

The Formation Mechanism of Short Video Addiction from a Human-Computer Interaction Perspective: Postprint

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Date: 2023-10-09T00:00:00+00:00

Abstract

Short video addiction is a problematic behavior in which individuals compulsively watch short videos, leading to significant loss of behavioral control or attentional disorders, and further causing difficulties in interpersonal, academic, and/or occupational adaptation. With the continuous expansion of the short video user base and the trend toward younger demographics, the threat of short video addiction to users' physical and mental health has attracted widespread attention. From a human-computer interaction perspective, short video usage is first divided into two categories: "instrumental" and "ritualistic." Second, by considering the human-computer interaction process and user vulnerability characteristics, a framework for the mechanism of short video addiction development is constructed. Finally, theoretical interpretations of short video addiction are provided from cognitive, emotional, motivational, and social perspectives. Future research should emphasize the mechanism of short video addiction development, focus on the media characteristics and technical attributes that trigger addiction, and dedicate efforts to promoting the prevention and governance of short video addiction.

Full Text

Preamble

ChinaXiv Collaborative Journal *Advances in Psychological Science*
2023, Vol. 31, No. 12, 2337-2349

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<https://doi.org/10.3724/SP.J.1042.2023.02337>

The Occurrence Mechanism of Short Video Indulgence from a Human-Computer Interaction Perspective*

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Abstract: Short video indulgence refers to a problematic behavior in which individuals compulsively watch short videos, resulting in significant loss of behavioral control or attentional impairment, and subsequently causing difficulties in interpersonal, academic, and/or occupational adaptation. As the user base expands and trends toward younger demographics, the threat of short video indulgence to users' physical and mental health has attracted widespread concern. From a human-computer interaction perspective, this paper first categorizes short video usage into "instrumental" and "ritualistic" types. Second, by considering both the human-computer interaction process and user susceptibility characteristics, a framework for the occurrence mechanism of short video indulgence is constructed. Finally, theoretical explanations for short video indulgence are provided from cognitive, emotional, motivational, and social perspectives. Future research should emphasize the occurrence mechanism of short video indulgence, focus on the media characteristics and technical properties that trigger indulgence, and work toward promoting the prevention and governance of short video indulgence.

Keywords: short video indulgence, human-computer interaction, instrumental use, ritual use, algorithmic closed loop

Classification Code: B849

Short videos refer to online videos ranging from a few seconds to several minutes in length, published and shared through social media platforms, video-sharing websites, and mobile applications. Due to their rich content, simple interaction, and broad age appropriateness, short videos have gained widespread popularity among users. The *Statistical Report on China's Internet Development* shows that in the first half of 2022, domestic short video users increased by 28.05 million, with total users exceeding 1 billion by year-end (CNNIC, 2022). A short video user survey report indicates that users' average daily usage exceeds 2.5 hours (QuestMobile, 2023), and over 60% of minors use short videos (Fang et al., 2022). As short videos increasingly "encroach" on daily life and "spread" to younger populations, concerns about short video indulgence and its harms have gradually attracted researchers' attention (Chen et al., 2022; Qin et al., 2022; Smith & Short, 2022; Ye et al., 2022; Zenone et al., 2021).

In related research, short videos are often treated as a type of online social media, with their unique impact on users receiving insufficient attention. As online social services continue to differentiate, various platforms have developed distinct functions, user groups, and social models (Cinelli et al., 2021). Leung and Chen (2021) suggested in their review that future research on internet addiction

should focus on specific behaviors or content types. Scholars have also called for attention to the differences between short videos and traditional social services to truly understand how they affect users (Masciantonio et al., 2021). Compared to traditional social media, short videos possess addiction-prone attributes such as high-density information stimulation and low participation costs. Blurring the distinction between short videos and general social media may lead to underestimation of short video indulgence problems and even pose hidden risks for the development of the short video industry and users' mental health. This paper focuses on short videos as an information carrier and their unique properties. Through a review of relevant literature and consideration of short video characteristics and usage patterns, we first analyze the facilitating mechanisms of short video indulgence from a human-computer interaction perspective; then delve into the user level to explore susceptibility factors for short video indulgence; and finally provide theoretical explanations from psychological and social perspectives, aiming to offer systematic insights into this issue.

2. Short Video Use and Indulgence

Short video usage patterns significantly influence the formation and maintenance of short video indulgence. Excessive viewing of short videos recommended by “personalized algorithms” can lead to abundant reward stimulation and neural adaptation, potentially exacerbating the degree of short video indulgence (Su et al., 2021). Meanwhile, indulgence tendencies also affect short video usage behavior. Research shows that craving for short video use leads to increasing frequency and duration of use (Tian et al., 2023). As we know, short video use does not necessarily lead to indulgence. To better understand the development process of short video indulgence, it is necessary to categorize short video usage behaviors.

