Research article

Is online shopping addiction still a depressive illness? —— the induced consumption and traffic trap in live E-commerce

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A B S T R A C T

While immersive shopping has injected new vitality into China's e-commerce, it has also resulted in consumers' over-reliance on online shopping. Psychological studies have linked online shopping addiction with depression, but business practices challenge this conclusion. This study, grounded in addiction theory, developed a theoretical model, and conducted an online survey with 214 live-streaming shoppers using structural equation modeling for validation. The primary focus was on determining whether consumers truly become addicted to online shopping in the four stages of the addiction model. The study unveils the process of consumers becoming addicted to online shopping. It explores the moderating role of perceived risk in the relationship between utilitarian and hedonic purchases and online shopping addiction. The findings suggest that through tactics such as traffic promotion, traffic trapping, anchor feature utilization, and incorporation of consumer aesthetics, merchants may induce utilitarian and hedonic purchases, leading to addiction to live-streaming shopping among consumers. Furthermore, perceived risk significantly and negatively moderates the relationship between utilitarian purchases and online shopping addiction. Our research indicates that merchants intentionally create external stimuli, enticing consumers to indulge in online shopping, suggesting that online shopping addiction is not merely a simple psychological state but may be influenced by external factors. This study provides novel insights into the phenomenon of online shopping addiction while offering valuable recommendations for consumers seeking to avoid succumbing to its allure.

1. Introduction

According to the "Digital China Development Report (2022)," China's digital economy witnessed substantial growth from 2017 to 2022, with its scale increasing from 27.2 trillion yuan to 50.2 trillion yuan, securing its position as the world's second-largest digital economy. Furthermore, the digital economy's contribution to the nation's GDP has increased from 32.9 % to 41.5 %, indicating a

deeper integration of digital technology and physical industries, accompanied by innovative forms and models. The evolution of e-commerce has transitioned from the conventional emphasis on transitioning from offline to online expansion, towards a dynamic amalgamation of the virtual and physical realms. Particularly noteworthy is the rise in popularity of novel interactive models such as community group buying, accompanied by a shift in consumer preferences from platform-centric electronic commerce to live-streaming electronic commerce. This transformation has fostered value co-creation among consumers, merchants, and platforms [1, 2]. Given the dramatic growth of the digital economy, addressing sustainability concerns is essential. While platform-based e-commerce also exhibits consumer habit lock-in Ref. [3], the profitability impact of continuous consumer purchasing behavior is more direct and easily comprehensible in the context of live-streaming e-commerce [4]. In the past, online shopping addiction was a relatively uncommon and secondary phenomenon in the world of e-commerce. However, with the advent of live-streaming e-commerce, addictive consumption has become an inherent aspect of the industry. According to traditional psychological and medical perspectives, shopping addiction is closely associated with depression, particularly with emotional and anxiety disorders, substance use disorders, and other impulse control issues [5].

Online shopping addiction, also known as compulsive online shopping, falls under the category of behavioral addiction [6]. According to ICD-11 (WHO 2019), the core characteristic of behavioral addiction is the psychological learning that non-pathological activities (such as gambling, online gaming, and shopping) inherently possess and an irresistible urge to repeatedly engage in these activities. Behavioral addiction is often associated with unipolar depressive disorders [7,8]. In many cases, disorders caused by gambling are related to substance use disorders [9], while disturbances caused by playing online games are often associated with anxiety disorders, especially in young people and those with attention-deficit/hyperactivity disorder [10]. Typical comorbid psychiatric disorders for pathological buying include unipolar depression, anxiety disorders, pathological hoarding, and binge eating disorders [11]. Currently, there are several viewpoints regarding the relationship between online shopping addiction and depression. Firstly, there is the secondary mental disorder hypothesis, suggesting that mental disorders may contribute to the development of addictive behavior. This hypothesis indicates that negative experiences and emotions might drive some individuals to excessively engage in online shopping as a way to relieve anxiety or depression, forming a compensatory relationship with online shopping. In this context, individuals who avoid or incorrectly self-regulate negative emotions may be more prone to falling into online shopping addiction non-response bias [12,13]. The second approach proposes the secondary addiction disorder hypothesis, suggesting that addictive disorders may trigger other mental illnesses, especially depression. In this case, the cognitive-behavioral framework focuses on three areas, including motivation drive associated with seeking rewards, behavioral control of executive inhibition, and decision-making. Addicted individuals immerse themselves in the world of online shopping, spending increasing amounts of time and energy, and when they leave the online shopping world and face reality, they may feel distressed or depressed [14,15]. The third approach emphasizes a bidirectional hypothesis, suggesting that addictive disorders or other mental illnesses may mutually increase vulnerability [16]. The final approach proposes a common-factor model, suggesting that addictive disorders and other mental illnesses share common risk factors and arise solely due to the higher risk of comorbidity [17,18].

However, these analyses primarily delve into the correlation between online shopping addiction and depression within a medical context. For individual consumers, their purchasing motives act as the direct catalyst for online shopping behavior and play a pivotal role in determining whether they fall into the trap of online shopping addiction. Purchasing motives can be broadly categorized into hedonic purchasing motives and utilitarian purchasing motives [19]. To start with utilitarian purchasing motives, consumers orient themselves toward pragmatic values during shopping, making rational and efficient choices based on considerations that save both time and money [20]. In the domain of online shopping, the convenience of information retrieval greatly facilitates this motive. Through online shopping, consumers can effortlessly peruse and compare a diverse array of product catalogs, craft personalized wish lists, and avail themselves of robust features such as filtering, personalization, and social network interaction [21]. On the other hand, hedonic purchasing motives predominantly seek sensory stimulation, social interaction, entertainment, and a sense of freedom and control. This encompasses dimensions like pleasure, adventure, socializing, self-satisfaction, ideas, roles, and the pursuit of values. With the rapid evolution of live-streaming commerce, consumers propelled by hedonic purchasing motives can effortlessly fulfill their desire for social interaction, sensory stimulation, and entertainment through the distinctive shopping experiences offered in live-streaming sessions [22,23].

In the era of rapid digital advancements, businesses harness the precise capabilities of big data to craft personalized advertising recommendation systems. Through personalized direct marketing rooted in customers' transaction histories, businesses deliver tailored product recommendations that resonate with individual preferences, fostering increased consumer engagement in live shopping [24]. To cater to consumers' aesthetic and entertainment desires, businesses enlist internet celebrities to host live shopping events. These hosts strategically showcase product details through practical use, employing a "product and efficacy combined" sales strategy. By offering personalized experiences, fostering heightened social interaction, and catering to hedonic needs, merchants effectively kindle consumers' desires for online shopping [25,26]. To further solidify user loyalty and streamline the purchase decision-making process, merchants implement strategies such as promotional discounts, the establishment of reward systems, and other effective tactics. Additionally, businesses delve into comprehending consumers' psychological factors, encompassing shopping motivations, values, and preferences. Through a precise understanding of consumer needs, merchants can adeptly tailor marketing strategies, delivering more alluring products and services. This phenomenon not only aligns with consumers' psychological expectations but also stimulates purchasing behavior [27]. However, these marketing strategies are not arbitrary; rather, they are meticulously crafted upon a robust foundation established through thorough and precise analysis of consumer psychological factors. The crux of their strategic design lies in gradually nurturing consumers' usage habits, thereby fostering a deep-seated reliance on the products and services, ultimately ensnaring them in a web from which they struggle to extricate themselves. This dependency transcends mere purchasing desires; it can penetrate into consumers' inner worlds and daily lives, forging an inseparable emotional bond.

When individuals excessively depend on something, they often fall into a state of addiction, unable to break free. The addiction model offers a clear framework delineating the process through which users become addicted to a product, spanning from initial attention to usage and dividing it into four stages: trigger, action, variable reward, and investment. This model has been substantiated by evidence that, with careful design and management of these four stages, users can be effectively guided to develop a dependency on the product, establish stable usage habits, and ultimately succumb to addiction. For businesses, this strategy of cultivating consumer dependency represents a valuable commercial asset. Considering the current landscape of e-commerce live streaming, it is highly likely that this strategy has been widely implemented in practice, as businesses employ astute tactics such as personalized recommendations, point rewards, and membership privileges, all of which encapsulate the essence of the addiction model.

This suggests that consumers' fixation on online live shopping is not solely tied to depression but also intricately connected to purchasing intentions and the marketing strategies employed by merchants. Consequently, it merits investigation whether online shopping addiction is genuinely correlated with individual disorders or arises due to the influence of other factors. Previous research has predominantly delved into the individual psychological realm, scrutinizing whether online shopping addiction is triggered by depression. Conversely, attention has been directed towards businesses and platforms utilizing extensive data for online marketing, aiming to expand the market size of the live e-commerce industry and augment its penetration into the realms of social consumption and online shopping. Nevertheless, studies on whether the formation of online shopping addiction is influenced by other factors remain relatively limited. Consequently, this study takes TikTok, the largest user group in China, as an example and applies the addiction model (Hoover, 2014). It dissects the process of live broadcasts inducing consumer and traffic traps into triggering, action, variable rewards, and investment processes, thereby exploring the "pathogenic factors" contributing to consumer addiction to online shopping. The primary objective of this paper is to delve into whether the current phenomenon of online shopping addiction has transcended what traditional medicine deems a manifestation of depression. Moreover, this research aims to illuminate the close connection between online shopping addiction and the inducements by merchants, along with the establishment of traffic traps for consumers. Simultaneously, it analyzes the potential of various consumer shopping motives in fostering addiction to online shopping and examines the inhibitory effect of individuals' perceived risks of addiction.

