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Unveiling the Myth: How Streamer Attractiveness Drives Impulse Buying in Live Streaming

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ABSTRACT

Drawing upon self-determination theory in the live streaming context, this study examines the relationships between streamer attractiveness, parasocial interaction, fear of missing out and consumers' impulse buying during live streaming events. The data were collected from 345 respondents who regularly participated in live streaming events. The findings reveal both a parallel and sequential mediation impact of parasocial interaction and fear of missing out, linking the streamer attractiveness to the impulsive purchasing behavior of consumers. This research not only illuminates the underlying mechanisms connecting streamer attractiveness to impulse buying but also showcase the significant mediation effect of fear of missing out.

KEYWORDS

Streamer attractiveness; parasocial interaction; fear of missing out; impulse buying; live streaming marketing

Introduction

Live-streaming marketing has seen a significant surge in promoting a diverse spectrum of products such as apparel, electronics, furniture, jewelry, and more (Wongkitrungrueng et al., 2020). Beckman (2023) indicates that the global spend on live-streaming commerce is projected to reach $55 billion by 2026. China takes a leading role in live streaming e-commerce (Cunningham et al., 2019). The latest statistics from CNNIC (2023) indicate that there are 515 million live streaming marketing users, constituting 48.2% of China's total internet population as of December 2022.

Live streaming shopping resembles an online version of traditional TV home shopping due to their reliance on video and a host (Xu et al., 2020), nonetheless there are significant distinctions in definitions, features, theoretical frameworks. These distinctions indicate that live streaming

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shopping is not merely a substitute for TV home shopping but a novel, digitally-native channel emerging from e-commerce and social commerce (Ki et al., 2024; Mao et al., 2022). Ki et al. (2024) emphasize that live streaming shopping primarily is focused on fostering consumer engagement and interaction, whereas TV home shopping is product-centric with a direct selling approach. Live streaming shopping emphasizing community building and multilateral and immediate interactions among the streamer, audience, and other viewers, leveraging the dynamic and interactive nature of live streaming to engage consumers (Luo et al., 2024), while TV home shopping prioritizes product presentation, maintaining a more traditional, unidirectional flow of information. The immersive experience and interactive nature of live streaming marketing have the potential to evoke impulse buying behaviors among consumers (Zhang et al., 2022), making online impulse buying a captivating theme for theorists and marketers alike. Despite extensive discussion on consumers' impulse buying, very limited research has been attended to the live streaming context (Redine et al., 2023).

During live streaming, consumers often establish parasocial interactions with streamers. Parasocial interaction has been identified as a crucial factor influencing consumers' impulse buying tendencies (Xiang et al., 2016), impulsive purchasing urges (Chen et al., 2021), and purchase intentions (Rungruangjit, 2022; Sokolova & Kefi, 2020). On the other hand, fear of missing out (FoMO), a concept derived from psychology and education literature, has gained traction in recent years, notably within studies exploring problematic smartphone usage (Elhai et al., 2016), Social Networking Service (SNS) addiction (Yin et al., 2021), and adverse social media usage, including phubbing behavior (Franchina et al., 2018). Przybylski et al. (2013) define FoMO as a form of diffuse anxiety, which emerges as a significant negative emotion influencing customer purchase behavior (Dinh & Lee, 2022). Despite the established impact of positive emotions on impulse buying in live marketing contexts, such as flow experience (Cui et al., 2022), arousal (Xu et al., 2020), and enjoyment (Lee & Chen, 2021), very few studies have addressed the impact of negative emotions. This gap reflects a prevailing "myth" in the literature: that consumer behavior in live streaming marketing is primarily driven by positive emotional states, while the role of negative emotions, such as FoMO, is overlooked. By introducing FoMO as a mediator, this study challenges this conventional perspective and provides a novel exploration of customers' impulse purchase behavior in live streaming marketing. Specifically, we question the assumption that impulse buying is solely a result of positive emotional engagement, such as enjoyment or arousal, and instead propose that negative emotions, like FoMO, play a critical and understudied role in shaping consumer behavior.

While live streaming marketing has become integral for companies to boost revenue, the effect of attractive streamers in prompting impulse buying among consumers remains underexplored. Using self-determination theory, this study endeavors to unravel the potential mechanisms through which streamer attractiveness influences customers' impulse purchase behavior, examining the mediation effects of parasocial interaction and FoMO. Specifically, our focus extends to a parallel multiple mediation effect and a serial mediating role of parasocial interaction and FoMO on streamer attractiveness and impulse buying. This study contributes fresh insights into the influence of streamer attractiveness on customers' impulse purchase in live streaming marketing, grounded in parasocial interaction and FoMO theories. Moreover, it pioneers the application of FoMO in studying consumers' impulse buying within the live marketing context.

Theoretical background and hypotheses

Self-Determination Theory (SDT) emphasizes individuals' innate growth tendencies and psychological needs, asserting that individuals are intrinsically motivated by the fulfillment of three core psychological needs: autonomy (freedom in one's actions), competence (efficacy in achieving desired outcomes), and relatedness (connection and care from others) (Ryan & Deci, 2020). Moreover, SDT posits a strong link between satisfying these needs and the development of a positive self-perception (Ryan & Deci, 2020). Scholars have argued that SDT, which aims to describe individuals' inner needs that influence their emotions and behaviors in various contexts (Ryan & Deci, 2020), is particularly relevant in the e-commerce or online shopping environment. The online shopping environment provides sensory and cognitive inputs comparable to those of a physical environment (Mollen & Wilson, 2010), thereby influencing customers' intrinsic motivation and driving their behavior. Consequently, SDT is considered an appropriate framework for explaining consumer psychology and behavior in the e-commerce context (Gao et al., 2018). Drawing upon SDT, this study investigates the influence of a streamer's attractiveness on consumers' impulsive purchasing behaviors by exploring the mediating mechanisms of parasocial interaction and Fear of Missing Out (FoMO). According to SDT, FoMO could result in adverse outcomes due to maladaptive self-regulation behaviors aimed at satisfying psychological needs. Faced with anxieties and negative emotions, individuals may engage in impulsive purchases as a potential means of emotional regulation, offering temporary relief or distraction (Tanrikulu & Mouratidis, 2023).

