Extending Theory of Planned Behavior to Predict TikTok Addiction Behavior among Chinese Users

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ABSTRACT

The rise of short-form video apps, such as TikTok, has led to concerns about their addictive nature, particularly among middle-aged and elderly users. This study investigates the TikTok addiction behavior model among Chinese middle-aged and elderly users. A quantitative approach was employed, using a survey questionnaire to collect data from 163 participants. Partial Least Squares and Structural Equation Modeling (PLS-SEM) software was used to analyze the data. The study integrated the Theory of Planned Behavior (TPB) and the Flow Theory (FT) to develop a comprehensive model of addiction behavior. The results provide valuable insights into TikTok addiction behavior among middle-aged and elderly users. The study's findings contribute to media-related research, providing insights for policymakers to develop strategies for overcoming addictive tendencies. The research highlights the importance of promoting healthy TikTok usage among middle-aged and elderly users.

Keywords: Extending theory of planned behaviour, Middle-aged and elderly, Short-video platforms, TikTok addiction behaviour, Flow theory

INTRODUCTION

With the increase of information technology and the evolving preferences of internet users, new social media platforms are emerging constantly [7], [20], [34]. The rapid rise of short-video apps, especially TikTok, has revolutionized how people consume and engage with digital content [38]. With over a billion active users globally, TikTok has become an essential part of modern life, particularly among younger demographics. However, recent studies indicate that elderly people are increasingly embracing TikTok, raising concerns about potential addiction [38], [49]. Short videos are ideal for mobile viewing and are easily shareable across different social media platforms. Driven by TikTok (Douyin), these brief clips have rapidly captured the interest of users across all age groups and have emerged as the most popular social media platform in China [38]. According to TikTok statistics and Laura Ceci, as of 2023, TikTok's user base in China has reached 1.7 billion worldwide. In the past 12 months, the number of content creators over the age of 50 on Xiaohongshu, a Chinese social app, has surged by over 100%. These statistics show a growing trend of elderly individuals in China, embracing social media platforms like TikTok.

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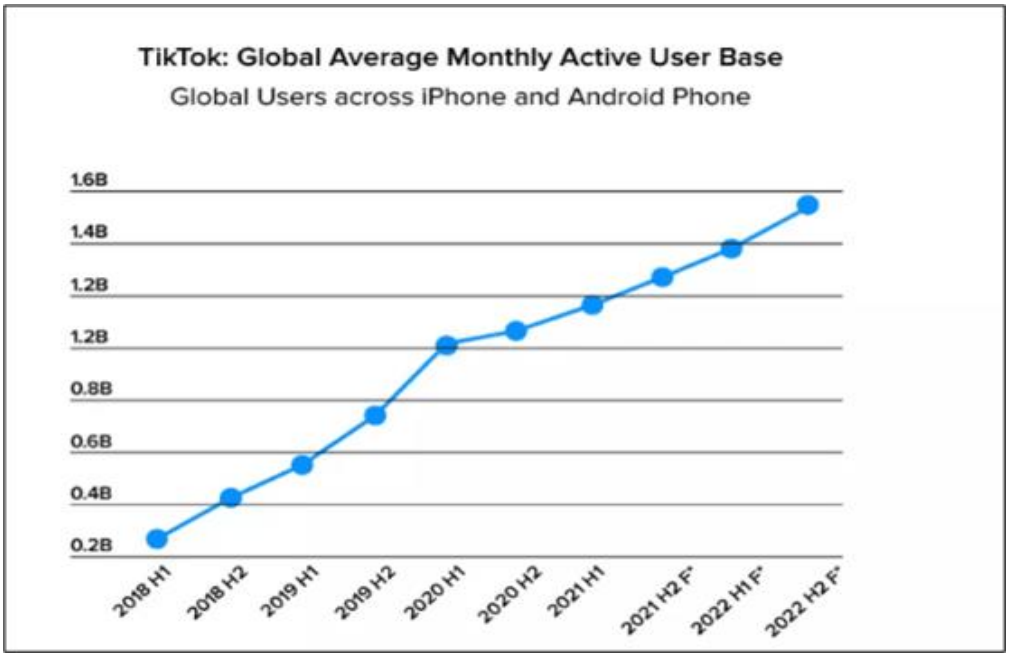

Fig. 1 Number of TikTok user worldwide from Gil Press, November 29th, 2023 Statistics

Moreover, in China, the percentage of middle-aged and older people using short video apps increased from 10.7% to 13.4% between 2018 and 2020. Elderly influencers, known as influencers, are sharing their daily lives, talents, and personalities with millions of followers [31]. For example, a group of retirees from Beijing, called Glamma Beijing, has gained over 2.3 million followers on Douyin, the Chinese version of TikTok. In a study conducted by [31], it was found that 40% of the elderly's free time was spent using mass media, which impacted their leisure activities and interpersonal relationships. This finding challenges the traditional belief about older individuals' involvement in mass media. As the elderly population increasingly engages with the Internet, there is a growing presence of older users in the audience for short videos. Research by [13], [18], [23], [31], demonstrates that retirees have a strong interest in media content and interaction.

Reference [31] and [47] revealed that over 60% of elderly individuals engage with TikTok on a daily basis, spending 1-2 hours per session. According to the 2020 Silver Hair Crowd Insight Report by Quest Mobile, the number of older users aged 50 and above in China using mobile devices has surpassed 100 million, comprising 40% of the total elderly population. This demographic is growing at a faster rate compared to others. Older individuals may face challenges when trying to access new forms of media [31]. Also, TikTok offers entertainment and a relatable perspective that resonates with older adults. Seniors are more open to embracing new things through this platform. Because of its unique characteristics, short videos have become the preferred way for the elderly to engage with the internet. A study by Reference [61] found that the primary reasons for excessive short video consumption were the captivating nature of the content (42.78%) and the monotony of life (39.04%).

In a study by [31], it was found that the willingness of older users to use technology is significantly influenced by their performance expectations. For older individuals, short videos are timelier and more effective in receiving information compared to text or images. Additionally, Reference [7] argued that media elements also play a role in encouraging older adults to engage in short video activities. The convenient operational mode and user-friendly video production of TikTok appeal to a larger number of older adults. Reference [26] and [60] also noted that mobile videos, create immersion. The main impact of ageing on the elderly is primarily loneliness, and engaging in viewing and creating TikTok videos can serve as an effective method to alleviate this sense of emptiness [31], [59].