The paper demonstrates outstanding academic contributions on multiple levels. Firstly, it significantly advances the theoretical understanding of online shopping addiction, particularly in analyzing the complex associations between online shopping addiction, consumer inducement, and the trap of online traffic, offering novel and profound insights. Secondly, the study references existing addiction models and integrates them with the current scenario of consumer online shopping to construct a new theoretical framework. Through meticulously designed surveys and empirical tests using structural equation modeling, the research deeply reveals how businesses cleverly induce consumers into a vicious cycle of online shopping addiction through the mechanism of online traffic traps. This finding not only enriches the study of consumer psychology and behavior but also provides a unique perspective for understanding the changing patterns of consumer behavior in the contemporary e-commerce environment. Furthermore, the paper introduces the moderating variable of perceived risk, delving into its crucial role in rational recovery and prevention of addiction before consumers fall into online shopping addiction. This innovative exploration not only enhances the integrity and explanatory power of the theoretical framework but also provides a new theoretical basis and practical guidance for preventing online shopping addiction. Importantly, the study challenges previous single understandings of online shopping addiction by clearly stating that it is not solely rooted in individual depressive emotions but rather serves the commercial purpose achieved by businesses through strategic inducement. Businesses strategically guide consumers into addictive online shopping behaviors to seek greater commercial benefits. This viewpoint not only offers new theoretical support and practical strategies for individual prevention of online shopping addiction but also provides a strong theoretical basis for regulatory authorities to formulate relevant policies. In summary, the research makes significant academic progress in both theoretical depth and empirical breadth. It not only helps us to understand and address the important issue of online shopping addiction more deeply in modern society but also provides valuable insights and references for future academic research.

The organization of the remaining sections in this paper is as follows: The subsequent section will offer a detailed presentation of the theory and methodology, encompassing the theoretical background, research design, and theoretical framework. The third section will elaborate on the research methods used in this study, encompassing the introduction of data, reliability, and validity testing of the scales. The fourth part constitutes the discussion section. The fifth part will present the conclusions. The sixth section will introduce relevant recommendations. The seventh section will discuss the limitations of the study and propose future research directions.

2. Materials and methods

2.1. Theory background

In the book "Hooked: How to Build Habit-Forming Products," Eyal presents a descriptive "Hook Model" [28]. This model outlines the four stages through which products cultivate our habits. By employing the cyclical mechanism of this model, products can autonomously engage users, gradually fostering dependence and ultimately transforming them into loyal users. The four steps of the model are as follows: Trigger, Action, Variable Rewards, and Investment. The first step, Trigger, involves guiding users to take action and can be categorized into external triggers and internal triggers. The second step, Action, represents the immediate response when users anticipate a reward. The third step, Variable Rewards, entails satisfying user needs and eliciting a desire for continued use. This aspect is influenced by various factors and incorporates an element of randomness. The fourth step, Investment, aims to cultivate returning users by encouraging them to invest their time, energy, money, social connections, and more, thus setting the stage for the next trigger. Fig. 1 illustrates the structure of the Hook Model proposed by Eyal.

Hoover's (2014) research is both innovative and captivating, yet it does have a couple of limitations. Firstly, it lacks a sufficient number of empirical studies to substantiate its claims. Secondly, the research primarily focuses on purchase triggers within the product itself, neglecting the impact of platform attitudes and social media interactions in influencing purchasing behavior. To address these shortcomings, this paper introduces modifications to the original model structure. In the revised model, the variable κ represents the actions taken to attract potential addicted users. The variable ε, as a random variable, signifies the variable rewards with certain random effects. The variable αX_i represents the potential number of addicted users formed as a result of adopting attractive strategies, while δ represents the successfully converted purchasing users. Furthermore, the structure depicted in Fig. 1 is expanded to encompass a competitive framework among multiple platforms. X_1 represents the user count of traditional e-commerce platforms, whereas X_2 represents the user count of emerging social e-commerce platforms. Fig. 2 illustrates the structure of the cross-platform e-commerce competition model based on the addiction model.

Assuming that the user demand for the original platform follows a decreasing function based on its own product's price and an increasing function based on competitors' prices, we can express this relationship with the following equations: $q_i = X_i - p_i + \alpha p_j + \varepsilon_i$ ($i = 1, 2; j = 2, 1$), Here, α represents the initial competition intensity between platforms. P_1 and P_2 represent the retail prices of products offered by traditional e-commerce and social e-commerce platforms, respectively. The sales volume of products from the traditional e-commerce platform is denoted by q_1, and the sales volume of products from the social e-commerce platform is denoted by q_2. The specific results are shown in equations (1) and (2).

$$q_1 = X_1 - p_1 + \alpha p_2 + \varepsilon_1 \tag{1}$$

$$q_2 = X_2 - p_2 + \alpha p_1 + \varepsilon_2 \tag{2}$$

Without considering addiction strategies, the market profits of the two platforms are shown in equations (3) and (4):

$$\pi_1(p_1) = p_1(X_1 - p_1 + \alpha p_2 + \varepsilon_1) \tag{3}$$

$$\pi_2(p_2) = p_2(X_2 - p_2 + \alpha p_1 + \varepsilon_2) \tag{4}$$

Let σ represent the standard deviation of the random variable ε. The decision objective functions for the business of the two platforms are shown in equations (5) and (6):

$$\Theta_1(p_1) = E[\pi_1(p_1)] - RVar[\pi_1(p_1)] = p_1(X_1 - p_1 + \alpha p_2) - Rp_1\sigma_1 \tag{5}$$

$$\Theta_2(p_2) = E[\pi_2(p_2)] - RVar[\pi_2(p_2)] = p_2(X_2 - p_2 + \alpha p_1) - Rp_2\sigma_2 \tag{6}$$

When considering addiction marketing strategies, it appears that social e-commerce platforms rely more heavily on addicted users. However, traditional e-commerce platforms can also easily adopt live streaming pages if it proves profitable for their respective platforms. Assuming a competition intensity μ between the two platforms in attracting addicted users and a conversion rate β of existing platform traffic into addiction shopping mode, with a fixed number of potential new users, the action taken by the traditional e-commerce platform is represented as π_1, and the action taken by the social e-commerce platform is represented as $\kappa - \kappa_1$. At this point, the normal demand of the original platform for traditional e-commerce and social e-commerce is q_{D1} and q_{D2}, respectively, while the demand for addiction shopping is q_{D1}^* and q_{D2}^*. Therefore, equations (7)–(10) hold true:

$$q_{D1} = (1 - \beta)(X_1 + \varepsilon_1) - p_1^* + \alpha p_2^* \tag{7}$$

$$q_{D2} = (1 - \beta)(X_2 + \varepsilon_2) - p_2^* + \alpha p_1^* \tag{8}$$
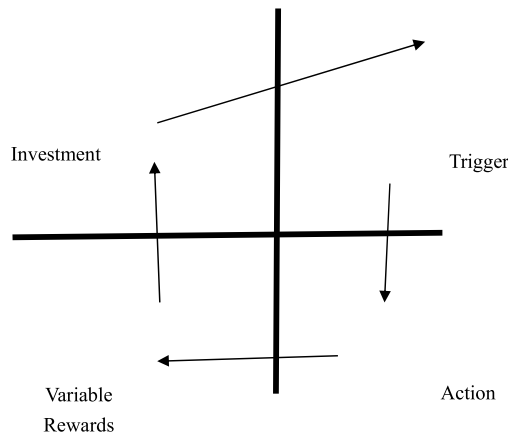

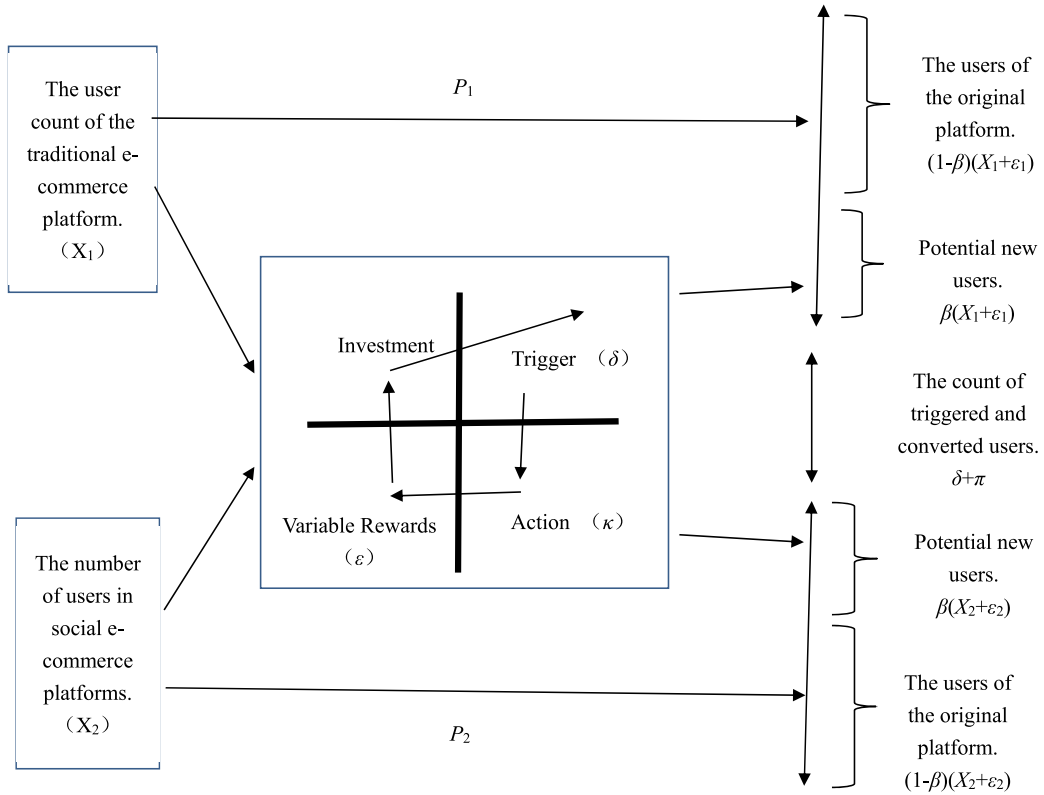**Fig. 1.** Illustrates the structure of Hoover's Hook Model.

