



Mindfulness as an Intervention for Smartphone Addiction in Adolescents

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Abstract

The rapid advancement in information technology around the world has impacted people's lives significantly. The role that the internet and smartphones played, acted as its primary carrier. The evolution of cell phone technology brought along the emergence of smartphone addiction as a form of behavioral addiction, barring none. India's youth is the most hit by this invisible epidemic, which is increasingly becoming a huge public health concern. One need cost-effective intervention strategy to help fight this battle. An automatic and mindless behavioral addiction can benefit from components of meditation and mindfulness as they bring about a comparable change in areas affected by addiction. An extensive database search on Scopus, PubMed and Google Scholar resulted in the systematic review of existing literature on yoga, mindfulness, meditation and smartphone addiction to evaluate their effectiveness for the long-term treatment of smartphone addiction in the young Indian

population. This research paper focuses on mindfulness to improve symptoms related to smartphone addiction and provides an extensive literature review for it.

Keywords: *Mindfulness, Smartphone addiction, Adolescents*

Introduction

Smartphone and internet technology have been developing at an unparalleled rate, and the global population of smartphone users has surged significantly in the last decade. Smartphones provide consumers with simple and practical ways to enhance their social lives (Sahu et al., 2019). Internet usage, being a huge part of the business and school environments, makes it challenging to recognize and diagnose addiction. As a result, many have unknowingly developed "smartphone addiction" (Duke & Montag, 2017) and have grown more and more dependent on their cell phones. The significant rise in the possession of mobile devices by children and young adolescents is disconcerting as their mental and physical faculties are yet not developed, especially in terms of self-discipline. The unrestrained use of mobile devices makes them susceptible to potential harm to their physio-psycho-social health (Department of Health. E-Report: 2018). Preliminary research studies provide evidence for impairments to cognitive development as well as a range of physiological and psychosocial issues, including but not limited to impaired vision, memory disruptions, deficits in attention, addiction, learning difficulties, and social issues because of extended use of these devices (Durusoy et al., 2017; Sadetzki et al., 2014).

Young (2004) who studied Internet addiction described addiction of any form as generally associated with an overwhelming desire that is frequently coupled with a loss of control, a fixation with use, and ongoing use despite the insight into the issues caused by the behaviour. Addiction is a chronic and basic disease that affects brain motivation and memory over time and has the potential to be fatal if not addressed quickly. Shin and Dey

(2013) believe that smartphone addicts must always have their phones with them and check them constantly. They have established several markers of addiction assessment encompassing factors such as spending more than five hours a day online, losing interest in other pursuits, and decreased social interaction. Studies have shown that the pattern of smartphone use among adolescents varies based on the target population and the country of origin. One of the popular smartphone features that make teenagers and adults more prone to develop smartphone addictions is social networking. Youngsters in Europe and the US enjoy using smartphones to access television programs online. Other activities that involve frequent internet use are completion of homework, seeking information and randomly passing time (Haug et al., 2015; Li & Chung, 2006; Lopez-Fernandez et al., 2014; Van Deursen et al., 2015).

According to Park et al. (2018), roughly 11% of South Korean adolescent boys and girls were at high risk of smartphone addiction, necessitating additional evaluation and intervention; Haug et al. (2015) found that 17% of teenagers and young adults in Switzerland had smartphone addiction. In India, the prevalence of smartphone addiction ranges from 39% to 44%. The age group of 25-34 reportedly has the highest rate of 62% of smartphone usage. 43% of Apple iPhone users and 50% of Android smartphone users are under the age of 34. 47% of smartphone users are women, whereas 53% of users are men. Indian teenagers are currently driving the country's smartphone boom. The percentage of 16 to 18-year-olds that use smartphones has risen significantly, from 5% in 2012 to 25% at the beginning of 2014. In urban India, there were recently "51 million" Smartphone users and the growth rate from 2012 has reportedly been 90% (Davey & Davey, 2014).