The use of TikTok has been suggested to reduce ageism by offering psychological support and satisfaction to older adults through positive expressions and words in an ageing society. Reference [55] also noted that

TikTok could diminish ageism by providing psychological support and satisfaction to older adults, and reference [31], suggested that TikTok allows older adults to showcase their lives and become more reliant on the platform. Therefore, older adults may feel more dependent on TikTok, which is a concern for their friends and family. In an ageing society, social issues can arise due to older individuals feeling less recognized. According to [31], TikTok has the potential to reduce ageism by offering psychological support and satisfaction to older adults through positive expressions. Similarly, Reference [50] proposed that TikTok provides older adults with a platform to share their lives and also allows them to become dependent on it. Consequently, TikTok is likely to become more significant for older adults due to the concern it raises among their friends and families.

In addition, few studies have focused on the specific context of short-video apps like TikTok, and most of them have centred on young users while ignoring middle-aged and elderly people's periphery. This study focuses on the addiction behavior of the middle-aged and elderly group. Also, it helps explore how users who have suffered from discourse deficits for many years use short videos. It can also help Internet enterprises better understand the middle-aged and elderly group so that developers of short video products can create better experiences based on the needs of middle-aged and elderly users (MG&E) and promote their active participation in social activities on the Internet.

This study focuses on the addictive behavior of the MG&E and thoroughly analyzes the relationship between the MG&E as well as the short-video app TikTok in China using a survey questionnaire. It explores the motivations of the middle-aged and elderly to participate in TikTok, aiming to find better ways for the users to integrate into the social community, open channels of communication between the MG&E as well as the outside world, and establish bridges of communication. This study aims to investigate some factors that can lead middle-aged and elderly individuals to develop an addiction to TikTok, and the negative effects it can have on their physical and mental health. The goal is to develop a reliable measurement tool for the proposed constructs and relationships in the research model. The research objectives are based on the following problems:

1. To examine the addiction behaviour factors influencing TikTok addiction in China.
2. To develop an addiction behaviour model tailored to middle-aged and elderly TikTok users in China.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

There is a growing user base of short videos on the network platforms, especially on mobile devices. TikTok short videos are a representative platform in the industry. It is a music video community platform for all ages, and has become popular worldwide. Previous studies have utilized various adoption theories such as the Stimulus-Organism-Response (S.O.R) Model, Interaction of Person-Affect-Cognition-Execution (I-PACE) model, Technology Acceptance Model (TAM), Selective Optimization with Compensation (SOC) Model, Generativity Theory (GT) Socioemotional Selectivity Theory (SST) and Uses and Gratification Theory (U&GT). However, this study aims to explore the factors influencing the behavior model for middle-aged and elderly users of the short-video app TikTok in China. It integrates the Theory of Planned Behavior (TPB) and the Flow Theory, emphasizing the role of individual factors and offering a comprehensive understanding of addiction behavior among middle-aged and elderly (MG&E) TikTok users. The model suggests that the unique features of applications or websites significantly impact user behavior, as they must align with users' intentions [53]. For example, individuals looking for social interaction are more likely to use social networking apps. Additionally, studies suggest that a combination of biological, psychological, and social elements plays a role in the onset of addictions. Reference [4], [30], and [52], which may also apply to social networking (SN) addiction. This suggests that SN addiction has a similar underlying cause as other substance-related and behavioral addictions. According to [30], because the use of social networks differs from other forms of Internet applications addiction, it is important to consider this experience individually, Particularly when considering the possibly detrimental impacts of both substance-related and behavioral addictions on individuals experiencing numerous adverse effects as a result of their addiction. [15],[16],[30],[51].

Current studies indicate the importance of distinguishing between different types of problematic online activities [8], [15], [53], [57]. A study conducted by [50] examined the antecedents of middle-aged and elderly users' video-creating intentions on short-video platforms from a lifespan perspective, combining the SOC model with generativity theory and socioemotional selectivity theory (SST).

Reference [14], [17], and [53] indicate that short video platforms are the main factor contributing to social media addiction. As a new genre of social media, short video platforms possess unique content formats, recommendation algorithms, and functionalities designed to attract and retain users [26]. They interact with users' individual traits to influence their usage behavior and outcomes [53]. Reference [49] suggests that goal priorities change throughout life, impacting socio-emotional considerations and behaviors, this is an important predictor of how middle-aged and elderly adults focus on future-oriented goals. Therefore, current models do not fully account for addiction behavior in middle-age and elderly individuals using the short-video app TikTok in China, highlighting the need for a specific framework for this issue. Reference [49] and [53] emphasized the importance of examining both individual and platform characteristics. However, their review primarily focused on general short video usage, without thoroughly investigating the specific factors that contribute to addiction behavior among middle-aged and elderly TikTok users. This review aims to address this gap by exploring the individual characteristics and elements that lead to TikTok addiction among MG&E users in China [53].

Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) is a widely used framework for understanding human behavior [1], [3]. According to TPB, behavior is influenced by three primary components: attitude, subjective norm, and perceived behavioral control. Attitude refers to an individual's positive or negative evaluation of the behavior, while subjective norm reflects the perceived social pressure from significant others. Perceived behavioral control relates to an individual's belief in their ability to perform the behavior. In the context of TikTok addiction among the elderly, TPB provides valuable insights into the psychological factors driving excessive usage. Research has shown that TPB successfully predicts various health-related behaviors, including substance abuse and technology addiction [6] [40]. In addition, The TPB is a comprehensive model that considers both internal personal factors and external social factors [33]. It can be adapted to include any factor that explains or predicts behavior and intentions and is widely used in sociology, psychology, management, economics, and communication to analyze various behaviors [33].

Flow Theory (FT)

Flow Theory, developed by [37], [21] and [45], describes the optimal psychological state of complete absorption in an activity. Flow experience is characterized by heightened focus, concentration, and enjoyment. According to Flow Theory, individuals seek activities that provide an optimal balance between challenge and skill, leading to a sense of mastery and satisfaction. In the context of TikTok addiction, Flow Theory offers a unique perspective on the psychological mechanisms underlying excessive usage. Research has demonstrated that experience contributes to technology addiction, including social media and gaming [17], [19], [30]. According to a hypothesis by [38], people experience when they engage in challenging activities within their capability, leading to feelings of control, concentration, and enjoyment. This experience is believed to influence TikTok addiction, leading to the creation of a TikTok addiction model based on flow theory. The theory helps explain why users may become addicted to TikTok and how the platform's design can influence their experience [38].

Therefore, combining TPB and Flow Theory provides a comprehensive understanding of the addiction behavior model for MG&E TikTok users. The integrated model proposes that TPB variables (attitude, subjective norm, and perceived behavioral control) influence intention, which, in turn, affects experience and ultimately addiction behavior. This may lead to positive experiences that can potentially encourage and

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facilitate knowledge experiences that drive the development of short-video app TikTok addiction. Fig. 2 the Proposed Model.

