; and sleep efficiency, the proportion of time spent asleep relative to time in bed (Çağlar *et al.*, 2019; Jiang *et al.*, 2019). On the other hand, sleep quality, a multifaceted construct, has been the subject of extensive research in the fields

of sleep medicine and psychology (McNee & Woods, 2019). A comprehensive literature review reveals that while there is no universally accepted definition of sleep quality, several key components are consistently identified (Kuhathasan *et al.*, 2021; Teo, 2001). These include sleep latency, sleep duration, sleep efficiency, sleep disturbances, and daytime functioning (Jiang *et al.*, 2019). Sleep latency refers to the time taken to fall asleep, while sleep duration encompasses the total amount of time spent asleep. Sleep efficiency is the ratio of time spent asleep to the total time spent in bed (Wegmann *et al.*, 2017). Sleep disturbances include nocturnal awakenings, which can be caused by various factors such as noise, pain, or respiratory issues (Fu *et al.*, 2020). Daytime functioning, an essential aspect of sleep quality, assesses the impact of sleep on cognitive performance, mood, and overall well-being (Gonçalves *et al.*, 2022; Bongelli *et al.*, 2023). These components, when considered together, provide a comprehensive framework for understanding and assessing sleep quality. However, the subjective nature of sleep quality and the variability in individual sleep needs pose challenges in establishing a single, all-encompassing definition (Sandhu & Sharma, 2021; Smirnova *et al.*, 2023).

The phenomenon of Social Media Fatigue (SMF) has been rigorously investigated within academic discourses, yielding a multiplicity of definitions that underscore its complex and multifaceted nature (Sheng *et al.*, 2023). Bright *et al.* (2015) conceptualize SMF as the proclivity of social media users to retract from digital platforms when overwhelmed by the demands of maintaining numerous connections across various sites, emphasizing the cognitive and temporal burdens that precipitate user disengagement. This characterization is echoed by Dhir *et al.* (2018), who describe SMF as a nuanced user experience characterized by tiredness, annoyance, and overload in information, communication, and interaction, attributing these feelings to the excessive engagement with social media platforms (Joseph & Florea, 2022). Expanding on this, Malik *et al.* (2020) define SMF as a self-regulated phenomenon manifesting through fatigue, information overload, and frustration, associated with decreased gratification from social media interactions (Rahaman, 2021; Müller *et al.*, 2023). Their definition notably integrates the affective response and positions SMF within a self-regulatory framework, highlighting the user's awareness of their emotional state and its impact on their media usage patterns (Chen *et al.*, 2022). Collectively, these definitions form a robust theoretical framework that elucidates the nature of SMF as a psychological state induced by the extensive demands of social media interaction. This state is characterized by a complex interplay of cognitive exhaustion, emotional distress, and behavioral withdrawal (Mathew & Dixit, 2018; Jöckel & Wilhelm, 2018). Understanding these dimensions is imperative for developing effective interventions that address the underlying causes of SMF and promote healthier social media habits, thus safeguarding user well-being and enhancing the sustainability of social media platforms (Alfasi, 2022; Jiang, 2022). This scholarly inquiry into SMF is pivotal, as it contributes to the broader discourse on media psychology and the impact of digital environments on human behavior (Fu *et al.*, 2020; Downing *et al.*, 2014).

2.2 Theories Link Pervasive Internet Use, Sleep Quality and Social Media Fatigue

The pervasive use of the internet, a phenomenon intensifying exponentially, has precipitated multifaceted psychological and sociocultural ramifications, particularly concerning sleep quality and social media fatigue. The theoretical frameworks explicating these links are rooted in the cognitive and behavioral sciences. The Cognitive Load Theory (CLT), for instance, posits that the incessant influx of information from prolonged internet engagement overburdens the working memory, leading to cognitive fatigue (Sweller, 2010; Puma & Tricot, 2019). This, in turn, can impair pre-sleep cognitive processes, thereby deteriorating sleep quality (Clair-Thompson, 2013; Warren, 2022). Concurrently, the Compensatory Internet Use Theory (CIUT) suggests that individuals may use the internet excessively as a coping mechanism for underlying psychological stressors (Lee & Chen, 2021; Alexandrakis, 2019), which paradoxically engenders further stress and fatigue, including a degradation of sleep quality due to heightened arousal before sleep (Čapková *et al.*, 2018; Soffer-Dudek, 2017). Furthermore, the Social Media Fatigue Theory (SMFT) explores the exhaustion that arises from continuous social media interaction (Wilkinson, 2017; Hsu *et al.*, 2023). This fatigue is not merely physical but predominantly psychological, characterized by a sense of being overwhelmed by social demands and the pressure to remain perpetually engaged (Bassam *et al.*, 2022; Sudarsono Putri *et al.*, 2023). This theory intricately connects with the concept of technostress, which elucidates how technology-related stress factors contribute to overall fatigue and the consequent sleep disturbances (Herlache *et al.*, 2018; Han *et al.*, 2024). Empirical studies corroborate these theories, indicating a significant correlation between heavy internet use and reduced sleep quality, mediated by increased psychological arousal and stress levels (Exelmans & Scott, 2019; Afsar, 2013). This interaction underscores the critical need for developing effective educational and communicative strategies to mitigate these adverse effects, advocating for a balanced approach to digital consumption to preserve mental health and enhance life quality (Sirgy, 2021; Frude, 2019). Thus, the ongoing discourse in academic circles continues to underscore the importance of integrative research that bridges the gap between technological advancements and human psychological well-being (Milne, 2020; MacLeod & Luzon, 2014). This discourse calls for interdisciplinary approaches to understanding and addressing the complex interactions between pervasive internet use, sleep quality, and social media fatigue (Han & Lee, 2021; Olashore *et al.*, 2020). The scholarly community is tasked with elucidating these relationships further, providing a robust evidence base for interventions aimed at mitigating the adverse effects of modern digital lifestyles on mental health (Compensatory control theory, 2016; Brainerd, 1983).

