



# Relationship between time pressure and consumers' impulsive buying—Role of perceived value and emotions

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## ARTICLE INFO

### Keywords:

Time pressure  
Perceived value  
Impulsive buying

## ABSTRACT

Live-streaming e-commerce has become one of the mainstream marketing scenarios, attracting the attention of consumers and the academic community. In live-streaming e-commerce, retailers often use limited-time sales to induce a sense of urgency, prompting consumers to make impromptu purchase decisions. However, existing studies show contradictory results regarding the effectiveness and underlying mechanism of this marketing method. This study empirically investigates the relationship between time pressure and impulsive buying, including affective and cognitive aspects, using the Stimulus-Organism-Response (SOR) and Schachter-Singer (SST) theories. The results suggest that time pressure has a positive relationship with impulsive buying, with an affective rather than cognitive focus. Moreover, the relationship between time pressure and affective (vs. cognitive) impulsive buying is mediated by perceived value. Positive emotions positively moderate, while negative emotions negatively moderate, the relationship between time pressure and affective impulsive buying. This study enhances the understanding of how consumers make purchase decisions under time pressure in live e-commerce scenarios.

## 1. Introduction

China's emerging livestreaming e-commerce industry has witnessed explosive growth amid the COVID-19 pandemic, thus creating new growth opportunities for a wide range of businesses and injecting new impetus into the economy [1]. As of June 2023, the number of digital shoppers in China rose to 884 million. In the first half of 2023, the nation's online retail sales amounted to 7.16 trillion yuan, up 13.1% year-on-year [2]. Live e-commerce platforms, website environments, personalized interfaces, and advertisements are among the factors that stimulate consumers' desire to make purchases. Previous research indicates that online shopping behavior tends to be more impulsive than offline retail [3]. However, only limited studies have investigated consumer impulsive buying behavior in the context of live-streaming e-commerce. This study will explore the drivers and underlying mechanisms of consumer impulse buying behavior in this scenario.

Scholars unanimously agree that impulsive buying is characterized by sudden, emotionally intense, and unplanned purchasing behavior [4]. Several studies have demonstrated that time pressure is a crucial factor that influences impulsive buying behavior [5]. From the early time-limited promotions in stores to the current time-limited promotions in online shopping, they all stimulate consumers' desire to buy by shortening the purchase time, thus causing impulsive buying behavior. However, it remains unclear whether time pressure has an association with impulsive buying. Some scholars posit that time pressure facilitates impulse buying. The

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<https://doi.org/10.1016/j.heliyon.2023.e23185>

Received 15 June 2023; Received in revised form 27 November 2023; Accepted 29 November 2023

Available online 3 December 2023

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time-limited promotions shorten consumers' decision time period, making them rely on experience or intuition to make decisions. Consequently, consumers tend to have an exaggerated view of the benefits of a purchase, while neglecting potential risks, which can encourage impulsive buying behavior [6,7]. However, some researchers argue that time pressure negatively correlates with impulsive buying behavior. According to Van Dillen et al. [8], increased time pressure may result in consumers resisting the temptation of impulse buying, thereby reducing their inclination for impulsive purchases. Yüksel [9] asserts that consumers are more prone to making impulsive purchases in a relaxed and pleasant shopping environment. In summary, scholars mainly studied the relationship between time pressure and impulsive buying and have yet to study impulsive buying behavior in a detailed classification. Therefore, this research classifies impulsive buying into cognitive and emotional impulsive buying to investigate the relationship between time pressure and affective (vs. cognitive) impulsive buying.

In addition, shopping situational factors, such as consumers' positive or negative emotions while shopping, influence consumers' impulsive buying [10]. Sohna et al. [11] suggested that positive emotions enhance both cognitive and affective aspects of impulsive buying. Therefore, this study hypothesizes that emotions mediate between time pressure and the affective (vs. cognitive) aspect of impulsive buying. While studies have enhanced the understanding of impulsive buying, they have neglected to examine the relationship between emotions and consumer decision-making in specific contexts. In particular, they have failed to examine the relationship between time pressure during live-streaming e-commerce. This study addresses this gap.

This study has three main contributions. First, this study classifies impulsive buying into affective and cognitive aspects and examines how time pressure affects each form of impulsive buying [8]. There has been little research on the role of positive and negative emotions in the impulsive buying process, despite the growth of marketing fields such as tourism and hospitality. Second, the Stimulus-Organism-Response (SOR) and Schachter-Singer theories (SST) are applied in this study to explain how emotions moderate impulsive buying behavior in situations where consumers experience time pressure and are prone to cognitive and emotional impulsivity [12,13]. Third, previous research has not adequately examined the mechanism by which time pressure affects impulsive purchasing while live-streaming. As a result, this study concentrates on the influence of time pressure on impulsive buying when live-streaming e-commerce is occurring.

In summary, this study aims to examine the relationship between time pressure and impulsive buying behavior (affective and cognitive). Specifically, based on the SOR and SST theories, the objectives of this study are as follows: (1) To investigate the correlation between time pressure and affective (vs. cognitive) impulsive buying in a live-streaming e-commerce environment. (2) To examine the influence of consumers' emotions on affective (vs. cognitive) impulsive buying. (3) To introduce the mediating variable of perceived value to explore the mediating role of perceived value between time pressure and affective (vs. cognitive) impulsive buying. Therefore, this study enriches the relevant content in live-streaming e-commerce by explaining the potential mechanism of consumer impulsive buying. This study will help e-commerce retailers and broadcasters understand consumers' impulse buying behavior better and develop more flexible marketing strategies for the live e-commerce industry.

## 2. Literature review and hypotheses formulation

### 2.1. Time pressure and impulsive buying

Time pressure is the subjective perception of a limited or scarce amount of time available to facilitate the decision-making process [14]. Ordonez and Benson [15] have demonstrated that time pressure denotes the degree of immediacy in deciding within a restricted period. Time pressure affecting consumer decision-making is typically divided into two main components. The first component is the decision pressure caused by objective time constraints. The shorter the promotion time the merchant gives, the greater the time pressure the consumer feels [16]. The second component is the perceived opportunity cost associated with money and time. Specifically, when products are presented with a discounted price, refraining from an immediate purchase generates an opportunity cost, causing consumers to perceive a potential future loss. Consumers may worry that by not buying the discounted goods, they may subsequently miss out on the opportunity to acquire them later [17]. Under the stimulation of time and money, consumers will have a strong opportunity cost perception, of which "subjective opportunity cost perception" is more representative. With the continuous development of e-commerce live-streaming, watching live-shopping has become the primary mode of consumption for young people [18]. During live-shopping, consumers will launch limited-time and limited promotion activities. The time pressure on consumers arises from the limited duration of promotional offers and the perceived opportunity cost. Based on previous studies, this study believes that time pressure is associated with the degree of apprehension felt by consumers during live-streaming, owing to the restricted window of promotional deals and their evaluation of opportunity cost.

Impulsive buying, as a phenomenon, has been the subject of scholarly inquiry for over seventy years [19]. As the concept of impulsive buying has been introduced into various academic fields, scholars have developed different definitions and classifications of impulsive buying from different perspectives. Early scholars defined impulsive buying behavior as unplanned consumption [20]. From a consumer psychology perspective, Rook [21] has defined impulsive buying as buying behavior that is immediate, without prior planning, and driven by strong emotional responses to environmental stimuli. Subsequently, other scholars have considered both extrinsic stimuli and consumers' internal emotional states when defining impulsive buying. According to a systematic literature review, Xiao and Nicholson [5] show that impulsive buying is a sudden and reckless behavior exhibited by consumers who do not make a plan before their purchases and are stimulated by certain factors. Although the online and offline shopping environments differ in various ways, they share several similarities. Therefore, the factors that influence impulsive offline buying behavior have a similar relationship to online shopping behavior. Existing studies have categorized the factors that influence online impulsive buying behavior into three main groups: product factors (e.g., price and type of product) [22], external marketing stimuli (e.g., promotional discounts

and website features) [23], and consumers' characteristics (e.g., impulsive buying tendencies and personal values) [24].