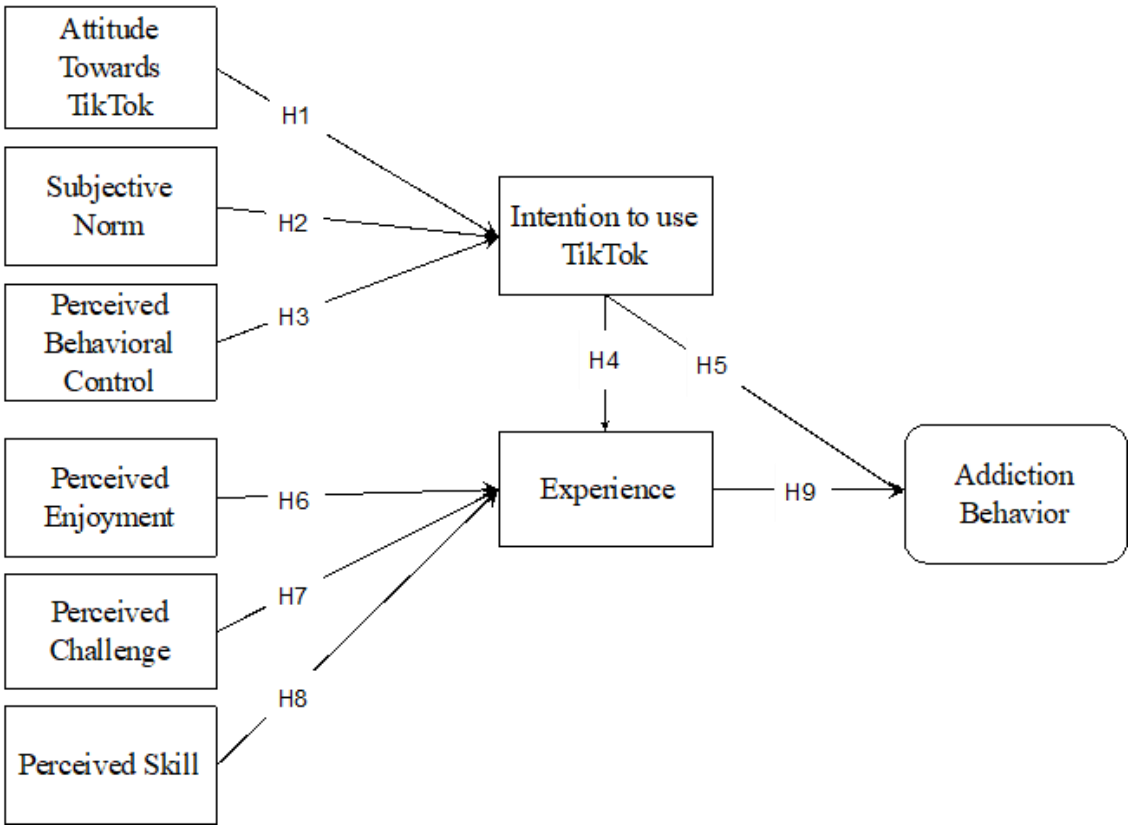

Fig. 2 The Proposed Model

RESEARCH HYPOTHESES DEVELOPMENT

Research hypotheses are critical for constructing the foundation of a study. Reference [43] and [44] explain that a well-planned hypothesis is essential for developing a reliable and valid research protocol. It is primarily based on known facts, potential outcomes, and expected results from the evaluated variables [43], [44]. The hypothesis serves as the cornerstone of the study, the collected data, and the derived conclusions. It is a vital tool for comparing observed data with expected outcomes and provides a guide for the researcher. The process of increasing a model holds significant importance in terms of testing and validating a formulated theory Therefore, the study proposed the following hypothesis:

Attitude Towards TikTok

The attitude toward the behavior defends the person's overall evaluation of the behavior [1]. It consists of two subcomponents: behavioral beliefs (beliefs about the consequences of the behavior) and outcome evaluation (corresponding negative or positive judgments about each of these features of the behavior) [2]. A positive attitude towards TikTok use is expected to increase the intention to use the app. Elderly users who perceive TikTok as enjoyable, useful, or beneficial will be more likely to intend to use it.

Hypothesis 1: Attitude towards TikTok use will positively predict intention to use TikTok among elderly users.

Subjective Norm

Subjective norms encompass two key subcomponents: normative beliefs, which pertain to the assumptions that individuals or significant others hold regarding specific behaviors, and motivation to comply, which

involves the positive or negative evaluations of each belief [2], [9]. The subjective norm, or the perceived social pressure from family, friends, and peers, will influence intention to use TikTok. Elderly users who believe that important others think they should use TikTok will be more likely to intend to use it.

Hypothesis 2: Subjective norm will positively predict intention to use TikTok among elderly users.

Perceived Behavioral Control

Perceived behavioral control refers to an individual's belief in their ability to carry out a specific behavior. This concept has two components: the level of control a person believes they have over the behavior and their confidence in their ability to perform or refrain from the behaviour [2], [9], [10]. Perceived behavioral control, or the ease or difficulty of using TikTok, will affect intention to use the app. Elderly users who believe they have the skills and resources to use TikTok will be more likely to intend to use it.

Hypothesis 3: Perceived behavioral control will positively predict intention to use TikTok among elderly users.

Intention to use TikTok

The concept of intention pertains to an individual's objective or aim driving their behaviour [11]. It represents what a person seeks to accomplish when acting. For instance, when someone assists a friend in relocating, their intention could be to nurture and fortify their friendship. Essentially, intention revolves around the reasons behind our actions. A strong intention to use TikTok will lead to actual usage. Elderly users who intend to use TikTok will be more likely to engage in the behavior.

Hypothesis 4: Intention to use TikTok will positively predict experience usage among elderly users.

Hypothesis 5: Intention to use TikTok will positively predict actual TikTok addiction behaviour usage among elderly users.

Perceived Enjoyment

Perceived enjoyment denotes the subjective experience of pleasure or gratification that individuals derive from using a specific technology or participating in a particular activity. It is a pivotal determinant in shaping user behavior and acceptance of diverse technologies, encompassing mobile games, augmented reality smart glasses, internet usage, and educational learning materials. Empirical evidence underscores the substantial influence of perceived enjoyment on users' attitudes, inclinations, and sustained adoption of these technologies [22], [42]. Enjoyment is a critical factor in experience. Elderly users who perceive TikTok as enjoyable will be more likely to experience flow.

Hypothesis 6: Perceived enjoyment will positively predict experience among elderly TikTok users.

Perceived Challenge

Challenges that are perceived play a role in enhancing self-efficacy. Social persuasion, an external factor, has a significant impact on an individual's self-efficacy. This refers to the support, confidence, commendation, or recognition from others, including leaders, which affirms that individuals are capable of accomplishing tasks [54]. A challenging yet manageable task is necessary for experience. Elderly users who perceive TikTok as challenging but not overwhelming will be more likely to experience flow.

Hypothesis 7: Perceived challenge will positively predict experience among elderly TikTok users.

