

Mechanisms of Smartphone Addiction in University Students and Intervention Methods

Naiyuan Zhang^{1,a,*}

¹*Jilin University, No. 2699, Qianjin Street, Changchun City, Jilin Province, China*

a. 2239523686@qq.com

**corresponding author*

Abstract: With the widespread use of smartphones among university students, smartphone addiction has become increasingly severe, negatively impacting mental health and social adaptation. This paper analyzes the emotional, behavioral, and cognitive characteristics of smartphone addiction among university students, exploring the roles of emotional motivation factors such as depression, anxiety, and loneliness, as well as cognitive-behavioral factors like sense of life meaning and core self-evaluation in the formation of addiction. It summarizes intervention measures related to emotions and motivation, as well as cognition and behavior. Future research should further explore the effectiveness of psychological measurement tools, the interaction between emotional and cognitive factors, and intervention methods incorporating modern technology to more comprehensively understand and address smartphone addiction among university students.

Keywords: University students, Mobile phone addiction, Influencing factors, Intervention.

1. Introduction

With the rapid advancement of information technology, smartphones have become essential network terminals due to their convenience and customization. As of June 2022, there are 1.051 billion mobile internet users in China, with 99.6% using smartphones [1]. While smartphones offer significant benefits, they also pose addiction risks, drawing considerable academic attention.

Smartphone addiction is characterized by a persistent craving and dependence, leading to social and psychological impairments. It is associated with emotional issues like depression, loneliness, and anxiety; physiological problems such as reduced immunity, vision decline, and sleep disorders; and cognitive issues like attention distraction and cognitive failure [2].

To address smartphone addiction among university students, research should focus on identifying addiction characteristics, assessing impacts on mental health, social adaptation, physical health, and cognitive functions, and exploring contributing psychological and social factors. Effective prevention and intervention strategies can be developed based on these insights, guiding educational institutions in promoting healthy smartphone use and providing a foundation for behavioral science research. Comprehensive studies will enhance our understanding of smartphone addiction's impact on students and support the development of scientific intervention strategies.

2. Characteristics of Mobile Phone Addiction Among University Students

Mobile phone addiction among university students not only leads to notable negative emotional experiences but also adversely affects their interpersonal relationships, academic performance, and sleep quality. Generally, university students who are addicted to smartphones tend to exhibit poorer self-evaluation, lower social cognition, and diminished attention and executive control functions. These characteristics collectively exacerbate the negative impact of addiction on their lives.

2.1. Emotional Characteristics

Smartphone addiction among university students often leads to negative emotional experiences, such as irritability, depression, loneliness, and anxiety. Emotional appraisal theory suggests that these negative emotions arise from discrepancies between expected and actual states [3]. Students may experience withdrawal symptoms, such as anxiety and irritability, when restricted from smartphone use. They are more sensitive to loneliness and have lower levels of happiness and self-esteem. Excessive smartphone use can exacerbate social anxiety, as individuals become distressed by the absence of updates or negative comments on social media [4]. This focus on negative information can trap users in a cycle of negative emotions, impacting their mental health and encouraging avoidance behaviors [5].

2.2. Behavioral Characteristics

Smartphone addiction can manifest in physical discomforts like neck pain and "texting thumb" and is akin to behavioral addictions such as gambling. Addicts may use their phones inappropriately, like during meetings or while driving, and experience physical discomfort from prolonged use. Addiction reduces opportunities for face-to-face interactions, affecting social skills and relationships. It also leads to sleep disturbances and vision problems. According to Baumeister's theory of self-control resources, prolonged smartphone use depletes psychological resources, reducing self-regulation and reinforcing the addiction cycle [6].

