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Examining the impact of parasocial interaction and social presence on impulsive purchase in live streaming commerce context

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In recent years, along with the rapid development of Internet technology and drastic changes in consumption patterns, live streaming commerce has gradually become an emerging business model that attracts the participation of consumers. Based on parasocial interaction and social presence created by live streaming commerce, this study uses SmartPLS software to exam the impact of parasocial interaction and social presence on impulsive purchase in live streaming commerce context. According to an empirical analysis of 407 valid questionnaire data from China through an online survey, consumers' social anxiety and fear of missing out have a significant positive effect on parasocial interaction, while their narrative involvement has a non-significant effect on parasocial interaction. Social presence has a significantly positive effect on impulsive purchase. Consumers' narrative involvement and smartphone addiction had a significant positive effect on their social presence. This study extends existing research findings regarding consumer impulsive purchase on live streaming commerce. In addition, this study provides evidence that consumers' parasocial interaction and social presence mediate the relationship between consumer characteristics and impulsive purchase.

KEYWORDS

impulsive purchase, live streaming commerce, parasocial interaction, social presence, SmartPLS

1 Introduction

The advent of live streaming technology has resulted in a significant shift in the e-commerce landscape (Hua et al., 2023). Live streaming commerce (LSC) platforms have emerged as dynamic spaces in which influencers engage with audiences in real time, showcasing products and services interactively and engagingly. This digital evolution has given rise to a unique consumer phenomenon, marked by impulsive purchase, creating a rich area for scholarly inquiry. The worldwide LSC market is expected to reach $129.6 billion by 2024, primarily driven by Asia. In China, these events attract millions of viewers and generate substantial revenue (Ghostretail, Ontario, Canada, 2024). McKinsey's report indicated that Chinese consumers are more likely to engage in impulsive purchase (Zhou et al., n.d.). Many scholars have examined the factors influencing consumers' impulsive purchase in LSC. Past research has endeavored to clarify the formation of impulsive purchase in LSC, focusing on summarizing factors from diverse perspectives, such as platforms (Zhu et al., 2023), live

streamers (Zhou and Huang, 2023; Chen et al., 2023), consumers (Luo et al., 2024), and sellers (Shang et al., 2023; Lu and Duan, 2024).

Academic research continues to focus on thoroughly investigating how consumer characteristics influence the purchasing process in LSC. Recent studies have emphasized social barriers, prompting greater reliance on smartphones for social interaction and consumer engagement during pandemic (Kindred and Bates, 2023). Previous research has recognized social media as an important tool for problem-solving in digital context (Koehler and Vilarinho-Pereira, 2023; Wang et al., 2023). Nevertheless, a thorough understanding of the nuanced effects associated with consumers' social anxiety and fear of missing out (FOMO) in LSC domain remains to be fully clarified. While the stimulus-organization-response (S-O-R) framework has demonstrated that narrative involvement is a key antecedent of impulsive purchase behavior in digital environment (Vazquez et al., 2020), its behavioral pathways in LSC ecosystems remain theoretically under-explored, which is a key research gap to be addressed in this study. Positioned as a critical influencing factor in contemporary digital ecosystems, smartphone addiction has been extensively studied for its substantial impact on shaping social media usage behaviors, particularly consumption patterns, user engagement dynamics among digital consumers (Chopdar et al., 2022).

The primary advantage of live streaming lies in its capacity to facilitate real-time, bidirectional interactivity between live streamers and viewers, fostering immediate engagement and dynamic communication (Zhang et al., 2022). Live streaming platforms enable real-time, dynamic interactions between live streamers and their audiences, facilitating immediate question-response exchanges and allowing for personalized content delivery, including tailored recommendations and customized solutions based on individual viewer needs (Yang et al., 2022). Parasocial interaction (PI) and social presence have become core elements that affect user participation, emotional connections, and immersive experience (Liao et al., 2023). PI connects consumers and live streamers to form relationships, going beyond traditional one-sided communication to give audiences a sense of connection, intimacy, and companionship (Zhong et al., 2021). Social presence defines the extent to which users perceive the presence of others in a shared virtual space, thus fostering a sense of co-presence and shared interaction (Woo et al., 2024). PI and social presence play key roles in influencing consumer behavior (Kim, 2022). However, most previous studies in the field of LSC have explored parasocial relationships from the perspective of live streamers, failing to discuss PI and social presence from the consumer perspective (Shraf et al., 2023). To address these gaps, this study addresses the following questions:

(1) Is there a significant positive relationship between social anxiety, FOMO, narrative involvement, smartphone addiction, PI, and social presence?
(2) Is there a significant positive relationship between PI, social presence, and impulsive purchase?
(3) Do PI and social presence mediate the relationship between social anxiety, FOMO, narrative involvement, smartphone addiction, and impulsive purchase?

Therefore, this study exams how consumers' characteristics relate to PI, based on parasocial interaction theory (Horton and Richard Wohl, 1956). Additionally, flow theory was employed to clarify the relationship between narrative involvement and smartphone addiction in consumer behavior (Nakamura and Csikszentmihalyi, 2002). This study contributes significantly to LSC in several ways. First, it enriches the LSC marketing theory by examining consumer characteristics, particularly focusing on innovative variables such as social anxiety and smartphone addiction. Second, it enhances the parasocial interaction theory, social presence, and flow theory. Finally, it empirically identifies the new antecedents of PI and social presence in LSC.