Perceived Skill

Understanding how a situation appears to another person and how that person is reacting cognitively and emotionally to the situation is known as perspective-taking. In essence, it involves the ability to empathize and see things from someone else's point of view, considering their experiences and beliefs [24]. A sense of mastery or skill is essential for experience. Elderly users who perceive themselves as skilled TikTok users will be more likely to experience flow.

Hypothesis 8: Perceived skill will positively predict experience among elderly TikTok users.

Experience

The state of experience is a highly motivating state in which individuals are completely absorbed in an activity, and willing to pursue it despite significant sacrifices purely for the sake of engagement. They may not even recognize feelings of hunger and fatigue, as nothing else seems to be as important as the activity itself [29]. experience is expected to contribute to addiction behavior. Elderly users who experience while using TikTok will be more likely to engage in excessive or compulsive usage.

Hypothesis 9: experience will positively predict addiction behavior among elderly TikTok users.

MATERIALS AND METHODS

Respondents and sample

The researcher in this study adopts a positivist philosophy, which asserts that objective information can only be validated through observation and measurement. In positivist research, the investigator systematically collects and interprets data. Consequently, the findings of such studies are generally explicit and quantitative. The participant pool consisted of elderly and middle-aged individuals ranging from approximately 45-49 years old to around 60-65 years old among Chinese users. Data collection spanned four weeks and employed a cross-sectional design, which is well-suited for large sample sizes [28]. Initially, 350 questionnaires were distributed via Google Forms, email, and WhatsApp. However, due to restrictions imposed on Google Forms in China, alternative platforms were employed to facilitate data collection through Virtual Private Networks (VPNs). Participants were recruited through social media platforms, including WeChat and Weibo. To ensure validity, the questionnaire was translated into Chinese and underwent a thorough back-translation process. A total of 198 completed questionnaires were collected on TikTok Addiction Behavior, of which 163 were retained for further analysis. Thirty-five responses were excluded during the data screening process due to inconsistent answer patterns and missing information. This section outlines the instrument development, validation, data collection processes, and data analysis procedures.

Instrument development and validation

The model included nine independent factors: Attitude Towards TikTok, Subjective Norm, Perceived Behavioral Control, Intention to use TikTok, Perceived Enjoyment, Perceived Challenge, Perceived Skill, and Experience, as well as one dependent factor, Addiction Behavior. These factors are consistent with prior research. The 32 measurement items were adapted from existing studies (Refer to the Questionnaire in the Appendix A). A five-point Likert scale (1=Strongly Disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly Agree) was utilized to assess perceived TikTok Addiction Behavior. The instrument underwent content validity, construct validity, and reliability assessments with some adjustments. Content validity was appraised by two professionals with expertise in social media technology research, from a public research university in China and Malaysia. The instrument was modified based on the feedback from the experts. The survey was split into two parts: A and B. Part A included items to evaluate respondents' general demographic information, such as gender and education, while Part B consisted of items to measure the nine factors. All items were created using established procedures in the literature and insights from stakeholders and specialists in this domain. At last, 198 questionnaires were collected and 35 labelled as invalid were removed, 163 remained.

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DATA ANALYSIS AND RESULTS

The details of respondents' demographic profiles are presented in Table1. All the eligible respondents in this study were Chinese Tik Tok (Douyin) users and focused on middle-aged and elderly. As shown in table I.

Table I Demographic Variables

S/N	Demographic Variables	Scale	Frequency	Percentage
1	Gender	Male	94	57.7
		Female	69	42.3
		Total	163	100.00
2	Age	45-49	101	62.0
		50-54	22	13.5
		55-59	13	8.0
		60-64	11	6.7
		65-69	7	4.3
		More than 70	9	5.5
		Total	163	100.0
3	Educational Level	University	78	47.9
		College	41	25.2
		High school	44	27.0
		Total	163	100.0

Source: Field Survey

The demographic data presented in the study provides valuable insights into predicting TikTok addiction behavior among Chinese users. The study shows a significant gender imbalance, with 67 male participants (62.0%) and 96 female participants (11.7%). This suggests that TikTok may be more popular among females in this demographic. The marketing strategies and content creation on TikTok could be tailored to appeal more to female users, who may exhibit different patterns of engagement and addiction compared to male users. Understanding these differences can help in developing targeted interventions to mitigate addiction. Similarly, the majority of participants fall within the 45-49 age group (62.0%), with fewer participants in older age brackets. This indicates that younger middle-aged users are more likely to engage with TikTok. The age group may have different motivations for using TikTok, such as social connection or entertainment, which could lead to higher addiction levels. Recognizing the age-related preferences and behaviors can inform strategies to address potential addiction issues in this demographic. Finally, the educational background of participants shows that 47.2% have a university education, while 25.2% have a college education, and 27.6% have completed high school. This suggests that users with higher educational levels are also engaging with TikTok. The educated users may have different expectations and uses for the platform, potentially leading to varied addiction behaviors. Understanding the relationship between education and TikTok usage can help in crafting educational programs aimed at promoting healthy usage patterns.

The demographic variables of gender, age, and educational level provide a framework for predicting TikTok addiction behavior among Chinese users. By analyzing these factors, stakeholders can develop targeted strategies to address addiction, enhance user experience, and promote healthier engagement with the platform.

Smart PLS has been recommended by prominent scholars such as [35] as an effective method for testing complex research models. The use of Partial Least Squares Structural Equation Modeling (PLS-SEM) is widely acknowledged in academic circles as particularly suitable for the aims of this study. This method enables the simultaneous estimation of both the measurement model, which assesses the relationships between

observed indicators and their underlying latent constructs, and the structural model, which evaluates the relationships between the latent constructs themselves.

Building on a foundation of interdisciplinary research, this study draws upon previous findings related to behaviors associated with short video viewing and mental health outcomes, such as research by [55] investigated TikTok addiction behavior among users, further supporting the relevance of the current study's focus.In alignment with these preceding works, this investigation employed Smart PLS version 4.1.8 to carry out a rigorous two-stage approach in model testing. This methodology allows for a comprehensive analysis of complex relationships within the data, thereby enhancing the robustness and credibility of the research findings.

RESULTS AND DISCUSSIONS

Measurement Model

The evaluation of internal consistency reliability was conducted using two key metrics: Cronbach's alpha and composite reliability. The findings indicated that the model demonstrated an adequate level of internal consistency, as both Cronbach's alpha and composite reliability scores exceeded the threshold of 0.7, which is generally recognized as a benchmark for reliable measures in social science research [35]. This suggests that the items within the model are sufficiently correlated, supporting their use in measuring the intended constructs effectively. The high-reliability coefficients reinforce the robustness of the measurement tools employed in this study.