2.3. Cognitive Characteristics

Smartphone addiction negatively affects cognitive functions, leading to attention distraction, cognitive failures, and diminished executive control. Addicted students often have poor self-evaluation and cognitive biases, attributing failures to personal inadequacies and fearing missing out on others' activities (FOMO) [7]. Self-Expansion Theory posits that smartphones become extensions of the self [8]. Losing access to these devices can feel like losing a part of oneself, leading to decreased attention and cognitive abilities. These cognitive issues impact academic performance and decision-making, creating a cycle that reinforces smartphone dependence.

3. Mechanism of Mobile Phone Addiction Formation in University Students

By exploring the mechanisms behind smartphone addiction among university students, we gain a deeper understanding of the influencing factors and processes involved in this behavior, providing new perspectives and insights for future research. The mechanisms of smartphone addiction can be categorized into two main aspects: emotional and motivational factors, and cognitive and behavioral factors.

3.1. Emotions and Motivations

Smartphone addiction among university students is influenced by emotional and motivational factors. Depression, anxiety, loneliness, and boredom are significant drivers of addiction. Depressive emotions, which involve persistent low mood, can push individuals to use smartphones as a coping mechanism, increasing the risk of addiction [9]. Anxiety and stress lead individuals to seek emotional relief online, aligning with the compensatory internet use model. Boredom proneness, a trait characterized by a lack of interest, also contributes to addiction. The novelty and anonymity of smartphones satisfy the need for stimulation when external stimuli are lacking [10]. Additionally, the need for uniqueness drives addiction as smartphones become symbols of personal identity and self-expression. According to Optimal Distinctiveness Theory, the internet provides a low-risk way to fulfill this need [11]. The I-PACE model further explains how individual traits, emotions, and cognitive processes interact to influence addiction [12].

3.2. Cognition and Behavior

Cognitive factors play a crucial role in smartphone addiction. Maladaptive cognition, such as poor core self-evaluations and a lack of life meaning, contributes to addiction. A higher sense of life meaning reduces addiction risk, as individuals with clear goals are less likely to escape into the virtual world [13]. Core self-evaluation affects addiction tendencies by enhancing life meaning, thus lowering addiction risk. Relative deprivation, or feeling disadvantaged compared to others, is linked to addiction. It increases negative emotions and can lead to excessive smartphone use as a coping mechanism. Relative deprivation is a known predictor of behavioral addictions, including gambling and internet gaming. Emotional, motivational, cognitive, and behavioral factors are interconnected. The I-PACE model illustrates how these factors interplay, with negative emotions like depression leading to poor cognitive adaptation and reinforcing addiction behaviors.

4. Intervention Methods for Mobile Phone Addiction of College Students

Preventing and intervening in smartphone addiction among college students can be achieved through various methods. For emotional and motivational aspects, interventions such as motivational therapy and biofeedback can help reduce negative emotions and modify underlying motivations. Cognitive and behavioral interventions, including cognitive-behavioral therapy (CBT), mindfulness-based cognitive interventions, impulse control training, educational interventions, and exercise interventions, aim to improve cognitive and behavioral patterns, enhance control over behaviors, and reduce addictive behaviors. Cross-theoretical model educational interventions and physical exercise can boost self-efficacy and physical fitness, helping to alleviate dependency issues and related symptoms. Utilizing a combination of these strategies can effectively prevent and treat smartphone addiction among college students.

4.1. Emotional and Motivational Interventions

Improving negative emotions (such as anxiety and depression) and changing motivations are crucial strategies for preventing and intervening in smartphone addiction among college students. Common interventions include motivational therapy and biofeedback, which have shown some effectiveness in alleviating smartphone addiction behaviors.

Motivational interventions are based on the Uses and Gratifications Theory, which suggests that users evaluate the potential rewards or gratifications when selecting media. When users receive satisfaction from media, they develop a positive attitude towards it, which can influence their usage behavior and potentially lead to continued dependence on the media. Park found a significant positive

correlation between smartphone dependence and motivations such as loneliness, time-passing, and escape from reality [14]. Peele further noted that the primary motivation for addictive behavior is to alleviate negative emotional states such as pain and anxiety, often as an escape from reality [15]. As a mixed media, smartphones can help people escape the negative emotions from real-life interactions and fulfill their entertainment needs.