A substantial amount of empirical evidence has shown that adolescents' and children's smartphone addiction is linked to a wide range of issues with their physiological,

psychological, and emotional well-being. It has been discovered that excessive smartphone use is linked to low-quality sleep, cardiovascular risk factors, and symptoms of depression and anxiety. It has also been found that teen sexual and behavioral problems, such as antisocial behavior, smoking, and alcohol intake, are linked to smartphone addiction (Choi et al., 2015; Grant et al., 2019; Kim et al., 2014; Wang et al., 2019). According to some researchers, smartphone addiction is a problem of impulse control and a lack of self-control (Young, 1996). Earlier studies have shown an inverse relationship between self-control and smartphone addiction (Song & Park, 2019). A higher degree of self-control in college students is linked to a lower prevalence of internet addiction (Agbaria & Bdier, 2021). Rumination is a form of undesirable reaction that has a strong link to mental health issues like depression, anxiety, and attempted suicide (Nolen-Hoeksema, 2000). Rumination has also been linked favorably to internet addiction, according to certain studies (Kircaburun et al., 2019; H. Li & Wang, 2013). Cheng et al. (2020b) concluded in their study that rumination and self-control are both proximal factors that lead to smartphone addiction before sleeping. The pattern of smartphone behavior may not be as predictable as the psychological trait of resilience which characterizes an individual's ability to cope with stress. Addiction to the internet/smartphone has been linked to low resilience. Strong resilience was revealed to be an important factor in protecting adolescents from online risks. It can also mitigate the negative psychological effects of internet addiction and risk exposure (Jiang & Li, 2018; Um et al., 2019; Wisniewski et al., 2015). With the evidence suggesting the significant role of resilience in influencing smartphone users' addictive behavior and enabling the prevention of addiction, clinicians are encouraged to seek evidence-based interventions to boost resilience and reduce the health risks associated with smartphone addiction.

Mindfulness, a Vipassana meditation technique that is part of traditional Buddhist practice,

was introduced as a clinical psychological intervention by Kabat-Zinn (1990). He described mindfulness as an individual's ability to focus attention on the present moment, observe their body and mind intentionally, experience the immediate experience, and accept this experience as it is. He believed that, through mindfulness practice, an individual can experience their mind as just a thought and realize that acting to avoid or eliminate emotions is unnecessary. Mindfulness is regarded as a method of self-regulation that emphasizes consciously perceiving and focusing our attention on the present moment. It has been associated with improved emotional regulation as well as positive emotional outcomes, as opposed to rumination (Quaglia et al., 2016; Tomlinson et al., 2018).

Recently scholars have found evidence that mindfulness promotes the expression of positive emotions and the maintenance of a state of emotional and internal calm; therefore, can provide effective strategies to clinicians for suppressing addiction and psychological problems (Cheng et al., 2020). Mindfulness therapy has now been known to be used to treat a wide range of mental illnesses, including behavioral addiction (Luberto et al., 2017; Manicavasgar et al., 2011). Furthermore, mindfulness is regarded as a therapeutic intervention suitable for smartphone addiction (Cheng et al., 2020; Liu et al., 2017). Certain mindfulness training techniques can assist addicts in identifying the intrinsic value of life and control incidences of rumination, mitigate withdrawal symptoms and relapse and lastly help regulate their anxious emotional state associated with smartphone addiction in students (Mandal et al., 2011). The research team, therefore, focuses on investigating the effectiveness of mindfulness interventions to manage the addictive smartphone behavior of this vulnerable group.

Mindfulness has been used in many different psychotherapies, including Mindfulness-Based Stress Reduction (MBSR) (Kabat-Zinn 1990), Mindfulness-Based Cognitive Therapy

(MBCT) (Segal et al. 2001), Dialectical Behaviour Therapy (DBT) (Linehan 1993), and Acceptance and Commitment Therapy (ACT) (Hayes et al. 1999).

Review of Literature

Smartphone addiction and comorbid health concerns

Regardless of the multitudinous benefits, excessive smartphone usage is cause for concern for its extensive association with harmful impact on the academics, and physical and mental well-being of youngsters (Sahu et al., 2019). Physical discomforts such as recurring headaches, dry eyes, shoulder stiffness and neck pain; psychological issues such as decreased productivity, overwhelming loneliness, low self-esteem, attention and sleep problems, anxiety and depression as well as a greater likelihood of mishaps and injuries have been reported to be associated with immoderate smartphone use (Boumosleh & Jaalouk, 2017; K. Kim et al., 2018; Yen et al., 2009).