Impulsive buying behavior has two fundamental characteristics. The first is that the process of impulsive buying is typically unplanned and spontaneous. The second is that the impulsive buying process is primarily driven by emotional responses to environmental stimuli [25]. Regarding the classification of impulsive buying, Stern [26] has classified impulse buying into four types: pure impulsive buying, reminder impulse buying, suggestion impulsive buying, and planning impulse buying. However, some scholars argue that impulsive buying can be viewed from two distinctive aspects. The first is the cognitive aspect, which posits that impulsive buying is a deliberate purchase behavior that follows careful consideration. The second is the emotional aspect, which suggests that impulsive buying is a purchase made by consumers who experience heightened positive emotions, such as excitement and happiness [27,28]. Sohn and Lee [11] have classified impulsive buying into two different categories: affective impulsive buying and cognitive impulsive buying. In contrast, Wood [29] has viewed impulsive behavior as unplanned and unthinking behavior and classified impulsive buying into two different types: compulsive impulsive buying and lack of volitional impulsive buying.

Researchers have classified consumption into hedonic and utilitarian categories in the existing literature. Hedonic consumption is primarily associated with emotional experiences such as pleasant sensory sensations, mood alleviation, and happiness. In contrast, utilitarian consumption places more emphasis on goal-directed practicality [30,31]. Several studies have confirmed that consumers generally use affective information processing for hedonic consumption and cognitive strategies for utilitarian consumption [32]. Combining these two categories of shoppers with impulsive buying tendencies indicates that affective aspects of impulsive buying are more related to hedonic consumption. In comparison, cognitive impulsive buying is more likely to be related to rational and utilitarian consumption. Therefore, this study divides impulsive buying into cognitive impulsive buying and affective impulsive buying through the above analyses and with reference to Sohn's [11] division of impulsive buying. Cognitive impulsive buying denotes instances of impulsive purchasing behavior where consumers have pre-planned to purchase a particular product. In contrast, affective impulsive buying refers to the sudden and direct shopping activities that are triggered by the excitement and happiness of consumers who are attracted by the broadcast room environment during online shopping.

Aminilari and Pakath [33] have found that under time pressure, consumers tend to perceive higher opportunity costs, leading to feelings of urgency and anxiety. Zinn [34] has suggested that time pressure can cause consumers to feel nervous and hurried, and that they can rely on intuition and experience to alleviate such incongruent emotions. Tversky and Kahneman [35] have argued that under time pressure, consumers' intuition may be subject to bias, increasing the perception of benefits and decreasing the perception of risks, thereby resulting in impulsive buying behavior. According to the construal-level theory, individuals have different psychological distances to objects, which affects their perception and their understanding. Consequently, when consumers make purchases online, an increase in time pressure reduces the amount of time available to gather relevant information, making them more likely to engage in impulsive buying behavior [36]. However, some scholars argue that when consumers experience significant time pressure, their cognitive load increases. In such circumstances, consumers tend to disregard the allure of price reductions, consequently diminishing the likelihood of impulsive buying [8]. Sohn and Lee [11] have argued that an increase in consumers' negative emotions can reduce their likelihood of engaging in affective impulsive buying behavior.

There is no clear consensus in the literature on whether time pressure increases or decreases consumers' impulsive buying behavior. An explanation for this ambiguity is that previous studies have inadequately distinguished between the two distinct types of impulsive buying. Therefore, this study will explore that the relationship between time pressure and impulsive buying behavior depends on whether it is cognitive or affective impulsive buying. Sohn and Lee [11] have shown that emotions, such as excitement, elicited during the shopping experience contribute to increased consumer satisfaction. Moreover, they argue that in the presence of time pressure, these emotions further enhance affective impulsive buying behavior. Liu et al. [37] have suggested that emotions and affections primarily drive impulsive buying behavior, resulting in higher levels of affective impulsive buying in situations with greater time pressure. In contrast, lower time pressure provides consumers with more time to gather information and evaluate their options, leading to an increase in cognitive impulsive buying behavior. Consumers may have already planned to buy a particular product before watching the live stream, or may have developed a recurring purchase habit during the streaming session. Therefore, when facing time pressure, the consumer's perception tends to adopt a closed state. This leads consumers to rely on intuition or past experiences to make purchase decisions, leading to an increase in cognitive impulsive buying behavior. However, during live-streaming, frequent interactions between the anchor and consumers, as well as positive emotions such as happiness and excitement generated by the products, can immerse consumers, leading to an increase in affective impulsive buying behavior. According to these analyses, this study proposes the following two hypotheses.

**H1a.** There is a positive relationship between time pressure and cognitive impulsive buying.

**H1b.** There is a positive relationship between time pressure and affective impulsive buying.

## 2.2. Mediating role of perceived value

Research on consumer perceived value has been of great interest to many scholars. Perceived value first appeared in the field of marketing to link value with consumers. Zenithal [38] has provided a summary of four consumer definitions of value, in which values are associated with four factors. Including low prices, meeting product or service demands, paying for quality, and obtaining all desired attributes. Academics have not yet reached a uniform definition of perceived value due to variations in the focus and scope of research. Scholars from various fields, including marketing and psychology, have conducted extensive research on the constituents and determinants of perceived value. Based on previous studies, this research defines perceived value as the consumers' holistic perception of products or services while watching live-streaming, particularly when merchants launch promotional activities such as limited-time

and -quantity offers.

Zenithal [38] has summarized four consumer definitions of value, in which values are associated with four factors. A higher perceived value leads to an increase in the desire to purchase, resulting in impulsive buying behavior. Similarly, Beatty and Ferrell [36] have confirmed a positive correlation between consumers' perceived value of a product and their inclination to buy impulsively. In other words, the higher the perceived value, the greater the likelihood of impulsive buying behavior. O'cass and McEwen [39] have asserted that consumers' perceptions of goods or services are positively influenced by emotional and social values associated with the act of shopping itself. These values, in turn, increase the likelihood of impulsive buying behavior. According to Chen et al. [40], the online shopping context is influenced by both product features and website characteristics, which in turn consumers' impulsive buying behavior through perceived value. This study contends that consumer purchasing behavior often shows predetermined patterns or habitual tendencies. Within live-streaming environments, merchants augment the perceived value for consumers by offering promotions limited in both time and quantity. This increase in perceived value subsequently causes heightened impulsive buying tendencies among consumers. Moreover, specific attributes of the anchors, such as professionalism and attractiveness, can attract consumers. This allure, coupled with the potential for products to evoke emotions like excitement and pleasure, contributes to consumers' impulsive consumption intention and further influences their impulsive purchasing behavior. As a result, consumers may engage in affective (vs. cognitive) impulsive buying by making consumption decisions in a short period. According to these analyses, this study proposes the following two hypotheses.

**H2a.** There is a positive relationship between perceived value and cognitive impulsive buying.

**H2b.** There is a positive relationship between perceived value and affective impulsive buying.

Social cognitive theory suggests that individuals rely on their cognitive abilities to process external information and make decisions [41]. Thus, when consumers participate in live-streaming for the shopping processes, activities such as limited-time sales enable them to evaluate the perceived value of products by considering the costs and benefits associated with the product. Currently, live-streaming enhances consumer purchases by implementing promotional tactics such as limiting the number of promotional items and the duration of promotional offers. A limited supply of products during live-streaming can create a sense of scarcity among consumers, leading to an increased perception of opportunity cost and subsequent impulsive buying behavior [17]. Commodity theory suggests that the perceived value of access to a product is inversely related to its degree of accessibility [42]. Therefore, limiting the number of promoted goods and the duration of promotional activities during live-streaming can increase consumers' perceived value of the product and impulsive buying behavior. In conclusion, time pressure can enhance consumers' perceived value and impulsive buying behavior during live-streaming purchases.

