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TikTok Addiction: An Examination in the Technical Aspects

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Abstract: In recent years, TikTok has gone viral as a social media that provides an infinite number of short videos. It has not only become the second most popular social media application but has also taken up a considerable amount of time from its users. Thus, the purpose of this paper is to analyze and discuss the technical aspects of TikTok addiction through the psychological and social lens. Specifically, after reviewing existing literature, this in-depth study evaluates algorithmic recommendation, hashtags, scrolling, and the interactive features in the addiction perspective and offers coping measures for each addictive function. The current study identifies the significant dopaminergic activities TikTok generates with its addictive functions and the strong social needs these functions meet. Furthermore, these functions combined can attract users to a great extent through synergy. The findings in this paper contribute to a deeper understanding of the mechanism of TikTok addiction and bring about new coping insights for future exercise and studies.

Keywords: TikTok addiction, technical functions, algorithm, coping measures, social needs.

1. Introduction

Around the world, short videos are all the rage. This form of entertainment is transient but powerful. TikTok is the leading company in providing short video content, aiming to inspire creativity and bring joy [1]. Of many competitive media platforms, TikTok has risen to be the second most appealing application for American teenagers according to the data from Pew Research Center [2]. Specifically, 16 percent of teenagers almost constantly visit TikTok. While 36% of U.S. teenagers believe they spend too much time on TikTok, 54% of U.S. teenagers consider it to be hard to give up TikTok [2]. The fact that over half of teenage TikTok users consider quitting TikTok to be hard, the addictive nature of TikTok is brought up.

What people do on TikTok, which is accessible on cellphones like all other trendy social applications, is to watch or produce short videos up to 15 or 60 seconds. To entertain, the content including pets, exercises, dancing, mockeries, and many other relaxing activities are provided, attracting over one billion users worldwide. Given the attention teenagers put on TikTok, it is of vital significance to learn more about the mechanisms behind Tik Tok that cause it to be so addictive. While promoting virtual interactions, TikTok possesses other qualities, such as its musical base and scrolling feature, that distinguish it from YouTube and other video media platforms.

This paper intends to examine TikTok addiction in a more technical aspect. Specifically, Several technical functions have been identified to be related to TikTok addiction including Algorithmic recommendation, hashtag, liking, comment, and sharing. Studies on each specific function evaluate

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how more users are drawn to TikTok and how the usage time of TikTok is increased through the sociological and mostly psychological perspective.

2. Literature Review

Addiction, by definition, is an inability to stop abusive use, or obsessive behavior that is causing negative consequences. From DSM-5TM, a more neutral term for addiction is substance use disorder [3]. This term represents the behavioral symptoms activated by drug abuse when it taps into people's reward systems. TikTok, though not an identified drug, provokes addiction to which the same mechanism behind substance use disorder can be applied.

In recent years, the abusive use of social networks has been put on the public agenda as social media platforms including YouTube, Facebook, Twitter, Instagram, Snapchat, and TikTok become viral, grabbing an unprecedented amount of usage time from their users. TikTok, for its very recent popularity, deserves more scholarly input.

For existing literature on TikTok, a major number of studies have focused on the social part of this social media addiction. One argument contends that the stress to continue the virtual social experience eventually develops into a habit that cannot be easily resisted [4]. Another piece of literature focuses on the dynamic communicative environment TikTok provides as it embodies significant cultural value [5]. Additionally, social isolation in the modern age is argued as a reason for the interpersonal attachment in TikTok [6]. Admittedly, the pandemic context has been giving TikTok an impetus to its popularity. One study analyzes how the scrolling feature erases lockdown boredom [7]. Lastly, the special characteristic of TikTok, its successful exploitation of music in the videos, connects users from different backgrounds, further boosting the thriving communities in TikTok [8].

Literature on teenage use of social media has been widely discussed as well. To begin with, teenagers' health and academic achievement have been studied concerning social media addiction [9]. One research studying teenage use thoroughly evaluated the technical, social, and psychological aspects of teenage TikTok addiction [10]. Through this literature, the extensive implication of TikTok in teenage life is noted.