Peele and Brodsky (2005), in their book “Love and Addiction” for very first time, claimed that addiction is not just limited to a substance or any chemical addiction but rather whatever makes an individual addicted to a specific behavior resulting in possible functional impairment, may be termed as an addiction. Chóliz (2010) in the letter to the editor of Addiction Journal asserts that smartphone addiction has characteristics comparable to other types of behavioral addiction, such as pathological gambling, gaming addiction and compulsive shopping. Smartphone addiction is regarded as a unique behavioral addiction that manifests in the form of psychological and physical symptoms such as a loss of control, craving, mood modification and cognitive salience; tolerance, withdrawal and obsessive symptoms; saliency, impulsive behavior, functional impairment, and relapse. These characteristics are in great conjunction with substance addiction. The impairment brought on

by the symptoms of smartphone addiction in the quality of one's life is a growing cause of public health concern especially for university students (Billieux et al., 2015; Griffiths, 2005; Panova & Carbonell, 2018; Yen et al., 2009).

Research findings have shown that obsessive smartphone use in university students can lead to mental health disorders along with additional types of psychopathologies, such as depression and anxiety. Compulsive anxiety was identified as a factor in smartphone addiction by Khang et al (2012). Steelman et al. (2012) discovered that excessive use of smartphones is similar to OCD behaviors as it reflects similar anxiety and stress in the attempt to manage regular responsibilities. Studies also found that social media use can predict signs and symptoms of a variety of personality and mood disorders such as bipolar mania. Problematic smartphone use can lead to emotional dysfunction or other psychological disorders, which can be linked to the severity of PTSD. Excessive smartphone usage can have a detrimental effect on the attention span, academic performance, financial concerns and sleep quality of students. Furthermore, problematic smartphone use has been strongly associated with feelings of loneliness and lack of self-regulation among students, resulting in mental or maladaptive behavioral problems, disrupting school or work, impede on real-life social engagement, leading to other relationship disorders and increasing interpersonal and familial conflicts (Mahapatra, 2019). A study conducted by Cajochen et al. (2011) to investigate screen time exposure and its resulting impact on our circadian physiology and our cognitive performance found that smartphone screens emit short-wavelength light, and exposure to this light during the night- time has a high possibility to impede our circadian rhythms, thereby affecting the quality of sleep. Poor sleep quality not only has a detrimental influence on physiological and psychological health in students but is also accompanied by poor sleep habits, such as using mobile phones before bed. Wang et al. (2019) in their study on sleep quality in adolescents found that excessive smartphone use is associated with an

unhealthy lifestyle where quality sleep time is drastically reduced, a proclivity to eat unhealthy high-calorie food is frequent and a greater likelihood to indulge in risky behavior such as substance abuse, self-harm and suicidal ideations (Kim et al., 2017; Kim et al., 2018; Swinkels et al., 2013). Furthermore, studies have linked the quality of sleep with poor mental health and depressive symptoms (Liu et al., 2016). Oshima et al. (2012) emphasized the link between sleep disruptions and death by suicide. They also pointed out in their study that smartphone dependency, frequent texting, and prolonged fear about not getting replies, particularly before bedtime, are likely to be associated with low mood, suicidal notions, and self-injury.