Fig. 2. Cross-platform e-commerce competition model based on the addiction model.

$$q^*_{D1} = \beta(X_1 + \varepsilon_1) + \kappa_1 + \delta \tag{9}$$

$$q^*_{D2} = \beta(X_2 + \varepsilon_2) + (\kappa - \kappa_1) + \delta \tag{10}$$

When taking addiction strategies into account, the profit expressions for the decision-making of the two platforms is shown in equation (11):

$$\pi_D(p_{D1}, p_{D2}, \delta) = p_{D1} \cdot q^*_{D1} + p_{D2} \cdot q^*_{D2} + p^*_1 \cdot q_{D1} + p^*_2 \cdot q_{D2} - \beta^2 \tag{11}$$

By conducting optimization, we can obtain the solution as shown in equation (12):

$$\beta = p^*_{D1} = p^*_{D2} = \frac{\kappa + \beta(X_1 + X_2)}{2 - 4\mu} \tag{12}$$

At this stage, a certain proportion of users, determined by β, will transition to the addiction shopping consumption mode. The implementation of addiction strategy marketing will also alter the competitive behavior of platform businesses. Both platforms will adopt proactive strategies for addiction shopping and may establish a cooperative competitive relationship to some extent.

2.2. Theory background

2.2.1. Triggering of traffic and consumer actions

With the socialization and grassroots nature of information production, information consumption is primarily driven by dynamic information streams, giving rise to native advertising in the form of sponsored content within social media platforms [29,30]. Native advertising, also known as social media advertising, intelligently promotes a product or service to different groups of users based on their preferences and characteristics across social media platforms. Personalized advertising recommendation systems leverage various techniques to understand user interests and preferences, providing tailored advertisements across multiple platforms such as PCs and mobile devices, which have demonstrated promising results in various applications [31]. Personalized direct marketing based on customer transaction history involves offering targeted product recommendations to customers with similar preferences, resulting in higher purchase rates [32,33]. Personalized recommendation systems employ statistical techniques to analyze user preferences and suggest the most suitable content (e.g., "Customers who liked this also liked … "). Such recommendation systems can significantly

increase the volume of purchases and potentially influence the product mix that users purchase. After receiving recommendations, users tend to opt for additional similar product combinations [34]. By delivering personalized ads through targeted traffic, consumers are prompted to pay attention to e-commerce live-streaming rooms, thereby generating interest in these livestreaming platforms.

Fogg summarized the "keys" to habit shift as the "Fogg Behavior Model." In this model, M represents motivation, indicating the desire to engage in a behavior; A represents ability, indicating the feasibility of performing a behavior; moreover, P represents prompts, which are signals that remind individuals to engage in a behavior. These three factors have a multiplicative relationship because behavior occurs only when all three factors are present. Researchers have analyzed that interest is a factor that positively influences consumer behavior, as it stimulates proactive searches and attention toward live streaming rooms. Based on this theory, the following hypotheses are formulated:

H1. Consumer's interest in e-commerce live streaming rooms and their proactive search behavior positively influence their attention towards live streaming rooms.

2.2.2. The variable rewards offered by e-commerce live streaming rooms and consumer engagement

In today's rapidly evolving information age, individuals, whether vertically or horizontally, struggle to grasp all the key points of knowledge. This usually leads to varying levels of knowledge anxiety. Key Opinion Leaders (KOLs) play a vital role in live-streaming scenarios. Their ability to attract a large number of consumers, particularly Generation Z, to join live streaming rooms, capture their attention, and drive purchase behavior is closely associated with their appealing appearance and distinct personality charm [35]. The distinctive allure of live-streaming KOLs significantly sparks consumer interest, and ordinary consumers commonly consider the opinions of these influential figures when making purchasing decisions [36]. In today's society, people not only consume products but also embrace aesthetics. They place greater emphasis on visual appeal and the symbolic value derived from consuming esthetics and products. Through this process, they consume social significance, shape their self-identity, and fulfill their desires [37]. Based on this understanding, researchers analyze that the host's professionalism, attractiveness (personal charm, beauty), and customers' aesthetic preferences are factors that positively influence consumer viewing behavior during live streaming. Based on the above theory, the following assumptions were formulated:

H2a. The level of consumer attention towards the live streaming room is positively correlated with the professionalism of the host, resulting in a positive effect on the consumer's continued viewership of the live stream.

H2b. The level of consumer attention towards the live streaming room is positively correlated with the attractiveness of the host, leading to a positive impact on the consumer's continued viewership of the live stream.

H2c. The level of consumer attention towards the live streaming room is positively correlated with the customer's aesthetic preferences, leading to a positive impact on the consumer's continued viewership of the live stream.

Emotions play a crucial role in various aspects of our daily lives, are closely intertwined with our cognition and behavior, and exert influence on shaping different organizational phenomena. Emotions have a significant impact on customer satisfaction and service quality, with different emotions yielding varying effects on satisfaction. The concept of emotional value refers to the disparity between the perceived emotional benefit and the cost to the customer. Emotional benefits pertain to positive emotional experiences, whereas emotional costs encompass negative emotional experiences [38]. For instance, the yoga brand Lululemon emphasizes the "pursuit of health," while the women's underwear brand NEIWAI promotes the idea of "freedom." Numerous market surveys indicate that consumers are willing to pay a premium for "emotional value." When consumers watch e-commerce live streams, they undergo an immersive pleasure through the distinctive explanations provided by the hosts. This engenders trust in both the hosts and their products, ultimately leading to impulsive purchase intentions [39]. Emotional experiences, encompassing perceived pleasure and arousal, serve as a crucial factor in triggering impulsive buying behavior in consumers. In the context of e-commerce live streaming, consumers with higher levels of pleasure and arousal are more prone to harbor impulsive purchase intentions. Promotional intensity, host characteristics (credibility, professionalism, attractiveness), and the level of activity within the live streaming room are pivotal external stimuli that influence consumer emotional experience. Elevating the level and intensity of these external stimuli can enhance consumers' perceived pleasure and arousal. Emotional experience stands as a crucial internal mechanism through which external stimuli influence consumers' impulsive purchase intentions [40,41]. The professionalism of internet celebrities has a positive impact on consumers' purchase intention through the cognitive path of perceived utilitarian value. Additionally, the attractiveness of internet celebrities positively influences consumers' purchase intention through the emotional path of perceived hedonic value [42–44]. Notably, there exists a significant positive correlation between how internet celebrity products are presented in terms of content, format, and the arousal of customers' aesthetic values. The arousal of customers' aesthetic values is also positively associated with their intention to make purchases. Furthermore, customers' aesthetic expectations can play a positive moderating role in the relationship between the presentation of internet celebrity products and the arousal of customers' aesthetic values [45,46].

Researchers have analyzed that the host's professionalism, attractiveness (personal charm, beauty), and customer aesthetic preferences play a significant role in positively influencing consumers' attitudes and purchasing behavior. Building on these theories, the following assumptions are formulated:

H3a. The professionalism of e-commerce hosts positively impacts consumers' utilitarian purchases.

H3b. The professionalism of e-commerce hosts positively impacts consumers' hedonic purchases.

H4a. The attractiveness of e-commerce hosts positively influences consumers' utilitarian purchases.

H4b.   The attractiveness of e-commerce hosts positively influences consumers' hedonic purchases.

H5a.   Customer consumption aesthetics positively affect consumers' utilitarian purchases.

H5b.   Customer consumption aesthetics positively affect consumers' hedonic purchases.

2.2.3. Multi-round triggers and consumer addiction to online shopping

The triggering process can be classified into two distinct categories: external triggering and internal triggering. External triggers encompass the utilization of diverse forms of traffic advertising by businesses, which are based on consumer spending habits. On the other hand, internal triggers refer to consumers making actual or hedonic purchases during the commitment phase to fulfill their practical or pleasure-related needs [47]. Businesses strive to incentivize consumers for consecutive purchases through a variety of trigger methods. Initially, businesses employ traffic promotions to prompt consumers to make their initial purchases. Subsequently, they organize additional live sessions and introduce activities such as discounts, loyalty points, and reward programs to attract and retain consumers. These activities above not only exert a repetitive influence on consumers' purchasing decisions but also contribute significantly towards enhancing their satisfaction levels. Furthermore, these activities foster an emotional connection between consumers and the business entity, thereby motivating them to engage in multiple subsequent rounds of purchases. Studies have demonstrated that engaging in online shopping can induce a state of flow, and businesses' offerings such as personalized recommendations and professional consultations further enhance consumers' flow experiences and overall satisfaction [48,49]. In the context of interactive community websites, it has been confirmed that the practical value of such websites positively impacts the flow experience and further influences users' willingness to continue using the interactive community platform [50]. Additionally, hedonic value is positively associated with making repeat purchases, as businesses enhance consumers' perception of hedonic value by providing enjoyable shopping experiences, such as promotions and thoughtfully designed product pages, thereby promoting the intention to make repeat purchases [51,52]. Researchers argue that both utilitarian and hedonic purchases exert a positive influence on consumer addiction to online shopping. Based on these theories, the following hypotheses are formulated:

H6a.   Consumers' utilitarian purchases exert a positive impact on the development of addiction to live-streaming online shopping.