Streamer attractiveness and parasocial interaction

Attractiveness, a fundamental concept in social psychology, refers to the cognitive biases and emotional responses triggered by perceiving another individual as possessing characteristics desirable for a potential bond or connection. Scholars in the communication and social media research domain have categorized attractiveness into three dimensions: physical, task, and social attractiveness (Shen et al., 2019; Zheng et al., 2022). Within the field of live streaming, streamer attractiveness encompasses viewers' perceptions of the streamer's looks, talent, and personality exhibited throughout live shows (Xu et al., 2020). For the purposes of this study, streamer attractiveness is conceptualized as customers' overall perception of the streamer in live stream marketing, representing a comprehensive and somewhat abstract evaluation of the streamer's various characteristics.

Parasocial interaction referring to a one-sided, friendship-like intimacy between television viewers and television personalities (Horton & Wohl, 1956), has been adapted in the research of online customer behavior in various media contexts such as film, radio, and television (Giles, 2002). The parasocial interaction theory has been employed by researchers to gain insights into the impulse buying patterns of online consumers (Hsu, 2020; Xiang et al., 2016). In the realm of social commerce platforms, parasocial interaction characterizes the unilateral connection established by media users with media personalities (such as experts, celebrities, or other users) based on their imagined closeness (Miller et al., 2017; Xiang et al., 2016). While the terms "parasocial interaction," "parasocial interaction relationship," and "parasocial relationships" are often applied interchangeably in academic literature, this study employs "parasocial interaction" to define a unique social bond in the live marketing setting, which represents a customer's perceived intimacy with the streamer, mirroring the dynamics of a friendly relationship.

According to the physical attractiveness stereotype proposed by Dion et al. (1972), individuals who are deemed attractive are often perceived as more popular, successful, and content in society, which could influence social interactions. Consequently, in interpersonal relationships, people exhibit a preference for interacting with attractive individuals and are more likely to form friendships through these interactions. Similarly, in the realm of social media, users tend to engage with attractive media personalities and perceive them as close social partners. Numerous studies in social media have substantiated that media personality attractiveness predicts parasocial interaction. For instance, Hsu's (2020) research on YouTube demonstrated that vloggers' physical attractiveness significantly positively influenced consumers' parasocial interaction. Rungruangjit (2022) also

found that streamer attractiveness played a pivotal role in fostering stronger parasocial relationships between customers and streamers, particularly within the context of using Taobao as a live streaming shopping platform. Thus, based on existing evidence, the subsequent hypothesis is formulated:

H1. Streamer attractiveness positively influences parasocial interaction.

Streamer attractiveness and impulse buying

The notion that that individuals with physical attractiveness tend to garner higher levels of likability and trust has been firmly established (Patzer, 1983). Scholars have verified the positive relationship between live streamers' favorable attributes (e.g., credibility) and customers' attitudes and behaviors (Soares et al., 2024). Specifically, the allure of attractive streamers goes beyond mere esthetics, as they can effectively convey the advantages and benefits of products, recommending cost-effective options based on their own experiences and professionalism. This, in turn, enhances customer trust in streamers—a factor known to significantly influence customer buying behavior (Tian et al., 2023). Given that customer trust can act as a driving force for impulse buying (Ming et al., 2021), the role of attractive streamers becomes pivotal in prompting unplanned purchasing behavior, characterized by quick, on-the-spot decisions without thorough consideration (Zheng et al., 2019).

Moreover, the persuasive communication skills associated with physically attractive individuals (Chaiken, 1979) extend to the realm of live streaming. Attractive streamers, leveraging their charm, are more persuasive in real-time communication, fostering receptiveness among viewers to the brands or products they endorse and ultimately driving impulse buying behavior. This aligns with research on digital influencers, where the attractiveness of influencers emerges as a key determinant influencing brand attitude, enhancing purchase intentions (Torres et al., 2019), and fostering tendencies toward impulse buying (Liu, 2022). Building on this analysis, it is reasonable to posit that streamer attractiveness exerts a pivotal influence in triggering consumers' impulsive buying behavior in the dynamic environment of live streaming marketing. Consequently, we propose that:

H2. Streamer attractiveness positively influences impulse buying.

Streamer attractiveness and FoMO

FoMO is characterized by diffuse anxiety stemming from frequent concerns about missing positive experiences or novel events in others' lives, accompanied by strong anticipation of staying connected to others' activities (Przybylski et al., 2013). In this study exploring streamers' impact on

consumer behavior in live streaming marketing, FoMO is defined as consumers' anxiety about missing out on streamer-related events that could benefit them. This includes concerns about missing opportunities to watch the streamer's live broadcasts and the FoMO on the chance to purchase a recommended product during a live stream.

