Review

Interdisciplinary Insights into Short Video Addiction: Integrating Psychological and Brain imaging Approaches in a Comprehensive Review

Tongshu Li , Huafang Liu , Xiaolong Liu *

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Interdisciplinary Insights into Short Video Addiction: Integrating Psychological and Brain imaging Approaches in a Comprehensive Review

Tongshu Li, Huafang Liu and Xiaolong Liu *

Institute of Brain and Psychological Sciences, Sichuan Normal University, Chengdu 610066, China; DavidLee.BLeaf@outlook.com (T.L.); 13053664612@163.com (H.L.)

* Correspondence: Correspondence: xiaolongliu@sicnu.edu.cn (X.L.)

Abstract: Short video addiction refers to a psychological dependency on short video applications, characterized by an intense attachment and an inability to control usage, leading to typical addiction symptoms. While its definition bears similarities to substance addiction, significant differences also exist. According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), published in 2013, short video addiction has not yet been officially classified as an addiction disorder. To facilitate more in-depth and standardized research on short video addiction, it is essential to synthesize and organize existing studies on its theoretical foundations and mechanisms.

Keywords: short video addiction; Tiktok; psychology; brain imaging; fMRI

1. Introduction

The exponential growth of the internet and the ubiquitous embrace of smartphones have engendered a profound transformation in user engagement patterns, particularly with the advent of short video applications. Characterized by attributes of brevity, accessibility, and immediacy, these short videos have swiftly ascended to prominence as a mainstream mode of new internet content dissemination over the past decade, deftly filling users' fleeting moments of leisure. However, alongside this trend, there has been an emergence of users engaging in uncontrolled and excessive use of short video applications, leading to detrimental effects on their physical and mental health, daily lives, as well as their learning and work. This phenomenon has become more prevalent since the introduction of the short video application Douyin (TikTok overseas) in 2016, attracting widespread attention from psychologists both domestically and internationally.

As excessive use of short videos exhibits symptoms akin to addiction, researchers have termed this phenomenon "short video addiction." Drawing upon conclusions from studies on Facebook addiction, some researchers have posited that short video addiction is conceptually similar to social media addiction (Ryan et al., 2014). Subsequently, building on the concept of social media addiction, other researchers have specifically defined short video addiction as a strong attachment and compulsive repetitive use of short-form videos (SFVs), leading to typical addiction symptoms (Yang et al., 2016). It is evident that the definition of short video addiction often draws parallels with addiction definitions in related fields. Furthermore, many researchers have begun to investigate the negative impacts of short video addiction on users: studies by Hong et al. (2014) and Gao et al. (2017) found that excessive short video use can result in issues such as attention deficits, poor time management, and reduced study time—typical indicators of addiction problems. Short videos may also contribute to mental health issues; according to a 2021 report by the World Health Organization (WHO), approximately 4.4% and 3.6% of users on social networking sites like TikTok suffer from anxiety and depression (Kentaro Kawabe et al., 2021).

Although short video addiction is not included in the International Classification of Diseases, Eleventh Revision 's (ICD-11) branch on addictive behaviors causing disease, and the American Psychological Association (APA) has not yet included it in the Diagnostic and Statistical Manual of

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Mental Disorders, Fifth Edition(DSM-5), the increasing number of short video users and the escalating negative impacts of their problematic use have brought the issue of short video addiction to the forefront as a significant topic in contemporary times, garnering increasing attention from the field of psychology. To advance research in this area, this paper focuses on existing literature related to short video addiction, problematic short video use, and short video use disorders. By integrating and evaluating existing research on short video addiction from four perspectives—definition, measurement tools, survey methods, and underlying mechanisms—the aim is to provide a more systematic understanding and approach to this emerging issue.

2. The Concept of Short Video Addiction

The concept of short video addiction and its growing attention are inseparably linked to the popularity of the short video application. As reported by China Internet Network Information Center (CNNIC) in its 53rd report on March 22, 2024, by December 2023, there were 1.091 billion mobile internet users in China, 99.9% of whom accessed the internet via mobile devices; short video users numbered 1.053 billion, accounting for 96.4% of the total internet user base.