2.1 Instrumental Use vs. Ritualistic Use of Short Videos

In social media research, user behaviors are often divided into “active use” and “passive use.” Active use refers to behaviors that create and share information to promote interaction with others, such as posting updates or comments; passive use refers to viewing information without engaging in interaction, such as browsing others' updates or statuses (Liu et al., 2017; Scherr & Wang, 2021). Researchers have found that, after controlling for gender and age effects, active short video use positively predicts individual well-being, while passive use has the opposite effect (Pan et al., 2023; Wu et al., 2021). With the emergence of personalized recommendation algorithms, short video content has gained the ability to “actively” match users (Zhang & Liu, 2021). Consequently, the primary usage pattern for most short video platform users may be passive information consumption on the “recommendation page,” which is the so-called “passive use” (Wu et al., 2021). Therefore, for short video usage, the “active vs. passive” distinction is no longer sufficient to reveal the developmental process from normal use to indulgence.

In drug addiction research, addicts' behaviors are generally considered to undergo a transition from "purposeful instrumental use" to "uncontrollable habitual use," depending on the interaction between "conditioned reflex¹" and "unconditioned reflex²" (Doñamayor et al., 2021; Everitt & Robbins, 2005). In other words, in the initial stage, individuals' drug use is purposeful, consciously pursuing stimulation, satisfying desires, or obtaining rewards. However, as behavioral outcomes are continuously reinforced, the behavior gradually becomes habitual and difficult to control. Individuals begin to exhibit automated behavior patterns, develop strong cravings and dependence on drugs, and lose autonomous control over their behavior (Doñamayor et al., 2021; Hogarth et al., 2013). This transition from "instrumental use" to "habitual use" contains the occurrence process of addictive behavior, providing important guidance for understanding, preventing, and treating addiction.

The ambiguity between reasonable use and problematic use of short videos may be precisely caused by the potential transformation between these two usage behaviors. Short videos emerged to meet society's demand for information diversification, while their high accessibility and intelligent recommendation algorithms have made them prevalent (Zhao, 2021). Given these addiction-prone characteristics, it is necessary to examine the interaction between users and short video media when discussing short video indulgence. Building on the classification foundation of drug use mentioned above, and combining communication scholar Rubin's classification of television viewing behaviors (Rubin & Perse, 1987), we propose dividing short video usage into "Instrumental Use" and "Ritual Use." Instrumental use of short videos refers to usage behaviors oriented toward achieving specific goals or meeting certain needs, where short videos serve as a tool or means to reach users' particular objectives, such as learning new knowledge, obtaining information, or solving problems. Ritualistic use of short videos refers to usage behaviors without subjective purpose, where short video use becomes a habitual behavior associated with specific contexts, times, or situations.

Compared to "active vs. passive," which emphasizes interaction between users and social objects behind the media, the "instrumental vs. ritual" distinction focuses on the interaction mode between users and the short video medium itself, helping to reveal the developmental process from short video use to indulgence while expanding new human-computer interaction perspectives for short video indulgence research. Instrumental and ritual use of short videos represent a classification based on users' subjective purposes and intentions; therefore, these two behaviors may intersect and overlap in each user's actual usage and may also transform into each other. For example, a user might initially use short videos out of curiosity or entertainment motivation—that is, instrumental use. As the user continuously obtains stimulation satisfaction from short videos and the behavior is continuously reinforced, it may gradually develop into a habitual behavior or even emotional dependence (ritual use), bringing the user closer to indulgence.

2.2 Concept of Short Video Indulgence

Uncontrolled use of social media is generally considered to have addictive tendencies (Ryan et al., 2014; Smith & Short, 2022). Since no research has yet identified symptoms or clinical diagnostic criteria for short video addiction, and to standardize terminology and reduce conceptual confusion, this paper adopts the term “short video indulgence³” from *People’s Daily* (Cui, 2023) to summarize this problematic usage behavior. Li et al. (2021) described short video indulgence as a chronic or periodic fascination state caused by repeated use of short video apps (Kuaishou, Douyin, etc.), producing strong, persistent craving and psychological and behavioral dependence. Some studies have also examined short video “indulgence” or “problematic use” (e.g., Mao & Jiang, 2022; Nong et al., 2023; Ye et al., 2022) but have not provided definitions. Like research on Facebook addiction, conceptual controversies emerged from the beginning and still exist today (Griffiths, 2000; Ryan et al., 2014). However, such controversies do not hinder ongoing research; they may even motivate scholars in the field. Of course, the short video research field is similar—conceptual disputes may persist for some time, but they do not prevent the gradual rise of short video indulgence research (e.g., Zhang et al., 2023). Objectively speaking, existing definitions of short video indulgence are almost entirely borrowed from concepts in related fields (such as internet addiction, Zhang et al., 2019) and have not yet addressed the uniqueness of short video indulgence behavior, indicating that current research remains in its early stages.