In live streaming marketing, the attractiveness of a streamer is directly linked to the likelihood of customers forming a close emotional connection with the streamer, manifested in their emotional attachment to the streamer (Li & Peng, 2021). This emotional attachment implies that attractive streamers can offer emotional support to customers. Psychological studies have indicated that emotional support is a predictor of FoMO. An examination of college students' phubbing tendencies in a study highlighted the impact of emotional support received *via* social media, indicating its influence on phubbing behavior through the mediating factor of FoMO (Fang et al., 2020). Similarly, research on Facebook found that emotional support provided on online social networking sites could trigger FoMO (Liu & Ma, 2020). In a live streaming marketing context, it is plausible that an attractive streamer establishes a robust emotional bond with customers, reciprocating emotional support during live streaming events. As customers become accustomed to receiving emotional support from the streamer, they are likely to develop heightened expectations for continued emotional connection. Consequently, when temporarily disengaging from the streamer, customers may experience increased concern about losing the immediate emotional support provided by the streamer, leading to heightened levels of FoMO. Thus, we propose that:

H3. Streamer attractiveness positively influences FoMO.

Parasocial interaction and FoMO

Parasocial relationships are perceived to effectively fulfill emotional needs (Sherrick et al., 2022). As individuals engage in parasocial interactions to experience a sense of companionship and emotional satisfaction. This can heighten their awareness of others' experiences and intensify their desire to partake in similar rewarding experiences, thereby exacerbating FoMO. From the perspective of social surrogacy, parasocial interactions serve as substitutes for actual social connections, offering a sense of belonging and social integration (Gabriel et al., 2017; Hsu, 2020). When individuals form strong parasocial bonds, they may feel part of a community or group associated with the media figure, which can amplify their FoMO as they strive to maintain this connection and avoid missing out on perceived social events or experiences of that group. Previous research has demonstrated that individuals with high levels of need for belonging tend to be

more socially connected and exhibit higher levels of FoMO (Alabri, 2022; Beyens et al., 2016; Wang et al., 2018). Furthermore, the social influence of media figures can shape individuals' perceptions of what constitutes a desirable experience (Paravati et al., 2020). As people engage in parasocial interactions with influential figures, they may feel pressured to maintain social connections and stay informed about ongoing activities to avoid missing out.

In the context of live commerce platforms like Taobao and Jingdong, we propose that parasocial interactions with streamers primarily drive FoMO for several reasons. First, the real-time nature of live streaming creates immediate awareness of ongoing events and opportunities, potentially triggering FoMO. Second, the parasocial bonds formed with streamers may lead to increased platform engagement, exposing consumers to more content that could generate FoMO. Third, the commercial nature of these interactions means that missing a live stream could result in tangible losses (e.g., limited time offers, exclusive products), amplifying FoMO beyond purely social concerns. Consequently, we propose that:

H4. Parasocial interaction positively influences FoMO.

Parasocial interaction and impulse buying

The influence of parasocial interaction significantly shapes the impetus to make purchases, consequently impacting behaviors associated with impulse buying (Hsu, 2020). Further substantiating this perspective, Vazquez et al. (2020) documented a significant influence of parasocial interaction on impulse buying behaviors among viewers of Chinese TV series engaged in second-screen social commerce, suggesting a potential mechanism for brands to leverage in this increasingly relevant context. In the realm of live streaming marketing, the dynamic, three-dimensional, interactive, and real-time environment it creates brings together a community of individuals sharing common interests. This environment facilitates a profound connection between consumers and streamers, fostering emotional empathy (Lin et al., 2021).

Live streaming marketing goes beyond passive observation, allowing consumers to actively engage in real-time interactions. This can involve conversations through the bullet screen, as well as expressing appreciation through likes or virtual gifts (e.g., tips) to the streamer, who, in turn, can respond promptly and offer personalized guidance and services to the consumer. Consequently, live streaming marketing amplifies the intimacy between consumers and the streamer. This heightened sense of connection translates into increased trust in the streamer (Chen et al., 2022), emulation of their style, and belief in the products or brands they

endorse—ultimately driving impulse purchases (Xiang et al., 2016). Therefore, we hypothesize:

H5. Parasocial interaction positively influences impulse buying.

FoMO and impulse buying

Although a paucity of research directly examines the interplay between FoMO and impulsive purchases, valuable clues can be gleaned from existing studies on scarcity marketing, social comparison, and emotional decision-making, paving the way for a deeper understanding of this understudied phenomenon. For instance, Çelik et al. (2019) identified that the tendency toward FoMO influences impulse buying behaviors, examining consumer behavior in retail stores. Similarly, Zhang et al. (2022) revealed that during the initial stages of the COVID-19 outbreak in China, Chinese consumers, concerned about the shortage of protective medical supplies, turned to impulsive buying as a response. These studies imply the involvement of FoMO in molding consumers' impulsive buying tendencies, a phenomenon that holds relevance within the realm of live streaming marketing.

Furthermore, the essence of FoMO, marked by the worry of missing out on others' experiences and the adoption of behavioral tactics to mitigate this apprehension, resonates with the intricacies of live streaming marketing dynamics. In this setting, customers may watch the live stream of an attractive streamer and make impulse purchases of recommended products to assuage the FoMO on both the live stream and the endorsed products. This implies a plausible connection between FoMO and impulsive purchasing tendencies within the domain of live streaming marketing. Therefore, we hypothesize:

H6. FoMO positively influences impulse buying.

Mediating effect of parasocial interaction and FoMO

Focusing on the social media context, research by Yuan and Lou (2020) has established that influencer attractiveness contributes to nurturing parasocial relationships between influencers and consumers. This parasocial interaction, as evidenced by Sokolova and Kefi (2020) and Xiang et al. (2016), heightens consumers' purchase intentions or propels their tendencies toward impulse buying, a factor that notably impacts their actual impulsive purchase behaviors (Parsad et al., 2021).

Expanding on this knowledge, there is a hypothetical view that in the context of live streaming marketing, parasocial interactions may mediate

between streaming attractiveness and consumer impulse buying behavior. Rungruangjit's (2022) exploration into the realm of Internet celebrities discovered that parasocial relationships mediated the link between Internet celebrity attractiveness and purchase intentions. Hence, it's rational to hypothesize that within live streaming marketing, streamer attractiveness fosters parasocial interaction between the streamer and the consumer, consequently driving consumers toward impulse buying. Thus, we propose that:

H7. Parasocial interaction mediates the relationship between streamer attractiveness and impulse buying.