The SOR theory posits that environmental stimuli impact human cognitive and affective reactions, thereby influencing behavior [12]. In recent years, many scholars have increasingly used the SOR model to investigate consumers' intentions to make impulsive purchase intentions. Therefore, this study adopts the SOR model as a theoretical framework. According to SOR theory, time pressure which serves as environmental stimuli may influence individuals' psychological processes and consumers' impulsive buying behavior. Previous research has demonstrated the relationship between time pressure and consumers' impulse purchase intentions [12]. Puri [43] has argued that when the perceived benefit of the product outweighs the cost paid, consumers are more likely to engage in impulsive buying behavior. When making consumption decisions, consumers tend to adopt the principle of maximizing their utility. Perceived value, which represents the balance between the cost paid and the benefits received, significantly influences both cognitive and affective impulsive buying behaviors among consumers. Thus, when shopping in a live-streaming setting, consumers evaluate the benefits that they can obtain based on their knowledge of the product, which in turn can lead to impulsive buying behavior. Taking the above analyses together, limited-period promotions occurring during live-streaming induce a sense of temporal urgency among customers, augmenting their perceived value of the product. This sense, in turn, can give rise to both cognitive and emotional impulsive buying behaviors.

According to these analyses, this study proposes the following two hypotheses.

**H3a.** Perceived value mediates the relationship between time pressure and cognitive impulsive buying.

**H3b.** Perceived value mediates the relationship between time pressure and affective impulsive buying.

### 2.3. Regulatory role of emotions

Emotions play a crucial role in shaping customer behavior. They are commonly perceived as positive or negative effects, prevalent across diverse genders, ages, and cultures [44]. According to the Functional Emotion Theory, emotions accelerate people's decision-making and evoke responses [45]. When presented with stimuli related to a product or brand, the consumer's brain is highly responsive [46,47]. It captures visual information from the advertisement or product instantly while also retrieving relevant stored memory information for advanced cognitive processing [48]. Additionally, it manages emotional responses that occur during the process [49,50]. According to neuromarketing experts, the medial prefrontal lobe, one of the higher cognitive regions of the brain, influences people's purchasing decisions based on their neural activity while shopping for and paying for goods [51]. When consumers see a price reduction promotion of an item in a live-stream, the subcortical nucleus ambiguous responsible for pleasure generation is activated [52]. Despite the activation of the insula in the consumer's brain responsible for negative emotions, the source of pleasure generation, the nucleus ambiguous, is already activated. At this stage, positive emotions influence people's decisions to make a purchase. Arnold [53] has proposed a cognitive perspective suggesting that emotions are evaluations of cognition, explicitly expressed as an individual's perception of external stimuli. With the advancement of marketing and consumer behavior research, the

investigation of consumer sentiment has developed simultaneously. Russell [54] has viewed emotions as consumers' emotional responses during the decision-making process of purchasing goods or services while shopping. Westbrook and Oliver [55] have defined emotions as a set of emotional responses that consumers experience throughout the consumption of goods or services.

Scholars have predominantly focused on developing two- and three-dimensional models of emotions. Emotions are universally classified into positive and negative emotions [56]. Positive emotions refer to the pleasurable components of an individual's emotions, such as relaxation, happiness, gladness, and excitement. Meanwhile, negative emotions refer to the distressing components of an individual's emotions, such as depression, anger, and boredom. Mehrabian and Russell [57] have proposed a three-dimensional model of emotions, which includes pleasure, arousal, and dominance. They also developed the M-R model derived from the first letter of their names. This model explains how individual convergence and avoidance behaviors are influenced by these emotions. In the M-R model, pleasure represents the degree of joy and happiness that consumers experience during shopping. Arousal refers to the level of excitement and stimulation that consumers feel during the shopping process, while dominance refers to the level of control that consumers exercise over their shopping behaviors. According to Tomkins' [58] classification of emotions and the current context of live e-commerce shopping, this study posits that positive emotions refer to feelings of happiness, pleasure, excitement, and satisfaction that consumers experience while watching live-streaming. Conversely, negative emotions during online shopping may include feelings of disgust, boredom, and sleepiness among consumers during online shopping.

As manifestations of individuals' perceptual responses to external stimuli, the role of emotions in cognition and behavior has attracted the attention of scholars. Based on cognitive appraisal theory, individuals initially evaluate external stimuli upon perception [45]. This subjective evaluation plays a critical role in generating emotions and consequently affecting behavior [59]. Some scholars have suggested that emotions can enhance cognitive appraisal to influence decision-making [60]. According to the Schachter-Singer theory (SST), when the external environment provides stimuli to an individual, the individual will produce physiological and cognitive changes [13]. When consumers watch live-streaming, the time pressure the provider creates exposes them to external stimuli that produce physiological (e.g., emotions) and cognitive (e.g., the desire to buy the product) outcomes. Lore and Ortony [61] have suggested that emotions have a direct relationship with judgment. Emotions generated by people in response to external stimuli are evaluated more quickly than cognition and provide people with informational cues for decision-making. Weinberg and Gottwald [4] have suggested that consumers, when stimulated by the external environment and experiencing strong emotional responses, tend to make a series of impulsive purchases without much deliberation. Previous studies show that consumer emotions play a moderating role between time pressure and consumer impulsive buying behavior. This implies that consumers' emotional responses to external stimuli can significantly influence their purchase decisions. This study classifies emotions into positive and negative types and investigates how they moderate the relationship between time pressure and affective (vs. cognitive) impulsive buying.

### 2.3.1. Moderating role of positive emotions

Rook [62] has argued that a strong and fast drive makes consumers involuntarily consume. Impulsive purchase intentions often arise when consumers experience positive emotions such as pleasure and satisfaction. As a result, consumers tend to engage in affective (vs. cognitive) impulsive buying behavior. Dawson et al. [63] have argued that positive emotions have a significant relationship with consumer behavior. Specifically, they suggested that positive emotions encourage consumers to spend more time in the shopping places, interacting with the store staff. Yüksel [9] has proposed that the positive emotions of consumers can increase both shopping time and money expenditure. Thus, when promotions create a sense of time pressure, consumers experience positive emotions such as pleasure and excitement, triggered by the atmosphere of the live-streaming room or certain qualities of the anchor, it can increase their likelihood of engaging in affective (vs. cognitive) impulsive buying.

This analysis proposes the following pair of hypotheses.

**H4a.** Positive emotions positively mediate the relationship between time pressure and cognitive impulsive buying.

**H4b.** Positive emotions positively mediate the relationship between time pressure and affective impulsive buying.

### 2.3.2. Moderating role of negative emotions

Mano and Oliver [64] have claimed that negative emotions during shopping can discourage consumers from engaging in shopping activities. Negative emotions can act as deterrents, reducing consumers' motivation and willingness to shop. Chebat and Michon [65] have proposed that negative emotions can arise when consumers are in a crowded store environment, which can increase the likelihood of consumers leaving the store without making a purchase. Van der Maelen et al. [66] have noted that browsing store shelves may result in conflicts or obstacles, contributing to augmented shopping expenses for consumers. This, in turn, can evoke negative emotions such as dissatisfaction and sadness. Ultimately, these negative emotions negatively affect consumers' willingness to buy, which may reduce their overall willingness to buy [67]. In the context of e-commerce live-streaming, promoting live-streaming goods with limited-time discounts can create a sense of time pressure for consumers. When the live room environment evokes negative emotions such as disgust and sadness in the consumer, it reduces the likelihood of the consumer buying the product. This, in turn, can reduce affective (vs. cognitive) impulsive buying.

This analysis introduces the following two hypotheses.

**H5a.** Negative emotions negatively mediate the relationship between time pressure and cognitive impulsive buying.

**H5b.** Negative emotions negatively mediate the relationship between time pressure and affective impulsive buying.

Fig. 1 depicts the research model of this study.

### 3. Methodology

#### 3.1. Participants

This study utilizes a questionnaire survey to collect data from consumers who have viewed live e-commerce broadcasts featuring various products. The data primarily relies on the Credamo platform.<sup>1</sup> This study primarily identifies the research subjects for the questionnaire by asking the question, "Have you watched a live webcast?" to ensure the validity of the questionnaire data. The questionnaire comprises two sections, i.e., demographic information and measurement scale, which specifically involves measurements of time pressure, perceived value, positive emotions, negative emotions, and affective (vs. cognitive) impulsive buying. The study was conducted for three months, from March to June 2022. Out of the 390 collected questionnaires, 53 respondents declared they had not viewed e-commerce live-streaming. After excluding the 53 invalid questionnaires discussed above, 337 valid questionnaires remain with an effective recovery rate of 86.1%.