Eichenberg et al. (2019) conducted a study to investigate problematic smartphone use by students in light of their attachment styles and discovered that excessive smartphone use has a strong link with an insecure attachment style. Another study found that students with problematic phone use scored high on maladaptive Cognitive-emotion regulation (CER) methods such as blaming others and self, constant rumination, and catastrophizing thought patterns (Extremiera et al., 2019). Problematic smartphone use has also been associated with experiential avoidance of thoughts, emotions, physical sensations and memories (García et al., 2018). Students addicted to smartphones engage in excessive reassurance-seeking behavior and were found to experience extreme measures of worry and anger (Elhai et al., 2019, 2020). Wacks and Weinstein (2021) conducted a review of various health concerns faced by youngsters because of problematic smartphone use. Their study brought to light the association of smartphone addiction with mental (alcohol use disorder, OCD, ADHD, Anxiety and depression), cognitive (social networking addiction, impaired cognitive function), emotional (shyness, impulsivity, low self-esteem), medical (poor eating habits, sleep issues, migraines, reduced physical fitness, decreased cognitive control) comorbidities and neurological (changes in grey matter volume) alterations.

Psychological underpinnings of Smartphone addiction

Smartphone addiction or mobile phone addiction, while posing a serious threat to an individual's physical, mental, emotional and cognitive health, hasn't been recognized as a diagnostic category in the Diagnostic and Statistical Manual of Mental Disorders, 4th and 5th edition due to a lack of empirical evidence. Several terminologies such as excessive phone use, problematic phone use, mobile phone addiction and others have come across interchangeably in the research literature as a result of a lack of set criteria to define addictive use. Initially, the drug addiction criteria (loss of control, cravings, withdrawal and relapse) have been used for describing and analyzing smartphone addiction. Subsequently tools, based on previously established substance abuse criteria were developed to help assess problematic smartphone usage, ultimately leading to describing specific social, psychological and biological risk factors for smartphone addiction (Bianchi & Phillips, 2005). Prior research studies highlight that smartphone addiction causes a significant loss of control (e.g., impaired decision-making abilities and decreased impulse control) (Billieux, 2012; Billieux et al., 2015). According to the present literature, impulsivity is an important marker of addictive behaviors (Billieux et al., 2015). Billieux et al. (2015) proposed an integrative pathway model leading to smartphone addiction. The first pathway is the "excessive reassurance pathway" referring to people whose problematic smartphone use is motivated by the need to maintain relationships and seek reassurance from others promoted by factors such as poor self-esteem, increased emotional instability, or insecure attachment and increased anxiety (Augner & Hacker, 2012; Ehrenberg et al., 2008; Lee et al., 2014; Leung, 2008). The second pathway is the "impulsive pathway" referring to people whose problematic smartphone use is fueled by poor impulse control, resulting in uncontrollable cravings and dysregulated usage. The "extraversion pathway" is the third pathway which claims that problematic smartphone use manifests in excessive use and dependence-like

symptoms motivated by a strong urge to be in constant communication and develop new relationships. These hypothesized pathways are said to be influenced by individual factors or unique psychological features of individuals, which further help identify risky smartphone use patterns, the frequency and type of use, as well as addiction-like symptoms. Evidence provided by Billieux et al. (2015) in their pathways model study can be corroborated by other existing literature focusing on these multidimensional factors such as low self-esteem, poor peer relationships, unique personality feature, mental health status (anxiety, depression, loneliness) etc., impacting smartphone addiction and related behaviors (Agbaria & Bdier, 2021; Choi et al., 2015; Ge et al., 2023; Ithnain et al., 2018; Wang et al., 2017).

Numerous research studies have examined the variables that may influence smartphone addiction and found self-esteem and self-control to be more closely associated with smartphone addiction (Chen et al., 2023; Ding et al., 2022; Fu et al., 2020; Lee et al., 2018; Li et al., 2021). Our view of ourselves, how we fit in this massive world and how our view of self is in our relationships defines our self-esteem. Low self-esteem has been theorized by Baumeister (1997) to result in people behaving in a self-destructive manner to escape self-awareness. Poor self-esteem manifests as negative beliefs about self, and a low sense of safety and identity in interpersonal relationships (Passanisi et al., 2015). Addiction-related behavior has frequently been connected to self-esteem (Marlatt et al., 1988). Self-control has been defined as an individual's capacity to endure both internal and external temptations to achieve long-term goals.