As a pivotal factor within live streaming marketing, the precise mechanisms guiding a streamer's impact on consumer behavior continue to be a subject of exploration. Research on consumer live-streaming shopping behavior suggests that streamer attractiveness directly influences perceived enjoyment, subsequently impacting the inclination for impulsive buying (Lee & Chen, 2021). Additionally, within the context of Chinese consumer behavior in live streams, streamer attractiveness contributes to impulsive consumption through arousal (Xu et al., 2020). Both arousal and perceived enjoyment are recognized components of consumers' emotional states, known to significantly influence their purchasing behavior (Lee & Chen, 2021; Xu et al., 2020), as outlined in prior studies (Chan et al., 2017).

FoMO is an anxiety emotion, triggered by the perception of missing out on a valuable experience, which may present a conceivable mediating role between streamer attractiveness and impulse buying. Hence, it's plausible to suggest that streamer attractiveness potentially shapes customers' impulse buying behaviors through the mediation of FoMO within the domain of live streaming marketing. Therefore, we propose that:

H8. FoMO mediates the relationship between streamer attractiveness and impulse buying.

Extant research demonstrates that the perceived streamer attractiveness is positively correlated with an increase in parasocial interactions (Rungruangjit, 2022), that the latter may further heighten consumers' levels of FoMO (Bartosiak, 2022); interestingly, a rise in FoMO levels has been linked to a greater propensity for impulse purchases (Zhang et al., 2022). In essence, an attractive streamer during live streaming marketing may enhance parasocial interaction and subsequently elevate consumers' FoMO levels, ultimately leading to impulse buying. As a result, the proposition emerges that both parasocial interaction and FoMO sequentially act as mediators between streamer attractiveness and impulse buying behavior. The ensuing hypothesis is postulated as follows:

H9. Parasocial interaction and FoMO sequentially mediate the relationship between streamer attractiveness and impulse buying.

In summary, the research framework encompasses the parallel multiple mediation and serial mediation roles of parasocial interaction and FoMO between streamer attractiveness and impulse buying, as depicted in Figure 1.

Methodology

Sampling and data collection

The study focused on consumers aged 18 and older who had engaged in live streaming shopping within the last year. Data were collected through an online survey distributed *via* a nonrandom sampling method. Specifically, the survey link was disseminated through targeted social media channels, such as WeChat groups and Xiaohongshu, to reach potential participants with relevant shopping experiences. To ensure the sample met the study's criteria, initial screening questions were included at the beginning of the survey. These questions asked respondents to confirm whether they were 18 years or older and whether they had made at least one purchase through live streaming shopping in the past year. Only respondents who met these criteria were allowed to proceed with the survey.

Prior to data collection, the questionnaire underwent a rigorous review process to ensure its validity and relevance. Three professors specializing in consumer behavior and e-commerce were invited to evaluate the measures. Additionally, a pilot test was conducted with 20 randomly selected consumers to assess the phrasing, clarity, and fluency of the questions. Based on their feedback, minor modifications were made, including grammatical corrections and improvements to sentence structure.

The survey was administered using Wenjuanxing, a widely recognized online survey platform in China. Data collection took place over a seven-week period in 2023, yielding 345 usable responses for analysis. To determine the minimum sample size required for this study, the formula

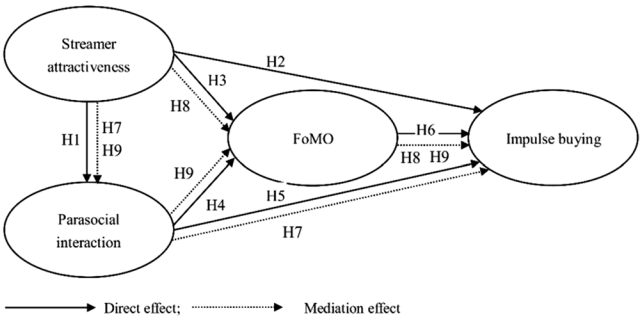

Figure 1. Conceptual model.

proposed by Tabachnick and Fidell (2013) was applied: $N \geq 50 + 8\,m$, where N represents the minimum sample size and m denotes the number of items included in the study. Based on this formula, the minimum sample size for this research was calculated as 202 ($N \geq 50 + 8 \times 19 = 202$). Additionally, a power analysis conducted using G*Power software suggested that a sample size of approximately 271 would be necessary to achieve 99% statistical power, assuming an effect size of 0.15 and a 1% margin of error. The final sample size of 345 respondents exceeded both thresholds, ensuring sufficient statistical power for testing the proposed conceptual model.

Among the 345 participants, 80.6% were women and 19.4% were men. Many of the participants (58.8%) aged between 18 and 25. A total of 55.1% of respondents reported monthly incomes equal to or less than CNY 2,000. More than 90% of the participants possessed a college degree or above. The respondents were generated from different regions, 43.2% from the Western regions of China, 31.6% from the Central regions of China, 25.2% from the Eastern regions of China. As for the frequency of live stream shopping, 72.5% of respondents reported engaging in this activity 1-3 times per month. Table 1 shows the demographic profiles of the respondents.