H6b.   Consumers' hedonic purchases have a positive influence on the emergence of addiction to live-streaming online shopping.

2.2.4. Moderation of perceived risk

The concept of perceived risk was first introduced by Bauer in the study of consumer behavior. He suggests that consumer behavior involves various uncertainties that can lead to unfavorable consequences after purchasing a product, thus presenting a certain level of risk [53]. Under the assumption of rationality, individuals prioritize their own interests as the highest life attitude and behavioral guideline. When a behavior results in personal loss, individuals tend to discontinue that behavior to avoid further loss. When
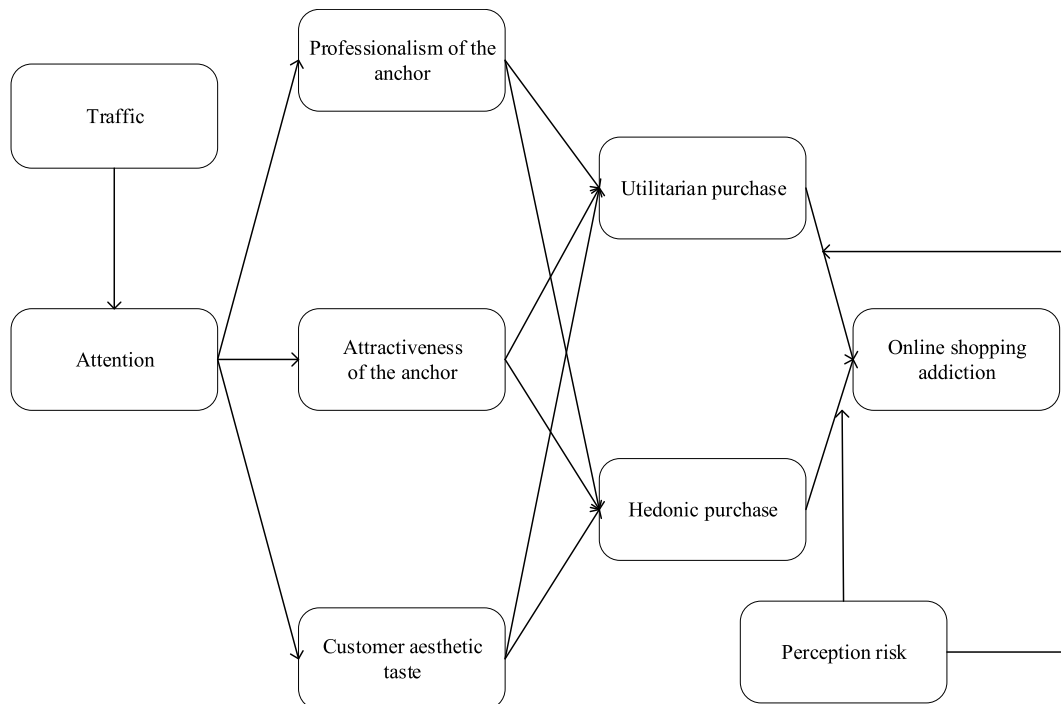

Fig. 3. The theoretical framework of this study.

considering potential gains, people tend to exhibit risk aversion [54,55]. It is widely believed that consumers prioritize product quality when making purchases. In the increasingly prevalent context of online shopping, consumers' uncertainty about product functionality and quality has become one of the primary obstacles to online purchases [56]. When perceived risk arises, consumers may employ strategies such as reducing consumption or abstaining from making purchases to mitigate and eliminate the uncertainty and severity of purchase outcomes [57]. Therefore, this study suggests that consumers' perception of risk in online shopping can decrease the likelihood of consumer addiction to online shopping. The following hypothesis is proposed:

H7a. Perceived risk moderates the relationship between utilitarian purchases and online shopping addiction.

H7b. Perceived risk moderates the relationship between hedonic purchases and online shopping addiction.

2.3. Constructing a model of factors influencing consumer addiction to e-commerce live streaming online shopping based on the "addiction model."

Based on the theoretical analysis and research hypotheses mentioned above, the relationships between variables in the theoretical

Table 1
Measuring items for the research model.

Measurement dimension	Measured variable	Code	Measurement items	Reference
Trigger	Traffic (T)	T1	You often browse information related to e-commerce live-streaming	[58]
		T2	You often receive push notifications from e-commerce live-streaming rooms	
		T3	Your friends often recommend e-commerce live-streaming information to you	
Action	Attention (A)	A1	You are interested in watching e-commerce live-streaming	[59]
		A2	You actively search for the e-commerce live-streaming rooms you want to watch.	
		A3	You actively follow and subscribe to your favorite e-commerce live-streaming rooms.	
Variable Rewards	Professionalism of the anchor (PA)	PA1	You trust the content presented by e-commerce hosts during live streaming.	[44,60]
		PA2	You believe that e-commerce hosts are capable of providing accurate assessments of the products they recommend.	
		PA3	You believe that the e-commerce hosts you watch possess specific skills and expertise.	
	Attractiveness of the anchor (AA)	AA1	You find the appearance of e-commerce hosts to be attractive.	[61]
		AA2	You believe that the e-commerce hosts you watch have professional knowledge.	
		AA3	You believe that the witty-humorous hosting style of e-commerce hosts can ignite your interest in shopping.	
	Customer aesthetic taste (CA)	CA1	The reason you watch e-commerce live streaming is because the "appeal" of the products attracts you.	[62]
		CA2	You watch e-commerce live streaming because you are attracted by the unique features of the products.	
		CA3	You watch e-commerce live streaming because you are intrigued by the unique and novel appearance of the products.	
Investment	Utilitarian purchases (UP)	PP1	You believe that the products recommended by e-commerce hosts perfectly meet your needs.	[63]
		PP2	You believe that the products recommended in e-commerce live streaming are everyday essentials in your daily life.	
		PP3	You believe that the products recommended in e-commerce live streaming are highly practical.	
		PP4	You believe that the products recommended in e-commerce live streaming are capable of addressing your needs.	
	Hedonic purchase (HP)	HP1	You believe that the products recommended by e-commerce hosts can provide you with a sense of pleasure.	[60]
		HP2	You believe that watching e-commerce live streaming enables you to experience a pleasurable shopping process.	
		HP3	You greatly enjoy the process of product recommendations in e-commerce live streaming.	
		HP4	You believe that the products recommended in e-commerce live streaming fulfill your pursuit of pleasure.	
Next round trigger	Online shopping addiction (OSA)	OSA1	You will frequently make repeat purchases and stock up on products because of their practicality.	[64]
		OSA2	You will repeatedly purchase and stock up on products because of the enjoyable shopping experience.	
		OSA3	When you see hosts recommending products, you feel a strong urge to make a purchase.	
		OSA4	You have an unconscious tendency to search for e-commerce streaming live-streaming rooms and make purchases of the products featured in them.	
Moderating Variables	Perception risk (PR)	PR1	Indulging in streaming live-streaming shopping can result in significant financial expenses.	[57,65]
		PR2	Indulging in live-streaming shopping can consume a significant amount of time.	
		PR3	There are certain flaws in the quality of products purchased through live streaming.	
		PR4	Live streaming shopping can result in a loss of control over personal privacy and payment information.	

framework of this study are illustrated in Fig. 3.

3. Empirical result and findings

3.1. Designing the questionnaire and measuring variables

In this study, our data primarily originated from a questionnaire survey. To ensure the reliability and validity of the questionnaire, we utilized established mature measurement scales and conducted a small-scale pre-survey before the formal distribution of the questionnaire. During the pre-survey, we addressed options with low reliability, solicited genuine responses from the testers regarding their experiences in completing the questionnaire, and further refined items that might be ambiguous to align with the characteristics of the "addiction model" and consumer addiction to live e-commerce shopping. Ultimately, we finalized the formal questionnaire. The formal questionnaire survey consisted of three parts: the first part gathered personal basic information of the respondents; the second part surveyed consumers' involvement in the entire live shopping process; and the third part investigated consumers' perception of risks. The questionnaire employed a Likert five-point scale, comprising a total of 31 measurement items. To ensure the internal validity of the measurements, each variable in the survey questionnaire was represented by at least three items. Data for this study were collected through a questionnaire survey. Established mature measurement scales were used to ensure the reliability and validity of the questionnaire. These scales were modified to accommodate the characteristics of the "addiction model" and consumer addiction to live e-commerce shopping. All variables were measured using a Likert five-point scale, where respondents scored scenarios in online live shopping based on their judgments. Specifically, "1″ represented "Strongly Disagree," "2″ represented "Disagree," "3″ represented "Neutral," "4″ represented "Agree," and "5″ represented "Strongly Agree." The scoring ranged from "Completely Disagree" to "Completely Agree," ensuring the accuracy and consistency of our measurements. Overall, we rigorously followed methods in questionnaire design and data collection to ensure the credibility and effectiveness of the obtained data. The details of the scales can be found in Table 1.