In 1980, gambling addiction was included in the American clinical psychiatric diagnostic manual (DSM-III), opening the door for theoretical research on non-substance addictions (such as internet addiction) (Griffiths, 2000). Later, public and academic attention to internet addiction also increased. In 2014, van Rooij and Prause compared three widely discussed internet addiction diagnostic criteria (or models) (Griffiths’ components model, Young’s Internet Addiction Test (IAT), and Tao et al.’s (2010) internet addiction diagnostic criteria) and found three features mentioned simultaneously: lack of control over internet use, resulting psychological, social, or occupational conflicts or problems, and mental distress. They also called on the academic community to focus on specific addictive behaviors, as the concept of internet addiction had become too vague for various specific forms of inappropriate internet use. In light of this, based on van Rooij and Prause’s (2014) summary of the three features of internet addiction and a review of existing research, we propose a descriptive concept of short video indulgence: short video indulgence is a problematic behavior in which an individual’s compulsive viewing of short videos leads to obvious behavioral control loss or attention disorder, and further causes difficulties in interpersonal, learning, and/or work adaptation. It should be noted that this descriptive concept aims to promote public and scholarly attention and research on short video indulgence and does not have any diagnostic significance.

Current research on short video indulgence focuses more on its harmful effects. For example, short video indulgence may lead to difficulty concentrating, poor

time management, declining academic performance, and a series of other problems (Chen et al., 2022; Su et al., 2021; Tian et al., 2023; Ye et al., 2022; Zhang et al., 2019). A recent study also found that short video indulgence causes cognitive dissonance and emotional fluctuations, further leading to intermittent work stoppages (Feng et al., 2022). Thus, preventing short video indulgence is an urgent social problem. However, the academic community lacks attention to the occurrence mechanism of short video indulgence, making it impossible to propose targeted scientific measures for its governance. This paper focuses on short videos as an information carrier and their unique properties. Through literature review and consideration of short video characteristics and usage patterns, we first analyze the facilitating mechanisms of short video indulgence from a human-computer interaction perspective; then delve into the user level to explore susceptibility factors; and finally provide theoretical explanations from psychological and social perspectives, aiming to offer systematic insights into this issue.

3. Human-Computer Interaction Perspective on Short Video Indulgence

Short video indulgence is a possible behavioral outcome of user interaction with short video services. To more comprehensively understand the process from short video use to indulgence, this paper reviews existing research from a human-computer interaction perspective. From four levels—information technology, content service, human-computer interaction, and user experience—we reveal the external occurrence mechanisms of short video indulgence while also examining the addiction-prone nature of short video media.

3.1 Information Technology Level—Algorithmic “Closed Loop”

One of the primary reasons for the rapid popularity of short videos is the application of personalized recommendation algorithms (Zhao, 2021). Personalized algorithms can collect users’ interest preferences and behavioral records and deliver short videos precisely to users’ mobile devices through content filtering⁴ and collaborative filtering⁵ (Geschke et al., 2019). Personalized algorithms represent a massive transformation for social media, as they liberate people from vast amounts of irrelevant information, eliminating the need for active searching or selection and allowing users to consume entertainment content based on algorithmic recommendations. This model greatly reduces the cost of obtaining information and changes people’s habits and experiences of acquiring information on the internet. As user data accumulates, algorithms can continuously optimize, making information push mechanisms more refined and accurate (Bobadilla et al., 2013; Chaney et al., 2018; Zhang & Liu, 2021). If the cycle of “personalized push—user need satisfaction—behavioral data accumulation—algorithm optimization—personalized push—...” continues, it forms the so-called algorithmic “closed loop” (see Figure 1 [Figure 1: see original paper]) (Zhao, 2021). This cycle can cause users to develop dependence and loss of self-control

through repeated satisfaction, ultimately potentially leading to short video indulgence or even addiction (Qin et al., 2022; Smith & Short, 2022). Research has also confirmed that watching personalized recommended short videos continuously stimulates the brain's ventral tegmental area (VTA), a neural circuit that generates pleasure and reinforcement motivation in response to stimuli. Sustained activation of this region can produce craving and addiction (Su et al., 2021).

3.2 Content Service Level— “Multi-Channel” Satisfaction

Short videos are brief online videos, typically lasting from a few seconds to several minutes. The compression of video duration increases the accessibility of information and entertainment for people in fast-paced lifestyles, giving short videos extensive user traffic (Wang, 2020; Wu, 2020). Zea and Jung (2019) found through behavioral case studies that most respondents believed short videos better fit their busy lifestyles because they could obtain sufficiently rich information stimulation within limited time. Research has also found that the fragmented communication mode of short videos perfectly matches users' needs for spiritual pleasure during fragmented time (Fang et al., 2019; Qin et al., 2022; Wu, 2020).