Measurement development

Drawing upon validated measures from previous research, this study tailors the measurement scales for each construct to enhance their suitability for the unique context of live-streaming consumer behavior. Specifically, streamer attractiveness was gauged using three items that were modified from the study by Park and Lin (2020). The scale of parasocial interaction was adapted from the measurements applied in Wan and Wu (2020)'s study, which includes six items. FOMO was measured by using eight items drawn from Good and Hyman (2020)'s study. The measurement of impulse buying behavior utilized four items adapted from Xiang et al. (2016). Items for all constructs were rated on a seven-point Likert scale, with 1 representing "strongly disagree" and 7 representing "strongly agree". To ensure cultural sensitivity and accurate measurement within the Chinese context, a rigorous back-translation procedure was implemented.

Data analysis and results

The study adopted SmartPLS 3.3 to perform a PLS-SEM (Partial Least Squares Structural Equation Modeling) for the data analysis. In contrast to CB-SEM (the covariance-based SEM), PLS-SEM's nonparametric nature

Table 1. Demographics of respondents.

Characteristics		Frequency	Percentage
Gender	Male	67	19.4
	Female	278	80.6
Age	18–25	203	58.8
	26–35	124	35.9
	36–45	14	4.1
	≥46	4	1.2
Education background	High school or below	6	1.7
	College or bachelor's degree	205	59.4
	Master or above	134	38.8
Monthly Income (CNY)	2000 or below	190	55.1
	2001–4000	43	12.5
	4001–6000	34	9.9
	Above 6000	78	22.6
Monthly live stream shopping frequency	1–3 times	250	72.5
	4–6 times	56	16.2
	7–10 times	22	6.4
	Over 10 times	17	4.9
Region of residence	Western regions of China	149	43.2
	Central regions of China	109	31.6
	Eastern regions of China	87	25.2

CNY: Chinese Yuan.

makes it can overcome the limitations of collinearity and data distribution in multiple regression (Uzir et al., 2021). PLS-SEM is attractive to researchers given its superior fundamental characteristics (Hair et al., 2021). In accordance with the psychometric recommendations of Anderson and Gerbing (1988), this study conducted a comprehensive evaluation of the measurement model, establishing construct reliability, convergent validity, and discriminant validity. Building upon this foundation, a structural equation modeling analysis investigated the hypothesized relationships between the independent and dependent variables within the proposed theoretical framework.

Common method bias (CMB)

The study made a conscious effort to mitigate the potential impact of CMB, which might occur when data for variables are sourced from the same respondents. We adopted procedural measures during the data collection phase as per Podsakoff et al. (2012), which involved refining the scale items to eliminate any ambiguity and minimizing social desirability bias in the item wording, while also ensuring the anonymity of the respondents. In addition, statistical remedies were also performed to examine whether CMB exists. Initially, we applied Harman's one-factor test, a commonly utilized approach as per Kock et al. (2021). The results indicated that the unrotated single factor solution explained only 31.66% of the total variance, showing well below the 50% threshold suggested by Fuller et al. (2016). Therefore, it is improbable that CMB had a substantial influence on the study's outcomes. Subsequently, we evaluated the bivariate

correlations among constructs, following the suggestions of Bagozzi et al. (1991). The results indicated that none of the construct correlations surpassed 0.90, thereby corroborating the absence of CMB as per the findings of Cegarra-Navarro et al. (2016).

Reliability and validity

Measurement models were constructed and evaluated to derive metrics for the assessment of Convergent validity, Discriminant validity, and Construct reliability. Specifically, we scrutinized the outer loadings of the constructs and AVE (the Average Variance Extracted) to gauge convergent validity. The former should exceed 0.708 and the latter should be above 0.5 to ensure adequate convergent validity (Hair et al., 2019). In this research, one item (PI2) of parasocial interaction and one item (IB4) of impulse buying behavior were excluded from the analysis due to a loading value below 0.708. The factor loadings of the remaining items and the AVE values surpassed the threshold values, thereby confirming adequate convergent validity. Regarding construct reliability, the Composite Reliability (CR) values for all constructs varied between 0.820 and 0.942, surpassing the acceptable criterion of 0.70 (Hair et al., 2019). Table 2 indicated the results of these metrics.

To ensure robust discriminant validity, a two-pronged approach was adopted. First, an examination of the Fornell and Larcker (1981) criterion revealed potential issues, as the square root of AVE values marginally exceeded certain inter-construct correlations (Table 3). Furthermore, subsequent HTMT analysis (Henseler et al., 2015) decisively confirmed satisfactory discriminant validity, with all HTMT ratios falling below the recommended thresholds of 0.85 and 0.90 (see Table 3).

Evaluating the structural model

Before evaluating the structural model, it is essential to conduct Variance Inflation Factor (VIF) analyses to address potential collinearity among the variables. As shown in Table 4, the maximum VIF value for all constructs in the inner model is 2.841, which is well below the threshold of 3 recommended by Hair et al. (2021). These findings confirm the absence of collinearity issues among the variables, thereby ensuring the reliability of the subsequent structural analysis. Following the confirmation of the measurement model's reliability and validity, we conducted hypothesis testing on the structural model using a bootstrapping procedure involving 5000 resamples. Table 4 summarized the results of the hypothesis testing. Consistent with the proposed hypotheses, streamer attractiveness demonstrated a significant positive influence on parasocial interaction ($\beta = 0.531$,

Table 2. Construct reliability and validity.