2 Literature review

In the era of digital economy, consumers' shopping patterns have changed significantly. In particular, the rise of LSC has dramatically changed the traditional shopping scenarios. This study focuses on consumers' impulsive purchase in LSC context, aiming to deeply examine the relevant influencing factors and the theoretical mechanisms. A systematic review of existing literature not only lays the foundation for understanding this complex consumer phenomenon but also clarifies the research gaps and provides directions for subsequent studies.

2.1 Impulsive purchase

Impulsive purchase refers to the purchasing behavior in which consumers suddenly develop a strong desire to buy and quickly put it into action without prior planning (Luo et al., 2024). Compared with planned purchasing behavior, impulsive purchase has significant characteristics of immediacy, unplanned, emotionally driven (Luo et al., 2024). In previous research, impulsive purchase predominantly takes place within physical retail settings, such as supermarkets and shopping malls. Here, consumers are spurred to make impulsive purchase by factors like on-site product displays and promotional campaigns (Kacen et al., 2012). Planned purchasing behavior is usually based on consumers' rational needs and decision-making process, and consumers will collect, compare, and evaluate sufficient information before purchasing (Kacen et al., 2012). However, impulsive purchase is more substantially influenced by factors like emotions and situational environments. Its decision-making process is comparatively rapid and lacks premeditation. In LSC context, consumers are bombarded with an overwhelming volume of information and a wide array of stimuli (Kim et al., 2008). This abundance renders it more likely for them to exhibit impulsive purchase. This behavioral paradigm exerts a significant influence not only on consumers' individual consumption decisions and financial circumstances but also on the formulation of marketing strategies by e-commerce platforms and sellers. Concentrating on impulsive purchase enables a more profound comprehension of consumers' irrational behavioral models within emerging shopping scenarios. Moreover, it furnishes more targeted recommendations and strategies for the advancement of the e-commerce industry.

2.2 Factors influencing impulsive purchase in LSC

Live streaming commerce, an emerging commerce paradigm, is characterized by its distinct interactivity and real-time nature (Luo

et al., 2024). In LSC context, the factors related to live streamers exert a substantial influence on impulsive purchase. A live streamer's professional ability, combined with proficient sales techniques, significantly impacts consumers' trust and purchase intentions (Huang et al., 2024). For instance, a live streamer equipped with comprehensive product knowledge and strong communication capabilities is better positioned to present products to consumers, thereby enhancing consumers' confidence in the products and potentially triggering impulsive purchase (Wang et al., 2022). Interactivity during live streaming, such as lucky draws and question—and—answer sessions, can augment consumer engagement and immersion. This, in turn, encourages consumers to make impulsive purchase decisions (Zhang et al., 2022). The inherent characteristics of products, such as their uniqueness and scarcity, are further accentuated in LSC context, thereby stimulating consumers' impulsive purchase desires (Miranda et al., 2024). Additionally, the atmosphere created in live stream, such as limited-time and a sense of urgency in the purchasing process, also motivates consumers to make quick purchasing decision (Qu et al., 2023).

2.3 Parasocial interaction theory

Parasocial interaction theory conceptualizes the one-sided psychological connections and perceived relationships that viewers develop with media personalities through mediated communication channels, characterized by asymmetrical intimacy and audience-driven engagement (Horton and Richard Wohl, 1956). Audiences begin to see media influencers as friends even though they have no or limited interaction with them (Giles, 2002). PI involves viewers interacting with people such as talk show hosts, celebrities, and influencers, focusing on how the audience engages with these characters (Makmor et al., 2024).

PI research on new media has not fully kept pace with technological advancements, but there is a growing focus in this area (Jarzyna, 2021). For example, Rubin et al. (1985) proved that loneliness is associated with less interpersonal communication, and loneliness and PI are associated with greater television dependence. Rubin and Step (2000) assessed the effects of motivation, interpersonal attraction, and PI on listening to the public affairs talk radio. Kassing and Sanderson (2009) conducted a thematic analysis of fan posts on the cyclist Floyd Landis website, using a constant comparison method. The results show that Internet communication technology has transformed the nature of PI from one-sided and passive to approximate actual social interactions (Makmor et al., 2024). They also confirmed that viewers could easily engage in PI with influencers. Social media influencers, such as YouTubers and Instagram, play a key role in marketing by introducing products to their audiences. Content created by online influencers in PI and their perceived trustworthiness are associated with purchase intentions (Sokolova and Kefi, 2020). Regardless of the level of product involvement in the social media context, PI has a significant positive impact on followers' attitudes and behavior (Gong, 2021). Some studies indicate that the interactive orientation of live streamers positively influences audience immersion and PI, thereby enhancing audience purchase intention (Liao et al., 2023; Fu and Hsu, 2023). Considering the dramatic increase in social media usage, this trend is expected to continue. Despite the well-documented empirical evidence and theoretical propositions put forth by researchers in the field, PI remains a crucial social need for social media (Deng et al., 2023). Current research suggests that the strength of parasocial interaction between live streamers and consumers affects impulsive purchase (Li et al., 2023). For example, live streamers establish an emotional connection with consumers by sharing their personal experiences of using the product, which strengthens parasocial interaction and then triggers impulsive purchase (Luo et al., 2025). The previous studies reveal that consumers' parasocial interaction with celebrities on social media affect their attitudes toward products and purchase decisions, which also applies to LSC (Safrianto et al., 2024). Studies on PI in LSC and its influencing factors remain limited. Given these gaps, this study focuses on consumers' social needs in LSC. Individuals with social anxiety may seek PI in a live stream to fulfill their social needs (Apaolaza et al., 2019).