The widespread adoption and popularity of these platforms underscore a significant trend: short videos are increasingly capturing users' fragmented entertainment time and penetrating daily life, raising concerns and discussions about their addictive use. Increasing scholarly attention is being directed towards TikTok, revealing that intensive users of these short video applications exhibit behaviors typical of addiction. This phenomenon, aligning with patterns of behavioral addiction, has been termed "short video addiction."

Definitions of short video addiction vary, often drawing parallels with similar studies, such as social media addiction. Scholars like Tian et al.(2023) have defined it from a technological addiction perspective, categorizing it as a unique form of behavioral addiction. Zheng et al. (2019) suggested that addiction to short video apps should be considered a subtype of internet addiction, negatively impacting personal adaptation and well-being. More recently, comprehensive studies by researchers like Mu et al, (2022) have adopted definitions from social media addiction, characterizing short video addiction as an intense, uncontrollable compulsion to use these apps repeatedly, leading to typical addiction symptoms such as withdrawal (significant negative emotions when unable to access the apps), salience (overpowering influence of short videos on an individual's thoughts and tasks), conflict (interference with other activities), and relapse (inability to reduce usage time).

However, the study of short video addiction faces several criticisms. Firstly, its pathological nature has not been officially recognized, as it is not included in the ICD-11 or DSM-5. Secondly, the concept lacks a unified consensus and clear criteria for addiction levels (Wang et al., 2023). Moreover, methodological issues abound, such as a reliance on cross-sectional designs that fail to account for the longitudinal development and changes in user behavior (Meng & Leung, 2021), difficulties in establishing causal relationships (Liu et al., 2021), inadequate consideration of environmental interventions (Wang et al., 2021), and a dependence on self-reported data from questionnaires and scales, which introduces subjectivity (Su et al., 2021).

3. Measurement Tools for Short Video Addiction

The advancement of psychometric instruments tailored to the assessment of short video addiction has experienced a discernible lag, with standardized scales and structured questionnaires gaining wide use within the scientific community only in recent times. This latency can be largely attributed to the persistent dearth of consensual understanding surrounding the concept of short video addiction, an issue that has engendered an uneven progression in empirical inquiry and consequent measurement tool development. Currently, the primary tools for measuring short video addiction are scales, which are often adaptations of existing addiction scales, such as those for smartphone and internet addiction; there is less use of neuroimaging devices.

The measurement tools used in existing studies each have their own limitations, primarily manifested as: (1) Subjectivity: Predominantly self-report methods are used, making it difficult to ensure objectivity. (2) Lack of Specificity: The scales are adapted from those used to measure related

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types of addiction, such as smartphone, internet, and social media addiction scales, lacking originality and making it difficult to specifically target short video addiction. (3) Diagnostic Inadequacy: Due to the inconsistent definitions of short video addiction, different scales use different standards to define the extent and boundaries of addiction, making it challenging to ensure the ecological validity of the scales in practical applications.

3.1. College Students' Short Video Addiction Scale

In 2019, Haoxuan Qin and colleagues developed the "College Students' Short Video Addiction Scale" suitable for domestic college students (Haoxuan et al., 2019). This scale was based on the "Mobile Phone Addiction Index Scale" (MPAI) developed by Leung at the Chinese University of Hong Kong in 2007 (Leung, 2007). Qin and his team administered the scale to a sample of college students (n=442) using a group testing method. The final scale consisted of four factors: withdrawal, escapism, loss of control, and inefficiency, with a total of 14 items. The scale uses a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating a more pronounced addiction tendency. This scale incorporates the seven diagnostic criteria from Young's IAT for internet addiction diagnosis and uses IAT's screening criteria. After exploratory factor analysis and the removal of items with low loadings, the final scale included seven diagnostic items. The results indicated good reliability and validity of the scale, with a Cronbach's alpha of 0.91, demonstrating good internal consistency and structural validity. The scale, integrating DSM-4 diagnostic criteria and drawing from the widely accepted Young's IAT, possesses preliminary diagnostic capabilities.

3.2. TikTok Addiction Scale – Short Version

In 2022, Maguire and Pellosmaa adapted the "Smartphone Addiction Scale – Short Version" (SAS-SV) developed by Kwon et al. in 2013 (Kwon et al., 2013) to create the "TikTok Addiction Scale – Short Version" (Maguire & Pellosmaa, 2022). They adapted the scale by replacing the term "Smartphone" with "TikTok" while retaining the original scale's six factors and 33 items. The factors include daily life interference, positive anticipation, escapism, online relational orientation, excessive use, and tolerance. The scale uses a 6-point Likert scale from 1 (strongly disagree) to 6 (strongly agree), with higher scores indicating higher levels of TikTok addiction. The revised scale's reliability and validity tests yielded positive results.