From a psychological perspective, neurological studies on TikTok addiction have been conducted. More generally, the dopamine implication in social media is noted when the feedback loop mechanism sustains social media use with the right placement of outcomes [11]. Specifically, for TikTok, its content can affect VTA activity, which is greatly related to the dopamine increase and the reward circuitry [12]. In addition, other studies emphasize on the uses and gratifications theory-the theory that emphasizes the motives and gratification of social media users [13-15]. It is identified in two pieces of literature that the motives for TikTok use include self-presentation, trendiness, escapist addiction, archiving, social interaction, and novelty [13, 15]. Meanwhile, it is pointed out directly that studies now should go beyond gratification theory [14].

Overall, according to Ulm University psychology professor Christian and his coworkers, currently, people know too little about the psychological mechanisms behind TikTok, such as its potentially detrimental aspects of it [14]. In turn, this paper intends to contribute an analysis of the technological, or technical, aspect of TikTok as it has been brought up as a matter of urgency [13]. Specifically, how the overall functions of the TikTok application, the technological aspect of it, cause addictive use, one psychological aspect of TikTok, is the focus of this paper.

3. Technical Functions

3.1. Algorithmic Recommendation

TikTok can be seen as a customized video feeding application. Although its algorithm is not disclosed to the public, people can still have a general understanding of the way it recommends videos.

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According to Guillaume Chaslot, the founder of Algo Transparency, “Each video a kid watches, TikTok gains a piece of information on him. In a few hours, the algorithm can detect his musical tastes, his physical attraction, if he’s depressed, if he might be into drugs, and many other sensitive information” [16]. Through actively engaging in interactions with the personalized algorithm, TikTok manages to promote users’ intrapersonal engagement, repeatedly confronting reflections of users’ persona [17]. TikTok considers several factors and provides the perfect recommendations.

The individualized recommendation of TikTok also neurologically affects its addiction as the “recommender algorithm is able to discover contents to up-regulate the activity of a set of DMN (default mode network) subregions and VTA(ventral tegmental area) to reinforce video-watching behavior” [12]. VTA is the origin of the dopaminergic cell bodies of the dopamine system, which makes it largely connected to the reward circuitry of the human brain. Specifically, the study showed that personalized videos, the ones displayed due to the algorithm, triggered stronger DMN and VTA activities than generalized videos, and the more personalized the videos are, the higher level of activation presents. Taking the nature of TikTok into consideration as well, for every 15 seconds of continual stimulations of short videos, the algorithm stimulates dopamine release constantly by providing new and captivating content, which supersedes other video companies both in the nature of video form (the length) and the algorithm not disclosed that tailor highly personalized content. In simple terms, the top-notch algorithm offers what users like incessantly and causes addiction, in turn, by constantly stimulating users’ reward circuitry to an extent that they cannot let TikTok go easily. In this sense, when playing TikTok, users’ need for more short videos has the same mechanism as drug addicts’ need for more drugs, and the algorithm is amplifying this addiction by constantly recommending videos of quality.

3.2. Hashtag

Like all major social network companies, TikTok takes advantage of hashtags. The most notable hashtag would be the #ForYou hashtag. This hashtag, unlike traditional hashtags, does not only gather all the videos in a specific category but also serves as a recommendation system in that “each person's feed is unique and tailored to that specific individual” [18], which makes it an extension of the application of the recommendation algorithm. Meanwhile, other hashtags promote engagements and collective actions on the platform such as youths’ engagement during the 2016 US presidential election [19]. In other words, each category of content groups up like-minded individuals and enables comfortable interactions. This comfort can also be confirmed with the hashtag #grief as grieving communities find each other when algorithm closeness, the way the algorithm manipulates the content shown, allows the right content to be presented under a hashtag in an algorithmically ranked manner [20]. Another way hashtag works is that it brings up the need for users to engage in trendy discussions and form bonds [21]. Through this virtual form of social life, users meet their social needs in the cyber community formed by hashtags. To further exploit this idea, TikTok also propagandizes the most heated hashtags through its official website in the community category. A case in point would be the #FashionForYou community this month [22]. In all, it comes to the word: identification. Hashtag values in-group identification and creates a pleasant environment for self-expression in order to meet social needs no matter if one’s aim is to follow up the trend or to feel belonging.