There has been massive evidence that those with weak self-control and vulnerability can develop smartphone addictions (Ruggiero, 2009). Individuals with poor levels of self-control experience anxiety in changing circumstances, making it difficult to face reality and avoid self-defeating behaviors (Adiyatma et al., 2020). Rumination, a compulsive form of

thinking, focused solely on considering the adverse consequences of a particular negative experience, is closely related to mental health issues like anxiety, depression, and suicide attempts (Nolen- Hoeksema, 2000). A review on mediating roles of Rumination and Fatigue on Smartphone addiction by Lian et al. (2022) found that rumination has been positively correlated with internet addiction. Their study also highlighted people with high levels of ruminating may experience poor sleep quality or sleep problems than people with low levels of rumination, thus feeling even more exhausted. Prior research work has demonstrated the detrimental impact of smartphone addiction and rumination on sleep quality (Hong et al., 2020; Kim et al., 2017; Kim et al., 2018; Liu et al., 2017).

Mindfulness-based interventions for smartphone addiction

Mindfulness can be described as an individual's ability to concentrate on their moment-to-moment thoughts and sensations and notice them without any judgment or attachment and be as non-reactive and open-hearted as possible (Kabat-Zinn, 2005). Practicing mindfulness in daily life can promote peace and relaxation. With our minds racing constantly, mindfulness, with regular practice can help slow down our thoughts and also aid in the holistic improvement of self-esteem and the development of a more positive mindset (The University of Southern California, 2020). The notion of mindfulness, which has its roots in Buddhism, has been conceptualized and researched as both a state (i.e., a temporary condition) and a trait (i.e., a permanent quality).

According to the available research, mindfulness practices during the adolescent years may promote healthy psychosocial development, including enhancing executive function, affective self-regulation, strengthening the capacity to regulate strong emotional states, as well as improving interpersonal relationships (Tang & Lee, 2021; Tang et al., 2012; Zelazo & Lyons, 2012). Studies examining how mindfulness can help treat behavioral addiction have

mainly targeted problem gambling and job addiction, rarely focusing on children and/or adolescents (Tang & Lee, 2021). Never has mindfulness attracted more attention from scientists. Research publications on the subject have grown exponentially since the early 2000s. A majority of this literature focuses on the development of mindfulness through the practice of mindfulness meditation. It includes various self-regulation techniques that put great emphasis on honing attention and building awareness thereby developing greater voluntary control over our mental processes and further promoting our mental well-being, improving concentration, and instilling calmness and clarity (Walsh & Shapiro, 2006).

Mindfulness techniques have been studied and applied in the medical field to overcome addictions and their efficiency has left researchers stunned (Kim et al., 2018). Given this degree of effectiveness, it comes as no surprise that mindfulness has been proposed as a strategy to treat additional mental illnesses, such as smartphone addiction, sharing similar psychological mechanisms with other addictions (Luberto et al., 2017; Manicavasgar et al., 2011; Young, 2004). Mindfulness training assists in breaking maladaptive habitual patterns and substitutes them with better self-regulation behavior's by allowing an individual to develop non- judgmental awareness for their distressing mind and body sensation. Multiple studies were found providing evidence that mindfulness training can considerably reduce college students' problematic smartphone use by improving their ability to manage their emotions (Tang & Lee, 2021). For instance, Cheng et al. (2020) conducted a study to examine the effect of mindfulness training on smartphone addiction among a group of 270 college students. The results of this study highlighted the effectiveness of mindfulness training in enhancing self- control and reducing the levels of rumination among the participants. Further, it also helped them avoid the negative effects of smartphone addiction before bed and thereby improve their sleep quality and mental health. Elhai et al. (2018) conducted a repeated- measures web survey on 261 college students and discovered that

degrees of problematic smartphone use were inversely correlated with mindfulness. Lan et al. (2018) conducted an experimental study on smartphone addiction by dividing a group of Chinese students into control and intervention groups to examine the effectiveness of “mindfulness-based cognitive- behavioral intervention (GMCI)”. The intervention programme continued for 8 weeks while conducting self-report measures for evaluating participants' level of smartphone usage and Mobile Phone Internet addiction scale (MPIAS) 4 times at 6-week intervals. The results revealed that the intervention group's smartphone use levels significantly decreased by the first-follow up session as compared to the control group. Their pilot study successfully demonstrated the significant impact of GMCI to treat smartphone addiction in college students.