Table 1 represents the descriptive statistics of the data. According to Table 1, 39.2% and 60.8% of consumers are male and female, respectively. Their age distribution shows that 7.7% are 20 and below, 62.3% are aged 21–30, 24.3% are aged 31–40, and 5.6% are aged 41 and above. In terms of education, most of the consumers are at the undergraduate level, accounting for 68%, followed by the master's level and above. Regarding income, their disposable income is mainly more than 4000 CNY and above for 53.1% and 1000–2000 CNY for 23.1% of the sample. The average time spent watching e-commerce live-streaming weekly is mostly concentrated in less than 3 h.

#### 3.2. Measures

To ensure that the questionnaire has good reliability and validity, the scales in this study were all adopted from reliable scales and adapted to specific contexts, and the questionnaire was measured on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

Among them, time pressure was referred to the scale designed by Inman and McAlister [17] and Payne and Bettman [69] with 5 items. Perceived value was adopted from the scale developed by Sweeney and Soutar [70] with 3 items. Positive and negative emotions were adopted from the scale developed by Babin and Attaway [71] both with 4 items. Affective (vs. cognitive) impulsive buying is based on Verplanken and Herabadi [27], Beatty and Ferrell [36], and Rook and Fisher [21] all with 5 items. To mitigate the influence of extraneous factors, this study adds several control variables including gender, age, education, annual income, and average time spent on watching e-commerce live-streaming weekly.

### 4. Results

#### 4.1. Reliability and validity analysis

This study analyzes the final 337 valid questionnaires for reliability and validity by SPSS 27.0 and AMOS software and PLS-SEM. SPSS version 27 was used for initial analyses and data exploration to test the reliability and validity of the measurements. Confirmatory factor analysis (CFA) using AMOS software version 23 was used to test the measurements. Owing to that data distribution was normal. Multicollinearity is a threat to multiple regression, including SEM [72]. This study uses PLS-SEM to test multicollinearity.

The Cronbach's alpha coefficient is the criteria to test the reliability of the whole questionnaire and each latent variable. The test results showed that Cronbach's alpha coefficients of all variables were higher than 0.7, according to Table 2. This result indicates that the scales had good internal consistency. The KMO and Bartlett's sphericity tests were performed on the scales using SPSS 27.0 to determine whether they were reliable for factor analysis. The test results are in Table 2. According to Table 2, the KMO value was 0.907, which was greater than 0.7, with a high correlation, implying its statistical significance according to Bartlett's sphericity significance level ( $p < 0.001$ ). This result confirms the reliability of the factor analysis. AMOS analyzes the standardized factor loadings of the observed variables, and calculates the factor loadings of all the latent variables corresponding to the measures. All the factor loadings were greater than 0.5, and each measured item had a strong correlation with the corresponding variable, indicating that the scale had good structural validity. According to the PLS-SEM showed that the variance inflation factor (VIF) was below 2.40. Therefore, there was no evidence of multicollinearity. Endogeneity concerns could arise whilst examining the relationship between time pressure and consumers' impulsive buying. It is also necessary to consider the factor of the duration of average weekly time spent watching e-commerce live-streaming. Therefore, this study conducted an endogeneity test. This study used Smart PLS version 4 for testing. According to the program developed by Hult et al. [73], endogeneity methods in PLS-SEM were identified and processed. The results showed that GC (average weekly time spent watching e-commerce live-streaming) -> CIB path  $p = 0.099$ , GC (average weekly time spent watching e-commerce live-streaming) -> AIB path  $p = 0.094$ , and there was no evidence of endogeneity issues [74].

This study uses AMOS 22.0 to verify the discriminant validity among the model variables, and conducts a validation factor analysis on six of the variables to test the discriminant validity among the variables by comparing the strengths and weaknesses of the fit indices

<sup>1</sup> The Credamo is a large online crowdsourcing platform, similar to Amazon Mechanical Turk, that selects participants based on demographics. Participants are usually recruited using Credamo in behavioral science research in China, and a vast body of literature has demonstrated the reliability, validity, and ethical concerns of data [68,69].

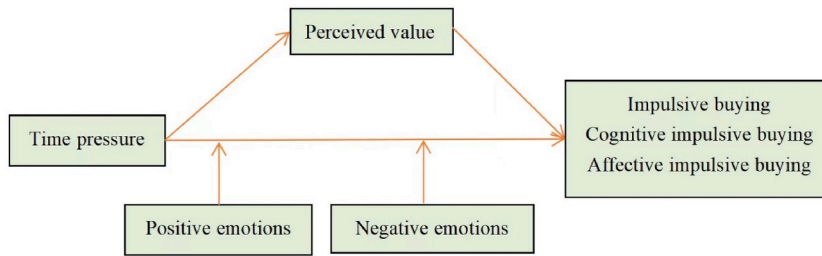


Fig. 1. Research model (Source: Own illustration, 2022).

Table 1  
Summary statistics.

| Variable   | Category   | Frequency | Percentage (%) | Cumulative percentage (%) |
|--|--|-----------|----------------|---------------------------|
| Gender   | Male   | 132       | 39.2           | 39.2                      |
|  | Female   | 205       | 60.8           | 100                       |
| Age  | 20 years old and below   | 26        | 7.7            | 7.7                       |
|  | 21–30 years old  | 210       | 62.3           | 70                        |
|  | 31–40 years old  | 82        | 24.3           | 94.4                      |
|  | 41 years old and above   | 19        | 5.6            | 100                       |
| Education  | Junior high school and below   | 3         | 0.9            | 0.9                       |
|  | General high school/junior high school/technical school/vocational high school | 14        | 4.2            | 5                         |
|  | Junior college   | 36        | 10.7           | 15.7                      |
|  | Undergraduate  | 229       | 68             | 83.7                      |
| Annual income  | Master and above   | 55        | 16.3           | 100                       |
|  | Less than 1000 CNY   | 15        | 4.5            | 4.5                       |
|  | 1000–2000 CNY  | 78        | 23.1           | 27.6                      |
|  | 2000–3000 CNY  | 28        | 8.3            | 35.9                      |
|  | 3000–4000 CNY  | 37        | 11             | 46.9                      |
| Average time spent watching e-commerce live-streaming weekly | More than 4000 CNY   | 179       | 53.1           | 100                       |
|  | Less than 3 h  | 154       | 45.7           | 45.7                      |
|  | 3–5 h  | 91        | 27             | 72.7                      |
|  | 5–7 h  | 57        | 16.9           | 89.6                      |
|  | 7 h or more  | 35        | 10.4           | 100                       |

Source: Author’s data analysis

of the hypothetical and competing models. Table 3 shows the results of the analysis. According to Table 3, the fit indices of the six-factor model ( $\chi^2 = 635.486$ ,  $df = 284$ ,  $TLI = 0.891$ ,  $CFI = 0.905$ , and  $RESEA = 0.063$ ) were significantly more reliable than those of the other competing models. Thus, the six-factor model is more appropriate for representing the structure of the measured factors and has higher discriminant validity among the variables.  $\chi^2/df = 2.238$  less than 3;  $CFI = 0.905$ ;  $TLI = 0.89$  is more than 0.5;  $RMSEA = 0.063$  is less than 0.08. The factor load of each project in the CFA analysis is more than 0.6, indicating that the structure in the model has reached convergence effectiveness.

To test the discriminant validity of each construct in the model, the study used the criteria the square root of AVEs compared with any correlation coefficients among constructs. The findings indicated that the square root of constructs was larger than the correlation coefficients of constructs showing that the constructs in the research model reached discriminant validity (Table 4).

4.2. Common method bias test

Since the questionnaire in this study involves data on variables provided by the same subject, there is a possibility of a common method bias effect. To test for possible common method bias, this research employs the Harman single-factor test [75].