3.3. Short-Form Videos Problem Use Scale

In 2023, Y. Chen and colleagues adapted Leung's "Mobile Phone Problem Use Scale" (MMPPUS) from 2007 (Leung, 2007) to create the "Short-form Videos Problem Use Scale" (Chen et al., 2023). They modified the MMPPUS by replacing "Mobile Phone" with "Short-form videos" and reassessed the reliability and validity of the original scale's four dimensions and 17 items. The revised scale demonstrated good reliability with a Cronbach's alpha of 0.91, CFI of 0.94, TLI of 0.93, and RMSEA of 0.08. This scale has demonstrated cross-cultural applicability; originally designed for Korean adolescents, its successful adaptation for Chinese college students indirectly validates the original scale's cross-cultural capabilities and the potential cross-cultural consistency of this addiction issue.

4. Research Methods for Short Video Addiction

The primary methodologies employed in the study of short video addiction include surveys, which are conducted online, offline, and through case studies. Online surveys involve researchers distributing questionnaires or scales related to short video addiction via internet-based channels to collect data from online users, such as through platforms like SurveyMonkey. Offline surveys, while entail researchers administering paper-based questionnaires or scales directly in real-world settings and collecting them afterward. Case studies involve comprehensive and in-depth investigations of individuals who exhibit significant distinctive characteristics (Chen et al., 2003).

 doi:10.20944/preprints202405.0824.v1

Among these, online surveys are most commonly used in the study of short video addiction. Given that short video addiction is a form of modern media addiction with inherent online characteristics, this method is particularly apt. Online surveys offer several advantages: they are efficient, cost-effective, and provide access to a broad data source, facilitating cross-cultural and cross-regional research. However, there are several issues associated with online surveys: (1) Subjectivity of data. Online surveys typically require self-reporting by users, and since the operation is conducted online, researchers cannot monitor participants or give immediate attention, leading to potential individual biases in understanding the questions and scales, which can compromise the objectivity of the data. (2) Limitation to exploratory and descriptive research. The results obtained from survey methods are confined to exploratory and descriptive research levels and do not establish causal relationships between variables, which is a significant limitation of this approach.

5. Mechanisms of Short Video Addiction

According to existing research, the mechanisms of short video addiction can be categorized into three primary aspects: behavioral, psychological, and neurological mechanisms.

In terms of behavioral mechanisms, studies have demonstrated significant effects of short video addiction on an individual's attention. Specifically, compared to non-addicts, those addicted to short videos exhibit lower levels of attentional focus (Meng & Leung, 2021; Zhang et al., 2019), shorter average gaze duration, longer reaction times, and higher error rates when processing and responding to target and distracting information. Y. Chen et al. used the Stroop test paradigm to assess individuals with short video addiction and found that, compared to non-addicts, addicts had lower attention scores, indicating poorer concentration levels; they also had more frequent but shorter gaze durations and were significantly more distracted by longer videos, indicating weaker attention maintenance capabilities; addicts also took longer to differentiate between distractors and targets, reflecting poorer resistance to distractions. These findings confirm that addicts exhibit more pronounced attentional issues (Chen et al., 2023). Short videos are characterized by their brevity, richness, diversity, and low content coherence, which constitute their unique fragmented pattern. This fragmentation accelerates the speed of information dissemination, allowing users to quickly browse and filter content of interest. However, this pattern can also intensely stimulate the brain's pleasure centers in a short period, leading to substantial dopamine release. Prolonged exposure to high levels of dopamine can intensify cravings, during which the activity of dopamine-degrading enzymes and the availability of dopamine transporters may decrease (Weinstein & Lejoyeux, 2015; A. M. Weinstein, 2010), resulting in typical addiction symptoms (Hou et al., 2012; Kim et al., 2011). Consequently, many researchers believe that this attention-disruptive fragmentation model is a root cause of the addictive nature of short videos (Firth et al., 2019).