Constructs	Items	Factor loadings	CR	AVE
Streamer Attractiveness	The live streamer at the live streaming platform gives me a good feeling (SA1).	0.715	0.820	0.604
	The live streamer at the live streaming platform is attractive (SA2).	0.760		
	The live streamer at the live streaming platform catches my attention (SA3).	0.850		
Parasocial Interaction	Watching live streaming makes me feel comfortable as if I am a friend with the live streamer (PI1).	0.718	0.893	0.625
	I feel included when I interact with the live streamer (PI3).	0.799		
	I found myself comparing my opinion about products and brands with what other members said, especially with the streamer's' opinions (PI4).	0.852		
	I like hearing what the live streamer has to say (PI5).	0.747		
	In the live stream, I like to read the messages posted by other members and especially like to hear what the live streamer has to say (PI6).	0.830		
FoMO	I am afraid later I will feel sorry I didn't buy products promoted by the live streamer (FM1).	0.871	0.942	0.669
	I will worry about I'm missing products endorsed by the live streamer (FM2).	0.858		
	I will worry other people are having more rewarding things than me by using products endorsed by the live streamer (FM3).	0.810		
	I feel concerned that other people are having more fun with products endorsed by the live streamer while I don't (FM4).	0.823		
	I will feel left out the trends if I don't have products endorsed the live streamer (FM5).	0.838		
	I will feel sorry that I didn't experience products endorsed by the live streamer (FM6).	0.841		
	I will feel anxious about not being with products endorsed by the live streamer (FM7).	0.778		
	I will feel bothered that I missed an opportunity to use that product endorsed by the live streamer (FM8).	0.715		
Impulse Buying Behavior	While watching live steaming shopping, I often buy something that I had not planned to buy (IB1).	0.765	0.868	0.688
	While watching live steaming shopping, I often buy things without thinking (IB2).	0.867		
	"I see it, I buy it" describes the way I buy things when watching live steaming shopping (IB3).	0.852		

Table 3. Discriminant validity assessment.

	Fornell & Larcker criterion			
	1	2	3	4
1. Streamer Attractiveness	0.777			
2. FoMO	0.244	0.818		
3. Impulse Buying Behavior	0.350	0.475	0.829	
4. Parasocial Interaction	0.533	0.254	0.377	0.791
	HTMT ratio			
	1	2	3	4
1. Streamer Attractiveness				
2. FoMO	0.286			
3. Impulse Buying Behavior	0.462	0.531		
4. Parasocial Interaction	0.774	0.327	0.534	

For the Fornell & Larcker criterion, bold values on the diagonal in the correlation matrix are square roots of AVE, and off-diagonal elements below the diagonal are correlations among the constructs.

Table 4. Results of the hypothesis testing.

Relationship	VIF	Path coefficient	t value	Bias-corrected CI 2.5%	Bias-corrected CI 97.5%	p value	Supported
H1: STAT → PAIN	1.000	0.531	11.558	0.42	0.609	.000	Yes
H2: STAT → IMBU	1.112	0.145	2.045	0.003	0.274	.041	Yes
H3: STAT → FoMO	1.111	0.148	2.287	0.021	0.273	.022	Yes
H4: PAIN → FoMO	1.111	0.181	2.752	0.049	0.302	.006	Yes
H5: PAIN → IMBU	2.841	0.210	3.117	0.077	0.340	.002	Yes
H6: FoMO → IMBU	2.714	0.380	7.855	0.273	0.466	.000	Yes
H7: STAT →PAIN → IMBU		0.112	2.909	0.041	0.191	.004	Yes
H8: STAT → FoMO → IMBU		0.056	2.169	0.009	0.107	.030	Yes
H9: STAT → PAIN → FoMO → IMBU		0.037	2.521	0.01	0.066	.012	Yes
		R^2	Q^2				
PAIN		0.282	0.116				
FoMO		0.083	0.051				
IMBU		0.310	0.202				

STAT: Streamer attractiveness; PAIN: Parasocial interaction; FoMO: Fear of missing out; IMBU: Impulse buying.

$p < .001$), impulse buying ($\beta = 0.145$, $p = .041$), and FoMO ($\beta = 0.148$, $p = .022$). Parasocial interaction, in turn, emerged as a significant predictor of FoMO ($\beta = 0.181$, $p = .006$) and impulse buying ($\beta = 0.210$, $p = .002$). Notably, FoMO further exerted a strong positive effect on impulse buying ($\beta = 0.380$, $p < .001$). These findings provide robust empirical support for all six direct effect hypotheses (H1–H6).

Bootstrapped and bias-corrected Confidence Intervals (CIs) were conducted to assess the mediation relationship, as recommended by Carrión et al. (2017). The findings revealed that streamer attractiveness indirectly influences impulse buying through parasocial interaction ($\beta = 0.112$, $p = .004$) and FoMO ($\beta = 0.056$, $p = .030$), with variance accounted for (VAF) at 43.6% and 27.9% (20% ≤ VAF ≤ 80%), respectively, providing evidence of partial mediation. Moreover, the results suggest that parasocial interaction and FoMO sequentially mediate the link between streamer attractiveness and

impulse buying ($\beta = 0.037$, $p = .012$), with a VAF of 20.3%, providing further evidence of partial mediation. Therefore, hypotheses H7, H8, and H9 received empirical support.

As suggested by Hair et al. (2019), the model's explanatory power was gauged using the R^2 value. The results showed that streamer attractiveness explained 28.2% of the variance of parasocial interaction, and the R^2 value for FoMO implied that both streamer attractiveness and parasocial interaction can explain 8.3% variations of FoMO. In addition, the R^2 value of 0.31 for impulse buying indicated that streamer attractiveness, parasocial interaction, and FoMO explain 31% variations in impulse buying. The R^2 values for these three endogenous constructs are greater than the 2% level of the small effect of explanatory power suggested by Cohen (1988) in social and behavioral sciences. The Q^2 values were computed to assess the model's predictive relevance. Given that all Q^2 values exceed zero (Hair et al., 2019), it suggests that the research model provided effective predictions for parasocial interaction (Q^2 = 0.116), FoMO (Q^2 = 0.051), and impulse buying (Q^2 = 0.202).