2.4 Social presence

Social presence refers to the perceived reality of an individual and its connection with others during media communication (Castellanos-Reyes et al., 2024). Presence refers to the psychological perception of others when people interact in a technology-supported environment (Rodríguez-Ardura and Meseguer-Artola, 2016). In the context of smartphone addiction and digital media use, social presence measures one's perception of the presence of others and the degree of intimacy or immediacy that simulates social experiences during online interactions (Kreijns et al., 2022).

Current studies indicate that social presence has been used in online shopping sites (Weisberg et al., 2011), live tourism (Zhang et al., 2024), meta-universe tourism (Ghali et al., 2024), online education (Kim et al., 2011; Sobaih et al., 2020) and social media (Lum and Chang, 2023; Yang et al., 2024). Researchers have begun incorporating social presence into LSC research. For instance, Gao et al. (2023) tested that virtual live streamers enhance social presence and telepresence, consequently facilitating purchase intention. When consumers feel a strong sense of social presence in social e-commerce, they feel closer to live streamers and other consumers, and are more likely to be influenced by live streamers' recommendations and other consumers' purchasing behaviors and then make impulsive purchase (Ju and Ahn, 2016).

2.5 Flow theory

Flow theory describes an invigorated state of mind in which individuals are fully immersed and completely engaged in the activity itself, losing self-consciousness (Wu and Liang, 2011). The central feature of the flow theory is immersion (Liao et al., 2023). Flow significantly affects continuous viewing and purchase intention (Zheng et al., 2023). Flow theory has become particularly important in the fields of internet consumption and narrative involvement. Narrative involvement primarily originates from consumers' self-expression and socialization needs, while parasocial interaction stems from consumers' emotional attachment and identification with media influences (Ahmed et al., 2024; Farivar et al., 2022). Narrative involvement is a two-sided interaction between dual consumers and others (Kang et al., 2020), whereas parasocial interaction is a unilateral emotional investment of consumers in media influencers, and it is often considered as a one-sided interaction (Lou, 2022). This

suggests that when individuals are immersed in engaging in digital content, such as narrative involvement or interactions on social media (Chang, 2013), the experience may induce a state of flow (Pelet et al., 2017).

Advancements in communication and internet technology offer new perspectives on e-commerce research. Interactivity enhances consumers' flow experiences during social searches on Instagram (Cuevas et al., 2021). Furthermore, research has begun to explore the role of flow experience in consumer characteristics and purchasing behavior. Researchers have found that flow experience positively affects purchase intention, satisfaction, and impulsive purchase (Hyun et al., 2022; Guan et al., 2022; Bao and Yang, 2022). Zheng (2023) drew on flow theory and conducted a questionnaire survey on Douyin (similar to Tiktok) users, confirming that flow experience positively moderates the relationship between hedonic value and emotional pleasure as well as between emotional pleasure and purchase intention. It has been found that flow significantly influences consumers' persistent viewing intention and purchase intention (Liu et al., 2022). Peer opinions on social networking sites have a considerable impact on consumers' impulsive purchase desires (Huang, 2016). Consumers' perception of time changes in the state of flow and they are more likely to make purchase decisions driven by impulsive emotions (Sun et al., 2023).

3 Conceptual framework and hypotheses

3.1 Effect of social anxiety

Social anxiety is a common psychological condition marked by heightened fear of being evaluated or judged by others in social situations (Morrison and Heimberg, 2013). Previous research demonstrated a positive relationship between social anxiety and web usage and online shopping behaviors (Pierce, 2009; López-Bonilla et al., 2021). Furthermore, research on PI suggests that individuals with higher social anxiety may be more inclined to develop parasocial relationships with media characters (Keefer et al., 2024; de Bérail et al., 2019), which may lead to higher sensitivity to impulsive purchase in LSC platforms. Based on these findings, we established H1 the follows:

> H1. Consumers' social anxiety positively affects PI in LSC.

3.2 Effect of FOMO

FOMO was first introduced into the media in the early 2010s (Cheng et al., 2023). It consists of both the worry that others are enjoying and the persistent desire to stay connected with others on social networks (Elhai et al., 2021). With the increasing popularity of smartphones, informational and normative social influence affect FOMO, which in turn affects compulsive buying (Mason et al., 2022). FOMO drives individuals to seek continued contact and participation in live streaming context, promotes the establishment of parasocial relationships, and enhances their social presence (Moore and Craciun, 2021). Thus, we propose:

> H2. Consumers' FOMO positively affects PI in LSC.

3.3 Effect of narrative involvement

Narrative involvement refers to the audience's engagement with the storyline (Hu et al., 2024). In this study, narrative involvement denotes the way LSC viewers interact with live streamers. Social media's interactive capabilities allow audiences and influencers to communicate directly with their followers (Arora et al., 2019). Hence, we propose:

> H3. Consumers' narrative involvement positively affects PI in LSC.

Interactivity directly affects the construction of social presence, which strongly influences narrative involvement (Fortin and Dholakia, 2005). Considering that narrative involvement enhances one's emotional and cognitive involvement with a story or content (Green, 2004), we hypothesize that consumers who are highly engaged in the narrative aspects of LSC interactions will also experience a greater sense of social presence. Thus, we propose:

> H4. Consumers' narrative involvement positively affects social presence in LSC.