3.2. Data collection and sample design

This study conducted a questionnaire survey targeting individuals engaged in e-commerce live streaming and live shopping within live streams. To ensure the validity and scientific rigor of the questionnaire, the design, distribution, and collection of the questionnaire were all conducted through a professional internet survey platform called "Wenjuanxing". During the sample collection phase, we placed high importance on the transparency of the study and the informed consent of the participants. We have obtained the Informed Consent of all participants. Firstly, we provided detailed explanations of the purpose and significance of the study to the respondents, ensuring that they made a decision on participation based on a full understanding of the research content. Upon obtaining the respondents' consent and signed informed consent forms, we provided them with the URL link to the survey questionnaire. When the

Table 2
Description of sample characteristics.

Variables	Options	Frequency	Percentage
Gender	Man	106	49.50 %
	Woman	108	50.50 %
Age	18–25 years old	87	40.65 %
	26–35 years old	54	25.23 %
	36–45 years old	45	21.03 %
	46–55 years old	28	13.08 %
Education level	Middle school or below	16	7.50 %
	High school/vocational school	51	23.80 %
	Associate degree	34	15.90 %
	Undergraduate degree	78	36.40 %
	Postgraduate and above	35	16.40 %
Occupation	Government civil servant	38	17.80 %
	Teachers, doctors, and researchers	36	16.80 %
	Company/enterprise employees	49	22.90 %
	Students	65	30.40 %
	Freelancers	20	9.30 %
	Other	6	2.80 %
Average monthly income	3000 and below	31	14.50 %
	3001–5000	71	33.20 %
	5001–8000	62	29 %
	8001–10000	34	15.90 %
	10000 and above	16	7.50 %
Online shopping frequency	3 times per week and above	44	20.60 %
	1-2 times per week on average	75	35 %
	1-2 times per month on average	46	21.50 %
	1-2 times per quarter on average	30	14 %
	1-2 times per half year on average,	16	7.50 %
	Never purchased	3	1.40 %

respondents clicked on the link, they were first presented with a crucial screening question: "Have you ever participated in online live shopping?" The purpose of this question was to filter out a sample group that aligns with the objectives of this study. If the respondent chose the option "participated", they would be automatically directed to the formal questionnaire page for completion; otherwise, if they chose "never participated", they would be directed to a thank-you page and informed that they did not meet the sample requirements for this study. Through this setup, we successfully excluded data from individuals who had never participated in live shopping, ensuring the appropriateness of the sample and the accuracy of the research results. Furthermore, to ensure the reliability of the collected data, the following principles were adopted for data screening and filtering: (1) excluding questionnaires with response times of less than 80 s; (2) excluding questionnaires where all answers are identical; (3) excluding questionnaires containing responses that are inconsistent with logical reasoning, such as checking whether the respondents' answers are logically related to the questions or if there are contradictory responses; (4) excluding duplicate responses, with only one copy retained if completely identical data were received. It is worth noting that the participants in this study were all adults and did not include minors. A total of 273 questionnaires were distributed in this survey, and after applying these data screening criteria, 214 questionnaires met the requirements of this study, resulting in an effective response rate of 78.39 %. Descriptive statistics of the data are shown in Table 2.

3.3. Descriptive statistics

This study delves into the behaviors of 214 users engaged in online live shopping, presenting fundamental statistics about their gender, age, education, occupation, salary, and online shopping habits. The survey instrument comprises nine scales: T, A, PA, AA, CA, PP, HP, PR, and OSA, encompassing a total of 31 questions. A detailed descriptive statistical analysis was performed on the pertinent variables, with specific findings outlined in Table 3.

3.4. Reliability and validity tests

Reliability testing is primarily employed to assess the reliability and accuracy of scale data. According to existing research, Cronbach's α value exceeding 0.7 is typically considered indicative of a relatively high level of reliability, signifying good internal consistency of the scale [66]. Detailed reliability analysis results are presented in Table 4. These results reveal that the Cronbach's α values of each latent variable in the questionnaire surpass the threshold of 0.7 significantly, indicating robust internal consistency of the questionnaire.

Validity testing encompasses three main aspects: content validity, convergent validity, and discriminant validity. Content validity refers to the extent to which the item set effectively reflects the research problem, commonly verified through literature review. The

Table 3
Descriptive statistics.

Latent Variables	Descriptive statistical	N	Min	Max	Mean	Variance
T	T1	214	1	5	3.58	1.24
	T2	214	1	5	3.57	1.458
	T3	214	1	5	3.52	1.537
A	A1	214	1	5	3.23	1.203
	A2	214	1	5	3.38	1.157
	A3	214	1	5	3.41	1.219
PA	PA1	214	1	5	3.43	1.514
	PA2	214	1	5	3.43	1.533
	PA3	214	1	5	3.38	1.25
AA	AA1	214	2	5	3.42	0.685
	AA2	214	1	5	3.56	0.745
	AA3	214	1	5	3.61	0.924
CA	CA1	214	1	5	3.43	0.998
	CA2	214	1	5	3.47	0.898
	CA3	214	1	5	3.5	1.012
PP	PP1	214	1	5	3.43	1.092
	PP2	214	1	5	3.39	0.98
	PP3	214	1	5	3.57	1.036
	PP4	214	1	5	3.48	1.011
HP	HP1	214	1	5	3.45	1.075
	HP2	214	1	5	3.41	1.079
	HP3	214	1	5	3.39	1.094
	HP4	214	1	5	3.48	1.302
OSA	OSA1	214	1	5	3.51	1.293
	OSA2	214	1	5	3.49	1.613
	OSA3	214	1	5	3.4	1.5
	OSA4	214	1	5	3.41	1.604
PR	PR1	214	1	5	3.22	0.66
	PR2	214	1	5	3.31	0.62
	PR3	214	1	5	3.26	0.699
	PR4	214	1	5	3.24	0.767

Table 4
Results of reliability and validity testing of the scale.

Latent Variables	Response Options	Factor Loading	AVE	CR	Cronbach's α
(T)	T1	0.79	0.57	0.80	0.80
	T2	0.77			
	T3	0.70			
(A)	A1	0.75	0.55	0.78	0.79
	A2	0.75			
	A3	0.73			
(PA)	PA1	0.76	0.56	0.79	0.79
	PA2	0.78			
	PA3	0.71			
(AA)	AA1	0.76	0.56	0.79	0.79
	AA2	0.78			
	AA3	0.71			
(CA)	CA1	0.90	0.58	0.80	0.79
	CA2	0.68			
	CA3	0.68			
(PP)	PP1	0.73	0.59	0.85	0.89
	PP2	0.79			
	PP3	0.81			
	PP4	0.74			
(HP)	HP1	0.78	0.55	0.83	0.86
	HP2	0.80			
	HP3	0.73			
	HP4	0.67			
(PR)	PR1	0.63	0.49	0.79	0.73
	PR2	0.65			
	PR3	0.72			
	PR4	0.78			
(OSA)	OSA1	0.64	0.51	0.81	0.84
	OSA2	0.75			
	OSA3	0.73			
	OSA4	0.74			

scales chosen for this study have been adequately validated in previous literature, and further adjustments were made based on the research theme, demonstrating good content validity. Convergent validity comprises the average variance extracted (AVE) and composite reliability (CR) of each variable. Previous studies suggest that AVE >0.5 and CR > 0.7 indicate satisfactory convergent validity. As shown in Table 4, the combined validity (CR) of each variable surpasses 0.7, while the AVE value of every scale remains well above 0.5. Notably, the only exception is the variable perceived risk (PR), which falls slightly below 0.5, but still remains quite close to the threshold. This underscores the overall good convergent validity of the variable table.

Discriminant validity assesses the extent to which observed indicators of each latent variable differ from those of other latent variables, ensuring statistical conceptual measurement uniqueness. When conducting a discriminant validity test, we assess the discriminant validity by comparing the square root of AVE within the potential structure against all structural correlations. As exhibited in Table 5, the square roots of AVE for each latent variable notably exceed the absolute values of the correlation coefficients across their respective rows and columns. This observation firmly establishes that the scales employed in this study demonstrate exceptional discriminant validity overall.

In conclusion, this study demonstrates exceptional performance in both reliability and validity testing of the scales, providing compelling evidence of their excellent reliability and validity in the design and implementation of this research.

Table 5
Discriminant validity.

	PP	T	A	CA	AA	PA	HP	PP	OSA
PP	0.7								
T	0.148	0.76							
A	0.034	0.231	0.74						
CA	−0.003	−0.022	−0.094	0.75					
AA	−0.001	0.002	0.008	−0.001	0.74				
PA	−0.004	−0.026	−0.112	0.01	−0.001	0.76			
HP	−0.003	−0.021	−0.09	0.367	0.229	0.526	0.77		
PP	−0.003	−0.022	−0.095	0.374	0.068	0.548	0.437	0.74	
OSA	0.141	0.004	−0.069	0.298	0.143	0.43	0.659	0.501	0.72

3.5. Common method bias test

Due to the data collection method used in this study, which involves a questionnaire survey, there is a potential for common method bias that could impact the reliability of the hypothesis testing results. Therefore, the Harman single-factor test and Harman single-factor method were employed to assess the presence of common method bias.