Training in mindfulness has been demonstrated to be beneficial for overcoming addictions, reducing impulsive behavior's, controlling incidences of rumination, and cravings, mitigating withdrawal symptoms and relapse and psychological and physiological reactions to stress, as well as improving emotion regulation (Mandal et al., 2011; Psyjdc, 2022). Existing literature on mindfulness is of the view that mindless attention might result in more addictive behaviors, such as using smartphones (Bahl et al., 2016; Bertin, 2015). K. Kim et al. (2018) talk about the theoretical procedure of mindless behavior thus providing an explanation for why using a smartphone automatically occurs unconsciously after being subjected to an environmental trigger.

Additionally, stress levels may rise if inappropriate coping mechanisms are used, they claimed. The concept of mindfulness suggests paying attention to the present moment without any reaction or judgment, this has been corroborated by previous research studies as they provide evidence that mindfulness-based intervention can help improve a person's self-control (Anderson et al., 2007). Liu et al. (2022) conducted an experimental study and found

that in comparison to the control group, a brief single-session mindfulness intervention reduced problematic smartphone use and raised levels of state of awareness and self-control in the intervention group. They also proposed that individuals engaging in mindfulness interventions are required to maintain their focus on the awareness of the present moment and deal with distractions brought on by irrelevant thoughts, which can be considered as self-control training, where the ability to exercise self-control is repeatedly and continuously worked on and significantly improved. Yang et al. (2019), in their study, found the moderating impact of mindfulness on anxiety, depression and smartphone addiction among adolescents. W. Chen et al. (2021) in their study on university students discovered that the participants' preference for solitude, their psychological distress, smartphone addiction and their daily phone usage overall decreased with increasing levels of mindfulness.

Research Methodology

A scientific yet flexible research methodology was adopted to conduct the current literature review. An elaborated methodology is discussed in the further sections of this research review.

Research Design

This systematic review paper is used to interpret the current literature in regard to the effect of mindfulness, being able to stop smartphone addiction especially in young adults or the adolescents. The research methodology will incorporate standard literature search procedures, criteria for inclusion and exclusion, data extraction and analysis to guarantee a comprehensive and unbiased review process.

Literature Search Strategy

A comprehensive literature search was conducted across multiple electronic databases,

including PubMed, PsycINFO, Google Scholar, and Web of Science. The search strategy combined keywords and phrases related to smartphone addiction and mindfulness interventions. Additionally, reference lists of relevant articles were manually searched to identify any additional studies not captured in the initial database searches. The specific search terms included but were not limited to:

- “Smartphone addiction”
- “Mobile phone addiction”
- “Problematic smartphone use”
- “Mindfulness intervention”
- “Mindfulness-based therapy”
- “MBCT”
- “MBSR”
- “Mindfulness meditation”

Inclusion and Exclusion Criteria

To ensure the relevance and quality of the included studies, the following inclusion and exclusion criteria were applied:

Inclusion Criteria

1. **Population:** Studies focusing on adolescents and young adults (ages 12-30) who exhibit signs of smartphone addiction.
2. **Intervention:** Studies that implement mindfulness-based interventions, including but not limited to Mindfulness-Based Stress Reduction (MBSR), Mindfulness-Based Cognitive Therapy (MBCT), and other mindfulness meditation techniques.
3. **Outcomes:** Studies that measure outcomes related to smartphone addiction, such as reduction in usage, improvement in self-control, decrease in anxiety and

depression symptoms, and enhancement in sleep quality.

4. **Study Design:** Randomized controlled trials (RCTs), quasi-experimental studies, and longitudinal cohort studies.
5. **Language:** Studies published in English.
6. **Time Frame:** Studies published between 2000 and 2023.

Exclusion Criteria

1. **Population:** Studies focusing on populations outside the specified age range or those without a diagnosis or significant symptoms of smartphone addiction.
2. **Intervention:** Studies that do not utilize mindfulness-based interventions as a primary treatment modality.
3. **Outcomes:** Studies that do not measure relevant addiction-related outcomes.
4. **Study Design:** Case studies, qualitative studies, and reviews without original data.
5. **Language:** Studies published in languages other than English.
6. **Time Frame:** Studies published before 2000.