3.4 Effect of smartphone addiction

The rich variety of functions and applications found on smartphones has given rise to a subset of individuals showing signs of addiction to their mobile devices (Jia et al., 2023). Past research has identified a relationship between smartphone addiction and increased online social interactions (Ihm, 2018). These findings suggest that people addicted to their smartphones may seek out and value social interactions facilitated by their devices. Being addicted to mobile phones leads to a higher frequency of using web pages or software (Barnes et al., 2019). Thus, we propose:

> H5. Consumers' smartphone addiction positively affects social presence in LSC.

3.5 Effect of parasocial interaction

PI is one-sided and individuals experience a sense of connection, familiarity, and immersion (Lee, 2013). In e-commerce, consumers engage in PI with influencers, brands, or other users on social commerce platforms (Jin and Ryu, 2020). These interactions create feelings of trust (Chen et al., 2019), which may influence impulsive purchase. Previous research shows that PI has a positive impact on impulsive purchase (Jarzyna, 2021). E-commerce platforms bridge the gap between users, encouraging them to exchange information like real-life friends, as well as providing them with the opportunity to interact with celebrities, thereby establishing PI (Xiang et al., 2016). Thus, we propose the following hypothesis:

> H6. Consumers' PI positively affects impulsive purchase in LSC.

3.6 Effect of social presence

Social presence refers to the perceived degree of feeling with others (Biocca et al., 2003). LSC enhances social presence through

real-time interactions and product demonstrations by live streamers, strengthening the psychological connection with consumers (Li et al., 2022). Prior research demonstrated that social presence promotes impulsive purchase. Ju and Ahn (2016) indicated that social presence in social commerce mimics the retail environment and fosters a sense of shopping, increasing the probability of impulsive purchase. Hence, we propose the following hypothesis:

> H7. Consumers' social presence positively affects impulsive purchase in LSC.

3.7 Mediation effects

Consumers become emotionally attached to and identify with media influencers in their interactions with them, making them more likely to accept the products or services they recommend. This emotional drive makes consumers make purchase decisions without rational thinking. When consumers watch the content of media influencers, they will unconsciously compare their lifestyles with their own, thus generating imitation behavior (Alnoor et al., 2024). In addition, media influencers' recommendations are often accompanied by positive feedback from other consumers, which further strengthens impulsive purchase (Lajnef, 2023). Combining the above hypotheses, we conclude that there may be a mediating relationship between consumer characteristics and impulse purchase. This study examines whether PI may be a partial mediator because consumer characteristics may bypass PI to directly stimulate consumer impulsive purchase. Thus, we propose the following hypotheses:

> H8a. Consumers' PI mediates social anxiety and impulsive purchase in LSC.
>
> H8b. Consumers' PI mediates FOMO and impulsive purchase in LSC.
>
> H8c. Consumers' PI mediates narrative involvement and impulsive purchase in LSC.

Consumers are more likely to be emotionally empathetic and immersed in the shopping experience in environments with high social presence (Saad and Choura, 2024). This immersion weakens consumers' rational judgment and makes them more susceptible to immediate stimuli. Social presence media, such as live streaming and video content, effectively convey non-verbal cues like facial expressions and gestures. This enables consumers to experience a more authentic and immersive interaction, thereby reducing the rational barriers to purchase decisions (Li et al., 2023). Similarly, social presence may mediate the relationship between consumer characteristics (i.e., social anxiety, FOMO, narrative involvement, and smartphone addiction) and impulsive purchase. In this study, we examined whether social presence may also be a partial mediator, as consumer characteristics may directly influence consumer impulsive purchase. Additionally, consumers with social anxiety, FOMO, narrative involvement, and smartphone addiction are more likely to impulsive purchase.

> H9a. Consumers' social presence mediates narrative involvement and impulsive purchase in LSC.
>
> H9b. Consumers' social presence mediates smartphone addiction and impulsive purchase in LSC.

The research model is presented in Figure 1.

Theoretically, parasocial interaction can enhance consumers' sense of social presence in mediated environments by fostering stronger emotional connections with media influencers. For instance, when consumers watch live streams, they often perceive a heightened social presence by viewing influencers as real-life social entities during their interactions. Despite the potential influence of parasocial