Although most short videos last only a few seconds to tens of seconds, their elements are sufficiently rich (Wang, 2020). This richness is reflected in both information content and presentation methods. Taking Douyin as an example, in terms of information content, short video themes cover news, beauty, cooking, movies, education, health, sports, technology, and other fields, meeting users' various information needs. In terms of information presentation, short videos typically combine bright melodies, eye-catching text, and corresponding video materials. This “multi-channel” sensory arousal can enhance users' experience of information content, thereby further reinforcing short video usage behavior. When users interact with a system, pleasant or stress-relieving experiences encourage them to repeat the interaction (Hernández et al., 2019; Kennett et al., 2013; Liu & Chang, 2016), and the same applies to short video use. The rich stimulation from short videos activates users' pleasure, alleviates negative emotions, and leads users to increase usage frequency and duration to reinforce this behavior (Mu et al., 2022; Tian et al., 2023). The continuous repetition of emotions and continuous reinforcement of behavior cause users to develop dependence on short videos, ultimately potentially leading to indulgence (Kennett et al., 2013).

3.3 Human-Computer Interaction Level— “High-Reward” Trap

Concise interaction modes and rich information experiences are the advantages and characteristics of short videos (Tian et al., 2023). However, long-term access to highly accessible stimulation satisfaction is highly likely to bring addiction risks (Zhao, 2021), as evidenced by related research in the addiction field. Studies show that high accessibility of stimuli increases addiction risk (Gillespie et

al., 2007, 2009; Volkow et al., 2019). The portability, immediacy, and ease of use of mobile electronic games can lead to more severe gaming addiction risks (Wang et al., 2019). Communication scholar Schramm proposed a formula to explain people's choices among different media: $\text{Probability of choice} = \frac{\text{Possible reward}}{\text{Effort required}}$ (Wilbur Schramm, 1984). In other words, when the satisfaction obtained through using a medium is greater and the effort required is less, the probability of users choosing that channel will be higher. For short video users, only a single-finger "swipe up" is needed to obtain a continuous stream of rich information, which greatly reduces the cost required for users to obtain information satisfaction (Huang et al., 2022; Su et al., 2021; Wu et al., 2021; Zhao, 2021). If we consider users' cognitive investment as cost and obtained stimulation satisfaction as benefit, compared to activities requiring high cognitive participation (such as gaming) or long-term concentrated attention (such as watching movies), short video use is clearly a "low investment, high reward" resource exchange activity. This high reward nature will continuously reinforce short video usage behavior, thereby causing indulgence risks.

3.4 User Experience Level— "Immersion" Experience

Previous research on internet addiction has shown that immersion during use is one of the key driving factors leading to indulgence (Kang et al., 2013; Kwak et al., 2014; Liu & Chang, 2016; Seo & Ray, 2019). Immersion makes individuals experience high control, high arousal, and concentrated attention, while also forgetting their surroundings and the passage of time (Michailidis et al., 2018; Yang et al., 2014; Lavoie & Zheng, 2023). When users interact with short videos—a medium characterized by "active recommendation, rich information, and simple interaction"—they focus more on current stimuli and less on the future or past, which is the so-called "immersion" experience. Research shows that short videos can create immersion for users through first-person perspective content (Wang, 2020). Moreover, when individuals watch algorithmically recommended short videos in personal accounts, brain regions related to cognitive control are suppressed, making it easy to enter an immersive state (Su et al., 2021). This low-cost immersion may bring huge indulgence risks to short video users.

It should be noted that although a considerable number of studies on internet or gaming addiction have used flow to explain the internal mechanisms of addicts (e.g., Chou & Ting, 2003; Huang et al., 2022; Liu & Chang, 2016; Pearson et al., 2021; Yang et al., 2014), flow and immersion are somewhat different, and this difference is precisely the key to distinguishing short video indulgence from general internet addiction. Specifically, flow refers to a holistic feeling people experience when fully engaged in an activity, representing an optimal experience (Csikszentmihalyi, 1990; Leung, 2020). This state includes: high levels of competence and control, high levels of challenge and arousal, highly concentrated attention, internal perceived pleasure, and high goal orientation and sense of achievement. Therefore, one condition for achieving flow is that an individual's ability must balance the task's challenge (Liu & Chang, 2016; Yang et al., 2014;

Zhou, 2013). When using short videos, users can obtain rich information stimulation with very low interaction cost, which does not meet the preconditions for flow experience. Immersion, however, is a subjective experience—the feeling of being surrounded by an environment that provides continuous stimulation (Witmer & Singer, 1998; Xu & Tayyab, 2021). Although flow and immersion have only subtle structural differences, they represent different psychological phenomena (Michailidis et al., 2018). Immersion is not an extreme state and does not require high-level interaction balance and perceived pleasure. In summary, compared to flow, immersion may be more suitable for describing users' focused state when using short videos.