Data Extraction

Data from the included studies were extracted using a standardized form. The key information extracted included:

- Author(s) and publication year
- Study design and setting
- Sample size and characteristics
- Description of the mindfulness intervention
- Duration and frequency of the intervention

- Outcome measures
- Main findings related to smartphone addiction
- Limitations reported by the authors

Data Synthesis and Analysis

The extracted data were synthesized narratively, given the heterogeneity of the study designs, interventions, and outcome measures. The synthesis focused on:

1. ***Effectiveness of Mindfulness Interventions***: Assessing the overall effectiveness of different types of mindfulness interventions in reducing smartphone addiction and its related symptoms.
2. ***Comparison of Intervention Types***: Comparing the effectiveness of various mindfulness-based interventions (e.g., MBSR vs. MBCT) to determine if any specific type shows superior outcomes.
3. ***Impact on Comorbidities***: Evaluating the impact of mindfulness interventions on comorbid conditions associated with smartphone addiction, such as anxiety, depression, sleep disturbances, and impulsivity.

Quality Assessment

The quality of the included studies was assessed using the Cochrane Collaboration's tool for assessing the risk of bias in randomized trials and the Newcastle-Ottawa Scale for non-randomized studies. This assessment focused on:

- Selection bias
- Performance bias
- Detection bias
- Attrition bias

- Reporting bias

Studies were categorized as having a low, moderate, or high risk of bias based on these criteria.

Ethical Considerations

This review did not involve direct human participation; however, ethical considerations in the included studies were noted, particularly regarding informed consent and the ethical treatment of participants in intervention studies.

Conclusion

Mounting evidence during the last two decades reveals that smartphones have grown to become the most popular and indispensable electronic in the lives of most of the humankind (Ding & Li, 2017; Hardell, 2018). The dramatically advancing technology leads to a massive shift in the pattern of use, multifunctional devices with strong internet connectivity serving as a doorway to the virtual world. This massive shift in the usage of smartphones interested researchers to investigate the consequences of smartphone use (Billieux et al., 2015). Despite the numerous benefits, excessive mobile phone use has lately been linked to potentially dangerous and/or maladaptive behaviours (such as signs of uncontrolled use, a negative impact on daily activities including relationship issues and hampered work performance) (Billieux et al., 2015). This review paper highlights various negative outcomes associated with smartphone addiction.

Effective intervention techniques for smartphone addiction had received scant research to date. Several research scholars recently became interested in the beneficial effects of mindfulness as a treatment modality for various psychological issues as well as in suppressing addiction-related behaviours, especially behavioural addiction (Shonin et al., 2014). Witkiewitz et al. (2013) were among the earliest psychologists to contribute to the

creation of mindfulness-based relapse prevention (MBRP), an 8-week group-based intervention which teaches individuals how to respond to their triggers and cravings healthily, trains them to not only notice but allows their urges to subside and pass, eventually. The effectiveness of mindfulness-based therapies for a range of mental and physical health, as well as neurological outcomes has been the subject of extensive research (Luberto et al., 2017; Manicavasgar et al., 2011; Young, 2004). Lately, mindfulness techniques have been considered an effective intervention for the treatment of smartphone addiction (Cho et al., 2017; Kim, 2013; Liu et al., 2017) as mindfulness-based interventions for addictions focus on an individual's level of awareness of their present experiences allowing them to deconstruct their urges and understanding them as a sensory component which is separate from themselves (Garland & Howard, 2018). However, the theoretical and intervention impact of mindfulness techniques on smartphone addiction received limited support in the research literature. The current study focused on studying the comorbidities associated with smartphone addiction, and various psychological underpinnings that lead to problematic phone use and showed that mindfulness intervention strategies are effective to treat smartphone addiction as it becomes more ingrained in daily life, becoming habitual during triggering situations. The focus of Mindfulness is enhancing our lives and how we live it daily.

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