Discussion

Drawing upon the tenets of SDT, this study delves into the intricate psychological mechanisms underlying impulse buying behaviors in the context of live streaming marketing. It advances a theoretical model comprising nine interlinked hypotheses that rigorously examine the interplay between streamer attractiveness, parasocial interaction, fear of missing out (FoMO), and impulse buying.

First, the research confirms a positive relationship between streamer attractiveness and parasocial interaction (H1), aligning with previous findings (Rungruangjit, 2022). This finding underscores the importance of streamer attractiveness in fostering a sense of connection and intimacy with viewers, which is critical for building trust and engagement in live streaming marketing. The results suggest that streamers who are perceived as attractive—whether physically, socially, or through their expertise—are more likely to establish strong parasocial bonds with their audience, thereby enhancing the overall viewing experience.

Additionally, streamer attractiveness is identified as a motivating factor for consumers' impulse purchases (H2), extending insights into the influence of influencer attractiveness on purchase intention and impulse buying tendencies (Liu, 2022; Torres et al., 2019). This finding highlights the persuasive power of attractive streamers in driving immediate purchasing decisions, particularly in the fast-paced and interactive environment of live streaming. The ability of attractive streamers to convey product benefits and build trust plays a pivotal role in triggering impulse buying behavior.

Second, this study reveals a positive correlation between streamer attractiveness and FoMO (H3), indicating that attractive streamers stimulate consumers' FoMO. This finding challenges the traditional focus on positive emotions in live streaming marketing and introduces FoMO as a critical negative emotion that influences consumer behavior. The results suggest that attractive streamers create a sense of urgency and exclusivity, heightening viewers' anxiety about missing out on valuable opportunities, such as limited-time offers or exclusive products.

Moreover, parasocial interaction is found to be positively associated with FoMO (H4), emphasizing the significance of intimacy between the streamer and the consumer in triggering FoMO. This enriches the literature on FoMO, particularly in the context of live streaming marketing. The findings suggest that the emotional bonds formed through parasocial interaction amplify viewers' FoMO, as they strive to maintain their connection with the streamer and avoid missing out on shared experiences.

Third, building upon prior research by Xiang et al. (2016), this study further strengthens the notion that parasocial interaction acts as a key driver of impulse purchases in the social commerce sphere (H5). The results highlight the role of parasocial interaction in fostering trust and emotional engagement, which are critical for driving impulse buying behavior. Additionally, the findings lend empirical support to H6, demonstrating a positive relationship between FoMO and impulse buying, consistent with observations by Zhang et al. (2022) during the COVID-19 pandemic. This suggests that FoMO, as a form of anxiety, can motivate consumers to make impulsive purchases as a way to alleviate their fear of missing out.

Fourth, this study shows that parasocial interaction and FoMO have parallel multiple mediating roles between streamer attractiveness and impulse buying. The findings that parasocial interaction mediates the link between streamer attractiveness and impulse buying (H7) expands upon Rungruangjit's (2022) research on a mediating effect of parasocial affiliation between online celebrity attractiveness and purchase intentions without including FoMO. This research revealed that FoMO serves as a mediator between streamer attractiveness and impulse buying (H8), indicating that appealing streamers are likely to heighten consumers' levels of FoMO, thereby stimulating impulse buying. Establishing the mediating role of FoMO in live streaming marketing provides more insights into consumer behaviors in the live stream market.

Finally, this study advances further by scrutinizing the roles of parasocial interaction and FoMO as sequential mediators within the association between streamer attractiveness and impulse buying (H9). The results suggest that streamer attractiveness not only fosters parasocial interaction but also elevates FoMO, subsequently motivating impulse buying. This sequential mediation process delivers a nuanced comprehension of the intricate psychological

mechanisms operating within the domain of live streaming marketing. The consumers' willingness to interact with an attractive streamer leads to a close parasocial interaction relationship, heightening the FoMO on live events, and ultimately driving impulse buying. This in-depth examination of the serial mediating impacts offers essential contributions to the expanding literature on consumer behavior within the realm of live streaming marketing.

In conclusion, this study not only validates the proposed hypotheses but also provides a deeper understanding of the psychological mechanisms driving impulse buying in live streaming marketing. By integrating SDT, parasocial interaction, and FoMO, the research offers a comprehensive framework for understanding how streamer attractiveness influences consumer behavior. The findings highlight the importance of emotional engagement and psychological needs in shaping impulse buying tendencies, providing valuable insights for both academics and practitioners in the field of live streaming marketing.

Theoretical implications

This research extends theoretical boundaries by incorporating FoMO, underscoring its intermediary function, and utilizing parasocial interaction theory to shed light on the complex interplay of streamer influence on consumers' impulse purchasing within the sphere of live streaming marketing. These contributions not only enrich theoretical models but also lay the groundwork for subsequent studies probing the diverse facets of consumer behavior in burgeoning marketing channels.

First, this study marks a pioneering effort by introducing the concept of FoMO into the domain of customers' impulse purchase within the setting of live streaming marketing, presenting a noteworthy advancement in the field. Traditionally rooted in Psychology and education, FoMO has seen limited exploration in consumer behavior studies, particularly in fields like social media advertising engagement (Bui et al., 2022) and purchase intention (Dinh & Lee, 2022). The scarcity of research linking FoMO to consumers' impulse buying (Zhang et al., 2022) underscores the novelty of this study. By transplanting FoMO from its typical domains into the marketing landscape, this research systematically investigates the intricate mechanisms through which streamer attractiveness influences consumers' impulse buying *via* parasocial interaction and FoMO. The construction and testing of a novel research model bring forth a fresh perspective, expanding the scope of FoMO research and enriching the understanding of its application in the specific setting of Chinese live streaming marketing.