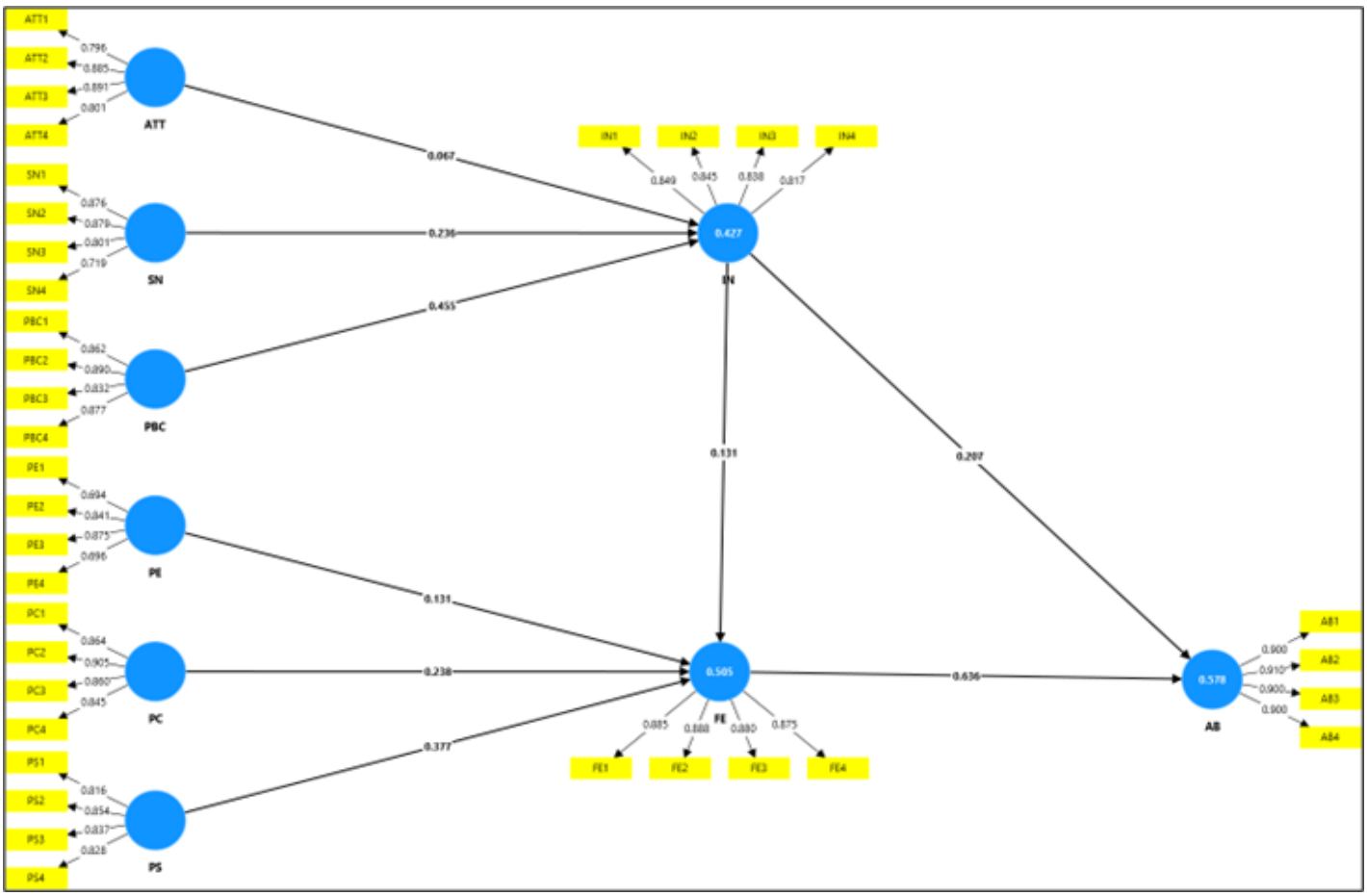

Fig. 3 Measurement Model

The reliability of the indicators was deemed satisfactory, with outer loadings surpassing the threshold of 0.6, as highlighted by [62]. This implies a strong relationship between the measurement items and their

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corresponding constructs. Furthermore, the evaluation of convergent validity confirmed its establishment, as evidenced by an average variance extracted (AVE) exceeding 0.5, following the criteria set forth by [63]. These findings demonstrate that the constructs effectively capture a substantial portion of the variance of their indicators. Detailed results of these analyses are presented in Table 2.

Table II Construct Reliability and Validity

Construct	Items	Loadings	AVE	CR	CA
ATT	ATT1	0.796	0.713	0.908	0.872
	ATT2	0.885			
	ATT3	0.891			
	ATT4	0.801			
SN	SN1	0.876	0.675	0.901	0.842
	SN2	0.879			
	SN3	0.801			
	SN4	0.719			
PBC	PBC1	0.862	0.749	0.923	0.889
	PBC2	0.890			
	PBC3	0.832			
	PBC4	0.877			
IN	IN1	0.849	0.701	0.903	0.858
	IN2	0.845			
	IN3	0.838			
	IN4	0.817			
PE	PE1	0.694	0.610	0.861	0.796
	PE2	0.841			
	PE3	0.875			
	PE4	0.696			
PC	PC1	0.864	0.755	0.925	0.892
	PC2	0.905			
	PC3	0.860			
	PC4	0.845			
PS	PS1	0.816	0.696	0.901	0.856
	PS2	0.854			
	PS3	0.837			
	PS4	0.828			
FE	E1	0.885	0.778	0.933	0.905
	E2	0.888			
	E3	0.880			
	E4	0.875			
AB	AB1	0.900	0.815	0.946	0.924
	AB2	0.910			
	AB3	0.900			
	AB4	0.900			

Source: PLS-SEM V4.1 8, 2024

Next, we adopted the Heterotrait Monotrait (HTMT) technique to test the discriminant validity [25]. The results presented that all the constructs did not violate HTMT 0.85, which confirmed that the discriminant validity was established [25]. Table 3 shows the findings that meet the threshold.

Table 3 Heterotrait-monotrait ratio (HTMT)

Constructs	(HTMT)
ATT <-> IN	0.687
SN <-> IN	0.808
PVC <-> IN	0.683
IN <-> E	0.597
IN <-> AB	0.482
PE <-> E	0.577
PC <-> E	0.677
PS <-> E	0.607
E <-> AB	0.772

Next the bootstrapping analysis was carried out to determine the direct effect of the independent variables on the dependent variable of the study. The study carried out bootstrapping analysis using 5000 subsamples using 163 cases. Based on the result, Fig. 3 is presented, which shows the structural model of the Extending Theory of Planned Behavior to Predict TikTok Addiction Behaviour Among Chinese users.