3.3. Scrolling

Scrolling is one prevalent technical edge media companies exploits, and it is especially effective in bringing success to TikTok. Whether on the #ForYou page or on any other hashtag page, when users click on one video, they can swipe up to watch countless videos. The idea that the content is not only

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tailored to meet users' interest but also coming in endlessly is the key factor in TikTok's technical success.

There is a view that treats scrolling as a slot machine, equating the intermittent reward of winning and losing to receiving good and bad content [23]. Specifically, swiping up the videos is like pulling the lever of the slot machine: users never know what they will get next. Thus, the unpredictability and the potential rewards are key factors in this exercise, constantly provoking dopamine increase to create the desire to continue scrolling. The long-lasting scrolling can also be explained by the concept of the feedback loop mechanism. From the initial high dopamine activity to the diminished level of activity, the right placement of rewarding outcomes keeps people in the loop for a long time [11]. In this case, TikTok can prolong users' experience.

Another aspect of scrolling lies in the social aspect. It is contended that the scrolling feature combined with accessing relevant content and living interesting experiences is compelling in persuading continuous swiping [24]. This desire to meet social needs is justifiable. However, as pointed out by professor Lupinacci, when the users wish to keep track of social events and trends, the continuous flow of content creates stress for its use as it never ends. To relieve the same stress, users have to continue swiping for reassurance.

Admittedly, scrolling would not become this successful without the first-class algorithm behind it. While swiping up, the algorithm takes in all kinds of information including if the user tagged a video with "like", if the video is rewatched, and if the user reads or leaves a comment [5]. It has been revealed that the algorithm can even identify gender through the touching gesture of the users [25]. From this perspective, though users are unable to tell the specific mechanism of the algorithm, TikTok utilizes the scrolling process to perfect its recommendation.

Nonetheless, TikTok does not always present the perfect recommendation. That can explain why some videos have a relatively lower quality. Still, acknowledging that the codes are not disclosed to the public, this insertion of inferior content might be intentional as it is pointed out that most rewarding content embedded with less rewarding content heightens the rewarding experience of scrolling [4].

Lastly, besides desiring rewards from the short videos, the motivation of scrolling may fade as habit forms [4]. After the swiping up gesture becomes a contextual cue for receiving a reward, even when the video-watching behavior becomes less rewarding, the habit of swiping up may continue to attract participants' attention when the users have only limited input from their intention. This habituation partially reflects users' excessive TikTok use.

3.4. Interactive Functions: Liking, Comment, and Sharing

As a social media, interactive functions are essential, and how TikTok taps into these functions paved its road to attracting an enormous number of users. 'Liking' was a function invented by Justin Rosenstein, a former Facebook engineer, who did not envision its later influence to be this significant. Now, the like button exists in every major social media application, and TikTok is no exception. The comment and sharing function, in addition to 'liking', further promotes the social interaction aspect of TikTok.

To evaluate the function of the like button, sharing, and comment, the producer's perspective is equally important as the user's perspective. When video producers post their works, one major incentive is to receive plausible responses. The unexpected number of above-mentioned responses tends to provoke dopamine increase, leading to the addition of more content production. To elaborate on this idea, content generators post content with an expectation to receive favors, and their dopamine response is correlated to the psychological gap between the expected response to the video and the actual response to the video, which incurs a positive surprise or negative surprise. In turn, positive surprise promotes the continuation of posting while negative surprise thwarts it.

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Counting on the participation of TikTok users, the reward effects can be magnified through reciprocity [4]. Specifically, the notification of user responses, the 'liking' and the comments, on the works of content producers create the urge for the producers to also reciprocate by liking, sharing, and commenting. Moreover, the kind of comment can even include posting another video and 'at' the user who is to be responded to, not mentioning the 'liking' the comments can receive. By sharing to further enhance the spread of information, the kind of social interaction and recognition TikTok created set up a rewarding system that causes TikTok addiction in a major way.

It has been noted previously in the algorithmic recommendation section that the algorithm takes in users' information to better tailor the recommendation. Therefore, the most basic interactive features in this section are very likely to be considered in the algorithm as what users like, comment on, and share would provide their viewing preference. Hence, the algorithm and the interactive features can create synergy and provide better content to amplify TikTok addiction.