Second, this research is at the forefront of incorporating the concept of FoMO into live streaming marketing, elucidating the role of streamer

attractiveness in influencing consumer's impulsive purchasing decisions. The findings indicate that FoMO emerges not only as the most influential factor steering consumers' impulse buying in comparison to streamer attractiveness and parasocial interaction but also mediates the connection between streamer attractiveness and impulse purchase behavior. These revelations unveil the nuanced psychological mechanisms through which streamer attractiveness operates on consumers' impulse buying, offering a fresh perspective and enriching the understanding of the intricate pathways through which streamer attractiveness shapes consumer behavior in live streaming marketing.

Third, this study enhances our comprehension of how streamers wield influence over consumers' impulse buying by taking a perspective from parasocial interaction theory. Despite certain scholars exploring the mediating effect of parasocial interaction in influencer marketing (Sokolova & Kefi, 2020), the limited focus has been directed toward its involvement in the specific domain of live streaming marketing. Particularly lacking are studies that concurrently investigate the multiple and serial mediating roles of parasocial interaction and FoMO (Rungruangjit, 2022). This study pioneers an exploration of the mediating role of parasocial interaction in live streaming marketing. The results underscore that the intimate relationship between streamers and consumers not only stands out as a pivotal factor influencing impulse buying but also exerts its impact through the lens of FoMO. By grounding its explanations in parasocial interaction theory, the complex dynamics defining the relation which exists between streamers and consumers' impulse purchase tendencies within the context of live streaming marketing is elucidated. This not only introduces a novel perspective to comprehend the mechanisms underlying streamer influence on consumer behavior but also helps to deepen the study of parasocial interaction theory within the specific context of live streaming marketing.

Practical implications

The findings of this research carry substantial practical implications for streamers, companies utilizing live streaming marketing, and the broader online retail services industry. By cultivating parasocial interaction and stimulating FoMO, these stakeholders can effectively influence customer behavior and drive business outcomes.

Firstly, companies engaging in live streaming marketing, as well as online retail platforms, should exercise meticulousness in the selection of streamers aligned with their target audience. This research delineates the pivotal factors and mechanisms affecting customers' impulse purchase behavior in the realm of live streaming marketing, emphasizing the paramount role played by streamer attractiveness. An attractive streamer not only initiates immediate impulse purchases but also exerts influence through parasocial interaction

and FoMO. Therefore, marketing professionals and online retail platforms should strategically choose streamers who resonate with their target demographic for optimal effectiveness in live marketing initiatives. For online retail services, integrating live streaming features into their platforms can enhance customer engagement and drive sales, particularly when streamers align with the brand's image and customer preferences.

Secondly, streamers and online retail platforms should prioritize the cultivation of parasocial interactions with consumers. The study underscores that streamer attractiveness not only directly impacts consumers' impulse buying through parasocial interaction but also sequentially through a combination of parasocial interaction and FoMO. This highlights the essential role of parasocial interaction in both streamer attractiveness and consumers' impulse buying decisions. For online retail services, fostering parasocial interaction can be achieved by encouraging streamers to actively engage in meaningful interactions with consumers during live streaming events. Streamers can proactively build interpersonal relationships by interacting on social media platforms like Weibo and Xiaohongshu. Additionally, online retail platforms can integrate interactive features, such as real-time Q&A sessions and personalized product recommendations, to enhance the sense of connection between streamers and consumers. Companies should equip streamers with comprehensive information about products and customers, enabling personalized product recommendations during live streaming.

Thirdly, acknowledging the influence of FoMO, companies and online retail platforms should be adept at managing and mitigating negative emotions during live streaming events. Strategies aimed at creating a sense of urgency without inducing excessive fear can contribute to a more positive consumer experience. For the online retail services industry, this could involve leveraging time-limited promotions, exclusive deals, or limited-edition products during live streams to heighten FoMO in a controlled manner. Given the pioneering role of this study in examining the mediating role of FoMO, companies could implement educational initiatives for streamers to enhance their awareness of psychological aspects influencing consumer behavior. Online retail platforms can also provide training or resources to streamers, helping them understand how to balance urgency and excitement to maximize consumer engagement and sales.

Finally, the integration of live streaming marketing into online retail services offers a unique opportunity to bridge the gap between entertainment and commerce. By combining the interactive nature of live streaming with the convenience of online shopping, platforms can create immersive shopping experiences that drive impulse purchases. For example, online retail services can collaborate with streamers to host live shopping events, where viewers can purchase products in real-time while interacting with the streamer. This approach not only enhances customer engagement but also provides valuable data for optimizing future marketing strategies.

Limitations and future research

We acknowledge several limitations underscore the need for consideration in future research endeavors. Our examination of impulse buying behavior is confined to Chinese customers. Given the potential impact of social and cultural factors, extending these findings is cautioned. Future research should broaden the scope by collecting data from diverse samples representing various socio-cultural backgrounds.

In addition, the factors influencing impulse buying were approached from a consumer perspective. Future studies could delve into alternative perspectives to provide a more comprehensive understanding. For instance, further study should explore the impact of panoramic virtual reality and digital human live streaming on consumers' impulse buying behaviors. Third, the differences between live streaming shopping and traditional TV home shopping may be exploring. While the identified mechanisms and antecedents of online streaming were explored, the model did not clearly delineate how these factors differ from those in traditional TV home shopping. Future research should consider examining the unique aspects of live streaming shopping, particularly the multilateral and immediate interactions among the streamer, audience, and other viewers, which are not present in traditional TV home shopping. Additionally, future studies could explore the implications of these differences for marketing strategies and consumer engagement, thereby offering valuable insights for both scholars and practitioners in the field.

Last, the ratio of female participants in our study was disproportionately high, which may affect the findings. Future research should strive for a more balanced gender representation to ensure that the findings are more representative and applicable across different demographic groups.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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