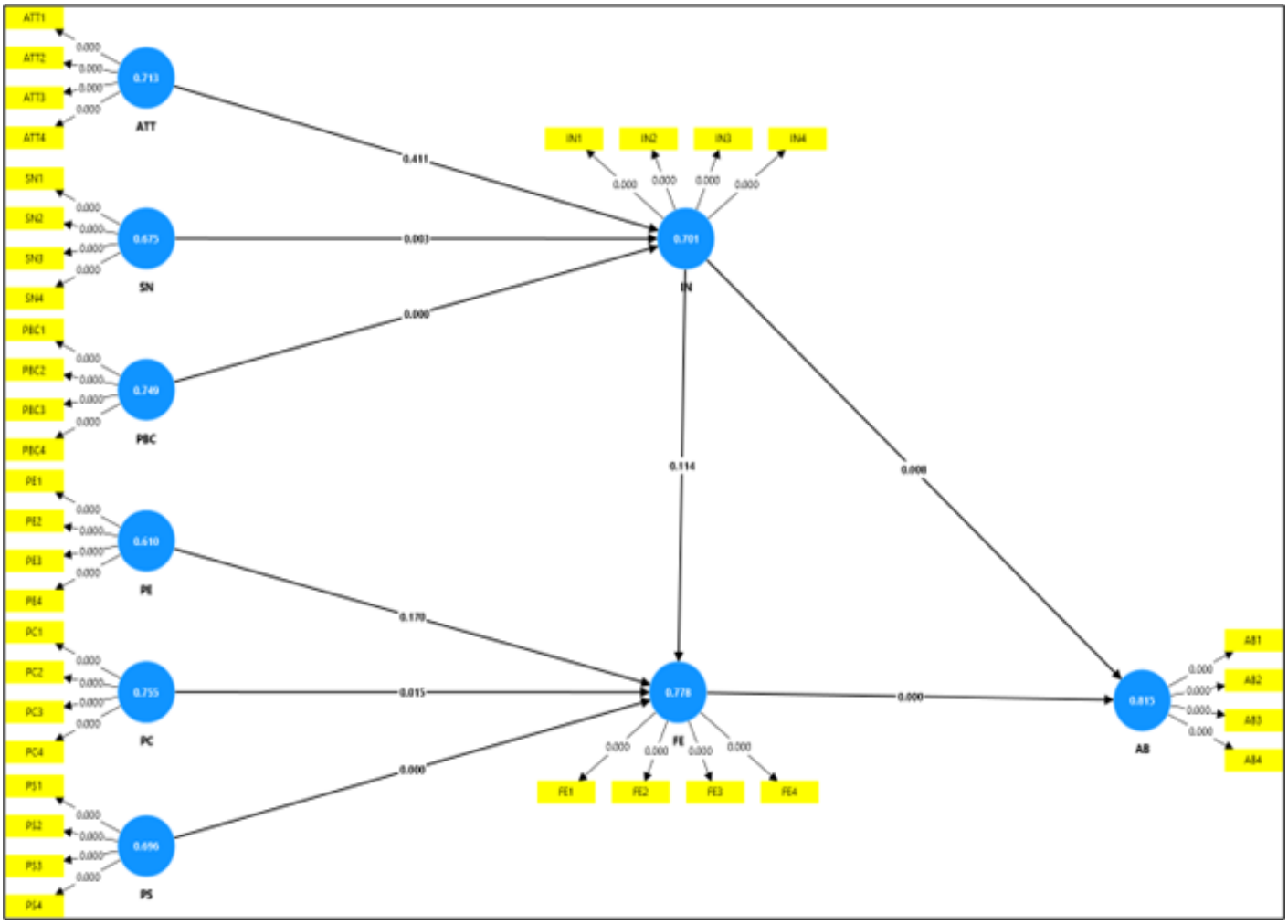

Fig. 4 Structural Model

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Fig. 4 above was used to estimate the path model to view the sampling distribution in order to determine the standard error and the standard deviation of the estimated coefficients distribution in the population.

Hypothesis Testing

In line with [35], the path relationships were examined with 5,000 bootstrap samples and a T statistic test with a 0.05 significance level. The PLS-bootstrapping results are presented in Tables 4.

Table 4 Hypothesis Testing

Path	Beta Value	Mean	Stand/dev	T statistics	P values	Decision
ATT->IN	0.067	0.071	0.082	0.822	0.411	Not Supported
SN->IN	0.236	0.241	0.079	2.974	0.003	Supported
PBC->IN	0.455	0.451	0.083	5.515	0.000	Supported
IN->FE	0.131	0.131	0.083	1.581	0.114	Not Supported
IN->AB	0.207	0.205	0.078	2.669	0.008	Supported
PE->E	0.131	0.135	0.095	1.371	0.170	Not Supported
PC->E	0.238	0.240	0.098	2.437	0.015	Supported
PS->E	0.377	0.377	0.096	3.933	0.000	Supported
E->AB	0.636	0.638	0.070	9.028	0.000	Supported

Our results showed that factors influencing TikTok usage and addiction behavior among users, Hypothesis 1 which state that, Attitude towards TikTok use will positively predict intention to use TikTok among middle-aged and elderly users were not supported (Beta = 0.067, p = 0.411) thus Hypothesis 2 which state that, subjective norm will positively predict intention to use TikTok among middle-aged and elderly users were Supported at (Beta = 0.236, p = 0.003). Similarly, Hypothesis 3: which state that, perceived behavioral control will positively predict intention to use TikTok among middle-aged and elderly users was supported with (Beta = 0.455, p = 0.000). But Hypothesis 4 which state that, intention to use TikTok will positively predict experience usage among middle-aged and elderly users was not Supported with (Beta = 0.131, p = 0.114). But Hypothesis 5 that state the intention to use TikTok will positively predict actual TikTok addiction behavior usage among middle-aged and elderly users. was supported with (Beta = 0.207, p = 0.008). Furthermore, Hypothesis 6 which state that perceived enjoyment will positively predict experience among middle-aged and elderly TikTok users was not Supported (Beta = 0.131, p = 0.170). Also, Hypothesis 7 which state that, perceived challenge will positively predict experience among elderly TikTok users was supported which (Beta = 0.238, p = 0.015). Similarly, Hypothesis 8 which state that perceived skill will positively predict experience among middle-aged and elderly TikTok users were supported with (Beta = 0.377, p = 0.000) the same thing which Hypothesis 9 which state that, experience will positively predict addiction behavior among TikTok users were also: Supported with (Beta = 0.636, p = 0.000).

Coefficient of determination (R2) and predictive relevance (Q2)

Besides, to justify the overall quality of the model, [35] suggested evaluating the coefficient of determination (R2) and predictive relevance (Q2), our results indicated that Addiction Behaviour, of Experience, and Intention to use TikTok accounted for a 58.3%, 52%, and 44%, variance in TikTok addiction behaviour. Therefore, our model had satisfactory explanatory power. The predictive relevance between exogenous and endogenous variables also showed that the Q2 value of the construct was greater than zero (i.e., Q2 TikTok Addiction Behaviour 0.518, of Experience 0.498 and Intention to use TikTok 0,406). Table 5 shows the Model results for R2 and Q2.