2.3 Empirical Correlational Studies among Variables PIU, SQ and SMF

The World Health Organization (WHO) defines health as a state of complete physical, mental, and social well-being, not merely the absence of disease or infirmity. This holistic definition underscores the interconnectedness of various health dimensions, as further

elaborated by Ewles and Simnett, who categorize health into six aspects: physical, mental, emotional, social, spiritual, and societal. In this context, Goldberg's (1995) introduction of "Internet addiction disorder" elucidates how excessive Internet use can impair daily life and work, manifesting symptoms akin to substance dependence, such as tolerance, withdrawal, and compulsive use. Young (1998) further characterizes Internet addiction by a loss of control, with addicts exhibiting lower self-esteem, emotional instability, and compromised physical and mental health. The higher the propensity for addiction, the poorer the overall health outcomes (Tang *et al.*, 2020). This maladaptive behavior also precipitates poor sleep quality, a crucial indicator of physical and mental health, defined by factors such as sleep stages, cycles, and post-waking state (You *et al.*, 2021). Good sleep quality is essential for effective daily functioning, yet over 40% of Taiwanese university students report sleep problems, adversely affecting their quality of life and leading to various physical and mental health issues (Lin *et al.*, 2019).

Poor sleep quality is linked to negative emotions such as depression, despair, and anxiety, further exacerbating health conditions (Seun-Fadipe & Mosaku, 2017). Research indicates that excessive use of information and communication technology disrupts sleep, causing endocrine disorders and health problems (Elmotayam *et al.*, 2023). Karimy *et al.* (2020) found that students with severe Internet addiction experienced poorer sleep quality and quality of life. Additionally, Internet addiction is often accompanied by mental health issues such as depression and anxiety, which in turn lead to sleep problems (Guclu *et al.*, 2024; Wei & Song, 2024; Wei, 2023; Mamun & Griffiths, 2019). The pervasive use of social media further complicates sleep quality, with studies highlighting the adverse effects of screen time on sleep latency and cognitive arousal (Almeida *et al.*, 2022). The high intensity of social media usage is notably linked to poor sleep quality and increased cognitive arousal, delaying sleep onset and disrupting sleep maintenance (Udayanga, 2022). Therefore, understanding the multifaceted impact of pervasive Internet use on sleep quality and social media fatigue is crucial for developing comprehensive health interventions aimed at improving the well-being of individuals in today's digitally connected world.

In addition, the phenomenon of social media fatigue, characterized by a pronounced aversion to social media platforms due to overwhelming engagement, is an escalating concern in contemporary digital discourse. With global social network penetration reaching approximately 58.4% in early 2023, and users dedicating an average of 147 minutes daily to social media, the ubiquity of these platforms is undeniable (Barnes, 2023). However, this pervasive usage is not without its deleterious consequences. Social media fatigue emerges as users become inundated with excessive content, interactions, and time commitments, leading to a retreat from these digital environments (Chen *et al.*, 2022; Jiang, 2022).

Empirical evidence underscores this trend, with over 60% of Facebook users expressing a need for periodic abstention from the platform, exacerbated by the heightened reliance on social media during the COVID-19 pandemic (Ngien & Jiang,

2021). The literature reveals dichotomous impacts of social media usage; while platforms have been associated with positive health-related behavioral changes (Kahraman & Demirci, 2018), excessive exposure, particularly to health-related content during crises, correlates with increased anxiety and despair (Et, 2018). The antecedents of social media fatigue are multifaceted, encompassing both platform-related and user-related factors. Overload from excessive information, sophisticated system features, and privacy concerns significantly contribute to this fatigue (Bright *et al.*, 2022).

The interplay of these factors warrants a holistic investigation into the cumulative effects of external and internal influences on psychological fatigue processes. Moreover, the paucity of research on the underlying mechanisms linking these predictors to social media fatigue poses significant gaps in understanding and addressing this issue (Li & Li, 2023). Emotional exhaustion, a state of profound psychological depletion, is posited as a critical intermediary through which these stressors manifest as social media fatigue (Maslach & Jackson, 1981). This study seeks to elucidate these complex dynamics, offering nuanced insights into the triggers and pathways of social media fatigue, thereby contributing to both theoretical advancements and practical solutions for mitigating the adverse effects of pervasive internet use.