Through a review of existing research and a novel human-computer interaction perspective, we argue that short videos have greater addiction-inducing potential than general social media and deserve unique attention. Information technology, content service, human-computer interaction, and user experience are the four components of user interaction with short video media (see Figure 2 [Figure 2: see original paper]). Each level of the framework identifies the most critical elements (not exhaustive) to provide clear research entry points for future studies. Additionally, the framework incorporates the concept of the algorithmic “closed loop,” making the overall cycle closed and more vividly presenting the behavioral reinforcement process of short video indulgence. To reveal the occurrence mechanism of short video indulgence and systematically 梳理 its influencing factors, focusing only on the interaction components is far from sufficient; the susceptibility characteristics of short video users are also key components of indulgent behavior.

4. Susceptibility Characteristics of Short Video Indulgence

In recent years, Brand et al. (2016, 2019) proposed the I-PACE (Interaction of Person-Affect-Cognition-Execution) model, which has gained attention and recognition in the field of problematic internet use behavior. This model systematically investigates the occurrence and maintenance of problematic behaviors from an integrated perspective of individual, affective, cognitive, and behavioral factors, providing a theoretical foundation for related research and clinical practice (Brand et al., 2019). Short video indulgence also belongs to problematic internet use behavior, so this paper will draw on the I-PACE model's classification of individual core characteristics to summarize and prospect both universal and unique susceptibility characteristics of short video indulgence.

4.1 Universal Susceptibility Characteristics

According to the life-course perspective, individuals' current behavioral performance is influenced by genetics and life experiences. Research shows that individuals carrying specific genotypes are more likely to show addiction to online stimuli (Hahn et al., 2017); negative life events in early life (Schneider et al., 2017) and resulting insecure attachment (Alvarez-Monjaras et al., 2019; Zhang et al., 2019) may also lead to dependence on immediate gratification; from a

mental health perspective, individuals with social anxiety and high perceived social rejection are more likely to seek compensation online, subsequently showing addictive behavior (Ho et al., 2014); in terms of personality traits, neuroticism and impulsivity are often regarded as risk factors for addiction (Kayaş et al., 2016). The above-mentioned factors that generally facilitate addictive behavior remain applicable to inducing short video users' indulgent behavior. For example, Mao and Jiang (2022) found that neurotic personality can significantly positively predict short video indulgence. Zhang et al. (2019) also found that individuals with social anxiety and high perceived social rejection are more likely to develop short video indulgence. Of course, some individual factors, such as high self-control ability (Li et al., 2021) and high perceived social support (Lei et al., 2018), are considered protective factors against addictive behavior. Future researchers should conduct more targeted studies incorporating short video characteristics.

4.2 Unique Susceptibility Characteristics

Compared to traditional social media, short videos have many features such as personalized algorithmic recommendation, brief yet rich content, and low interaction cost. These characteristics may highly align with certain personalities or needs of short video users, together forming the “facilitators” of indulgent behavior. From a need-motivation perspective, we propose some potential susceptibility characteristics corresponding to the four aspects of the external occurrence mechanism of short video indulgence (information technology, content service, human-computer interaction, user experience): 1) The personalized recommendation algorithm behind short videos surrounds users with information matching their personal preferences. Therefore, individuals with low openness personality traits or self-centered biases may be more adapted to short video algorithms' information distribution mechanism, thus having greater indulgence risk; 2) Short video content is brief but element-rich, providing stimulation satisfaction during fragmented time. Thus, short video users with boredom proneness, sensation seeking, and higher optimal arousal levels are more likely to develop indulgent behavior; 3) As an information medium, short videos are characterized by simple interaction and low cognitive participation. For users seeking immediate gratification and having low self-control ability, short video indulgence is a potential risk; 4) Watching short videos allows users to escape from stressful environments and relieve negative emotions. Therefore, users with high stress sensitivity, high current perceived stress, depressive emotions, and negative coping styles are more likely to develop short video indulgence (Liu et al., 2021; Yao et al., 2023). It should be noted that these interaction-process-based susceptibility factors are mostly theoretical considerations and urgently require scientific verification in future research.

4.3 Occurrence Mechanism of Short Video Indulgence

Based on the human-computer interaction perspective, the previous sections summarized and 梳理 relevant factors in the occurrence process of short video indulgence, mainly divided into two parts: short video media characteristics and their accompanying interaction features, and user susceptibility characteristics. The combination of these factors may push users' short video usage behavior from "instrumental" to "ritualistic," ultimately leading to short video indulgence. Building on this, we constructed a short video indulgence occurrence mechanism framework, exploring it from both human-computer interaction and susceptibility characteristics perspectives (see Figure 3 [Figure 3: see original paper]). The first part includes four components: information technology, content service, human-computer interaction, and user experience, whose typical characteristics can be summarized as technological advancement, content richness, high interaction reward, and user immersion. Additionally, driven by recommendation algorithms, users' short video usage behavior is continuously reinforced. The second part 梳理 susceptibility factors for short video indulgence. The four categories of unique susceptibility characteristics correspond to the four components of the interaction mechanism, while universal susceptibility characteristics represent categories that generally facilitate addictive behavior. Considering the similarities between short video indulgence and general internet addiction, the "unique" and "universal" susceptibility characteristics intersect and overlap. Overall, the role of the interaction mechanism is to awaken susceptibility characteristics, while susceptibility characteristics increase users' responsiveness and vulnerability to inducing factors. The various elements of the human-computer interaction part, intertwined with users' susceptibility characteristics under the drive of recommendation algorithms, promote the transformation of users' short video usage patterns from "instrumental" to "ritualistic," ultimately leading to short video indulgence. This framework attempts to clarify the causes and processes of short video indulgence and provides researchers in this field with a systematic thinking framework to promote scientific governance of short video indulgence.

