NARRATIVE REVIEW OPEN ACCESS

The Psychopathology of Problematic Smartphone Use (PSU): A Narrative Review of Burden, Mediating Factors, and Prevention

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ABSTRACT

Background & Aims: Problematic smartphone use (PSU) has emerged as a growing public health concern, with increasing evidence linking it to mental health issues such as anxiety, depression, and sleep disturbances. While smartphones offer numerous benefits, excessive use can contribute to cognitive overload, emotional distress, and behavioral addiction. This review aims to explore the burden of PSU, its psychological and neurobiological mediating factors, and potential prevention and intervention strategies.

Methods: A narrative literature review was conducted using relevant studies from PubMed, Scopus, and Google Scholar. Articles were selected based on their relevance to PSU and its associations with mental health conditions, including depression, anxiety, and insomnia. Both theoretical and empirical studies were included to provide a broad perspective on the topic.

Results: Findings indicate that PSU is associated with increased stress, anxiety, depression, and sleep disruptions. The mechanisms underlying these associations include dopaminergic dysregulation, social comparison, Fear of Missing Out, cognitive overload, and poor sleep hygiene. Various interventions, such as cognitive-behavioral therapy, digital detox programs, and smartphone usage tracking applications, have been proposed to mitigate the negative impact of PSU.

Conclusion: PSU is a significant risk factor for mental health disturbances, particularly among adolescents and young adults. Addressing PSU requires a multi-faceted approach involving behavioral interventions, public awareness initiatives, and policy regulations. Further research is needed to assess the long-term effectiveness of existing interventions and to develop tailored strategies for reducing smartphone overuse and its psychological consequences.

1 | Introduction

One of the remarkable global success stories in technology is mobile phone use [1]. In the USA, nearly all adults own a mobile phone and nine of ten of them have a smartphone, This indicates a tremendous increase in the ownership of handheld devices in recent years [2]. Smartphone plays a vital role in communication, for example, text messaging on various platforms, Internet-based services, as well as access to different information [3, 4]. Smartphone also used in the health sector

for both preventive and therapeutic purposes. Some applications are advantageous tools for the treatment of depressive symptoms [3, 5, 6].

The term "problematic smartphone use (PSU)" describes the inability to control or regulate smartphone use, which has detrimental effects on daily living [7]. PSU is different from normal usage due to its severe cravings and withdrawal symptoms that interfere with daily functioning. PSU is known for its excessive use, where people spend an excessive amount of time on their smartphones. Furthermore, poor usage habits are indicated by withdrawal symptoms such as anger, restlessness or anxiety when the device is not available and the inability to self-regulate smartphone use [8].

PSU is becoming an alarming issue due to its adverse effects on people's health. Major problems such as lower academic performance, disordered eating, alcohol abuse, as well as mental health issues such as depression and anxiety, have been strongly linked to the PSU [9]. PSU and loneliness have been correlated, highlighting the societal implications [10, 11]. Research has consistently linked Fear of Missing Out (Foo) to PSU [11, 12]. Elhai et al. (2017) found that Foo, along with the need for sensory interaction, significantly correlates with increased anxiety and depression among frequent smartphone users. This supports the notion that PSU exacerbates mental distress by intensifying feelings of exclusion and comparison [13]. PSU has also been associated with impulsivity, neuroticism, cyberbullying, and a decline in communication skills, underscoring the wide variety of harmful effects [12].

Anxiety, sleeplessness, sadness, and other mental health conditions have been more closely associated with PSU [14, 15]. Due to adverse effects on social connections and sleep quality, research suggests that excessive use of smartphones can worsen anxiety and depression [14]. People with PSU often engage in activities such as using phones at night, which disrupts sleep cycles and increases the risk of insomnia [16]. In addition, depressed symptoms can result from consuming too much bad news and social media comparisons, while anxiety can be increased by the relentless drive to stay connected and the fear of missing out (FOMO) [17, 18]. Policymakers, educators, and the public must understand the relationship between problematic smartphone use and mental health issues to enhance healthier smartphone use, develop effective intervention and mitigate the negative consequences of excessive smartphone use. This study aims to explore the burden, mediating factors, and possible preventive methods associated with problematic smartphone use and mental health disorders.