Motivational interventions aim to reduce negative emotions and the motivation for engaging in harmful behaviors by altering users' motivations. Specifically, such interventions help individuals identify and challenge their dependency motivations on smartphones, guiding them to seek gratification from real-life experiences rather than relying on smartphones to alleviate anxiety or loneliness. By promoting self-reflection and behavioral change, motivational interventions can effectively reduce the risk of smartphone addiction.

Biofeedback therapy has recently gained recognition for its application in treating issues related to internet addiction, physical symptoms accompanied by anxiety, depression, and sleep quality, showing preliminary effectiveness. Biofeedback therapy is a scientific psychological treatment technique that monitors physiological indicators, such as heart rate, muscle tension, and skin conductance, in real-time. This allows patients to recognize and regulate their physiological responses, thereby alleviating stress, anxiety, and other discomforts.

Research by Sun Ruonan et al. found that biofeedback therapy can effectively alleviate physical and mental discomfort caused by excessive smartphone use, such as anxiety, depression, and inattention, thereby reducing smartphone addiction behavior [16]. Specifically, biofeedback therapy helps individuals enhance their awareness and control of their physiological state, leading to improved emotional states and psychological health. This intervention not only helps reduce physical and psychological discomfort associated with smartphone addiction but also enhances individuals' ability to cope with stress and manage emotions. Consequently, biofeedback therapy can contribute to the prevention of smartphone addiction in the long term.

4.2. Cognitive and behavioral interventions

Cognitive and behavioral interventions are crucial strategies for preventing and addressing smartphone addiction among college students. These methods target maladaptive cognitive and behavioral patterns, helping individuals establish healthier psychological and behavioral habits. Common intervention methods include cognitive-behavioral therapy (CBT), mindfulness-based cognitive behavioral interventions (MBCT), inhibition control training, educational interventions, and physical exercise interventions.

Cognitive Behavioral Therapy (CBT) is a widely used psychological treatment for addiction. By helping patients become aware of their addictive behaviors and the underlying cognitive and emotional reasons, CBT assists individuals in identifying and altering unhealthy thought patterns and behavioral responses. This therapy changes how addicts view themselves and their environment, which in turn influences their specific behaviors. In interventions for smartphone addiction, CBT can help individuals reassess their dependence on smartphones and develop healthier usage patterns. Research shows that CBT for internet addiction remains effective even after six months of treatment, indicating its enduring therapeutic benefits.

Mindfulness-Based Cognitive Therapy (MBCT) is an effective treatment method rooted in Buddhist meditation practices, emphasizing full, direct, and active engagement with present experiences [17]. Through mindfulness exercises, participants can increase their awareness of psychological impulses and maintain appropriate distance from these impulses. This approach is suitable for addressing behavioral addictions, including smartphone addiction. First, meditation can reduce relapse and withdrawal symptoms. Second, mindfulness helps regulate distressing emotional states such as anxiety and depression. Additionally, mindfulness practices assist individuals in

recognizing the intrinsic value of life rather than being absorbed in the superficial rewards of addictive activities. Research has found a significant negative correlation between mindfulness levels and smartphone addiction among university students; higher levels of mindfulness are associated with lower likelihoods of smartphone addiction. Thus, mindfulness-based cognitive interventions are an effective method for addressing smartphone addiction.

Inhibition control training is designed to enhance an individual's ability to resist impulses and control behaviors. Inhibition control is a crucial component of executive function, involving the capacity to resist inappropriate impulses and habitual behaviors. Empirical studies have demonstrated that inhibition control abilities can be significantly improved through training, showing positive outcomes in interventions for addiction, substance abuse, and obesity [18]. Under laboratory conditions, inhibition control training often uses computer-based classic Go/No-Go tasks or stop-signal tasks, with short-term training effects widely recognized. For individuals addicted to smartphones, long-term use can deplete psychological resources, leading to decreased inhibition control abilities. Research has found that university students with high levels of smartphone addiction have significantly lower inhibition control compared to those with lower levels of addiction [19]. Therefore, enhancing students' self-control through inhibition control training is a vital approach to reducing smartphone addiction.