The specific steps of the Harman one-factor test were to have all the measurement questions of the study variables loaded on only one common factor, thus constructing a one-factor structural equation model, and to test the model fit. The data results showed that the fit of the one-factor model was poor, with  $\chi^2/Df = 5.633 > 5$ ,  $RMSEA = 0.117 > 0.08$ ,  $RMR = 0.065 > 0.05$ , indicating no serious common method bias in this study. Similarly, the unrotated first factor explained  $32.4\% < 50\%$  rejects any serious common method bias in this study.

4.3. Descriptive statistics and correlation analysis

Table 5 represents the means, standard deviations, and correlation coefficients of the variables. Time pressure has a positive

**Table 2**  
Results of reliability and validity analysis.

| Constructs                       | items | Outer Loadings   | VIF   | Cronbach' $\alpha$ | KMO   |       |
|----------------------------------|-------|--|-------|--------------------|-------|-------|
| Time pressure (TP)               | TP1   | I feel that the promotion time specified by the anchor is generally short.                                   | 0.684 | 1.751              | 0.832 | 0.832 |
|                                  | TP2   | I feel that the promotional items purchased in the broadcast room are running out of time.                   | 0.701 | 1.735              |       |       |
|                                  | TP3   | I feel that the promotional goods are very good, do not buy will be snapped up by others.                    | 0.715 | 1.702              |       |       |
|                                  | TP4   | I feel that the number of promotional goods is very limited, do not buy will be snapped up by others.        | 0.731 | 1.775              |       |       |
|                                  | TP5   | I feel that the opportunity to buy the goods in the live room is fleeting and it is too bad not to buy them. | 0.702 | 1.693              |       |       |
| Perceived value (PV)             | PV1   | I think that the products recommended by the live studio are very practical.                                 | 0.837 | 2.112              | 0.804 | 0.690 |
|                                  | PV2   | I think that the products recommended by the live studio are trustworthy.                                    | 0.679 | 1.515              |       |       |
|                                  | PV3   | I think that the products recommended by the live stream please me.  | 0.787 | 1.936              |       |       |
| Positive emotions (PE)           | PE1   | I felt excited.  | 0.758 | 1.959              | 0.839 | 0.804 |
|                                  | PE2   | I felt energetic.  | 0.778 | 1.821              |       |       |
|                                  | PE3   | I felt happy.  | 0.745 | 1.821              |       |       |
|                                  | PE4   | I felt satisfied.  | 0.731 | 1.687              |       |       |
| Negative emotions (NE)           | NE1   | I felt disgusted.  | 0.813 | 2.133              | 0.838 | 0.809 |
|                                  | NE2   | I felt bored.  | 0.693 | 1.717              |       |       |
|                                  | NE3   | I felt annoyed.  | 0.705 | 1.673              |       |       |
|                                  | NE4   | I felt sleepy.   | 0.792 | 2.082              |       |       |
| Cognitive impulsive buying (CIB) | CIB1  | Before I buy something I always carefully consider whether I need it.  | 0.636 | 1.490              | 0.792 | 0.811 |
|                                  | CIB2  | I usually only buy things that I intended to buy.  | 0.676 | 1.567              |       |       |
|                                  | CIB3  | I like to compare different brands before I buy one.   | 0.605 | 1.386              |       |       |
|                                  | CIB4  | I usually think carefully before I buy something.  | 0.689 | 1.539              |       |       |
|                                  | CIB5  | I only buy things that I really need.  | 0.613 | 1.461              |       |       |
| Affective impulsive buying (AIB) | AIB1  | I sometimes cannot suppress the feeling of wanting to buy something.   | 0.752 | 2.370              | 0.860 | 0.796 |
|                                  | AIB2  | I sometimes buy things because I like buying things, rather than because I need them.                        | 0.727 | 2.355              |       |       |
|                                  | AIB3  | I sometimes cannot suppress the feeling of wanting to buy something.   | 0.771 | 2.270              |       |       |
|                                  | AIB4  | I can become very excited if I see something I would like to buy.  | 0.598 | 2.120              |       |       |
|                                  | AIB5  | I sometimes cannot suppress the feeling of wanting to buy something.   | 0.568 | 2.041              |       |       |

Source: Author's data analysis

**Table 3**  
Validation factor analysis.

| Models             | Factor Structure              | $\chi^2$ | Df  | $\chi^2/Df$ | CFI   | TLI   | RESEA | SRMR  | NFI   |
|--------------------|-------------------------------|----------|-----|-------------|-------|-------|-------|-------|-------|
| Six-factor model   | TP; PV; PE; NE; CIB; AIB      | 635.486  | 284 | 2.238       | 0.905 | 0.891 | 0.063 | 0.045 | 0.846 |
| Five-factor model  | TP; PV; PE; NE; CIB + AIB     | 1044.128 | 289 | 3.613       | 0.808 | 0.784 | 0.088 | 0.056 | 0.755 |
| Four-factor model  | TP; PV; PE + NE; CIB + AIB    | 1143.103 | 293 | 3.901       | 0.784 | 0.760 | 0.093 | 0.057 | 0.731 |
| Three-factor model | TP + PV; PE + NE; CIB + AIB   | 1305.820 | 296 | 4.412       | 0.743 | 0.718 | 0.101 | 0.057 | 0.693 |
| Two-factor model   | TP + PV + PE + NE; CIB + AIB  | 1533.965 | 298 | 5.148       | 0.686 | 0.657 | 0.111 | 0.060 | 0.640 |
| One-factor model   | TP + PV + PE + NE + CIB + AIB | 1684.252 | 299 | 5.633       | 0.648 | 0.617 | 0.117 | 0.065 | 0.604 |

Note: TP = time pressure, PV = perceived value, PE = positive emotions, NE = negative emotions, CIB = cognitive impulsive buying, AIB = affective impulsive buying, + indicates that the two factors are combined into one factor.

Source: Author's data analysis

**Table 4**  
Discriminant validity analysis.

| Constructs                       | TP           | PV           | PE           | NE           | CIB          | AIB          |
|----------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Time pressure (TP)               | <b>0.707</b> |              |              |              |              |              |
| Perceived value (PV)             | 0.634        | <b>0.771</b> |              |              |              |              |
| Positive emotions (PE)           | 0.634        | 0.630        | <b>0.753</b> |              |              |              |
| Negative emotions (NE)           | -0.634       | -0.557       | -0.791       | <b>0.731</b> |              |              |
| Cognitive impulsive buying (CIB) | 0.396        | 0.413        | 0.425        | -0.446       | <b>0.645</b> |              |
| Affective impulsive buying (AIB) | 0.349        | 0.376        | 0.441        | -0.287       | 0.119        | <b>0.688</b> |

Note: The main diagonal value (in bold) is the square root of the average variance extracted.

Source: Author's data analysis



correlation with cognitive impulsive buying ( $r = 0.288$ ) and affective impulsive buying ( $r = 0.310$ ), which is statistically significant ( $p < 0.001$ ). Also, perceived value has a positive correlation with cognitive impulsive buying ( $r = 0.279$ ) and affective impulsive buying ( $r = 0.279$ ), which is statistically significant ( $p < 0.001$ ). Similarly, time pressure shows a positive correlation with perceived value ( $r = 0.532$ ), which is statistically significant ( $p < 0.001$ ). There was a significant correlation between the variables, and the correlation results were consistent with the direction of the original hypothesis of this study, providing preliminary support for the subsequent hypothesis testing.

#### 4.4. Hypothesis testing

##### 4.4.1. Testing of the structural model

This study employed SPSS 27.0 software to examine the relationship between time pressure and impulsive buying using multiple linear regression. Table 6 presents the results of the analysis, specifically for the relationship between time pressure, perceived value, and affective (vs. cognitive) impulsive buying.