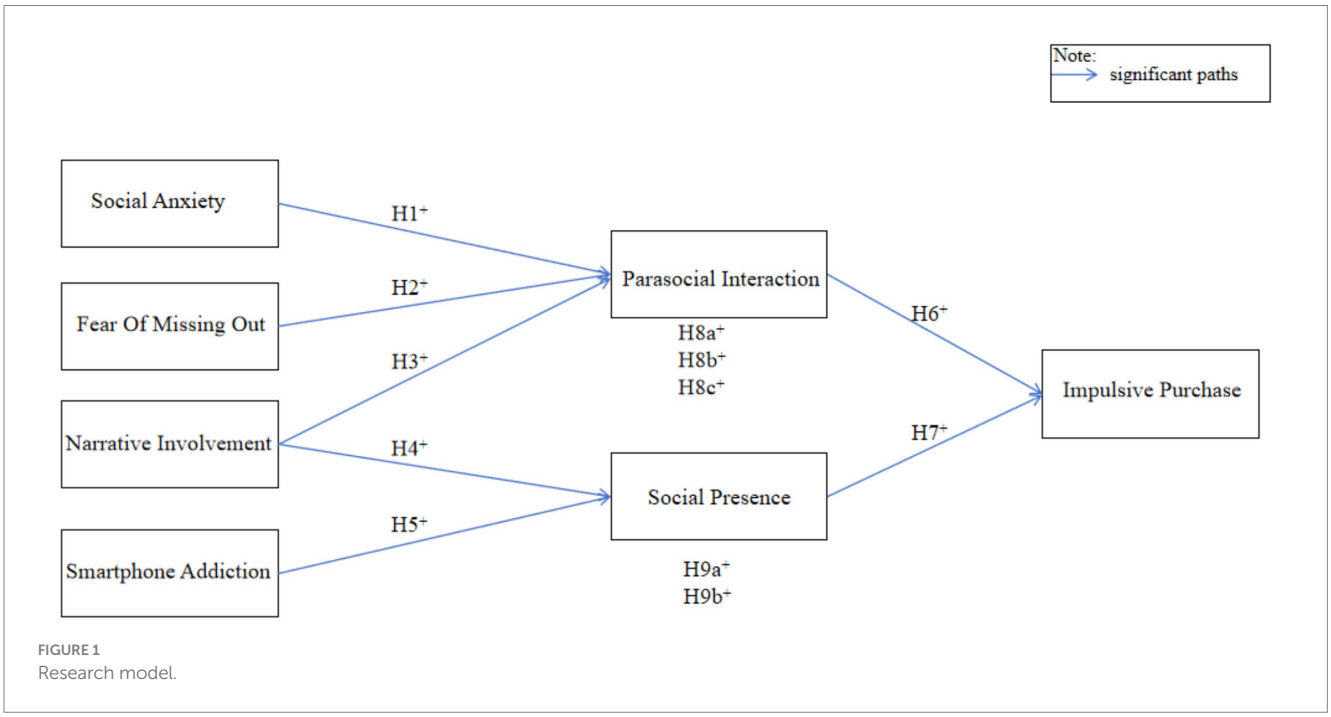

FIGURE 1
Research model.

interaction on social presence, the two constructs are typically treated as independent variables in existing models (Tsai et al., 2021). This separation arises for two main reasons: first, the measurement methods for parasocial interaction and social presence differ significantly, making it challenging to accurately capture their interplay within the same model. Second, current theoretical frameworks have not yet fully explored or integrated the relationship between parasocial interaction and social presence, leading to their interconnectedness being overlooked in many models (Kim and Song, 2016).

4 Method

4.1 Measurements

The questionnaire included seven variables: social anxiety (SA), fear of missing out (FOMO), narrative involvement (NI), smartphone addiction (SMA), parasocial interaction (PI), social presence (SP), and impulsive purchase (IP). The items were adapted from prior research (see Appendix). Responses were collected using a 5-point Likert scale, ranging from "1 = completely disagree" to "5 = completely agree." As the survey was conducted in China, all original items were translated from English to Chinese, and two Chinese researchers reviewed the translations to enhance the reliability and validity of the questionnaire. A pilot was conducted with 50 users and the final questionnaire was obtained.

4.2 Data collecting and descriptive statistics

The recruitment process started on the 15 April 2024, until 15 May 2024. The study population consisted of individuals with experience using LSC platforms, and potential participants were aged 18 years or older. A total of 425 questionnaires were sent to respondents, of which 407 valid questionnaires were analyzed using SmartPLS version 4.1. The characteristics of the sample are presented in Table 1.

Impulsive purchase: $R^2 = 0.094$ (adjusted $r^2 = 0.089$). Parasocial interaction: $R^2 = 0.11$ (adjusted $R^2 = 0.104$). Social presence: $R^2 = 0.087$ (adjusted $R^2 = 0.082$). These results indicate that the model has some explanatory power for the endogenous variables, especially parasocial interaction ($R^2 = 0.11$). FOMO → parasocial interaction: $f^2 = 0.02$ (small effect), narrative involvement → parasocial interaction: $f^2 = 0.008$ (small effect), narrative involvement → social presence: $f^2 = 0.013$ (small effect), parasocial interaction → impulsive purchase: $f^2 = 0.03$ (small effect), smartphone addiction → social presence: $f^2 = 0.069$ (medium effect), social anxiety → parasocial interaction: $f^2 = 0.046$ (small effect), social presence → impulsive purchase: $f^2 = 0.036$ (small effect). These results suggest that smartphone addiction has a strong effect on social presence ($f^2 = 0.069$), while the other paths have smaller effect sizes. Impulsive purchase: $q^2 = 0.048$ (RMSE = 0.982, MAE = 0.79). Parasocial interaction: $Q^2 = 0.089$ (RMSE = 0.959, MAE = 0.809). Social Presence: $Q^2 = 0.074$ (RMSE = 0.968, MAE = 0.755). All Q^2 values were greater than 0, indicating that the model has good predictive power.

TABLE 1 Sample characteristics ($N = 407$).