First, the Harman single-factor test was conducted by performing exploratory factor analysis on all research items. Eight principal components with eigenvalues greater than 1 were extracted. The initial variance explained by the largest common factor was 34.49 %, which is below the 50 % threshold commonly used to determine the presence of substantial common method bias. This suggests that the presence of common method bias in the sample is relatively low and is not expected to significantly impact the results of the model analysis. Furthermore, the Harman single-factor method was employed to further examine the potential common method bias. The specific steps involved focusing on a single common factor for all measurement items and constructing a single-factor structural equation model. The fit of the model was then evaluated. The results indicated poor model fit, with $\chi^2 = 1451.33$, $df = 405$, $NFI = 0.583$, $IFI = 0.66$, $CFI = 0.656$. In summary, based on the findings, there is no substantial issue of common method bias in the measurement process of this study.

4. Discussion

The present study primarily utilized confirmatory factor analysis (CFA) to scrutinize the structural equation model. Previous research has highlighted CFA's utility in evaluating both reliability and validity, with its goodness-of-fit serving to further validate the structural convergence [67]. In this investigation, we employed a range of CFA goodness-of-fit indices, encompassing the chi-square to degrees of freedom ratio ($\chi^2/df=1.751$), root mean square error of approximation ($RMSEA=0.059$), goodness-of-fit index ($GFI=0.814$), adjusted goodness-of-fit index ($AGFI=0.78$), and comparative fit indices ($IFI=0.893$, $TLI=0.888$, $CFI=0.892$).

Drawing insights from the works of Baumgartner(1996), we can make the following observations: the chi-square to degrees of freedom ratio is below 3, indicating a satisfactory overall model fit; *GFI* and *AGFI* values exceed 0.8, providing further confirmation of the model's adequacy; *RMSEA* is under 0.08, signifying high-quality model fit; and *IFI*, *TFI*, and *CFI* values all surpass 0.8, indicating the model's acceptability [68]. Upon scrutinizing the findings presented in this paper, we note that only the *AGFI* slightly falls below the standard value, albeit still in close proximity to the typical benchmark of 0.8. Therefore, we can conclude that the goodness-of-fit indices derived from the CFA in this study either meet or closely approach the conventional acceptance standards, indicative of a well-fitted relationship between the measurement model and the data. Despite the minor deviation in *AGFI*, given its nearness and the overall fit, we can affirm the adequacy of the relationship between the measurement model and the data in this study.

Based on the structural model, the hypotheses were tested, and the results are presented in Table 6. The findings indicate that the push of traffic advertisements has a significant positive effect on consumers' interest in e-commerce live streaming rooms and their attention to these rooms ($\beta = 0.219$, $P < 0.05$), confirming hypothesis H1.

The attention of consumers to live streaming rooms did not exhibit a significant correlation with the professionalism of the anchors, and it did not have a significant impact on consumers' continued viewership of the live streams ($\beta = -0.125$, $P > 0.05$), suggesting that hypothesis H2a was not supported. In certain existing live-streaming rooms, the professionalism of the anchors may not be acknowledged by consumers, which leads to a decline in consumer viewership. Additionally, with a multitude of live streams accessible on the platform, consumers face a plethora of options, and even if they initially show interest in a particular live streaming room, they may seek out better experiences in more captivating live streaming rooms, thus reducing their viewership of the initially followed room [44]. Furthermore, modern consumers have increasingly diversified channels for information acquisition, enabling them to learn about product information and market dynamics through various means. Therefore, while the professionalism of anchors may contribute to consumers' awareness of products to some extent, it is not the sole determinant of consumers' attention.

The attention of consumers to live streaming rooms did not demonstrate a significant correlation with the attractiveness of the anchors, and it did not have a significant impact on consumers' continued viewership of the live streams ($\beta = 0.006$, $P > 0.05$), indicating that hypothesis H2b was not supported. Presently, the structure, routines, and processes associated with live streaming for

Table 6
Path analysis results.

Structural Paths			Estimate	Variance	C.R.	P
A	<—	T	0.219*	0.085	2.558	0.011
PA	<—	A	−0.125	0.1	−1.254	0.21
AA	<—	A	0.006	0.067	0.088	0.93
CA	<—	A	−0.1	0.093	−1.076	0.282
PP	<—	PA	0.454***	0.079	5.728	0.000
HP	<—	PA	0.407***	0.072	5.677	0.000
PP	<—	AA	0.084	0.093	0.91	0.363
HP	<—	AA	0.265**	0.088	3.026	0.002
PP	<—	CA	0.322***	0.077	4.165	0.000
HP	<—	CA	0.296***	0.071	4.177	0.000
OSA	<—	PP	0.24**	0.076	3.139	0.002
OSA	<—	HP	0.53***	0.091	5.811	0.000

Note: ***p < 0.001, **p < 0.01, *p < 0.05.

product promotion have become relatively standardized, resulting in a high degree of similarity among the content, format, or personal traits of the majority of live streaming rooms. When consumers engage in long-term viewing of multiple similar live-streaming contents from the following rooms, the lack of distinctiveness diminishes the attractiveness of the anchors, failing to captivate their interest and attention [69]. Additionally, consumers have diverse personal preferences and interests; for some consumers, they may value the humor and affability of the anchors more, while for others, may appreciate the professional knowledge and rigorous attitude of the anchors. Therefore, the attractiveness of the anchors may vary among different consumer groups, making it difficult to establish a unified standard to measure its impact on consumers' attention.

The attention of consumers to live streaming rooms did not demonstrate a significant correlation with customer aesthetic preferences, and it did not have a significant impact on consumers' continued viewership of the live streams ($\beta = -0.1$, $P > 0.05$), indicating that hypothesis H2c was not supported. Different consumers may have significant differences in their definitions, understanding, and pursuit of beauty. Therefore, even if live streams are designed and presented aesthetically, it is challenging to ensure that they align with all consumers' aesthetic preferences. Additionally, consumers' aesthetic preferences may change over time and in different environments, suggesting that aesthetics are not static attributes. In the context of live streaming platforms, consumers' attention may be drawn at any time by immediate interaction, unique content, or other viewers' behavior, factors that are not directly related to consumers' aesthetic preferences.

The professionalism of the anchors has a significant positive impact on customers' utilitarian purchases ($\beta = 0.454$, $P < 0.001$), confirming hypothesis H3a. It also has a significant positive impact on customers' hedonic purchases ($\beta = 0.407$, $P < 0.001$), confirming hypothesis H3b. The impact of host professionalism on the utilitarian purchases of customers is significantly stronger than its effect on the hedonic purchases. This is likely due to the fact that e-commerce anchors typically have specialized knowledge and experience in specific domains. They are familiar with the features, functions, and uses of the product, allowing them to provide detailed explanations and demonstrations. This professionalism helps customers better understand the practical utility of products, thereby increasing their inclination to make utilitarian purchases [59,61]. On the other hand, the attractiveness of the anchors does not have a significant impact on customers' utilitarian purchases ($\beta = 0.084$, $P > 0.05$), but it does have a significant positive impact on customers' hedonic purchases ($\beta = 0.265$, $P < 0.01$). This suggests that hypothesis H4a is not supported, while hypothesis H4b is supported. Currently, e-commerce live streaming primarily focuses on entertainment. E-commerce anchors frequently possess excellent performance skills and appealing qualities. They may introduce the product humorously and engagingly to create a relaxed and pleasant atmosphere. This entertainment value stimulates the interest and desire of customers to make hedonistic purchases. Additionally, when e-commerce anchors have a pleasing appearance or image, they enhances the audience's affinity, providing a pleasant and visually appealing experience that makes viewers perceive live shopping as a delightful form of enjoyment [70]. Customers' aesthetic preferences have a significant positive impact on both their utilitarian purchases ($\beta = 0.322$, $P < 0.001$) and hedonic purchases ($\beta = 0.296$, $P < 0.01$), confirming hypotheses H5a and H5b. Firstly, aesthetic preferences, being integral to individual values, directly impact consumers' purchasing decisions. For consumers prioritizing utilitarian purchases, functionality and practicality are paramount. If a product's visual design aligns with their aesthetic preferences, customers are more likely to perceive it as fulfilling their practical needs in daily life, thus boosting their willingness to buy. Secondly, for consumers prioritizing hedonic purchases, emotional satisfaction and pleasure are key. A product's design that resonates with consumers' aesthetic sensibilities can evoke feelings of pleasure and satisfaction, increasing the likelihood of purchase. Consequently, aesthetic preferences often emerge as a pivotal factor in the decision-making process, particularly for such products.

Customers' utilitarian purchases have a significant positive impact on their online shopping addiction ($\beta = 0.24$, $P < 0.01$), confirming hypothesis H6a. Similarly, customers' hedonic purchases also positively contribute to their online shopping addiction ($\beta = 0.53$, $P < 0.001$), confirming hypothesis H6b. However, in terms of the degree of influence, hedonic purchases had a significantly greater impact on online shopping addiction than utilitarian purchases. There are several specific reasons for this observation. First, hedonic purchases can quickly satisfy consumers' desires and provide them with a sense of pleasure, leading them into a cycle of shopping desires. In addition, the influence of social identification and group dynamics plays a role in shaping consumer behavior. Consumers are influenced by trends and recommendations, striving to pursue specific fashions or popular items to shape their social image and identity, which increases the impulse to make purchases [23]. In addition, marketing strategies and promotions through limited-time discounts, special offers, and other incentives stimulate consumers' purchasing desires, further increasing the likelihood

Table 7
Analysis of moderation effects.