After including the independent variable time pressure in the model and considering the control variables, the results of M4 and M8 show that time pressure has a significant and positive correlation with affective (vs. cognitive) impulsive buying ( $\beta = 0.238, p < 0.001$ ;  $\beta = 0.360, p < 0.001$ ). This result accepts H1a and H1b. The regression coefficient between time pressure and affective impulse buying is more significant, indicating that the relationship between the two is more important. Secondly, M5 adds perceived value based on M3. The results show that perceived value has a positive correlation with cognitive impulsive buying ( $\beta = 0.261, p < 0.001$ ), verifying H2a. Similarly, M9 adds perceived value to M7. The results show that perceived value has a positive correlation with affective impulsive buying ( $\beta = 0.330, p < 0.001$ ), verifying H2b. The regression coefficient between perceived value and affective impulsive buying is more significant, indicating that their relationship is more powerful.

##### 4.4.2. Testing the mediation effects

This study tests the mediating role of perceived value using multiple linear regressions in SPSS 27.0, and the results of the study are in Table 6. Time pressure and perceived value were added to M6 and M10, respectively. As shown by M6, perceived value has a positive correlation with cognitive impulsive buying ( $\beta = 0.188, p < 0.01$ ). There is a positive correlation between time pressure and perceived impulsive buying ( $\beta = 0.155, p < 0.05$ ). However, the coefficient decreases from 0.238 to 0.155, suggesting that perceived value only partially mediates the association between time pressure and cognitive impulsive buying. This result verifies H3a. Similarly, as shown by M10, perceived value has a positive correlation with affective impulsive buying ( $\beta = 0.203, p < 0.05$ ). Time pressure still has a positive correlation with affective impulsive buying ( $\beta = 0.271, p < 0.01$ ), but the coefficient decreases from 0.360 to 0.271, indicating that perceived value partially mediates the relationship between time pressure and affective impulsive buying, verifying H3b.

To further verify the mediation of perceived value, this study uses the Bootstrap method. According to Table 7, the indirect effect value of time pressure influencing consumers' cognitive impulse purchase intention through perceived value is 0.0966, and the 95% confidence interval is (0.0214, 0.1793), which does not contain 0. Therefore, perceived value plays a mediating role between time pressure and consumers' cognitive impulse purchase intention, which further supports H3a. The indirect effect value of time pressure affecting consumers' affective impulsive purchase intention through perceived value is 0.1301 and the 95% confidence interval is (0.0291, 0.2401), which does not contain 0. Therefore, perceived value plays a mediating role between time pressure and consumers' affective impulsive purchase intention, which further supports H3b.

##### 4.4.3. Testing the moderation effects

The moderating effects were tested using the Process Macro version 3.2, model 1 [76]. The resulting moderating effects are reported in Table 8 and plotted in Fig. 3. According to models M2 and M3, the interaction term between time stress and positive emotions has an insignificant correlation with cognitive impulse buying ( $\beta = -0.103, p > 0.05$ ). The results suggest that positive emotions have an insignificant moderating effect on the relationship between time pressure and cognitive impulse buying, rejecting H4a. According to models M4 and M5, the interaction term between time stress and negative emotions has an insignificant correlation with cognitive impulse buying ( $\beta = 0.022, p > 0.05$ ). The result indicates that negative emotions have an insignificant moderating effect on the

**Table 5**  
Descriptive results and correlation coefficient matrix.

| Variable | Mean  | SD    | TP        | PV        | PE        | NE        | CIB   |
|----------|-------|-------|-----------|-----------|-----------|-----------|-------|
| TP       | 4.120 | 0.499 |           |           |           |           |       |
| PV       | 4.171 | 0.460 | 0.532***  |           |           |           |       |
| PE       | 3.920 | 0.634 | 0.531***  | 0.538***  |           |           |       |
| NE       | 2.000 | 0.644 | -0.531*** | -0.465*** | -0.668*** |           |       |
| CIB      | 3.990 | 0.514 | 0.288***  | 0.279***  | 0.300***  | -0.316*** |       |
| AIB      | 3.650 | 0.767 | 0.310***  | 0.279***  | 0.371***  | -0.217*** | 0.056 |

SD = standard deviation

Note: TP = time pressure, PV = perceived value, PE = positive emotions, NE = negative emotions, CIB = cognitive impulsive buying. AIB = affective impulsive buying, \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

Source: Author's data analysis

**Table 6**  
Results of testing the structural model.

| Variable   | Perceived value     |                    | Cognitive impulsive buying |                     |                     |                    | Affective impulsive buying |                     |                     |                    |
|--|---------------------|--------------------|----------------------------|---------------------|---------------------|--------------------|----------------------------|---------------------|---------------------|--------------------|
|  | M1                  | M2                 | M3                         | M4                  | M5                  | M6                 | M7                         | M8                  | M9                  | M10                |
| Gender   | 0.053<br>(0.049)    | 0.007<br>(0.044)   | 0.035<br>(0.056)           | 0.010<br>(0.056)    | 0.021<br>(0.055)    | 0.008<br>(0.055)   | -0.102<br>(0.081)          | -0.140<br>(0.079)   | -0.119<br>(0.080)   | -0.141<br>(0.079)  |
| Age  | 0.038<br>(0.039)    | -0.011<br>(0.035)  | 0.111*<br>(0.045)          | 0.084<br>(0.044)    | 0.101*<br>(0.044)   | 0.086<br>(0.044)   | -0.048<br>(0.064)          | -0.088<br>(0.064)   | -0.061<br>(0.063)   | -0.086<br>(0.063)  |
| Education  | 0.021<br>(0.034)    | 0.007<br>(0.030)   | 0.029<br>(0.039)           | 0.022<br>(0.038)    | 0.024<br>(0.038)    | 0.021<br>(0.038)   | 0.170**<br>(0.056)         | 0.159**<br>(0.054)  | 0.163**<br>(0.055)  | 0.158**<br>(0.054) |
| Annual income  | 0.031<br>(0.020)    | 0.012<br>(0.018)   | 0.027<br>(0.023)           | 0.016<br>(0.023)    | 0.019<br>(0.023)    | 0.014<br>(0.023)   | 0.075*<br>(0.033)          | 0.059<br>(0.033)    | 0.065<br>(0.033)    | 0.057<br>(0.033)   |
| Average time spent watching e-commerce live-streaming weekly | 0.122***<br>(0.025) | 0.058*<br>(0.024)  | 0.051<br>(0.029)           | 0.017<br>(0.030)    | 0.020<br>(0.030)    | 0.006<br>(0.030)   | 0.186***<br>(0.042)        | 0.134**<br>(0.043)  | 0.146***<br>(0.043) | 0.122**<br>(0.043) |
| Time pressure  |                     | 0.44***<br>(0.047) |                            | 0.238***<br>(0.060) |                     | 0.155*<br>(0.067)  |                            | 0.360***<br>(0.086) |                     | 0.271**<br>(0.096) |
| Perceived value  |                     |                    |                            |                     | 0.261***<br>(0.062) | 0.188**<br>(0.069) |                            |                     | 0.330***<br>(0.089) | 0.203*<br>(0.099)  |
| N  | 337                 |                    |                            |                     |                     |                    |                            |                     |                     |                    |
| R <sup>2</sup>   | 0.118               | 0.300              | 0.059                      | 0.102               | 0.108               | 0.122              | 0.129                      | 0.173               | 0.164               | 0.183              |
| Adjusted R-squared   | 0.105               | 0.288              | 0.045                      | 0.086               | 0.091               | 0.103              | 0.116                      | 0.158               | 0.148               | 0.166              |
| F  | 8.877***            | 23.59***           | 4.187**                    | 6.255***            | 6.636***            | 6.533***           | 9.797***                   | 11.503***           | 10.764***           | 10.557***          |

Note: \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001. The values in parentheses are standard errors.  
Source: Author's data analysis