Items	Categories	Number	Percentage (%)
Gender	Male	180	44.226
	Female	227	55.774
Age	18–25	104	25.553
	26–35	117	28.747
	36–40	94	23.096
	Above 40	92	22.604
Highest degree	Under bachelor	127	31.204
	Bachelor	185	45.455
	Master	60	14.742
	Others	35	8.600
Occupation	Student	18	4.423
	Teaching and research staff	51	12.531
	Officer	59	14.496
	Enterprise staff	218	53.563
	Others	61	14.988
Monthly income	Below 3,000 RMB	72	17.690
	3,000–5,000 RMB	121	29.730
	5,000–9,000 RMB	145	35.627
	Above 9,000 RMB	69	16.953
Length of exposure	Less than 1 year	53	13.022
	1–2 year	102	25.061
	3–4 year	155	38.084
	Above 4 years	97	23.833
Favorite platforms	Taobao	137	33.661
	Douyin	112	27.518
	Jingdong	90	22.113
	Others	68	16.708
Total		407	100.0

5 Data analysis and results

5.1 Measurement model

Calculation of the loadings of the measurement model indicates that the loadings of "social anxiety" range from 0.790 to 0.820, "fear of missing out" range from 0.765 to 0.799, "narrative involvement" range from 0.804 to 0.866, and "smartphone addiction" ranged from "0.795 to 0.849," and the loadings for the latent variables of social interaction, social presence and impulse buying were all greater than 0.6, indicating a high level of internal consistency of the measurement items. The findings are presented in Table 2.

Using the SmartPLS 4.1 software environment, a latent variable model was constructed to assess convergent validity. This validity was evaluated using two key metrics: Average Variance Extracted (AVE) and Cronbach's alpha. Convergent validity was considered satisfactory if the AVE value for each factor exceeded 0.5 and the Composite Reliability (CR) value surpassed 0.7, indicating strong internal consistency and reliability. The results in Table 3 show that the AVE values for the seven

TABLE 2 Results of cross-loadings.

	IP	NI	FOMO	SMA	SP	SA	PI
SA1						0.790	
SA2						0.814	
SA3						0.795	
SA4						0.820	
SA5						0.811	
FOMO1			0.765				
FOMO 2			0.795				
FOMO 3			0.789				
FOMO 4			0.799				
FOMO 5			0.773				
FOMO 6			0.792				
FOMO 7			0.779				
FOMO 8			0.785				
NI1		0.841					
NI2		0.804					
NI 3		0.866					
SMA1				0.826			
SMA 2				0.838			
SMA 3				0.828			
SMA 4				0.795			
SMA 5				0.849			
PI1							0.838
PI2							0.815
PI 3							0.802
PI 4							0.802
PI 5							0.817
SP1					0.828		
SP2					0.826		
SP3					0.837		
SP4					0.815		
IP1	0.822						
IP2	0.847						
IP3	0.856						

constructs of impulsive purchase, narrative involvement, fear of missing out, smartphone addiction, social presence, social anxiety, and parasocial interaction are 0.708, 0.701, 0.616, 0.685, 0.683, 0.65, and 0.664, with variance explained levels of 70.8, 70.1, 61.6, 68.5, 68.3, 65, and 66.4%, respectively. It is generally accepted that Cronbach's alpha coefficients are above 0.7 (Beaudart et al., 2017), and the reliability levels of the above variables are greater than 0.7, indicating a high level of internal consistency in the measurement construct.

The dimensions are significantly correlated with each other, the absolute value of the correlation coefficient is less than 0.50 and the two-by-two correlation coefficients of impulsive purchase, narrative involvement, fear of missing out, smartphone addiction, social presence, social anxiety, and parasocial interaction

TABLE 3 Results of convergent validity.

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	AVE
IP	0.794	0.794	0.879	0.708
NI	0.79	0.814	0.876	0.701
FOMO	0.911	0.919	0.928	0.616
SMA	0.885	0.892	0.916	0.685
SP	0.845	0.847	0.896	0.683
SA	0.866	0.871	0.903	0.65
PI	0.874	0.881	0.908	0.664

constructs are less than the square root of the AVE of the corresponding variables. The square root of the AVE for impulsive purchase is 0.842, and the correlation coefficients between impulsive purchase and the other variables range from 0.166 to 0.258, which is less than the threshold required level of 0.842, indicating ideal discriminant validity. Discriminant validity results are presented in Table 4.

5.2 Structure model

Social anxiety had a positive and significant effect on parasocial interaction ($\beta = 0.221$, $p < 0.001$), fear of missing out had a positive and significant effect on parasocial interaction ($\beta = 0.140$, $p = 0.002 < 0.01$), and there was no positive and significant effect of narrative involvement on parasocial interaction ($\beta = 0.088$, $p = 0.066 > 0.05$). Narrative involvement had a positive and significant effect on social presence ($\beta = 0.111$, $p = 0.012 < 0.05$) and smartphone addiction had a positive and significant effect on social presence ($\beta = 0.254$, $p < 0.001$). There was no positive or significant effect of social presence on impulsive purchase ($\beta = 0.194$, $p < 0.001$), and there was a positive and significant effect of parasocial interaction on impulsive purchase ($\beta = 0.177$, $p = 0.001 < 0.01$) (see Table 5).

We further tested the indirect effects to explore how SA, FOMO, NI, and SMA may influence impulsive purchase through significant mechanisms. The path from SA to IP via PI was significant (H8a). The study found no support for the mediating effect of parasocial interaction on the relationship between fear of missing out, narrative involvement, and impulsive purchase (H8b and H8c). The mediating effect of social presence on the relationship between narrative involvement is not supported (H9a). Social presence mediates the effects of smartphone addiction and impulsive purchase (H9b). The results of the research model are illustrated in Figure 2.

6 Discussion

Based on parasocial interaction theory and flow theory, this study reveals the dual-path mechanism by which consumer characteristics influence impulsive purchase through media perceptions. The research model clarifies the influence of consumer characteristics on their parasocial interaction and social presence, as well as the mediating role of parasocial interaction and social presence between consumer characteristics and impulsive purchase. The results of the

study not only validate some of the presuppositions of the established theory but also reveal several noteworthy findings.