1.1 | Methods

This narrative review synthesizes findings from existing literature on PSU and its associations with mental health outcomes. A literature search was conducted using databases such as PubMed, Scopus, and Google Scholar. The selection of articles was based on relevance to PSU and its relationship with mental health, including depression, anxiety, and sleep disturbances. Studies were included if they examined PSU in relation to

psychological distress or cognitive impairments. The following search terms were used: 'problematic smartphone use,' 'mental health,' 'depression,' 'anxiety,' and 'sleep disorders.' Studies published between 2010 and 2024 were included. Inclusion criteria required that studies specifically analysed PSU in relation to mental health outcomes. Exclusion criteria involved non-peer-reviewed articles, studies focusing on general smartphone use without addressing PSU, and non-English publications. Given the narrative nature of this review, no formal systematic selection process (e.g., PRISMA) was employed, and articles were selected to provide a comprehensive overview of current knowledge of this topic.

The measurement of problematic smartphone use varies across studies, leading to differences in reported prevalence and impact. Commonly used assessment tools include the Smartphone Addiction Scale (SAS) and the Mobile Phone Problem Use Scale (MPPUS), each of which defines PSU differently [19]. The inconsistencies in operationalization should be considered when interpreting study findings, as different scales may yield varying degrees of association with mental health outcomes.

1.2 | Burden of Problematic Smartphone Use

Concern over PSU is spreading throughout the world and has serious repercussions for social and mental health. Studies show that PSU prevalence varies greatly between locations, with an estimated global prevalence of 37.1% [20]. Studies indicate that the highest rates of addiction are found in adolescents and young adults, highlighting the severity of this problem among younger populations [21, 22]. Up to 30% of people, according to research, may exhibit PSU symptoms, which affect daily functioning and mental health symptoms. Severity ranges from minor discomfort to severe impairment [23]. In Austria, PSU is present, approximately 38.1% of adolescents and young adults and is associated with increased risks of anxiety, eating disorders, alcohol addiction, and depressive symptoms [24], Furthermore, PSU affects 43.5% of adolescents in Malaysia, where it is more common among international medical students (at 27.3%), and is highly correlated with stress, anxiety, and depression [25]. According to recent studies conducted in South Korea, 85.7% of adolescents used cell phones for more than 2 h a day; however, other studies found that on weekdays, 31.3% of adolescents and 61.3% of adolescents, respectively, used smartphones for more than 4 h [9, 26]. The amount of time spent on cell phones has been linked to serious mental health issues, including anxiety and depression as well as unhealthy habits like drinking, smoking, and not moving around much [9].

In China, the study has shown a prevalence rate of 21.3% among college students [27]. About the PSU status in Africa, study found that the prevalence rate among children and young adult ranges from 14% to 31.2%, with a median prevalence of 23.3% [28]. On other hand 46.5% of young people respectively reported as having moderate to severe problematic smartphone use [29].

In the workplace, excessive smartphone use is a leading cause of reduced job efficiency, because of decreasing job performance

and a rise of absenteeism [30]. Excess smartphone use has been linked to forgetfulness, distractibility, false triggering, and severe cognitive impairments, it has also been repeatedly associated with cognitive distortions, cognitive failures, and declining intelligence [14, 31, 32]. Executive functioning, memory retrieval, and attention span are also concerned [33]. Health care is heavily affected by an increase in mental health disorders, including anxiety, depression, and insomnia because of PSU, these become a burden as they go along with societal problems such as decreased community involvement and lost productivity, as well as financial and social consequences [1, 28]. These problems demonstrate how urgently we need to implement practical solutions to lessen the negative effects of PSU on people and society.

2 | Mediating Factors

In the digital world of today, PSU has gained high attention because of the increased number of mental health and cognitive functioning problems. There are mediating factors which help to understand the relationship between PSU and some mental health issues. Mediating factors, including the dopaminergic system, sleep disruption, and Foo, explain how PSU contributes to mental health disorders by influencing neural reward pathways, cognitive overload, and emotional regulation.

2.1 | Dopaminergic System and Reward Pathways

The dopaminergic and brain reward circuits are very important in controlling pleasure and reinforcement learning and are severely disrupted by PSU through excessive smartphone use, particularly by engaging in game apps and social networks [34]. Figure 1 [36]. As in substance addiction, this overstimulation changes reward circuitry or limbic activity [34]. Smartphone sensitivity causes dopamine releases due to its overuse, and consequently led to a greater sense of enjoyment [37]. Research

has demonstrated a clear association between anxiety, depression, and the brain's reinforcement and reward systems. For example, increased feelings of inadequateness often stem from social comparisons and digital dissatisfaction, which can contribute to depressive symptoms [38]. Furthermore, this can be exacerbated when anticipated rewards or incentives are not achieved, reinforcing negative emotional states [39].