Independent variable	Perception risk		
	Model 1	Model 2	Model 3
UP	0.242***	0.214**	0.238***
HP	0.468***	0.477***	0.465***
PR	0.106*	0.107*	0.112*
PR*UP		−0.147**	
PR*HP			−0.093
R^2	0.446	0.467	0.454
$Adj\text{-}R^2$	0.438	0.457	0.444
$\triangle R^2$		0.021	−0.013
F Value	56.325	45.744	43.528

Note: ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

of online shopping addiction [71]. Finally, the convenience of online shopping and the protection of privacy provide consumers with a convenient way to shop anytime, anywhere. This reduces social pressure and the fear of judgment from others, making it easier for consumers to indulge in the freedom and comfort of online shopping. These factors collectively contribute to consumers falling into frequent online shopping habits and gradually developing addictive behaviors.

4.1. Moderation effect analysis

In this study, a hierarchical regression analysis was used to examine the moderating effect of perceived risk. The regression results are presented in Table 7. The analysis revealed that perceived risk significantly moderates the negative relationship between utilitarian purchases and online shopping addiction, providing support for hypothesis H7a. However, the moderating effect of perceived risk on the relationship between hedonic purchases and online shopping addiction is not significant, failing to support hypothesis H7b.

To help illustrate the moderating effect, Fig. 4 was created. The graph shows that utilitarian purchases have a more pronounced negative effect on online shopping addiction at elevated levels of perceived risk. In contrast, at low levels of perceived risk, utilitarian purchases still have a negative impact on online shopping addiction, but the moderating effect is weaker. This suggests that as individuals perceive higher levels of risk, consumers who make utilitarian purchases become more concerned about the potential gains and losses for their own interests. They are more cautious in their purchasing decisions and are less likely to engage in impulsive buying behavior. This helps them avoid falling into online shopping addiction by prioritizing their practical needs and avoiding products that may not meet their utilitarian expectations or pose risks to their well-being [55,72].

5. Conclusions

This article posits that empirical evidence suggests a nuanced relationship between online shopping addiction and depression in the rapidly evolving e-commerce landscape. The conventional notion, of associating online shopping addiction merely as a manifestation of depression, might be insufficient in capturing the complexity of their interplay. An alternative perspective proposed here is the intentional induction of online shopping addiction by merchants. Employing the addiction model's intricacies - trigger, action, variable rewards, and investment - merchants strategically establish traffic traps. These traps serve as conduits to entice consumers into the realm of online live shopping, progressively engaging and instilling the formation of a detrimental online shopping addiction. The proposed addiction model, leveraging an array of psychological and behavioral mechanisms, instigates a persistent shopping desire in users and furnishes satisfaction through recurrent shopping engagements, rendering users entwined in a challenging cycle of addiction.

Firstly, businesses utilize the Internet and big data technologies to capture and analyze consumer preferences, enabling personalized advertising customization. They showcase tailored advertisements across multiple platforms, including PCs and mobile devices, utilizing external triggers to captivate consumers' attention and stimulate their interest, ultimately fostering active engagement in the live shopping experience. In the current era of information overload, individuals often experience varying degrees of stress related to information anxiety, appearance concerns, body image issues, and more. Amidst these internal triggers, live shopping has emerged as a means for people to satisfy their shopping cravings while seeking relaxation; effectively alleviating information anxiety and other pressures.

The interplay of external and internal triggers stimulates consumers' shopping interests, prompting them to instinctively search for and engage in live shopping events tailored to their individual needs. In the addiction model, this 'action' stage involves individuals actively pursuing and participating in specific behaviors to satisfy their needs and desires. This proactive process of searching and following perfectly aligns with the 'action' stage described in the addiction model.

Subsequent live-streaming campaigns initiated by merchants leverage highly skilled and captivating hosts, as well as the introduction of products that cater to customers' aesthetic preferences, thereby stimulating consumer interest and engagement. Merchants employ a variety of incentives to reinforce the connection and emotional resonance between consumers and the live-streaming room, which in turn enhances the liveliness of the live-streaming shopping experience and drives consumer behavior. However, this study did
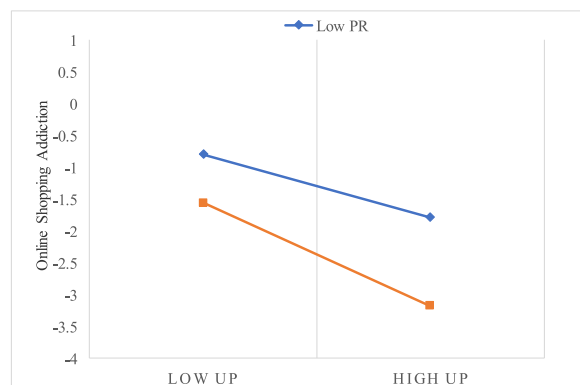

Fig. 4. Illustration of the moderating effect of perceived risk.

not establish a direct correlation between "action" and "diverse rewards." It was observed that consumers do not solely sustain their viewership of live streams due to receiving "diverse rewards" upon completing specific actions. In today's fiercely competitive live shopping industry, consumers are presented with an abundance of options when selecting from various live-streaming rooms. The homogeneity in content, format, and personal characteristics among numerous live streaming rooms undermines the effectiveness of "diverse rewards" in fostering sustained viewership among consumers.

Although there is no direct causal relationship between "variable rewards" and "action," the former plays a pivotal role in enhancing consumer engagement. The "variable rewards" step effectively stimulates consumer interest and purchasing desires, allowing them to derive greater pleasure from their consumption experiences. The psychological effects of hedonic purchasing, driven by this enjoyment-oriented buying, leave consumers feeling satisfied. Simultaneously, the demonstration of various products' functionalities and features by hosts during this process aids consumers in selecting items that better suit their needs, promoting pragmatic purchasing.

Finally, the time, energy, and money that buyers invest in live-streaming online shopping gradually immerse consumers into the world of online shopping, initiating a new cycle of user engagement. While addiction models may appear to consist of distinct phases, they are interconnected and synergistic, creating integrated effects. Beginning with the initial user trigger, consumers' live-streaming online shopping behavior evolves from being optional to becoming an essential part of their lives, establishing habitual usage patterns, fostering dependence, and ultimately culminating in online shopping addiction.

Simultaneously, our research reveals that when consumers perceive heightened risks, particularly those driven by practical purchase motivations, they exhibit a tendency to decrease their engagement in live shopping. This emphasizes the crucial role of attitudes in avoiding online shopping addiction, particularly for consumers primarily driven by utilitarian purchases. These consumers prioritize a comprehensive evaluation of the practicality of purchased items during the shopping process and meticulously assess potential risks linked to their acquisitions. However, during the decision-making process of participating in live shopping, consumers confront diverse potential risks or losses, encompassing concerns about product quality meeting expectations, the promptness of logistics and product delivery, and the sustainability of personal funds for continuous online shopping. These inherent risk factors may diminish consumers' inclination to make purchases, thereby averting potential inducements by merchants and aiding in steering clear of succumbing to the allure of online shopping addiction. In contrast, consumers immersed in hedonic purchasing concentrate more on the pleasurable experience during the shopping process, allocating relatively less attention to the potential risks involved.

In this investigation, we observed an absence of a complete loop between actions and variable rewards in the context of live shopping. This observation suggests that the correlation between actions in live shopping, such as product browsing and order placement, and variable rewards, such as limited-time discounts and lottery activities, may not be robust enough to fulfill the closed-loop conditions prescribed by the addiction model. This phenomenon is likely influenced by various factors, including individual psychological characteristics, social environments, and consumer habits. Notwithstanding the limitations posed by an incomplete loop, the findings of this study offer an initial insight into the potential ramifications of live shopping on online purchasing behavior.

For various stakeholders engaged in online live shopping, this study offers profound insights and reflections. For consumers, it aids in comprehending the potential risks and pitfalls of live shopping, along with recognizing their own psychological vulnerabilities during the shopping process. Consumers should reconsider their behavior patterns in live shopping, adopt a more rational stance towards the temptations in live streams, clarify their shopping needs, and evade being misled by merchants' marketing strategies.

For merchants, the study's findings hold extensive academic and practical significance. It meticulously analyzes the complexity of consumer behavior and reward mechanisms in the live shopping environment, furnishing merchants with a theoretical framework to reassess and refine their marketing strategies. Merchants ought to prioritize consumer needs, create high-quality and personalized shopping experiences, rather than solely pursuing profits. Simultaneously, they must adhere strictly to relevant laws, regulations, and professional ethics, steering clear of unfair practices like false advertising and fraudulent sales, and abstaining from exploiting consumers' psychological vulnerabilities for detrimental sales. Moreover, the study delineates paths for improvement and innovation for e-commerce platforms. By integrating advanced technologies like big data analysis and artificial intelligence, e-commerce platforms can gain deeper insights into consumer needs and behavior patterns, refine marketing strategies and shopping processes, and enhance operational efficiency.

For policymakers, this study furnishes invaluable insights, enabling them to discern the issues in live shopping more clearly. Merchant practices such as stimulating consumption and fabricating traffic traps may contribute to consumer online shopping addiction, while deceitful and misleading advertising by unscrupulous merchants seriously undermines consumer rights. This facilitates policymakers in attaining a more comprehensive understanding of the challenges in live shopping and formulating targeted policy regulations to foster the healthy development of online live shopping.