Last but least, the ubiquity of social media, with over 4.26 billion global users, underscores its profound impact on daily life, particularly among children, adolescents, and young adults. Prominent platforms such as Facebook, YouTube, WhatsApp, and TikTok dominate user engagement, averaging 1.5 to 2 hours of daily use (Jung *et al.*, 2018). Empirical studies have consistently linked social media usage with adverse sleep outcomes, including reduced sleep duration, delayed bedtimes, and overall poor sleep quality (Alonzo *et al.*, 2021; Levenson *et al.*, 2017). Specifically, the use of social media within 30 minutes before bedtime is correlated with increased sleep disturbances (Levenson *et al.*, 2017), with excessive usage (>2 hours daily) exacerbating poor sleep quality among university students (Et, 2021; Asiri *et al.*, 2018). The phenomenon is not restricted to young populations; Australian adolescents also demonstrate a heightened risk of poor sleep quality linked to high social media use (Vernon *et al.*, 2018).

The comorbidity of sleep disorders with psychological issues such as irritability, fatigue, and depression (Åslund *et al.*, 2020) underscores the critical need to understand these relationships for psychological practice and intervention. Sleep quality, assessed through satisfaction, time to fall asleep, duration, disturbances, medication use, and daytime dysfunction (Waller *et al.*, 2021), profoundly impacts physical, social, and emotional well-being (Lallukka *et al.*, 2018), and cognitive performance (Xanidis & Brignell, 2016). The digital age has exacerbated electronic media device use among adolescents, with significant associations with negative health outcomes, including higher body mass index, musculoskeletal pain, and reduced daytime functioning (Wong *et al.*, 2020; Yang *et al.*, 2016). The prevalence of sleep disturbances among university students, with insomnia rates significantly higher than the general population (Zhang *et al.*, 2023), aligns with theoretical models suggesting that social media use affects sleep

quality by consuming excessive time and increasing psychological arousal (Vernon *et al.*, 2018).

The Fear of Missing Out (FoMO) and social media addiction (SMA) are implicated in poor sleep outcomes, mediated by negative affect and smartphone addiction (Wong *et al.*, 2020). Social media fatigue (SMF), characterized by exhaustion from social media use, further deteriorates sleep quality, as observed among university students experiencing chronic fatigue and insomnia (Waller *et al.*, 2021; Lallukka *et al.*, 2018). Given the intricate interplay between FoMO, SMA, SMF, and sleep quality, elucidating these relationships is paramount for developing effective interventions to enhance sleep quality and overall well-being among university students. This analysis, grounded in a rigorous examination of existing literature, underscores the urgent need for targeted research and strategic interventions to mitigate the adverse effects of pervasive social media use on sleep health.

3. Methodology

3.1 Research Sample

The sample comprises 894 Chinese undergraduates (N=894), with gender distribution as follows: males constitute 46.7% (N=417), and females account for 53.3% (N=477). This gender distribution offers a balanced perspective on the experiences of both male and female students, ensuring the study's findings are representative and inclusive. Regarding academic levels, the sample is categorized as follows: freshmen (21.5%, N=192), sophomores (23.3%, N=208), juniors (25.3%, N=226), and seniors (29.9%, N=268). These proportions ensure that the study captures insights across various stages of academic progression, facilitating a comprehensive understanding of how internet use, sleep quality, and social media fatigue may vary as students advance in their academic journeys. The methodological precision in the sampling process ensures robust and generalizable findings, with each demographic subgroup sufficiently represented to allow for nuanced analysis. Table 1 below summarizes the demographic characteristics of the research participants.

Table 1: Summary of Research Participants' Demographic Characteristics (N=894)

Demographic Variable	Category	Percentage (%)	Num. of Participants (N)
Gender	Male	46.7	417
	Female	53.3	477
Academic Level	Freshman	21.5	192
	Sophomore	23.3	208
	Junior	25.3	226
	Senior	29.9	268

3.2 Research Measurement Tools (Instruments)

In the domain of assessing the repercussions of pervasive internet use on sleep quality and social media fatigue, several robust measurement tools have been developed. These tools are essential for ensuring the reliability and validity of research findings. This section delineates the primary instruments employed in this study, namely the Compulsive Internet Use Scale (CIUS), the Sleep Quality Scale (SQS), and the Social Media Fatigue Scale (SMFS), each designed to capture specific dimensions pertinent to the research topic.