Furthermore, research has shown that excessive use of short videos impacts users' perception of time. Researchers suggest that short videos act like a "time black hole," shortening people's perception of time due to the high immersion experience they provide. Immersion leads to heightened control, increased awareness, and concentrated attention, while also causing individuals to forget their surroundings and the passage of time (Michailidis et al., 2018; Yang et al., 2014). The features of short videos, such as "active recommendations and interactive information," focus users on current stimuli, reducing attention to the past and future. At the same time, the brain's cognitive control regions are predisposed, making users more susceptible to entering a state of immersion, thereby disrupting time perception (Su et al., 2021).

Regarding psychological mechanisms, existing research has demonstrated that short video addiction can impact an individual's mental health. Specifically, those addicted to short videos exhibit a higher prevalence of mental health issues such as depression, anxiety, and increased stress levels compared to non-addicts. According to a cross-sectional study by Maguire et al., there is a significant positive correlation between TikTok addiction and negative mental health outcomes; as TikTok usage increases, so do levels of depression, anxiety, and stress, with anxiety and stress showing the highest correlation with excessive use of short videos (Maguire & Pellosmaa, 2022).

 doi:10.20944/preprints202405.0824.v1

There are two prevailing explanations for the negative psychological impacts of short video addiction. Some researchers argue that the positive correlation between short video addiction and mental health issues is inseparable from the unique gratification properties of short videos: firstly, short videos can provide a variety of content forms, combining audio, images, and text in a multi-channel sensory activation that greatly enhances content stimuli and user satisfaction (Tian et al., 2023); secondly, the algorithmic loop of short videos ensures users always receive the most relevant content, satisfying their needs. Short video platforms utilize personalized algorithms that extensively collect users' preferences and behavioral data, using filtering techniques to precisely deliver favored content, significantly reducing the cost of information acquisition and shaping user habits and experiences in a continuous cycle of 'push-accept-algorithm optimization-repush...' (Zhao, 2021); thirdly, the high accessibility of stimulating content in short videos provides users with a strong immersive experience, where intense immersion can be achieved at a very low cost, leading to substantial gratification (Gillespie et al., 2009; Zhao, 2021). From this perspective, the intense satisfaction derived from short videos can lead to severe withdrawal reactions and discomfort when users are unable to access or are forced to disengage from these platforms, thereby leading to anxiety, depression, and other mental health issues.

Alternatively, other researchers believe that the psychological health issues stemming from short video addiction are largely related to the fear of missing out (FOMO), which is an anxiety that emerges from the possibility of missing out on important information or novel events, accompanied by diffuse emotions such as fear, loss, worry, and frustration (Przybylski et al., 2013). Short videos also have social functions that greatly satisfy users' social needs. When users are unable to continue using short videos or are interrupted by external factors, FOMO can lead to discomfort, such as worry, fear, and anxiety, thereby prompting users to find ways to quickly reactivate their short video apps to continue meeting their needs and avoid negative emotions.

In terms of neural mechanisms, existing research has confirmed that watching algorithmically recommended short videos continuously stimulates the Ventral Tegmental Area (VTA) of the brain, a region critical for the neural circuits involved in pleasure and motivational reinforcement. Prolonged activation of this area can induce cravings and addiction (Su et al., 2021). Studies have shown that excessive use of digital applications like TikTok can affect learning systems and memory circuits, gradually transitioning the recreational use of short videos into habitual and ultimately compulsive use (Hyman et al., 2006). In 2021, Su and colleagues conducted a detailed study using fMRI technology on the brain activity of individuals addicted to short videos, exploring brain activations during the viewing of personalized recommended videos. This study provides a neurobiological explanation for the issue of users' prolonged focused use of short video apps due to recommendation algorithms (Su et al., 2021), marking one of the earliest empirical studies on short video addiction that incorporated neuroimaging.

Researchers compared brain activations between watching algorithmically personalized videos (PV) and system-randomly recommended videos (GV) using fMRI neuroimaging. The fMRI results indicated that, addicts watching short videos were in a state of high arousal, which correlated with stimulation across multiple brain regions. When viewing PV, the Default Mode Network (DMN) was activated in a wide range of cognitive tasks. The DMN plays a crucial role in processing self-relevant information, including monitoring the external environment, self-reflection, social cognition, and autobiographical memory. Higher activations in the DMN subcomponents, VTA, and discrete areas including the lateral prefrontal cortex, anterior thalamus, and cerebellum were observed, indicating enhanced functions such as self-awareness, emotional regulation, cognitive control, and social cognition among addicts watching personalized videos, with multiple brain areas being highly active.