Educational interventions based on the Transtheoretical Model primarily address the external triggers and driving forces behind smartphone addiction. The Transtheoretical Model examines the process of behavioral change and outlines four interrelated components. Firstly, behavioral change is described through five distinct stages, representing the timeline, motivation, and consistency of behavior modification. Secondly, the change process involves activities and events that facilitate behavioral change. Thirdly, decision balance reflects the individual's assessment of the pros and cons of changing behavior. Lastly, self-efficacy refers to the confidence in one's ability to manage high-risk situations without relapse.

Studies show that educational interventions based on the Transtheoretical Model are highly effective in reducing students' smartphone usage time, alleviating dependency, and relieving associated symptoms. These interventions help students recognize the dangers of addictive behaviors, and by enhancing self-efficacy, students can effectively reduce their reliance on smartphones. The Transtheoretical Model promotes progress through each stage, helping individuals reach the action stage and significantly reduce the degree of smartphone addiction.

Exercise intervention, as another effective method, has been shown to reduce smartphone usage time among those addicted to smartphones, thereby decreasing the level of smartphone addiction. Physical exercise is a planned, regular activity aimed at enhancing physical fitness, improving health, regulating mood, and enriching life. Actively engaging in physical exercise helps improve students' physical and mental well-being, which positively impacts their daily studies, life, and social interactions. Exercise can improve mood, reduce anxiety, and enhance cognitive abilities. Therefore, exercise intervention is an effective means to address smartphone addiction, helping university students reduce their reliance on smartphones and improve their overall health.

Intervention strategies for smartphone addiction among university students need to consider the complex factors underlying addictive behaviors. Combining methods such as cognitive improvement, motivational interventions, mindfulness training, family management, school education, as well as biofeedback and exercise interventions, can achieve optimal treatment outcomes. Future research should continue to explore the effectiveness and mechanisms of these interventions to address the increasingly severe social issue of smartphone addiction among university students.

5. Conclusions

With the rise of smartphones, we have entered an "always connected" era. University students frequently use smartphones for social media, short videos, and online games, increasing their dependence on these devices. This addiction is not solely due to smartphones themselves but to the potentially addictive nature of their applications. Smartphone addiction is a significant psychological issue, involving behavioral addiction linked to emotional, motivational, and cognitive-behavioral problems like depression, anxiety, and ADHD.

University students, in a crucial stage of identity formation and goal-setting, often face negative emotions and stress. To manage these, they need support from family, teachers, and friends. Students should engage in open communication, balance work and rest, and participate in social and physical activities to improve emotional well-being and avoid negative mindsets. Universities play a vital role by providing mental health support, counseling services, and promoting healthy habits.

Despite advances, research on smartphone addiction among college students faces challenges. Many smartphone addiction scales lack strong psychometric validity and do not accurately reflect actual usage. Additionally, there is insufficient research on how distal factors like negative emotions influence addiction through proximal factors like maladaptive cognition. Future research should explore these interactions and develop targeted interventions.

Technological interventions, such as Virtual Reality (VR) and Augmented Reality (AR), could offer new ways to address addiction. Big data and artificial intelligence can provide personalized intervention plans, while neuroscience research could reveal underlying brain mechanisms. Cross-disciplinary and long-term studies are needed to fully understand the impact of smartphone addiction on mental health, career development, and social relationships.

In summary, more comprehensive and longitudinal research is needed to understand smartphone addiction among college students. Future studies should integrate psychological theories and develop effective strategies to address this growing issue.