**Table 7**  
Mediation effects test.

| Path   | Effect type     | Effect value | Standard error | Boot LLCI | Boot ULCI | Relative effect value/% |
|--|-----------------|--------------|----------------|-----------|-----------|-------------------------|
| Time pressure → perceived value → cognitive impulsive buying | Indirect effect | 0.0966       | 0.0406         | 0.0214    | 0.1793    | 32.61%                  |
|  | Direct effect   | 0.1996       | 0.0630         | 0.0757    | 0.3236    | 67.39%                  |
|  | Total effect    | 0.2962       | 0.0539         | 0.1902    | 0.4024    |                         |
| Time pressure → perceived value → affective impulsive buying | Indirect effect | 0.1301       | 0.0540         | 0.0291    | 0.2401    | 27.27%                  |
|  | Direct effect   | 0.3469       | 0.0934         | 0.1631    | 0.5307    | 72.73%                  |
|  | Total effect    | 0.4770       | 0.0798         | 0.3200    | 0.6340    |                         |

Source: Author's data analysis

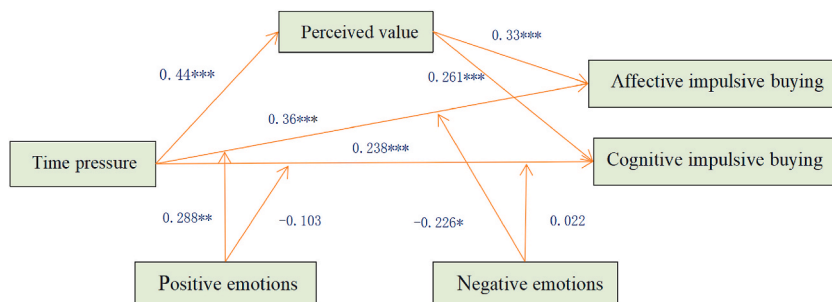
relationship between time pressure and cognitive impulse buying, refusing H5a. According to models M7 and M8, the interaction term between time pressure and positive emotions has a significant and positive correlation with emotional impulse buying ( $\beta = 0.288, p < 0.01$ ), which indicates that positive emotions enhance the relationship between time pressure and affective impulsive buying, verifying H4b. According to models M9 and M10, the interaction term between time stress and negative emotions has a significant and negative correlation with affective impulsive buying ( $\beta = -0.226, p < 0.05$ ), which indicates that negative emotions have a negative moderating correlation with the relationship between time stress and affective impulsive buying, supporting H5b. Fig. 2 displays the relationship between the constructs within the model. Fig. 2 shows the main outcomes including the path coefficients and path significance.

This study illustrates the moderating effects of negative and positive emotions through Fig. 3(a) and (b). Fig. 3(a) illustrates that when positive emotion is high, subjects' affective impulsive buying tends to significantly rise with the increase in time pressure. On the other hand, when positive emotion was low, subjects generally exhibited lower levels of impulse purchasing. The results indicate that positive emotion has a positive moderating effect on the relationship between time pressure and affective impulsive buying, verifying H4b. Regarding Fig. 3(b), the increase in emotional impulse buying is significantly higher at low levels of negative emotion than at high levels of negative emotion as time pressure increases. The results indicated that negative emotion has a negative moderating effect on the relationship between time pressure and affective impulsive buying, confirming H5b.

**Table 8**  
Moderating effects of positive and negative emotions.

| Variable   | Cognitive impulsive buying |                     |                     |                     |                     | Affective impulsive buying |                     |                     |                     |                     |
|--|----------------------------|---------------------|---------------------|---------------------|---------------------|----------------------------|---------------------|---------------------|---------------------|---------------------|
|  | M1                         | M2                  | M3                  | M4                  | M5                  | M6                         | M7                  | M8                  | M9                  | M10                 |
| Gender   | 0.035<br>(0.056)           | 0.011<br>(0.055)    | 0.003<br>(0.055)    | 0.006<br>(0.055)    | 0.003<br>(0.055)    | -0.102<br>(0.081)          | -0.136<br>(0.078)   | -0.114<br>(0.078)   | -0.139<br>(0.080)   | -0.112<br>(0.080)   |
| Age  | 0.111*<br>(0.045)          | 0.073<br>(0.044)    | 0.068<br>(0.044)    | 0.076<br>(0.044)    | 0.074<br>(0.044)    | -0.048<br>(0.064)          | -0.110<br>(0.063)   | -0.097<br>(0.062)   | -0.087<br>(0.064)   | -0.072<br>(0.064)   |
| Education  | 0.029<br>(0.039)           | 0.021<br>(0.038)    | 0.020<br>(0.037)    | 0.017<br>(0.037)    | 0.017<br>(0.038)    | 0.170**<br>(0.056)         | 0.157**<br>(0.053)  | 0.159**<br>(0.053)  | 0.160**<br>(0.054)  | 0.155**<br>(0.054)  |
| Annual income  | 0.027<br>(0.023)           | 0.007<br>(0.023)    | 0.006<br>(0.023)    | -0.002<br>(0.023)   | -0.002<br>(0.023)   | 0.075*<br>(0.033)          | 0.039<br>(0.032)    | 0.040<br>(0.032)    | 0.063<br>(0.034)    | 0.059<br>(0.034)    |
| Average time spent watching e-commerce live-streaming weekly | 0.051<br>(0.029)           | -0.003<br>(0.030)   | 0.002<br>(0.031)    | -0.007<br>(0.030)   | -0.006<br>(0.031)   | 0.186***<br>(0.042)        | 0.095*<br>(0.043)   | 0.082<br>(0.043)    | 0.139**<br>(0.044)  | 0.127**<br>(0.044)  |
| Time pressure  |                            | 0.166*<br>(0.065)   | 0.120<br>(0.074)    | 0.159*<br>(0.064)   | 0.149*<br>(0.071)   |                            | 0.216*<br>(0.092)   | 0.345***<br>(0.103) | 0.376***<br>(0.093) | 0.477***<br>(0.103) |
| Positive emotions  |                            | 0.147***<br>(0.053) | 0.151***<br>(0.053) |                     |                     |                            | 0.293***<br>(0.075) | 0.282***<br>(0.075) |                     |                     |
| Negative emotions  |                            |                     |                     | -0.170**<br>(0.054) | -0.168**<br>(0.054) |                            |                     |                     | 0.034<br>(0.078)    | 0.023<br>(0.078)    |
| Time pressure × Positive emotions                            |                            |                     | -0.103<br>(0.077)   |                     |                     |                            |                     | 0.288**<br>(0.109)  |                     |                     |
| Time pressure × negative emotions                            |                            |                     |                     |                     | 0.022<br>(0.068)    |                            |                     |                     |                     | -0.226*<br>(0.1078) |
| R <sup>2</sup>   | 0.059                      | 0.123               | 0.127               | 0.128               | 0.129               | 0.129                      | 0.21                | 0.226               | 0.173               | 0.187               |
| Adjusted R-squared   | 0.045                      | 0.104               | 0.106               | 0.110               | 0.107               | 0.116                      | 0.193               | 0.207               | 0.156               | 0.167               |
| F  | 4.177**                    | 6.563***            | 5.976***            | 6.924***            | 6.056***            | 9.797***                   | 12.458***           | 11.972***           | 9.863***            | 9.411***            |
| N  | 337                        |                     |                     |                     |                     |                            |                     |                     |                     |                     |

Note : \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001. The values in parentheses are standard errors.  
Source: Author’s data analysis



**Fig. 2.** Relationship among constructs in the model. Notes: \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.  
(a) positive emotions (b) negative emotions.  
Source: Author’s data analysis, 2022