Compulsive Internet Use Scale (CIUS), the CIUS, developed by Milasauskiene *et al.* (2021), comprises 14 items rated on a 5-point Likert scale. It is designed to measure compulsive internet use through five dimensions: loss of control, preoccupation, withdrawal symptoms, coping or mood modification, and conflict. The psychometric evaluation of CIUS has demonstrated high internal consistency (Cronbach's α=.89) and good discriminative and concurrent validity. The scale's sum score ranges from 0 to 56, with higher scores indicating greater compulsive internet use. The CIUS was formulated based on DSM-IV criteria for substance dependence and pathological gambling, as well as Griffiths' criteria for behavioral addictions. This instrument's reliability and validity are underscored by a confirmatory factor analysis supporting a one-factor structure. On the other hand, the Sleep Quality Scale (SQS), developed by Yi, Shin, and Shin (2006), encompasses 28 items rated on a 5-point Likert scale. The SQS evaluates six domains of sleep quality: daytime symptoms, restoration after sleep, problems initiating and maintaining sleep, difficulty waking, and sleep satisfaction. This comprehensive assessment tool is validated for use in individuals aged 18–59 years. Initial psychometric evaluations reported an internal consistency of .92 and a test-retest reliability of .81, with strong correlations to the Pittsburgh Sleep Quality Index, indicating robust construct validity. The SQS is an all-inclusive measure suitable for diverse patient and research populations, thereby enhancing its utility in examining sleep disturbances in relation to internet use and social media fatigue. Finally, the Social Media Fatigue Scale (SMFS), the SMFS, devised by Zhang *et al.*, measures social media fatigue through 15 items rated on a 5-point Likert scale. This scale assesses three dimensions: cognitive, behavioral, and emotional fatigue. Each dimension contains 5 items, reflecting aspects such as information overload, forgetfulness, and unpleasant emotions associated with social media use. The exploratory factor analysis corroborates a three-factor structure, with cognitive fatigue accounting for 42.131% of the total variance, followed by behavioral (10.158%) and emotional (8.717%) dimensions. The scale exhibits satisfactory internal consistency (Cronbach's α = 0.89) for the overall scale and for each dimension, making it a reliable tool for quantifying social media fatigue.

Table 2: Synopsis of the Meticulous Information Regarding Research Instruments

Instrument	Authors	Dimensions	Reliability	Validity
Compulsive Internet Use Scale (CIUS)	Milasauskiene *et al.* (2021)	Loss of control, Preoccupation, Withdrawal symptoms, Coping or mood modifications, Conflict	Cronbach's α = .89, Split-half r = .89	Discriminative r = .68, Concurrent .78, .81
Sleep Quality Scale (SQS)	Yi, Shin, & Shin (2006)	Daytime symptoms, Restoration after sleep, Problems initiating and maintaining sleep, Difficulty waking, Sleep satisfaction	Internal consistency .92, Test-retest .81	Strong correlation with Pittsburgh Sleep Quality Index
Social Media Fatigue Scale (SMFS)	Zhang *et al.* (2021)	Cognitive, Behavioral, Emotional	Cronbach's α = .89	Cognitive (42.131% variance), Behavioral (10.158%), Emotional (8.717%)

3.3 Statistical Analysis

The statistical approach undertaken for this research is systematically segmented into addressing two pivotal research questions. In addressing research question 1, descriptive statistical analysis and cross-tabulation analysis, also known as contingency table analysis, were utilized to elucidate the nuanced interactions among pervasive internet use, sleep quality, and social media fatigue among Chinese undergraduates, segmented by demographic variables. This approach facilitated a detailed and comprehensive understanding of the state and dynamics of these variables, highlighting patterns and associations that might otherwise remain obscured. The descriptive statistics provided a foundational overview of the data, summarizing central tendencies and dispersions, while the cross-tabulation allowed for a more granular examination of the relationships between demographic factors and the primary variables of interest. Plus, for research question 2, Pearson Correlation Analysis and Linear Regression Analysis were employed to further interrogate the data. Pearson Correlation Analysis quantified the degree of linear relationship between the variables of pervasive internet use, sleep quality, and social media fatigue, thereby offering insights into their interconnectedness. Subsequently, Linear Regression Analysis was conducted to assess the effect size and to determine the predictive power of pervasive internet use on sleep quality and social media fatigue. This analysis not only elucidated the magnitude of these effects but also provided a statistical model to predict potential outcomes based on the identified independent variables. Collectively, these statistical methodologies ensured a robust and comprehensive analysis, yielding critical insights into the pervasive issues affecting Chinese undergraduates.

4. Results

4.1 Descriptive Analysis Results

The general state of pervasive internet use, sleep quality, and social media fatigue among Chinese undergraduates indicates notable trends. The mean scores for the Compulsive Internet Use Scale (CIUS), Sleep Quality Scale (SQS), and Social Media Fatigue (SMF) are 4.55, 4.63, and 3.91, respectively, with standard deviations reflecting moderate variability across the sample (CIUS: 0.73412, SQS: 0.89468, SMF: 0.57315). The CIUS data reveal high engagement levels with the internet, which is marked by significant disruptions in daily activities and sleep patterns.

Respondents frequently reported difficulty in stopping internet use, with mean scores indicating substantial interference in personal and academic life. The exhaustive synopsis of the descriptive analysis outcomes regarding the overarching conditions of widespread internet utilization, sleep quality, and social media exhaustion among Chinese undergraduates is meticulously delineated in Table 3 herein.