References

- [1] Hong, W., Liu, R. D., Ding, Y., et al. (2020). *Mobile phone addiction and cognitive failures in daily life: The mediating roles of sleep duration and quality and the moderating role of trait selfregulation*. *Addictive Behaviors*, 107, 106383.
- [2] China Internet Network Information Center (CNNIC). (2022). *The 50th Statistical Report on the Development of the Internet in China*. Beijing: China Internet Network Information Center.
- [3] Koopman, J., Rosen, C. C., Gabriel, A. S., Puranik, H., & Johnson, R. E. (2020). *Why and for whom does the pressure to help hurt others? Affective and cognitive mechanisms linking helping pressure to workplace deviance*. *Personnel Psychology*, 73(2), 333362.
- [4] Chen, C. Y., Lian, S. L., Sun, X. J., et al. (2018). *The relationship between social networking site addiction and adolescent depression: The mediating roles of cognitive load and core selfevaluation*. *Psychological Development and Education*, 34(2), 210218.
- [5] Hou, J., Zhu, Y. G., & Fang, X. Y. (2021). *Mobile phone addiction and depression: The multiple mediating roles of social anxiety and negative emotional information attention bias*. *Acta Psychologica Sinica*, 4(4), 362373.
- [6] Baumeister, R. F., & Heatherton, T. E. (1996). *Selfregulation failure: An overview*. *Psychological Inquiry*, 7(1), 115.
- [7] Przybylski, A. K., Murayama, K., DeHaan, C. R., & Gladwell, V. (2013). *Motivational, emotional, and behavioral correlates of fear of missing out*. *Computers in Human Behavior*, 29(4), 1841–1848.
- [8] Russell, W. B. (1988). *Possessions and the extended self*. *Journal of Consumer Research*, 15(2), 139–168.
- [9] Ranjan, L. K., Gupta, P. R., Srivastava, M., & Gujar, M. N. (2021). *Problematic internet use and its association with anxiety among undergraduate students*. *Asian Journal of Social Health and Behavior*, 4(4), 137.
- [10] Young, K. S. (2009). *Internet addiction: The emergence of a new clinical disorder*. *Cyber Psychology & Behavior*, 1(3), 234239.
- [11] Brewer, M. B. (1991). *The social self: On being the same and different at the same time*. *Personality and Social Psychology Bulletin*, 17(5), 475482.

- [12] Su, S. B., & Chen, C. Q. (2009). *Behavioral inhibition abilities of individuals with varying degrees of internet addiction. Chinese Journal of Mental Health*, 23(10), 752-756.
- [13] Steger, M. F., Kashdan, T. B., Sullivan, B. A., & Lorentz, D. (2008). *Understanding the search for meaning in life: Personality, cognitive style, and the dynamic between seeking and experiencing meaning. Journal of Personality*, 76(2), 199–228.
- [14] Park, W. K. (2003). *The mobile phone addiction among Korean college students. Korean Society for Journalism & Communication Studies*, 47, 250-281.
- [15] Peele, S. (1985). *The Meaning of Addiction*. Lexington: Lexington Books.
- [16] Sun, R. N., Qin, J. F., & Jing, L. S. (2020). *Observation of the effect of electroencephalogram biofeedback therapy on college students' mobile phone dependence. Journal of Chengdu Medical College*, 15(6), 752-755.
- [17] Shonin, E., Van Gordon, W., & Griffiths, M. D. (2014). *Are there risks associated with using mindfulness for the treatment of psychopathology? Clinical Practice*, 11(4), 389–392.
- [18] Ding, X. L., Zu, J., & Zhang, X. K. (2018). *Intervention effect of inhibitory control training on college students with mobile phone dependence. Journal of Psychology and Behavioral Research*, 16(3), 342-348.
- [19] Alcorn, J. L., Pike, E., Stoops, W. S., et al. (2017). *A pilot investigation of acute inhibitory control training in cocaine users. Drug and Alcohol Dependence*, 174, 145–149.