2.2 | Social Comparison and Fear of Missing Out (Foo)

PSU worsens mental health through increased social comparison and fear of missing FOMO [40]. According to the hypothesis of social comparison, people judge and evaluate their lives based on standards established by others [41]. For example, overuse of social networks exposes users to well-chosen and frequently idealised depictions of the lives of other people [40]. The connection between low self-esteem and unfavourable self-evaluations increased by social comparison, therefore, many falls in depression and unpleasant emotional experience [42].

FOMO is a source of widespread anxiety [38]. Due to this dread concern, people develop a habit of constantly checking their smartphones for updates and notifications [38]. An upward trend of FOMO has shown a relationship with smartphone addiction that has been attributed to the increase in anxiety and depressive symptoms [40, 43]. Likewise, FOMO is a source of increased feeling of isolation and dissatisfaction with social interaction in the individual with PSU [44].

2.3 | Sleep Disruption

Melatonin is a hormone that controls sleep-wake cycles, and blue light inhibits its production [45]. Research has shown that exposure to blue light can inhibit melatonin, which can cause insomnia by delaying the onset of sleep and shortening the duration of sleep [45].
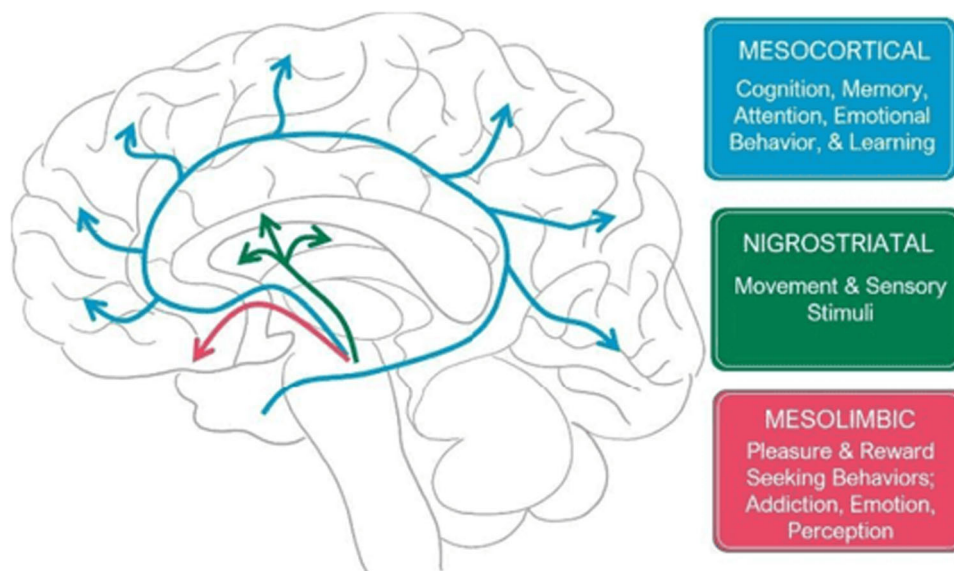

FIGURE 1 | Dopaminergic pathways (*source:* Haynes, 2018) [35].

Using cell phones late at night can induce cognitive and emotional responses that interfere with falling asleep, and is most common in individuals with PSU [46]. Playing games, reading interesting articles, and interacting on social networks can increase alertness and slow the onset of sleep [47]. Studies reveal that this increased arousal not only delays sleep but also reduces sleep quality, leading to less restorative and fragmented sleep [48].

Additionally, the habit of using the smartphone late at night can lead to shorter sleep durations and irregular sleep-wake disorder [47]. Teenagers and young adults are most affected by this disturbance in the sleep pattern [15]. Reduced sleep quality over a period increases daytime fatigue, deleterious impacts on general health, and affects cognitive performance [49].