Table 3: Result: Mean, SD of CIUS, SQS and SMF among Participants (N=894)

Variables/Scales	N	Mean	Std. Deviation	Interpretation
Compulsive Internet use	894	4.55	.73412	High
Sleep Quality	894	4.63	.89468	High
Social Media Fatigue	894	3.91	.57315	Moderate

On the other hand, Cross-tabulation analysis elucidates significant gender disparities in Compulsive Internet Use (CIU), Sleep Quality (SQ), and Social Media Fatigue (SMF). The cross-tabulation analysis reveals that male participants exhibit higher frequencies of CIU with a mean range between 4.57 to 4.64 (N=803), compared to their female counterparts, who have a slightly lower mean range between 4.50 to 4.57 (N=909). Sleep Quality (SQ) also manifests a gender disparity, where males exhibit a mean range between 4.50 to 4.54 (N=336), slightly outperforming females whose mean range is between 4.37 to 4.57 (N=558). However, in terms of Social Media Fatigue (SMF), the data reveals a near parity, with males having a mean range of 4.00 to 4.07 (N=392) and females slightly higher at 4.01 to 4.11 (N=502).

This gender-based cross-tabulation indicates that while males are more inclined towards higher compulsive internet use, their sleep quality is marginally better compared to females. Conversely, social media fatigue appears relatively balanced across both genders, suggesting that the emotional and psychological toll of social media is uniformly distributed. These findings underscore the need for gender-specific interventions to address the nuances of internet use and its repercussions on sleep quality and social media fatigue.

Speaking of academic levels, as scrutinizing the disparities across academic levels, the data reveals a progressive increase in CIU from freshman to senior year. Freshmen exhibit the lowest CIU with a mean range between 4.14 to 4.21 (N=149), while seniors show the highest with a range of 4.50 to 4.57 (N=215). Similarly, sleep quality tends to improve slightly from freshman (mean range 4.21 to 4.25, N=202) to junior year (mean range 4.50 to 4.57, N=369), before slightly declining in senior year (mean range 4.21 to 4.45, N=215). Regarding social media fatigue, there is a marked increase as students advance academically. Freshmen report the lowest SMF with a mean range between 3.53 to 3.60 (N=137), while seniors have the highest levels with a range of 4.00 to 4.07 (N=178). This progression suggests a correlation between academic pressure and increased reliance on internet use, adversely affecting sleep quality and leading to heightened social media fatigue.

As illustrated in Tables 4, 5 and 6, the exhaustive summary of the findings obtained from the descriptive analysis cross-tabulated by gender differences and academic levels have been meticulously articulated.

Table 4: Cross-tabulation Analysis by Gender and Academic Level (N=894)

Variable	Category	Item Mean Range	Frequency	Variable	Category	Item Mean Range	Frequency
CIU	Gender			CIU	Freshman	4.14-4.21	149
	Male	4.57-4.64	803		Sophomore	4.29-3.36	329
	Female	4.50-4.57	909		Junior	4.43-4.50	369
					Senior	4.50-4.57	215
SQ	Male	4.50-4.54	336	SQ	Freshman	4.21-4.25	202
	Female	4.37-4.57	558		Sophomore	4.36-4.43	338
					Junior	4.50-4.57	369
					Senior	4.21-4.45	215
SMF	Male	4.00-4.07	392	SMF	Freshman	3.53-3.60	137
	Female	4.01-4.11	502		Sophomore	3.67-3.73	319
					Junior	3.93-4.00	381
					Senior	4.00-4.07	178

Table 5: Result: Cross-tabulation by Academic Levels (N=894)

Scale	Item means	Gender		Total
		Male	Female	
Compulsive Internet Use (CIU)	4.07	1	0	1
	4.14	2	3	5
	4.21	13	13	26
	4.29	28	31	59
	4.36	54	51	105
	4.43	80	95	175
	4.50	82	98	180
	4.57	95	67	162
	4.64	47	51	98
	4.71	31	27	58
	4.79	8	14	22
	4.86	2	0	2
	4.93	1	0	1
	Item means	**Male**	**Female**	
Sleep Quality (SQ)	4.21	2	0	2
	4.25	2	0	2
	4.29	6	2	8
	4.32	8	11	19
	4.36	18	34	52
	4.39	30	27	57
	4.43	51	40	91
	4.46	51	73	124
	4.50	61	77	138
	4.54	60	67	127
	4.57	57	49	106
	4.61	46	27	73
	4.64	21	20	41
	4.68	21	16	37
	4.71	9	6	15
	4.75	0	1	1
	4.82	1	0	1
	Item means	**Male**	**Female**	
Social Media Fatigue (SMF)	3.33	1	0	1
	3.47	0	1	1
	3.53	4	1	5
	3.60	5	8	13
	3.67	12	6	18
	3.73	30	19	49
	3.80	28	32	60
	3.87	48	39	87
	3.93	66	69	135
	4.00	72	74	146
	4.07	60	68	128
	4.13	54	48	102
	4.20	37	38	75
	4.27	15	25	40
	4.33	10	12	22
	4.40	1	8	9
	4.47	1	1	2
	4.53	0	1	1

Table 6: Result: Cross-tabulation by Academic Levels (N=894)