5. Theoretical Perspectives on Short Video Indulgence

The occurrence mechanism of short video indulgence can be revealed by 梳理 various factors leading to indulgence and their interactions. However, to more deeply understand the psychological mechanisms of short video indulgence, scientific theoretical analysis is also needed. Below, we provide theoretical exposition of short video indulgence from cognitive, emotional, motivational, and social perspectives, aiming to enhance public reflection on short video use and provide a scientific basis for research on short video indulgence problems.

5.1 Cognitive Level—Dual Process Theory

Dual Process Theory posits that individual cognition and decision-making are achieved through the coordination of automatic processing systems and con-

trolled processing systems (de Neys & Glumicic, 2008). The automatic processing system relies on environmental cues, is associative and automatic, and can directly control behavior without attentional involvement; the controlled processing system is decontextualized, rule-based, and requires intentional attention participation (Henden, 2017). Dual Process Theory points out that due to limited cognitive resources, when the controlled processing system is weak or impaired, the automatic processing system's influence on behavior should be greater; when the controlled processing system is strong or intact, the automatic processing system's influence should be smaller. To achieve goals rationally and effectively, individuals must ensure that the controlled processing system can perform its supervisory and control functions to suppress the intuitive impulses of the automatic processing system during decision-making (Saunders & Over, 2009). In recent years, Dual Process Theory has been frequently used to explain the internal mechanisms of addiction. Research has found that the formation of addictive behavior is related to the strengthening of the automatic processing system and the weakening of the controlled processing system (Yan et al., 2021; Lindgren et al., 2019), a view also supported by neurophysiological research (Koob & Volkow, 2010). Su et al. (2021) also showed that when participants watched personalized short videos, the brain's default mode network (DMN) was activated and its coupling with visual and auditory pathways was enhanced, but its coupling with the precuneus and cingulate cortex decreased. This means that attentional resources were highly concentrated on audiovisual information processing, making attention regulation difficult; simultaneously, areas involving cognitive control were suppressed, potentially leading to loss of control over short video usage behavior. It can be considered that this study revealed the cognitive processing patterns of the brain during short video use from a neurobiological perspective. On this basis, due to low cognitive involvement when individuals interact with short video media, the automatic processing system is continuously strengthened, the controlled processing system is restricted, resulting in compulsive use⁶ and ultimately potentially leading to short video indulgence.

5.2 Emotional Level—Opponent Process Theory

Opponent Process Theory, also known as positive-negative reinforcement theory or hedonic dysregulation, is helpful for understanding behaviors such as addiction, child attachment, and thrill-seeking (Lee et al., 2014). Opponent Process Theory describes underlying positive and negative reinforcement mechanisms, intuitively explaining why specific systems become addictive through two opposing processes of positive and negative emotions (Tian et al., 2023; Turel & Serenko, 2012). Short videos primarily serve as an entertainment information medium. When users interact with them, pleasure appears as stimulation, activating users' positive emotions or hedonic states. At this time, positive reinforcement (or positive emotions) is activated. In real-world situations, due to psychological or external factors, users often have to (temporarily) stop using short videos. Once stimulation stops or decreases, positive reinforcement is lost,

while triggering negative reinforcement (or negative emotions), that is, adverse feelings such as anger and stress. To maintain positive emotions and reduce negative emotions, users must repeatedly activate short video usage behavior, ultimately potentially leading to short video indulgence (Tian et al., 2023).

5.3 Motivational Level—Uses and Gratifications Theory

Uses and Gratifications Theory (Katz et al., 1973) is one of the most famous classic theories in communication research. Its proposal and popularity marked the breaking of media producers' central position in the communication field, with media audiences' usage needs becoming the goal-oriented guide for content production. Uses and Gratifications Theory helps clarify why people choose a particular medium and understand the basic needs that drive people to utilize that medium. Early research has applied Uses and Gratifications Theory to many traditional media usage scenarios, such as watching TV and listening to the radio; the theory has also been widely applied to new media research, such as Facebook and Instagram (Omar & Dequan, 2020). The theory posits that individuals, influenced by psychology, society, and culture, use information media to achieve goals considered gratifying. Differences in individual preferences will cause differences in usage content/types. For example, teenagers who love online games will follow video bloggers sharing exciting game moments; young people interested in military and modern weapons may frequently browse battlefield frontline videos to obtain satisfaction. The popularity of short videos as a new medium undoubtedly meets and aligns with various needs of the public.