In summary, this scholarly article reevaluates the association between online shopping addiction and depression, providing a comprehensive and profound understanding that aids in comprehending and intervening in online shopping addiction. Through an intricate structural model and meticulous data analysis, our research reveals that merchants intentionally cultivate consumer addiction to online shopping by enticing consumption and creating traffic traps, rather than depression being the primary driver of online shopping addiction. This discovery serves to prompt consumers to reconsider live shopping, heighten awareness of potential merchant influences, and avoid the pitfalls associated with developing an addiction to online shopping, thereby contributing to the cultivation of healthier online shopping behaviors. Additionally, we delve into the constructive role of perceived risk in dissuading consumers from participating in online shopping. Moreover, this study introduces a novel theoretical perspective on the nexus between online shopping behavior and mental health for the academic community. Our conclusions provide insightful directions for future research aimed at a comprehensive understanding and mitigation of the escalating issue of online shopping addiction in contemporary society. By scrutinizing merchant strategies and individual consumer distinctions, our study furnishes valuable insights for scholars, practitioners, and

decision-makers in related fields, facilitating the creation of a more wholesome and sustainable online shopping environment.

6. Suggestions

The addiction model consists of four interconnected stages, wherein each stage builds upon the outcomes of the preceding one and serves as a foundation for the subsequent stage. Although this study does not establish a complete closed loop, it is crucial to acknowledge the reciprocal effects between these phases. Designing a product that users depend on and habitually utilize is an arduous task, which should not involve exploiting human vulnerabilities for unethical manipulation. In the relationship between technology and the individual, maintaining a balance still necessitates intelligence, which entails user self-restraint and entrepreneurial self-reflection. By prioritizing user needs and continuously optimizing and iterating the product, the ultimate objective is to achieve a mutually beneficial outcome for both the company and its users.

Therefore, for merchants, it is imperative to consistently approach product design from the consumer's perspective, ensuring that products align with genuine consumer needs. The primary objective should be the fulfillment of consumer demands, refraining from the exploitation of consumers' psychological vulnerabilities for the sake of profit. Merchants should institute transparent communication mechanisms, furnishing users with accurate information about products and services, eschewing deceptive advertising and exaggerated tactics, and ensuring consumers are empowered to make well-informed purchasing decisions. Additionally, merchants bear responsibility for societal welfare, contemplating the potential impact of live shopping on users' mental health. It is essential to counsel users against excessive live shopping and implement measures to mitigate negative consequences. Furthermore, adopting a sustainable approach is essential for merchants, considering the potential long-term impact rather than solely fixating on immediate sales and profits. At the same time, businesses should also prioritize consumers' mental well-being by encouraging them to shop thoughtfully and refrain from excessive spending. Throughout the shopping experience, businesses can provide guidance on shopping decisions, assist with consumption planning, and offer other services aimed at helping consumers develop healthy spending habits. The establishment of a sustainable relationship between merchants and consumers holds paramount significance. Only through such an approach can the dual objectives of merchants and consumers be authentically achieved.

Consumers need to take a self-directed approach to control their inclination toward online shopping addiction by addressing internal factors that contribute to compulsive buying. This involves adjusting their mindset and correcting misconceptions about values, building self-esteem and adopting a healthy consumption perspective, managing psychological stress through various methods, and seeking more social interactions. Consumers should also be mindful of their emotional state, making timely adjustments and finding ways to relieve negative emotions to mitigate the development of online shopping addiction. Secondly, cultivating self-control is the key. Consumers should learn to resist temptation, especially when browsing shopping websites or watching live e-commerce broadcasts. You can set a shopping list, and strictly follow the list of purchases, to avoid being influenced by various promotions and preferential information. External factors can be addressed by reducing the frequency of browsing shopping websites and watching e-commerce live streams, interrupting the decision-making process, and fostering a rational mindset towards consumption. Moreover, consumers should enhance their sensitivity to risks, recognizing excessive risks promptly and proactively adjusting their behavior. During the online shopping process, consumers are encouraged to maintain prudence and rationality, steering clear of impulsive purchases and blindly following trends. Setting reasonable shopping budgets, clarifying shopping needs, and avoiding excessive consumption decisions influenced by emotional fluctuations or promotional activities are also recommended tactics for consumers. Finally, if consumers find themselves leaning towards online shopping addiction, they should promptly seek professional help. They can consult psychologists or relevant organizations to understand the harms of online shopping addiction, learn about available treatment methods, and take proactive measures to overcome this detrimental habit.

As a key participant in the market, the government assumes the responsibility of guiding and fostering the healthy and sustainable development of the business environment. In light of the phenomenon wherein merchants intentionally foster consumer addiction to online shopping through tactics like enticing consumption and creating traffic traps, the government should proactively formulate and implement pertinent regulatory policies. These policies should be designed to curb excessive inducements and other business practices that could contribute to consumer online shopping addiction. Simultaneously, there should be concerted efforts to advance public digital literacy education, heightening awareness of the risks associated with online shopping addiction and fostering a more rational understanding of live shopping among consumers. Simultaneously, the government can organize promotional and educational activities to guide consumers towards making rational purchases. Illegal behavior should be punished according to the law to safeguard consumers' legal rights and interests. Through these measures, a healthier and more orderly shopping environment can be cultivated, thus promoting the wholesome development of live shopping.

In reality, both substance addiction and pathological behavioral addiction are highly intricate phenomena. They can be viewed as the outcome of a complex interplay between biological, psychological, and social risk factors and vulnerability through a variety of pathways. The effects of each factor vary from case to case, accounting for extreme individual variation in clinical presentation, susceptibility, and treatment response. Research on addiction has expanded rapidly in recent years, establishing it as one of the most challenging and complex areas of research. Unlike other mental disorders, addiction involves a multi-step process that relies on the interaction between vulnerable individuals at biological, psychological, and social levels and stimuli (substances or behaviors) that are not inherently addictive in the general population. Psychiatrists and psychologists are grappling with a vast and diverse field that encompasses issues such as compulsive buying, technology addiction, and emerging substance use disorders. Investigating these forms of psychopathology is crucial not only because they have significant impacts on daily life but also because they effectively express and epitomize the actual discomfort stemming from societal changes. Rapid and profound shifts in social life, family structure and dynamics, consumer styles, cultural patterns, and leisure management often disrupt the regulation of cognitive structures and emotional

states, ultimately facilitating the development of addiction. Therefore, research focused on substance and behavioral addiction should broaden the understanding of the multi-step etiological process. The ultimate objective is to discover appropriate interdisciplinary models for the optimal prevention and treatment of these sudden and multifaceted disorders.

7. Limitations and future research directions

Currently, this study has certain limitations. Firstly, online shopping addiction is a complex behavior influenced by various factors. The study did not consider other psychological disorders that may contribute to online shopping addiction, such as anxiety disorders, which could interact with depression. Therefore, future research could delve into the complex interactions between online shopping addiction and psychological disorders, further exploring the associations among different psychological disorders and their respective impacts on online shopping addiction. For instance, longitudinal studies tracking participants' mental health status and online shopping behaviors over time could be conducted to understand the independent contributions of different psychological disorders to the risk of online shopping addiction and potential interactions. Moreover, employing multi-method and interdisciplinary research designs, integrating clinical evidence and psychological theories could provide a more comprehensive understanding of the relationship between online shopping addiction and psychological disorders. Additionally, this study did not consider the potential influence of different cultural backgrounds on online shopping addiction, which is also a worthwhile avenue for further exploration. Future research could broaden the sample scope to include participants from diverse cultural backgrounds to compare the characteristics of online shopping behaviors and addiction risks across different cultures. Through cross-cultural comparisons, a more accurate understanding of the global trends in online shopping addiction can be obtained, aiding in the development of cross-cultural mental health intervention strategies. Furthermore, this study did not fully consider the influence of demographic factors on online shopping addiction. Future research could delve deeper into the roles of heterogeneous factors such as gender, age, income level, and education level in online shopping addiction. Analyzing the associations between these factors and online shopping behaviors could better elucidate the patterns of online shopping behaviors and potential addiction risks among different populations. Additionally, considering the impact of socioeconomic backgrounds, it is also necessary to explore the potential influence of external factors such as family environment and occupational stress on online shopping addiction to establish a more comprehensive addiction risk model. Beyond the perspectives of psychology and sociology, future research could draw insights from other disciplines' theories and methodologies, such as neuroscience, economics, and information technology, to explore the mechanisms of online shopping addiction. Utilizing brain imaging techniques and neurobiological indicators could provide insights into the relationship between online shopping addiction and brain activity, explaining the occurrence and development of addictive behaviors from a biological perspective. Simultaneously, integrating economic theories could analyze the structure and characteristics of the online shopping market, as well as the impact of merchants' marketing strategies on consumer shopping behaviors, thereby revealing the commercialization factors of online shopping addiction.

Data availability statement

Data will be made available on request.

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CRediT authorship contribution statement

Chengyu Li: Writing – review & editing, Writing – original draft, Resources, Project administration, Funding acquisition, Conceptualization. **Zuhui Xia:** Writing – original draft, Software, Methodology, Investigation, Data curation. **Yiqing Liu:** Writing – review & editing, Visualization. **Shuyan Li:** Writing – original draft, Validation, Investigation. **Shuchang Ren:** Visualization, Software. **Hongjun Zhao:** Formal analysis.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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