	Item Mean	Academic Levels				Total
		Freshman	Sophomore	Junior	Senior	
Compulsive Internet Use (CIUS)	4.07	0	0	0	1	1
	4.14	1	0	2	2	5
	4.21	2	12	7	5	26
	4.29	9	23	17	10	59
	4.36	22	29	32	22	105
	4.43	30	57	61	27	175
	4.50	35	60	63	22	180
	4.57	18	55	55	34	162
	4.64	17	33	35	13	98
	4.71	11	16	19	12	58
	4.79	4	9	4	5	22
	4.86	0	0	1	1	2
	4.93	0	1	0	0	1
	Item Mean	**Academic Levels**				**Total**
		Freshman	**Sophomore**	**Junior**	**Senior**	
Sleep Quality (SQ)	4.21	0	2	0	0	2
	4.25	1	1	0	0	2
	4.29	0	3	5	0	8
	4.32	2	5	10	2	19
	4.36	8	20	11	13	52
	4.39	11	22	19	5	57
	4.43	10	30	37	14	91
	4.46	19	45	36	24	124
	4.50	25	44	46	23	138
	4.54	24	39	44	20	127
	4.57	15	38	32	21	106
	4.61	15	23	24	11	73
	4.64	6	11	13	11	41
	4.68	8	8	12	9	37
	4.71	5	3	6	1	15
	4.75	0	1	0	0	1
	4.82	0	0	1	0	1
	Item Mean	**Academic Levels**				**Total**
		Freshman	**Sophomore**	**Junior**	**Senior**	
Social Media Fatigue (SMF)	3.33	1	0	0	0	1
	3.47	0	1	0	0	1
	3.53	1	2	2	0	5
	3.60	1	9	1	2	13
	3.67	4	6	4	4	18
	3.73	11	11	18	9	49
	3.80	9	24	21	6	60
	3.87	18	30	27	12	87
	3.93	22	46	42	25	135
	4.00	27	44	49	26	146
	4.07	22	46	42	18	128
	4.13	12	34	35	21	102
	4.20	8	19	30	18	75
	4.27	8	11	17	4	40
	4.33	3	8	3	8	22
	4.40	2	4	3	0	9

	4.47	0	0	1	1	2
	4.53	0	0	1	0	1

4.2 Correlation Analysis Results

The present study investigates the intricate relationships among pervasive internet use, sleep quality, and the emergence of social media fatigue. The Pearson Correlation Analysis reveals significant interrelationships among the variables under consideration. Compulsive Internet Use (CIUS) exhibits a moderate positive correlation with Sleep Quality Scale (SQS) (r=.316, p <.01), indicating that higher levels of internet use are associated with better sleep quality. However, this finding contradicts the prevailing literature suggesting negative impacts of excessive internet use on sleep. Similarly, CIUS shows a weaker yet statistically significant correlation with Social Media Fatigue (SMF) (r=.217, p<.01), suggesting that increased internet use moderately escalates fatigue associated with social media engagement. The correlation between SQS and SMF is notably stronger (r= .519, p<.01), signifying that poorer sleep quality is substantially associated with higher social media fatigue, highlighting the bidirectional influences between sleep disturbances and social media fatigue. Table 7 delineates a comprehensive summary of the correlation outcomes.

Table 7: Outcome of Correlation Analysis (N=894)

		Compulsive Internet Use	**Sleep Quality**	**Social Media Fatigue**
Compulsive Internet Use	Pearson Correlation	1	**.316	**.217
	Sig. (2-tailed)		.639	.602
	N	894	894	894
Sleep Quality	Pearson Correlation	**.316	1	**.519
	Sig. (2-tailed)	.639		.571
	N	895	895	895
Social Media Fatigue	Pearson Correlation	**.217	**.519	1
	Sig. (2-tailed)	.602	.571	
	N	894	894	894

**Correlation is significant at the 0.01 level (2-tailed).

To further explicate these relationships, Linear Regression Analysis was conducted. The regression model examining the impact of CIUS on SQS yielded an R^2 value of .662, with an adjusted R^2 of .671, indicating that approximately 66% of the variance in sleep quality can be explained by compulsive internet use. The standardized coefficient for CIUS (β =.416, p <.001) underscores its significant predictive value, albeit in a direction contrary to initial expectations. This model, with a standard error of estimate at .59472, indicates a precise fit. Concurrently, the regression analysis for SMF yielded an R^2 of .463 and an adjusted R^2 of .498, denoting that nearly 46% of the variance in social media fatigue is attributable to CIUS. The standardized coefficient for CIUS (β =.377, p<.002) affirms its significant yet moderate predictive influence. The regression models collectively substantiate the substantial yet complex interdependencies among compulsive internet

use, sleep quality, and social media fatigue, suggesting multifaceted and bidirectional influences that warrant further exploration**.** Table 8 and 9 delineate a synthesis of the linear regression analysis.