Previous research has shown that short video use can satisfy users' interpersonal/belonging needs (Tian et al., 2023; Zhang et al., 2019), self-presentation needs (Wu et al., 2021), entertainment needs (Liang, 2021; Lu & Lu, 2019), stress release (Mu et al., 2022), and trend pursuit (Scherr & Wang, 2021). Meanwhile, during short video use, users continuously discover new needs and stimulate new usage motivations (Zhang & Liu, 2021). Zhang et al. (2023) also found that users' compensatory expectations of satisfying various needs through short video use may promote their tendency toward excessive use. In summary, different needs of short video users evoke different usage motivations, leading to different short video attention directions and usage intensities. With the progress of the times and the continuous 更迭 of mainstream platforms, behind new trends and fashions is the satisfaction and alignment of new media with public needs, or the stimulation and satisfaction of those needs (Boczkowski et al., 2018). Therefore, systematically discussing the psychological needs of short video users from the Uses and Gratifications Theory perspective and clarifying usage forms and intensities driven by different needs will provide scientific guidance for the rational use and management standardization of short videos.

5.4 Social Level—Social Shaping of Technology

Social Shaping of Technology theory also points out that technological consequences arise from a combination of supporting factors—individuals, technology,

and related institutions—which together influence technology’s development and subsequent use (Baym et al., 2004; Scherr & Wang, 2021). This theory emerged from criticism of “technological determinism.” Unlike traditional perspectives that only focused on technological progress outcomes, this theory emphasizes examining the specific processes involved in technology’s content and innovation. Specifically, the core of Social Shaping of Technology lies in the fact that every stage of new technology’s generation and implementation involves choices among different technical solutions (though not necessarily conscious choices), and each choice is directly or indirectly influenced by social or human factors, which in turn have corresponding impacts on people and society (Williams & Edge, 1996). In other words, we must open technology’s “black box,” reveal and analyze the socio-economic patterns in technological innovation processes, to clarify the true origin of technology and its impacts.

The realization of personalized short video content recommendations relies on recommendation algorithms, and the continuous “evolution” of recommendation algorithms is not completed by engineers alone but is gradually implemented driven by user feedback. Internet application service levels continue to improve, and users’ demands for internet content become more specific and precise. Personalized recommendation algorithms emerged in response to this and have developed driven by users’ continuously accumulating behavioral data. However, when facing short video indulgence, we cannot simply attribute responsibility to recommendation algorithms or short video platforms. Instead, we should rationally consider technological products (such as short videos) from the perspective of social development environment and user needs. For example, is the existence of short video media “reasonable”? Why do different individuals have different attitudes toward short videos? If we ignore the shaping of technology by society or people and only unidirectionally examine the impact of technology (or products) on individuals and society, preventive measures will always be “one step behind.”

6. Research Gaps and Future Directions

6.1 Methodological Singularity—Enriching Research Approaches

Different research approaches for the same scientific problem satisfy methodological needs from different research perspectives while revealing multiple aspects of the problem. Our review found that existing short video indulgence research mostly obtains data through participant questionnaire reports (e.g., Feng et al., 2022) and has not considered the specificity of short video indulgence. Luo (2022) once used qualitative research to propose a targeted measurement method for short video indulgence, but this scheme included other usage content on short video platforms (such as receiving gold coins), which goes beyond the scope of short videos and is more like a measurement for addiction to a specific short video platform. Of course, similar situations occurred when predecessors constructed measurement schemes for internet addiction and Facebook addiction (Lortie & Guitton, 2013; Ryan et al., 2014). Future research can enrich short

video indulgence research approaches through: 1) developing short video indulgence scales through interviews or expert evaluation (refer to Hsu et al., 2015) to specifically determine whether users exhibit short video indulgence; 2) using neuroimaging techniques (refer to Su et al., 2021), such as functional magnetic resonance imaging (fMRI) and electroencephalography (EEG), to observe users' brain activity when watching short videos, analyzing neural mechanisms such as attention, emotion, and reward systems to reveal the neurobiological basis of short video indulgence; 3) using behavioral experiments, such as randomized controlled trials (RCT) and delay discounting tasks (DDT), to explore users' choice preferences, decision-making abilities, and self-regulation strategies under different conditions, thereby understanding the behavioral characteristics of short video indulgence.