4. Coping Measures

4.1. Algorithmic Recommendation

The TikTok algorithm not only keeps users hooked by providing the best content but also builds the foundation for other major technical advantages including scrolling and hashtag. With this power, the algorithm makes delayed gratification too hard to achieve as TikTok provides immediate and sustained gratification. Still, users must be able to control their use even through committing to the outside device. Specifically, on one hand, setting a fixed amount of using time with cellphone applications installed that can automatically lock TikTok when the time passes would be one effective way. On the other hand, without aid from third parties, users can mentally divert their attention away from TikTok through intrapersonal bargaining-constantly signaling themselves by seeing how their's future would be at stake and how alternative exercises are much more desirable.

Of course, the government can also play a role by forcing TikTok to reduce the addictiveness of its algorithmic recommendation by pushing forward new acts. In this way, users can also increase their chance of gaining usage time control since reducing addiction is exceedingly hard.

4.2. Hashtag

Besides the hashtag #ForYou, which is supported by an algorithm, other hashtags mostly focus on their social value. Indeed, hashtag provides easily accessible environments for like-minded individuals and promotes trendy video interactions. To some extent, hashtags give users a chance to stay tuned and gratify basic social needs. Still, users cannot ignore the value of real-life social interactions, which differs exceedingly from virtual, social life. In addition, it should be realized that the excessive use of TikTok creates further anxiety about not receiving enough information on current social events [24]. In this sense, TikTok can excessively meet the social needs of its users. To counter this effect, the users can choose to follow only the most interesting and relevant hashtags only, reducing the time required to follow up on less relevant content. Hence, users must realize the drawbacks of too much online social exposure and maintain a limited amount of usage time to maximize the social gratification TikTok can provide to the users.

4.3. Scrolling/ Liking, Comment, and Sharing

Scrolling can create an endless loop in which users indulge for a long time. It has been identified that the algorithm behind takes in users' information to perfect the recommendation [16]. Hence, to fight this loop, users can manipulate their feedback to TikTok by intentionally pushing the interactive buttons-liking, commenting, and sharing- irrespective of their own disposition from time to time. In

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this way, the algorithm cannot better identify users' interest and the scrolling loop would be easier to disrupt for the flow of information no longer sustain enough dopamine increase to keep users attracted. In a few words, the less information users disclose to TikTok, the less tailored the recommendation system becomes.

Another convenient and effective approach to ameliorate TikTok addiction is turning off this application's notification. This way, every sharing, commenting, and liking between users would not immediately be notified, and users would not excessively use TikTok every time it tries to tempt them.

5. Conclusion

The popularity of TikTok has raised significant concern for it takes up too much of a user's time. Yet, the existing literature has limited reach in studying the technical functions in TikTok through technical respects. This paper has analyzed the prominent functions of TikTok-algorithmic recommendation, hashtag, scrolling feature, liking, commenting, and sharing- and presented an overview of how each function invokes TikTok addiction through psychological and social lenses. In addition, this study also discussed how each of these separate functions can create synergy to amplify TikTok addiction.

For the four major functions, Algorithmic recommendation causes addiction to the greatest extent for it is highly developed in providing the most fitting content and maintaining high dopaminergic activity. Additionally, algorithmic recommendation serves as a foundation for hashtag and scrolling features. At the same time, it taps into the interactive features to collect information, aiming to personalize recommendations. Hashtags attract users by meeting their social needs. For the scrolling feature, it taps into the slot machine mechanism. With the right placement of content, users are kept in the loop. At the same time, users who intend to meet social needs find themselves unable to stop swiping up as the stress to keep track of social events intensifies due to the continuous flow. Lastly, the interactive features in TikTok focus on the reward of responses and potentially collect data to better the recommendation.

This paper contributes to the scarce literature on technical studies and coping measures for addiction. Additionally, this overall analysis of the major TikTok functions provides insights into the synergic effects of the major functions that cause TikTok addiction. More studies are made regarding TikTok addiction through different facets, but few propose effective countermeasures. Prospectively, users must recognize the seriousness of TikTok addiction and actively cope with it when it takes up too much time for them. To do so, studies on coping require further input. Neurological studies on TikTok functions are also deficient. How specific functions alone or combined would provoke neurological activity should be a future focus. Lastly, the role of music in the trending videos that keep users engaged requires further studies.

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