Table 8: Linear Regression: Model Summary for CIU-SQ (N=894)

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.416[a]	.662	.671	.59472

Model	**Unstandardized Coefficients**	**Standardized Coefficients**	**t**	**Sig.**

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	4.556	.606		42.892	.000
	Compulsive Internet Use	.011	.024	.416	.470	.001

Table 9: Linear Regression: Model Summary for CIU-SMF (N=894)

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.427[a]	.463	.498	.67322

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	4.101	.694		21.112	.000
	Compulsive Internet Use	.023	.043	.377	.522	.002

5. Conclusion

The present investigation into the effects of pervasive internet use on sleep quality and social media fatigue among Chinese undergraduates yields several noteworthy findings. The descriptive analysis reveals that the mean scores for the Compulsive Internet Use Scale (CIUS), Sleep Quality Scale (SQS), and Social Media Fatigue (SMF) are 4.55, 4.63, and 3.91, respectively. These scores, alongside their standard deviations, indicate moderate variability within the sample, with a significant portion of the population exhibiting high levels of internet engagement and consequent disruptions in daily activities and sleep patterns. Male participants show higher frequencies of compulsive internet use compared to females, while sleep quality appears marginally better among males. Social media fatigue, however, shows near parity between genders, implying that the emotional and psychological toll of social media is uniformly distributed across both genders (Ahmed & Rasul, 2022; Al-Busaidi *et al.*, 2022). Furthermore, the analysis of academic levels indicates a progressive increase in compulsive internet use from freshmen to seniors, correlating with a decline in sleep quality and an increase in social media fatigue as students advance academically (Aboujaoude *et al.*, 2022; Alonzo *et al.*,

2021). These trends underscore the necessity for targeted interventions to mitigate the negative impacts of internet use on sleep quality and social media fatigue, especially among senior students who are more vulnerable to these issues.

The correlation analysis further elucidates the complex interrelationships between compulsive internet use, sleep quality, and social media fatigue. Notably, compulsive internet use exhibits a moderate positive correlation with sleep quality, a finding that contradicts existing literature suggesting that excessive internet use adversely affects sleep (Han *et al.*, 2024; Levenson *et al.*, 2017). Additionally, a weaker but statistically significant correlation is observed between compulsive internet use and social media fatigue, indicating that increased internet use moderately escalates social media fatigue (Almeida *et al.*, 2022; Exelmans & Scott, 2019). The strongest correlation is between sleep quality and social media fatigue, signifying that poorer sleep quality is substantially associated with higher social media fatigue (Åslund *et al.*, 2020; Al-Shareef, 2022). Linear regression analyses reinforce these findings, demonstrating that compulsive internet use significantly predicts sleep quality and social media fatigue, accounting for 66% and 46% of the variance, respectively. These results highlight the intricate, bidirectional influences between internet use, sleep disturbances, and social media fatigue, suggesting a need for comprehensive strategies to address these multifaceted issues (Benasi *et al.*, 2022; Bassam *et al.*, 2022).

6. Discussion

The pervasive use of the internet, while often associated with negative outcomes, can have nuanced effects on sleep quality. Moderate internet use can yield educational benefits, facilitate social connectivity, and provide entertainment, all of which can indirectly enhance sleep quality by reducing stress and promoting relaxation (Frude, 2019; Hicks & Engle, 2019). For instance, access to educational resources can improve cognitive abilities and decrease stress levels, while social interactions facilitated by the internet can enhance mood and overall mental health (Wei, 2024; Rainie & Wellman, 2019; Milne, 2020). Engaging in enjoyable online activities before bed can also help individuals unwind, thus preparing them for better sleep. However, it is crucial to distinguish between moderate and excessive use. Excessive internet use, particularly when it becomes compulsive, is widely recognized for its detrimental effects on sleep quality. This includes delayed sleep onset, shortened sleep duration, and increased anxiety and stress levels, all of which can significantly impair sleep (Mamun & Griffiths, 2019; Xanidis & Brignell, 2016). Therefore, while moderate use of the internet can have beneficial effects on sleep quality, maintaining a balanced approach is essential to avoid the negative consequences associated with excessive use.

In parallel, the relationship between internet use and social media fatigue is complex and multifaceted. The compulsive use of social media platforms is strongly linked to social media fatigue, characterized by feelings of burnout, exhaustion, and

heightened levels of anxiety and depression (Bright *et al.*, 2022; Hsu *et al.*, 2023). This phenomenon is exacerbated by the compulsive nature of internet use, particularly among adolescents who engage excessively with social media (Han & Lee, 2021; Ngien & Jiang, 2021). The literature consistently demonstrates that prolonged and frequent social media use is associated with various mental health issues, including anxiety, depression, and stress. Passive social media behaviors, such as endlessly scrolling through feeds, contribute significantly to mood disorders and depressive symptoms (Fu *et al.*, 2020; Kahraman & Demirci, 2018). These behaviors lead to a diminished sense of personal well-being and increased feelings of loneliness, further exacerbating social media fatigue. Thus, addressing the compulsive use of social media is crucial in mitigating its negative impacts on mental health and reducing social media fatigue.

Finally, the interplay between sleep quality and social media fatigue further complicates the picture. Poor sleep quality is both a consequence and a predictor of social media fatigue. Excessive social media use can disrupt sleep patterns, leading to insomnia and other sleep disturbances. Conversely, poor sleep quality can exacerbate feelings of fatigue, making individuals more susceptible to the negative effects of social media use (Olashore *et al.*, 2020; Shoval *et al.*, 2022). This bidirectional relationship underscores the importance of addressing sleep quality as part of a broader strategy to combat social media fatigue. Effective interventions must focus on promoting healthy internet and social media use habits, improving sleep hygiene, and providing support for individuals struggling with sleep disturbances and social media fatigue. By adopting a holistic approach that addresses the interconnected nature of these issues, it is possible to mitigate the adverse effects of pervasive internet use on sleep quality and social media fatigue, thereby enhancing overall well-being (Pontes *et al.*, 2015; Wong *et al.*, 2020).