6.2 Insufficient Technology Focus—Emphasizing Addiction-Inducing Technology Improvement

Gaming addiction and problematic social network site use have been widely studied, yet few scholars have explored the causes of addiction from a technology or device perspective (Smith & Short, 2022; Tian et al., 2023). Short video indulgence, as an emerging problem triggered by technology, is even more so. Short video platforms' recommendation algorithms continuously iterate based on market feedback, with specific parameters also evolving according to changes in users' personal information and accumulated usage behavior. The more users' short video usage behavior, the more the recommendation algorithm will cater to their preferences, leading to deeper user involvement (Zhang & Liu, 2021). Compared to general online social platforms, the key interaction in short video use is not between users and their social networks but between users and the so-called algorithmic self (Bhandari & Bimo, 2020). This suggests that there may be a closed loop between short video use and algorithm optimization (see Figure 1), and the continuation of this effect may lead to more user indulgence and even greater social impacts. Simply treating the technical support behind short video services as a black box is not a long-term solution, as studying the impact of short videos on users without addressing personalized algorithms may fail to truly reach the core of the problem. We might consider from the “supply side”: if platforms blindly pursue the richness of user profiles and the precision of content recommendations, it will only lead to more users exhibiting ritualistic usage behavior or even short video indulgence. Since short video platforms can use intelligent algorithms to achieve precise positioning of users' information preferences, they should also continuously pursue harmonious coexistence between short video media and users under the guidance of human-centered artificial intelligence frameworks. Here, we suggest that short video platforms adhere to a user-centered approach and develop more responsible and transparent algorithms (see Elahi et al., 2022). Algorithm researchers should also pay more attention to the negative effects that recommendation algorithms may bring, rather than simply aiming to increase user stickiness. In this way, the initiative of short video use returns to users, and short video media can also

gain broad development prospects by forming a more harmonious ecology with users.

6.3 Unclear Formation Mechanism—Deepening Research on Occurrence Mechanisms

The fundamental solution lies in deeply understanding the essence of the problem. However, current research mainly focuses on the harms of short video indulgence while neglecting its occurrence mechanism, leading to an inadequate understanding of the problem and inability to propose effective governance solutions. The short video indulgence occurrence mechanism framework proposed in this paper (see Figure 3) aims to provide systematic research ideas for scholars in this field. Information technology, content service, human-computer interaction, and user experience are the four components involved in short video use and are also potential causes of short video indulgence. The technological advancement, content richness, interaction simplicity, and user experience quality in short video services all differ from traditional social media. Meanwhile, these characteristics may intertwine with user needs and psychological traits, facilitating the occurrence of short video indulgence. Future research should not only deeply explore the external facilitating mechanisms of short video indulgence but also further investigate the psychological and behavioral factors underlying users' indulgence. The 梳理 of external mechanisms and exploration of internal mechanisms will jointly serve to clarify the whole story of this problematic behavior, thereby providing scientific guidance for developing prevention and intervention measures. On the other hand, by popularizing the internal mechanisms of short video indulgence among the public, we can hopefully raise public awareness and understanding of this potential risk to achieve a “fundamental solution” effect.

6.4 Inadequate User Characteristic Research—Emphasizing Susceptibility Factor Research

In the internet addiction field, van Rooij and Prause (2014) pointed out that exploring individual differences leading to high internet usage rates might be more useful than diagnosing internet addiction. The same applies to short video indulgence research: we must not only study short video media but also pay attention to users' susceptibility to short video indulgence. Qin (2020) found through research on Chinese college students that neuroticism and extraversion personality can significantly positively predict short video indulgence, while agreeableness can significantly negatively predict it. Additionally, Zhang et al. (2019) found that individuals with social anxiety and high perceived social rejection are more likely to develop short video indulgence. From the short video perspective, personalized recommendation algorithms are one of the key factors facilitating short video indulgence (Zhao, 2021). That is, the application of recommendation algorithms has made more users part of the short video indulgence-susceptible population. When users rationally cope with short video recommendation al-

gorithms and actively avoid short video indulgence, algorithmic literacy may be an important knowledge reserve (Bakshy et al., 2015). Therefore, popularizing knowledge about algorithms and their operation modes, improving users' rational thinking and coping abilities regarding algorithms, may reduce the possibility of users being "enslaved" by algorithms, thereby achieving population prevention of short video indulgence. We suggest that future research design randomized controlled intervention experiments to explore the protective effect of improving users' algorithmic literacy on short video indulgence. Subsequent researchers can further delve into susceptible populations and facilitating factors of short video indulgence from aspects such as individuals' environments, stress states, and social support systems, to provide more targeted suggestions for scientific prevention of short video indulgence.

¹ Conditioned reflex refers to the conditioned response to stimuli that individuals form after multiple uses of drugs. These conditioned responses are related to environment, context, and learning processes, gradually forming the reinforcing effect of drugs.

² Unconditioned reflex refers to individuals' spontaneous responses to drugs, including physiological and neurochemical reactions that produce reward feelings. These responses are closely related to individuals' genes, physiological structures, and neural pathways.

³ We thank several reviewers for their valuable suggestions. The authors have standardized the originally proposed "short video addiction" to "short video indulgence." When citing some internet addiction-related research, some still use the term "addiction." Readers should note the differences and connections.

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⁶ “Compulsive behavior” refers to a repetitive behavior that the actor realizes has deviated from overall goals but “must be executed” (Luigjes et al., 2019).

Note: Figure translations are in progress. See original paper for figures.

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