Consistent with expectations, consumers' social anxiety and fear of missing out had a significant positive effect on parasocial interaction (H1, H2 accepted). This finding aligns with previous research (Deng et al., 2023), suggesting that individuals with high social anxiety prefer to engage in virtual parasocial interaction via live streaming commerce to compensate for anxiety in real social situations. Notably, this study further revealed the unique role of the real-time feedback properties of live streaming in creating virtual intimate compensation (Wu et al., 2023). Social anxious individuals receive instant social rewards through screen interactions (Li et al., 2024), and this operant conditioning mechanism drives impulsive purchase (Djafarova and Rushworth, 2017), which provides a new theoretical perspective for understanding consumption behavior in live streaming commerce context.

However, contrary to the hypothesis, the effect of narrative involvement on parasocial interaction was not significant (H3 reject), despite adequate measurement reliability. This null effect potentially related to our operationalization through the scale may have inadequately captured the dimensions of engagement for specific groups. The observed discrepancies may stem from cross-cultural variance in narrative interpretation frameworks and individual phenomenological differences. In addition, consumers' exposure to narratives may be influenced by other factors including viewing environment, resulting in insufficient emotional involvement, which in turn weakens the formation of parasocial interaction (Giles, 2002). Future research could further explore measures of narrative involvement and consider other potential factors.

The findings support both H4 and H5, suggesting that consumers' narrative involvement and smartphone addiction significantly affected their social presence. This suggests that deeper narrative involvement enhances consumers' perceptions of community atmosphere, while smartphone addiction may exacerbate consumers' reliance on virtual socialization (Vazquez et al., 2020). In addition, H6 and H7 were also validated that parasocial interaction and social presence had a significant positive effect on consumers' impulsive purchase, which is in line with the findings of a past study (Fu and Hsu, 2023).

The results of the mediation effects test validated H8a and H9b that parasocial interaction mediates between social anxiety and impulsive purchase, and that social presence mediates between smartphone addiction and impulsive purchase. However, the study unexpectedly found that H8b, H8c, and H9a were not supported. This result may be due to insufficient sample size or the presence of moderating variables. For example, individual differences (e.g.,

TABLE 4 Results of discriminant validity.

	IP	NI	FOMO	SMA	SP	SA	PI
IP	0.842						
NI	0.166	0.837					
FOMO	0.274	0.148	0.785				
SAM	0.177	0.168	0.21	0.827			
SP	0.258	0.154	0.218	0.273	0.826		
SA	0.211	0.295	0.313	0.3	0.377	0.806	
PI	0.248	0.173	0.219	0.274	0.365	0.289	0.815

TABLE 5 Direct effects.

	β	t	p	f^2	Decision
SA → PI	0.221	4.595	<0.001	0.046	Supported
FOMO → PI	0.14	3.094	0.002	0.02	Supported
NI → PI	0.088	1.842	0.066	0.008	Not supported
NI → SP	0.111	2.499	0.012	0.013	Supported
SMA → SP	0.254	5.596	<0.001	0.069	Supported
PI → IP	0.177	3.322	0.001	0.03	Supported
SP → IP	0.194	3.645	<0.001	0.036	Supported

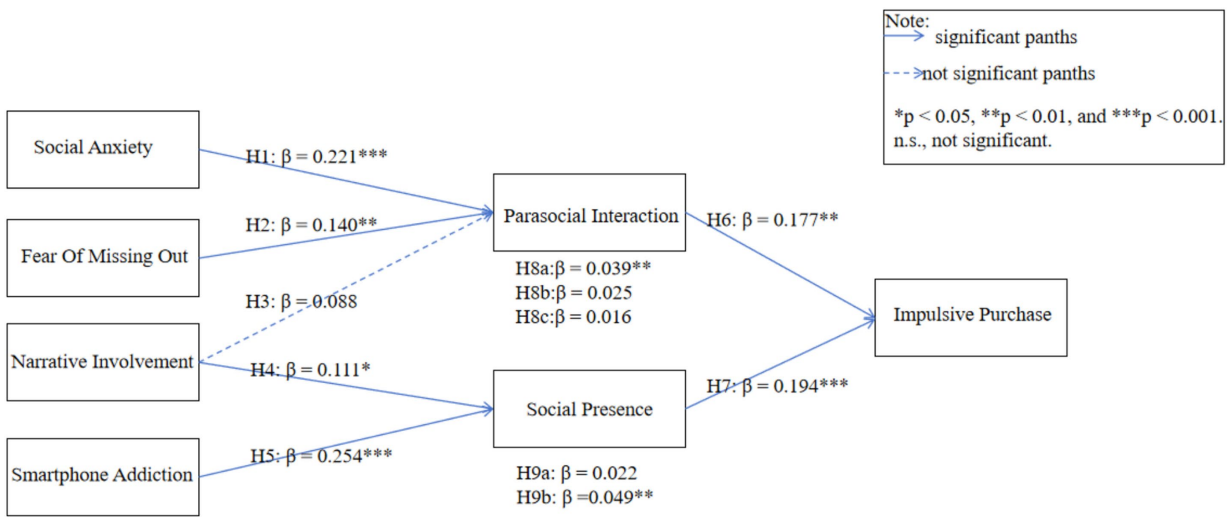

FIGURE 2
Results of the research model.

self-control, consumerism, etc.) may have moderated the effects of parasocial interaction and social presence on impulsive purchase (Nawaz et al., 2021). Thus, future research could expand the sample size and incorporate potential moderate variables to further validate the robustness of the research model.