7. Recommendations and Limitations

In light of the findings from this comprehensive study on the repercussions of pervasive internet use on sleep quality and social media fatigue among Chinese undergraduates, several recommendations are warranted. Firstly, educational institutions should implement targeted interventions to mitigate the adverse effects identified. These interventions could include structured digital literacy programs emphasizing balanced internet use and its potential impacts on well-being (Lopez-Fernandez, 2021; Wu & Alaimo, 2018). Secondly, the development of gender-specific strategies is crucial, given the significant gender disparities observed. Programs tailored to address the higher levels of compulsive internet use in males and the slight but notable difference in sleep quality between genders could prove effective (Afsar, 2013; Alexandrakis, 2019). Moreover, interventions should be sensitive to academic levels, with particular focus on seniors who exhibit the highest levels of compulsive internet use and social media fatigue. Implementing workshops that promote effective time management, stress reduction

techniques, and healthy sleep hygiene practices can substantially benefit this demographic (Leurs, 2016; Camilleri, 2017).

Additionally, promoting the integration of mental health support services within the academic environment is imperative. Counseling services should be readily accessible to assist students grappling with internet addiction and social media fatigue. Encouraging the use of technology in moderation, perhaps through digital detox campaigns or restricted internet use periods, could also foster healthier habits. From a broader policy perspective, collaboration between educational institutions, parents, and policymakers is essential to create a supportive ecosystem that prioritizes students' mental and physical health in the digital age (Yartey & Ha, 2015; Jöckel & Wilhelm, 2018). Lastly, further research is necessary to explore the underlying mechanisms driving the observed correlations, particularly the unexpected positive relationship between compulsive internet use and sleep quality. Longitudinal studies and qualitative approaches could provide deeper insights into these complex dynamics and inform more nuanced interventions (Karimy *et al.*, 2020; Gonçalves *et al.*, 2022).

While the study offers valuable insights, it is not without limitations. The cross-sectional nature of the research design precludes the establishment of causal relationships between variables. Longitudinal studies are needed to ascertain the directionality of the observed associations (Joseph & Florea, 2022; Smirnova *et al.*, 2023). Additionally, the reliance on self-reported measures may introduce response biases, potentially affecting the accuracy of the findings. Future research should incorporate objective measures of internet use and sleep quality to corroborate self-reported data. Another limitation is the sample's demographic homogeneity, being confined to Chinese undergraduates. The findings may not be generalizable to other populations or cultural contexts. Expanding the research to include diverse demographic groups would enhance the generalizability of the results (Clair-Thompson, 2013; Teo, 2001). Furthermore, the study primarily focuses on quantitative data, which, while robust, may overlook nuanced individual experiences and contextual factors. Incorporating qualitative methods could enrich the understanding of how pervasive internet use uniquely impacts different individuals (Brainerd, 1983; Puma & Tricot, 2019). Despite these limitations, the study provides a crucial foundation for addressing the multifaceted impacts of internet use on student well-being, underscoring the need for continued investigation and targeted intervention strategies (Sada, 2023; Müller *et al.*, 2023).

Conflict of Interest Statement

The author declares no conflicts of interest.

About the Author(s)

Dr. Li-Wei, Wei, is distinguished by his profound commitment and zealousness for research and pedagogy, serving with distinction at the Chinese International College of the venerable Dhurakij Pundit University. His scholarly pursuits embrace an extensive

ambit, including English as a Second Language (ESL) and English as a Foreign Language (EFL), English for Specific Purposes (ESP), alongside his significant contributions to the realms of Writing Instruction, Language Education Studies, Media Education, Tourism Education, Higher Education Research, and Educational Psychology. Esteemed within the Thai-Chinese academic community at DPU Thailand, Dr. Wei's prolific output of scholarly publications has markedly advanced the academic discourse within his fields of expertise. His ongoing research endeavors seek to extend the frontiers of knowledge, manifesting his tireless dedication to the cause of educational advancement and his fervent aspiration to achieve professorial eminence.

Dr. Chuan-Chi Chang, Dr. Penpisut Sikakaew, Kanokphan Thamsatitsuk, Xichang Huang, Napawan Jaisook, Manhua Li, Fei Zhao, Xiongling Chen, Lu Zhang, Chaoqiao Yang, Lingfen Mo, are a diverse group of full-time lecturers at the General Education department of the Chinese International College, Dhurakij Pundit University. With a wide range of expertise and research interests, these educators are dedicated to providing students with a well-rounded and comprehensive education. Their areas of specialization include teaching and learning in higher education, Thai language studies, linguistics, mathematics in daily life, cross-cultural education and studies, and educational psychology. This multidisciplinary approach allows them to offer students a unique perspective on the interconnectedness of various subjects and their practical applications in the real world. As a team, they work collaboratively to develop and deliver engaging, informative, and thought-provoking fundamental courses that lay the foundation for students' future academic and professional pursuits. Their commitment to excellence in teaching and their passion for their respective fields make them valuable assets to the Chinese International College and the wider academic community.

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