The widespread activation of multiple brain regions in short video viewing is related to its multi-channel communication format. Regardless of the video type, the ventral (occipito-temporal) and dorsal visual pathways (occipito-parietal) as well as auditory pathways were broadly activated, indicating that short videos stimulated the audiovisual pathways of addicts, enhancing inter-regional brain cooperation and information exchange, thereby increasing brain activity and excitement.

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The inability of addicts to self-regulate their viewing of recommended videos is associated with limited brain regulatory functions. Under PV conditions, addicts showed reduced brain regulation capabilities, making them more susceptible to immersive experiences and thus promoting addiction. This was particularly evident in lower activations in DMN subregions (such as vMPFC), dACC, caudate, and parts of the thalamus. These DMN subregions are known to regulate internal brain activities and optimize cognitive functions (Anticevic et al., 2012), while the ACC, caudate, and thalamus have been shown to play roles in inhibitory control (Hart et al., 2013). Reduced activation in these areas leads to diminished regulatory and inhibitory control, deepening immersion in short videos and potentially exacerbating problematic use leading to addiction.

There is a close association between short video addiction and brain regions related to self-control. Self-control is described as the ability to inhibit internal impulses, restrain desired behaviors, and resist external temptations (Muraven & Baumeister, 2000). fMRI results showed that under PV conditions, the DMN and VTA subsystems, specifically the dMPFC (dorsomedial prefrontal cortex), were more active compared to GV conditions. High and sustained activation of the VTA region contributes to pleasure and motivational reinforcement from stimuli, leading to cravings and addiction, ultimately demonstrating a significant negative correlation between TikTok use and self-control, consistent with findings in other behavioral addictions such as internet addiction (Özdemir et al., 2014; Shirinkam et al., 2016), gaming addiction (Mehroof, 2010), and smartphone addiction (Han et al., 2017).

These findings suggest that short video recommendation algorithms can effectively identify content of greatest interest to users, rapidly and sustainably activating DMN subregions and VTA activity, thereby enhancing short video viewing behavior. The DMN subregions and VTA may represent the neural basis for advanced processing in personalized video perception and addiction.

6. Future Perspectives

As outlined above, short video addiction is an increasingly prominent topic of interest within the field of psychology, and research into this phenomenon is still emerging. From the perspective of addiction studies, the majority of current research supports classifying short video addiction under behavioral addictions. It shares similarities with substance addictions, such as adopting similar criteria for diagnosing addiction; however, it also presents significant differences in its manifestations. From the standpoint of behavioral addiction, short video addiction is closely related to other types of behavioral addictions. Recent studies have identified factors influencing short video addiction that are connected to earlier research on similar addictions, such as the impact of personality and flow experiences, which have also been demonstrated in smartphone addiction (Meng & Leung, 2021; Sun et al., 2015), and the influence of social needs, as shown in Facebook addiction (Fernandez et al., 2012). The methodologies and theoretical approaches in the study of short video addiction draw heavily on these precedents.

Future research should start by defining the concept and criteria of short video addiction more scientifically and accurately, taking into account its unique characteristics. Based on a solid scientific definition, research methods should be expanded to include: (1) more longitudinal study designs that thoroughly consider individual differences and cross-cultural, cross-regional issues; (2) the incorporation of interviews and experimental methods, along with the development of highly specific and targeted scales; (3) the integration of neuroimaging techniques to analyze the neural mechanisms of attention, emotion, memory, and reward systems in short video addicts, thereby exploring the neural basis of this addiction. With more comprehensive and targeted research methods, it will be possible to summarize and refine the diverse theories and models of short video addiction and conduct more standardized and in-depth studies into its mechanisms.

In conclusion, short videos as a unique product of contemporary digital media, harness advanced algorithmic architectures to meticulously align with individual user predilections, thereby engendering profound levels of satisfaction. The potential negative impacts of short video usage have been repeatedly highlighted and warned about by researchers attest to its status as a pressing concern

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meriting rigorous scholarly research. It is clear that the path to understanding short video addiction is long and demands continued scholarly exploration.

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