Table 5 Shows the Model results for R2 and Q2

Constructs	R-square	Q^2predict
Addiction Behaviour	0.583	0.518
Experience	0.517	0.498
Intention to use TikTok	0.438	0.406

Effect Size of Exogenous Variables

In their 2021 study, Hair and colleagues conducted a comprehensive analysis of the effect size of exogenous variables concerning the scores of latent variables. They highlighted the significance of examining how these exogenous variables contribute to the overall performance and interpretation of latent constructs. By assessing the effect size, researchers can attain a clearer understanding of the influence that external factors exert on the scores derived from latent variables, ultimately strengthening the robustness of their findings. This approach promotes a more detailed exploration of the relationships among variables, thereby facilitating enhanced theoretical and practical implications in the field.

Table 6 Effect Size of Exogenous Variables

Constructs	f-square	Effect Size
Addiction Toward TikTok	0.005	Small
Subjective Norms	0.060	
Perceived Behavioural Control	0.223	
Perceived Enjoyment	0.020	
Perceived Challenge	0.055	
Perceive Skills	0.193	

Table 6 presents the results of the ESEV targeting TikTok Addiction Behavior. The findings indicated that the influence of Addiction Toward TikTok had a small effect size (0.005), followed by Perceived Enjoyment (0.020). In contrast, Perceived Behavioural Control exhibited the highest effect size (0.223), while Perceived Skills had a notable effect size of (0.193). Additionally, Subjective Norms and Perceived Challenges demonstrated moderate effect sizes of (0.060) and (0.055), respectively. Consequently, in the context of this study, Perceived Behavioural Control emerges as the most significant predictor of TikTok Addiction Behavior, reflecting the highest effect size among Chinese users.

Discussion of the Findings

Based on extending the theory of planned behavior paradigm this study attempted to Predict TikTok Addiction Behaviour among Chinese users. Some findings was of significance.

First, this study shows lack of support for hypothesis one suggests that simply having a positive attitude towards TikTok does not significantly influence the intention to use the platform among elderly users. This was not aligned with former studies [46]. Additionally, this suggests that other factors, such as social influences or perceived control, may play a more significant role in shaping users' intentions. Furthermore, the findings from the second hypothesis underscore the importance of social influences in the decision-making process related to users. We empirically demonstrated their positive impact on TikTok addiction behavior. Previous research has indicated that social influences directly affect social media addiction [38]. This study further elaborates that when family, friends, or peers encourage TikTok usage, older individuals are more likely to express an intention to use the app. This highlights the critical role social networks play in technology adoption among adult users. Third, we found that the strong support for hypothesis three indicates that middle-aged and elderly (MG&E) users who feel they have the skills and resources to use TikTok are more likely to

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intend to use it. The TPB theory may provide a possible explanation. Reference [5] agreed that perceived behavioral control was the key factor. This suggests that enhancing perceived behavioral control through education and support could facilitate greater engagement with the platform. In hypothesis four which indicate lack of support suggests that merely intending to use TikTok does not guarantee that users will experience flow.

The findings presented in this study show some inconsistencies when compared to the research conducted by [64]. As a result, we undertook a comprehensive empirical revision of the flow theory, particularly within the context of the TikTok platform. This revision suggests that additional elements, such as the type of content shared and the design of the user interface, could play a crucial role in enabling a experience for users. Understanding these factors is essential for enhancing user engagement and satisfaction on social media platforms like TikTok.

But in hypothesis five the finding indicates that a strong intention to use TikTok correlates with actual addictive behaviors. It suggests that elderly users who plan to engage with TikTok are more likely to develop compulsive usage patterns, highlighting the potential for addiction in this demographic. So also, there is lack of support for hypothesis six which suggests that enjoyment alone may not be sufficient to induce a experience. Other elements, such as the complexity of tasks or user engagement, may be necessary to create a experience state. The finding in hypothesis seven indicates that elderly users who find TikTok challenging yet manageable are more likely to experience flow. This suggests that the right level of challenge can enhance user engagement and satisfaction.

Furthermore, the strong support for hypothesis eight indicates that elderly users who perceive themselves as skilled are more likely to experience. This suggests that fostering a sense of competence can enhance the overall user experience on TikTok. In hypothesis nine the finding highlights a significant relationship between experiences and addictive behaviors. MG&E users who experience while using TikTok are more likely to engage in excessive usage, indicating that creating engaging and immersive content could lead to higher addiction rates.

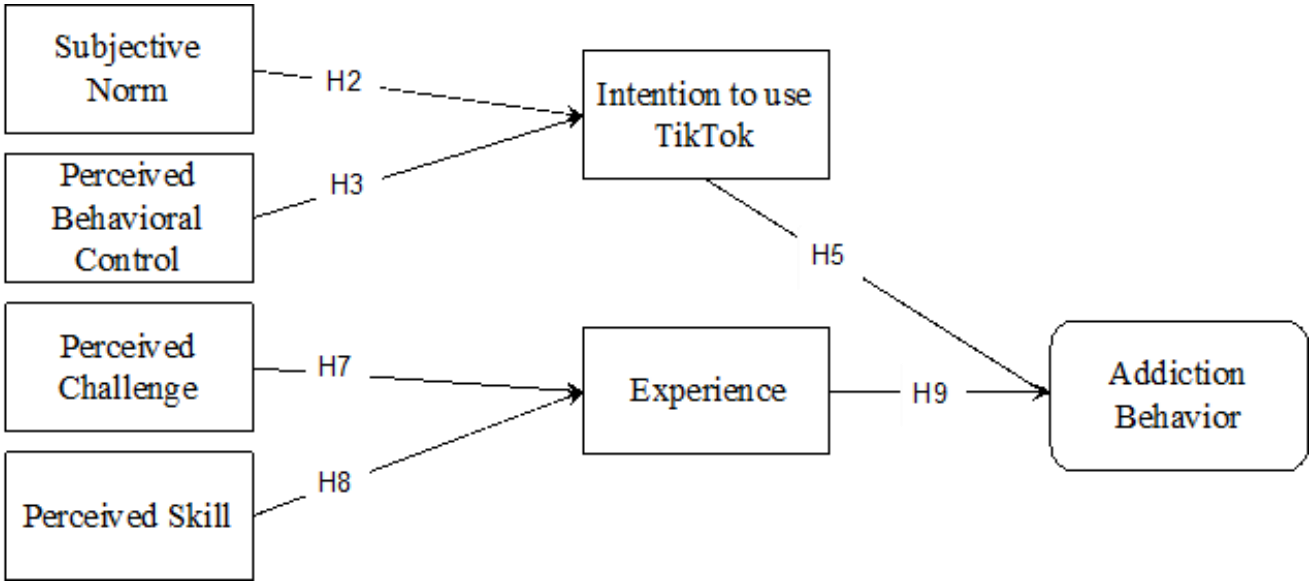

Fig. 5 Final Model

Overall, the findings suggest that social influences, perceived behavioral control, and the experience is critical factors in predicting TikTok usage and addiction among users. While attitudes and perceived enjoyment did not significantly impact intentions or experiences, the perceived challenge and skill levels were essential for enhancing user engagement (See Fig. 5 final model). These insights can inform strategies to promote healthy TikTok usage among MG&E users, focusing on social support and skill development.