7 Conclusion

7.1 Theoretical and practical implications

Theoretically, this study encompasses the following aspects. Firstly, previous research on consumer impulsive purchase influences has focused on influencers and live streaming technology, with little consideration of individual consumer characteristics. This study confirms that consumer characteristics, such as social anxiety, fear of missing out, and smartphone addiction, have an impact on their impulsive purchase, thus contributing to the improvement of live streaming marketing theory. Secondly, this study identifies the impact of parasocial interaction, social presence provided by new media on consumers' impulsive purchase in the context of the growing popularity of the digital economy and considering the dual influence of traditional and new media. Finally, the findings of this study do not confirm the positive impact of narrative involvement on consumer impulsive purchase, which differs from previous research and opens possibilities for new research directions (Vazquez et al., 2020). Overall, this study enriches the theoretical framework of live streaming marketing from the perspectives of communication and psychology.

Practically, this study holds significant implications for live streaming commerce platforms and sellers. First, platforms should pay attention to high social anxiety user groups and enhance users' virtual social experience by optimizing functions such as screen interaction and virtual gifts, thus promoting conversion rate. Second, sellers should focus on the narrative and interactivity of the live streaming content to enhance consumers' sense of participation and social presence and then stimulate their desire to purchase. Finally, platforms and sellers should guide users to consume rationally and avoid over-reliance on virtual socialization and impulsive purchase.

7.2 Limitations and future research

Despite the great strengths of this study there are still several limitations. First, the study sample is mainly from China, which may limit the applicability of the findings to other countries (Djafarova and Rushworth, 2017). Future studies could expand the sample to test the generalizability of the findings. Second, this study did not consider other potential influencing factors, such as product type and live streamer characteristics. Future research should incorporate additional studies to ascertain whether other potential factors influence consumers' impulsive purchase, thereby constructing a more comprehensive research model. Additionally, respondents' answers were based on a recent live streaming experience. There is a certain time lag between the respondents' answers and the viewing experience. Lastly, respondents held different views on live streaming due to the different live streaming platforms. As a result, respondents may have biased their responses toward emotions. In the future, we plan to address these limitations by inviting respondents to view LSC live, and fill out the questionnaire.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors without undue reservation.

Author contributions

YH: Formal analysis, Methodology, Software, Writing – original draft. SM: Project administration, Supervision, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

Publisher's note

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Appendix

Measures of study constructs items.

Construct	Items	Source
Social anxiety (SA)	SA1: I have difficulty talking with other people.	Lyngdoh et al. (2023)
	SA2: I worry about expressing myself in case I appear awkward.	
	SA3: I am nervous mixing with people I do not know well.	
	SA4: I feel I will say something embarrassing when talking.	
	SA5: When mixing in a group, I find myself worrying I will be ignored.	
Fear of missing out (FOMO)	FOMO1: I'm afraid later I will feel sorry I didn't buy products endorsed by the live streamer.	Dinh et al. (2023)
	FOMO2: I will worry about I am missing products endorsed by the live streamer.	
	FOMO3: I will worry other people are having more rewarding things than me by using products endorsed by the live streamer.	
	FOMO4: I feel concerned that other people are having more fun with products endorsed by the live streamer while I don't.	
	FOMO5: I will feel left out the trends if I don't have the products endorsed by the live streamer.	
	FOMO6: I feel sorry that I don't experience products endorsed by the live streamer.	
	FOMO7: I will feel anxious about not being with products endorsed by the live streamer.	
	FOMO8: I will bother that I missed an opportunity to use that product endorsed by the live streamer.	
Narrative involvement (NI)	NI1: I was really pulled into the story.	Vazquez et al. (2020)
	NI2: While viewing, I was completely immersed in the story.	
	NI3: I wanted to learn how the story ended.	
Smartphone addiction (SMA)	SMA1: Using my smartphone is one of my daily activities.	Chopdar et al. (2022)
	SMA2: If my smartphone does not work, I really miss it.	
	SMA3: My smartphone is important in my life.	
	SMA4: I cannot go for several days without using my smartphone.	
	SMA5: I would be lost without my smartphone.	
Parasocial interaction (PI)	PI: While watching e-commerce livestreaming, the anchor is like an old friend of mine.	Deng et al. (2023)
	PI2: While I watch e-commerce livestreaming, the streamer keeps me company.	
	PI3: While I watch e-commerce livestreaming, I feel as if I am part of it.	
	PI4: I look forward to watching streamers' live streaming.	
	PI5: I would like to meet the streamers of the e-commerce live streaming in person.	
Social presence (SP)	SP1: While I watch e-commerce livestreaming, the other users can feel my presence.	Deng et al. (2023)
	SP2: While I watch e-commerce livestreaming, my emotions are affected by other viewers.	
	SP3: While I watch e-commerce livestreaming, I feel close to other viewers.	
	SP4: While I watch e-commerce live streaming, the distance between the other viewers and me is narrowed.	
Impulsive purchase (IP)	IP1: When I watch live-streaming, I buy things that I had not intended to purchase.	Luo et al. (2024)
	IP2: I am a person who makes unplanned purchases.	
	IP3: It is fun to buy spontaneously.	