2.4 | Cognitive Overload and Stress

Cognitive overload and stress are significant mediators between PSU and mental health issues such as anxiety, depression, and insomnia [15]. Smartphone use due to multitasking and always-on notifications effectively overloads the brain by providing too much information, which diminishes mental reserve causing cognitive overload in the long run [33]. This can lead to an overload of which is associated with anxiety and depression. Stress, alternatively, gets sourced from reality: constant social comparison on digital outlets (e.g. Instagram, Facebook, and Snapchat), FOMO (fear of missing out), and disappearing work-life boundaries due to universal connectivity—all this gives rise to long-term anxiety, not enough emotional exhaustion [50]. Due to multitasking, the brain secretes the stress hormone 'cortisol' which increases the level of anxiety and worsens both physical and mental well-being [51].

3 | Prevention and Intervention

Medical experts have used different approaches to treat different mental health problems associated with PSU. Screening techniques have been used to identify people who may be at risk for PSU [52]. To address psychological symptoms experienced by people with PSU cognitive behaviour therapy (CBT) is done [53]. Furthermore, detox programs have also been implemented to reduce reliance on smartphones through mindfulness exercises, scheduled breaks, and substitute activities [54].

To minimize distractions and encourage better habits, educational policy, for example, restricted hours of using smartphones at school during class time, public awareness campaigns and other community-based initiatives were all implemented to address PSU and its problems related issues [55].

Different tech companies have incorporated smartphone features that help users to control their screen time, such as usage tracking and the limit-setting tool. For example, integrated functions such as 'digital wellbeing' on Android and screen Time on iOS allow users to track and manage their screen time and encourage more healthy usage habits [56]. Furthermore, apps such as "Forest" and "Moment" motivate users to track their smartphone usage and participate in activities that improve focus [56]. These solutions have demonstrated efficacy in mitigating excessive screen time and promoting mental health. Technological approaches provide a meaningful way to ease the adverse effects of PSU and promote healthy use of smartphones.

4 | Recommendation

To manage PSU, we need practical, individualised approaches. Using screen time tracker, set phone free hours can help mitigate excessive smartphone use, and it can also be useful to cultivate mindful usage practices. People are obliged to use blue light filters, create a regular sleep schedule, and cut back on-screen time before bed to improve the quality of sleep. Physical activities, hobbies, might be very helpful to reduce smartphone dependence. In case of severity, we can seek expert help, such as consulting the cognitive behavioural therapists.

Additionally, to minimise the effects of PSU, helpful technology should be included in smartphones, for example improving built-in resources such as digital health apps and screen time trackers can provide consumers with insightful information about their usage habits and promote more deliberate engagement with their gadgets. Developers should focus on features that support self-regulation, such as customised notifications and usage limitations. Making mindfulness and wellbeing apps more widely accessible can help people form better online habits and improve their mental health in general.

Widely accessible interventions, such as cognitive behavioural therapy (CBT), mindfulness training, and digital detox programs, have shown effectiveness in helping individuals develop healthier smartphone usage habits and mitigate the negative mental health effects associated with PSU.

Healthcare and policy levels are called to enforce regulations that prohibit smartphone use during essential tasks and encouraging offline activities like mass physical exercises, and this will highly reduce the excessive smartphone use in fields like schools and businesses. Simultaneously, it is important to decrease the influence of addictive design elements in apps and user interfaces, such as never-ending scrolling and incessant notifications, as these elements could worsen PSU. In healthcare settings, it is critical to expand access to healthcare services for individuals affected by PSU and to increase the number of PSU medical professionals. Furthermore, cognitive behaviour therapy (CBT) and lowering the stigma of getting help over PSU in society can improve mental health.

5 | Conclusion

PSU and mental health conditions such as depression, anxiety, and insomnia are significantly mediated by cognitive overload, sleep difficulties, social comparison, and FOMO, and the dopaminergic system and reward pathway. PSU negatively impacts social connections, cognitive functioning, and academic achievement. Individual acts, medical procedures, and legislative initiatives are part of a good prevention and

intervention effort. Future studies will investigate the long-term effectiveness of different treatment strategies, the neurobiological pathways that connect PSU to mental health and will yield insightful information on how the development of technologies both exacerbates and mitigates PSU.

Author Contributions

Egide Ndayambaje: conceptualization, writing – original draft, writing – review and editing. **Promise Udohchukwu Okereke:** methodology, writing – review and editing, supervision.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The authors have nothing to report.

Transparency Statement

All authors have read and approved the final version of the manuscript. Ndayambaje Egide had full access to all data and takes complete responsibility for the integrity and accuracy of the analysis.

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