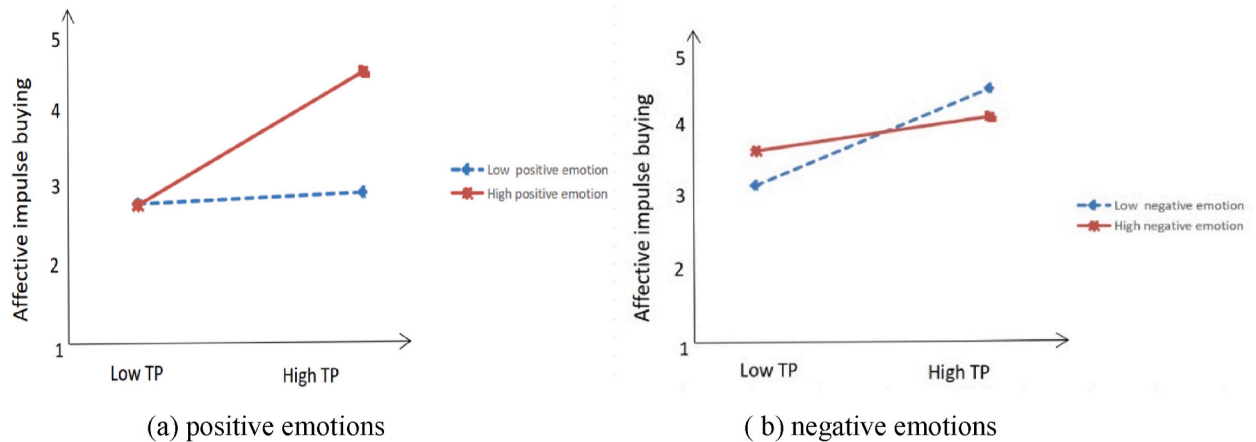
**5. Conclusion and implications**

**5.1. Research conclusions**

This study is centered on the impulsive buying behavior of consumers during e-commerce live-streaming. A sense of time pressure is felt by consumers owing to the limited-time promotions conducted by merchants. This has led to an increased scholarly interest in the link between time pressure and impulsive buying behavior. While the majority of preceding studies have concentrated on online shopping, this study examines the scenario where consumers view e-commerce live-streaming to extend the scope of research.

This study found that time pressure has a positive correlation with affective (vs. cognitive) impulsive buying behavior, with a stronger relationship for affective impulsive buying. Specifically, a limited number of products available in the live-streaming room creates a sense of time pressure on consumers, which can increase their likelihood of engaging in affective impulsive buying. Consumers cannot obtain complete information on products and form impartial assessments. Consequently, they are more prone to impulsive purchasing tendencies. Specifically, after the live anchor completes the product presentation, consumers tend to have a positive and joyful mood, which further enhances their willingness to make purchases.

Secondly, perceived value acts as a mediator between time pressure and affective (vs. cognitive) impulsive buying. The perceived value of a product significantly influences consumers’ affective (vs. cognitive) impulsive buying behavior. This study found that the



**Fig. 3.** Relationship between affective impulsive buying and time pressure in low and high positive emotions (a) and negative emotions (b). (Note: TP = time pressure).

Source: Author's data analysis, 2022

greater the consumer's perceived value, the greater their impulsive purchase intention. Online live-streaming with goods is not only about selling products, but also about providing consumers with positive emotions. The time-limited-time and -quantity promotions of products showcased in live-streaming rooms can foster a sense of urgency and exclusivity. This approach assists consumers in evaluating potential benefits and losses, thereby enhancing their perceived value of the products. This phenomenon can lead consumers to overestimate the perceived benefits and overlook the perceived risks associated with the products. In combination, these behaviors contribute to an increase in consumers' impulsive buying tendencies.

Furthermore, this study emphasizes the vital function of positive and negative emotions in time pressure and affective (vs. cognitive) impulsive buying. Previous research has confirmed the considerable effects of both positive and negative emotions on consumers' impulsive buying behavior [77,78]. The results of this study indicate that positive emotions positively influence the relationship between time pressure and affective impulsive buying. In contrast, negative emotions negatively influence the relationship between time pressure and affective impulsive buying. Limited-time and -quantity events via live-streaming can result in time pressure on consumers. If the anchor or atmosphere of the live-broadcasting room evokes positive emotions in consumers, these emotions drive their affective impulse to buy. Conversely, excessive marketing within the live room instills negative emotions, thereby reducing consumers' propensity to buy. Consequently, this process dampens consumers' affective impulsive buying. Furthermore, this study that the insignificant positive and negative emotions have an insignificant moderating effect on the relationship between time pressure and cognitive impulsive buying.

## 5.2. Further discussion

This study has some limitations in guiding the field with regard to time constraints and impulsive buying behaviors. Firstly, the focus is entirely on perceived value acting as a mediator between time pressure and impulsive buying. The process of consumers making impulse buying is intricate and intricate. There may be other mediators beyond perceived value, such as flow experience and perceived pleasure. Secondly, the study exclusively depends on a questionnaire survey as a research method, which may constrain the depth and wealth of data that could be obtained. Obtaining more substantial and robust results requires employing additional research methods, such as experiments or observational studies. Moreover, gathering questionnaires from various age groups in future investigations can enhance the representativeness of the study. In addition, distributing a larger quantity of questionnaires can improve the generalizability and validity of the findings.

## 5.3. Theoretical implications

Live-streaming delivery is a relatively new marketing approach that lacks substantial academic investigation. More empirical research is necessary to attain a thorough comprehension of the phenomenon generated by the time pressure from online live-streaming. Prior studies on customers' impulsive buying behavior have mostly focused on determining external effects, neglecting to delve into the underlying mechanisms. However, this study takes a nuanced approach by not only examining the impact of time pressure on consumers' impulsive buying behavior but also distinguishing between affective and cognitive impulsive buying. This study advances our understanding of time pressure, perceived value, and affective (vs. cognitive) impulsive buying, thereby enriching current knowledge. This deduction holds substantial importance for live-streaming platform operations and management.

#### 5.4. Management implications

Currently, the main advantage of live e-commerce lies in the competitive pricing it offers. This is due to the trend of e-commerce platforms to focus on delivering products at reduced costs. Merchants support customers in making purchase decisions within a predetermined time frame, by providing options such as no-hassle returns as well as transportation insurance fees. If customers perceive a potential loss of interest by delaying their purchase, they may resort to engaging in impulsive buying behaviors. Therefore, merchants should increase the potency of time pressure factors to encourage impulsive buying during live streams. They can achieve this by shortening the promotional period and offering better deals when introducing new products. Such an approach could enhance consumers' motivation to buy. Also, live-streaming anchors should actively promote the products. While promoting, anchors should emphasize the product's functionality, benefits, and value. This strategy boosts the transactional usefulness of the product whilst simultaneously increasing the perceived opportunity cost to the consumer. In the end, consumers tend to exhibit impulsive buying behavior. Secondly, consumers must continuously enhance their ability to distinguish and make choices while maintaining a clear mind and avoiding blind consumption. Finally, live-streaming platforms need to strengthen their control measures. Currently, the rise of e-commerce live platforms has created a crisis of trust and a lack of after-sales service. Relevant institutions ought to establish a proper system to regulate live-streaming, safeguard the legal rights and interests of consumers, and cultivate a healthy environment for live-streaming.

Secondly, anchors should be aware of the emotional state of consumers and utilize it to encourage impulsive buying. Anchors can enrich consumers' positive emotions by actively engaging with them during the live-streaming session. This can be accomplished by incorporating interactive elements such as responding to real-time questions from consumers. Moreover, anchors can enhance consumers' sense of presence and immersion by including features like lucky draws and offering small gifts. The design of the shopping environment for consumers warrants attention. By providing a rapid and convenient purchasing experience, the platform may bolster positive consumer emotions and engender impulsive buying behavior.

Furthermore, the live-streaming platform should improve service awareness and concentrate on the design of the shopping environment to increase consumer interest in purchasing. The platform should specifically take note of consumers' shopping preferences and needs, and conduct surveys to gain insight into their various behavioral aspects. This will facilitate the launch of coveted products by the live-streaming platform and enable customization of their marketing strategies to consumer demands. In addition, merchants recording short promotion videos should highlight the product's features and quality to save shoppers' search time and augment their perceived value.

#### Funding statement

This work was supported by National Natural Science Foundation of China (No. 72202114) and Shandong Province Natural Science Foundation (No. ZR2022QG024).

#### Ethics approval

Human Research Ethics Committee of Qingdao University approved this study (QDU-2022000145).

#### Data availability statement

Data will be made available on request.

#### CRediT authorship contribution statement

**Binbin Sun:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Yu Zhang:** Writing – original draft, Data curation. **Li Zheng:** Writing – original draft, Methodology.

#### Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Yu Zhang reports financial support was provided by National Natural Science Foundation of China. Yu Zhang reports financial support was provided by Shandong Province Natural Science Foundation. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e23185>.

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