CONCLUSION

This study successfully extends the Theory of Planned Behavior to better understand TikTok addiction among users in China. By analyzing the relationships between attitudes, subjective norms, perceived behavioural control, and the intention to use TikTok, the study reveals key insights into the drivers of engagement and potential addiction. The findings show that while enjoyment and perceived usefulness play important roles, the social environment and users' perceived digital skills have a substantial impact on how they engage with the platform. This research highlights both the addictive qualities of TikTok and the need for customized strategies to improve the digital experience for older adults.

THEORETICAL IMPLICATIONS

This study contributes to the existing literature by applying the Theory of Planned Behavior to the context of social media addiction, specifically among middle-aged and elderly populations. Previous research has primarily focused on environmental factors related to platform design, website layout, and the characteristics of video content [49]. This study highlights the significance of social influences and perceived behavioral control in predicting technology use. The findings indicate that traditional behavioral models may need to be adjusted to address the unique motivations and challenges encountered by older adults in the digital age. This theoretical extension offers new pathways for future research into how demographic factors impact technology adoption and addiction.

PRACTICAL IMPLICATIONS

The findings provide valuable practical insights for both practitioners and policymakers. By identifying the factors that contribute to TikTok addiction among users, we can develop interventions aimed at promoting healthier usage patterns. For instance, fostering supportive environments that encourage social interaction and the development of digital skills may help mitigate addictive behaviors. Consequently, app developers can create features that improve user experience while minimizing risks of addiction, such as integrating tutorials or community support systems specifically designed for older adults.

RECOMMENDATIONS

Based on the study’s findings, it is recommended that app developers, healthcare providers, and policymakers work together to create resources that assist users in navigating platforms like TikTok. This could involve educational initiatives focused on digital literacy, promoting healthy online habits, and encouraging social connections through technology. Furthermore, continued research should examine the long-term effects of TikTok use on the mental health and social engagement of elderly users, ensuring interventions remain timely and effective.

LIMITATIONS AND FUTURE RESEARCH

This study delivers insightful perspectives on the experiences of MG&E users on TikTok; however, it is important to recognize several limitations that may affect the robustness of the findings. Firstly, although the sample size comprises 163 participants—an amount that is generally considered adequate for initial exploratory research—this number may fall short of representing the extensive diversity present among older adults in China. Factors such as regional differences, varying educational backgrounds, distinct socioeconomic statuses, and differing levels of technological familiarity could lead to significant variations in how individuals interact with and perceive the platform. This suggests that future research should aim for larger, more heterogeneous samples to ensure that the findings reflect a broader range of experiences and can be generalized across the population.

Moreover, the present research tends to provide a static view of TikTok usage, capturing user behavior at a single moment in time. To develop a richer understanding of how TikTok usage impacts addiction and social engagement over extended periods, future investigations would benefit from a longitudinal approach. Such studies would allow researchers to observe the evolution of users' behaviors and attitudes over time, thereby uncovering valuable insights into the long-term effects of social media use on mental health and community interaction among older adults.

Additionally, it is crucial to delve into the cultural dynamics that influence how older adults in different parts of China adopt and engage with technology. Individual differences, such as prior exposure to digital platforms, personal attitudes toward innovation, and unique social contexts, significantly shape the way older users approach social media. Gaining a deeper understanding of these cultural and personal factors will be vital in forming a comprehensive picture of social media usage among older demographics.

Ultimately, the insights garnered from this study could provide a foundational basis for developing targeted interventions. These initiatives could promote healthier media consumption patterns, foster meaningful social connections, and support older adults in navigating the complexities of modern social media landscapes, ensuring that they can benefit fully from the opportunities that platforms like TikTok offer.

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APPENDIX

Appendix A Questionnaire Items

	Items	Source
Attitude (ATT)	I think using TikTok is enjoyable.	Venkatesh and Davis, (2000), Sharabati et al., (2022), Yaqi et al., (2021) Nugroho et al., (2023) and Sabir et al., (2020)
	Using TikTok is beneficial for my social life.	
	I find TikTok entertaining.	
	Using TikTok is a waste of time.	
Subjective Norm (SN)	My family and friends think I should use TikTok.	Liang, (2021), Venkatesh and Davis, (2000) and Nugroho et al., (2023)
	People important to me use TikTok.	
	I feel pressure from others to use TikTok.	
	Most people my age use TikTok.	
Perceived Behavioral Control (PBC)	I have the skills to use TikTok effectively.	Nugroho et al., (2023) Zaman et al., (2010)
	I have access to a device to use TikTok.	
	Using TikTok is easy for me.	
	I am confident in my ability to use TikTok.	
Intention (IN)	I intend to use TikTok regularly.	Yaqi et al., (2021) and Nugroho et al., (2023)
	I plan to continue using TikTok.	
	I will make an effort to use TikTok daily.	
	I am committed to using TikTok.	
Perceived Enjoyment (PE)	I enjoy watching videos on TikTok.	Nugroho et al., (2023) and Zaman et al., (2010)
	TikTok makes me happy.	
	I find TikTok entertaining.	
	Using TikTok is boring.	
Perceived Skill (PS)	I am skilled at using TikTok.	Nugroho et al., (2023) and Zaman et al., (2010)
	I can easily navigate TikTok.	
	I understand how to use TikTok.	
	I struggle to use TikTok.	
Perceived Challenge (PC)	TikTok challenges me to learn new things.	Nugroho et al., (2023) and Zaman et al., (2010)
	I find TikTok engaging.	
	Using TikTok requires effort.	
	TikTok is too easy.	

Experience	I lose track of time when using TikTok.	Yao & Omar, (2022), Zaman et al., (2010) Tse et al., (2020)
	I feel fully engaged when using TikTok.	
	Using TikTok makes me feel alive.	
	I am completely absorbed in TikTok.	
Addiction Behavior (AB)	I spend more time on TikTok than intended.	Nugroho et al., (2023), Zaman et al., (2010) and Yao & Omar, (2022)
	I neglect important activities due to TikTok.	
	I feel anxious when unable to use TikTok.	
	I experience withdrawal symptoms when not using TikTok.	