How social presence influences impulse buying behavior in live streaming commerce? The role of S-O-R theory

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Abstract

Purpose – This paper aims to examine how presence (the social presence of live streaming platforms, of viewers, of live streamers and telepresence) affects consumer trust and flow state, thus inducing impulsive buying behaviors, personal sense of power as moderator.

Design/methodology/approach – Drawing on the Stimulus-Organism-Response (S-O-R) framework, the conceptual model covers social presence, telepresence, consumer trust, flow state, personal sense of power and impulsive buying behavior. An online survey was conducted from 405 consumers with the experience of live streaming shopping in China; structural equation modeling (SEM) was used for data analysis.

Findings – Results find that three dimensions of social presence (the social presence of live streaming platforms, of viewers, of live streamers) and telepresence have a positive and significant influence on consumer trust and flow state, thus triggering consumers’ impulsive buying behavior. Furthermore, consumers’ sense of power moderates the process from consumer trust, flow state to impulsive buying behavior.

Practical implications – This study will help live streamers and e-retailers to have a further understand on how to stimulate consumers’ buying behavior. Furthermore, it also provides reference for the development of live streaming commerce in other countries.

Originality/value – This research examines the effect of social presence and telepresence on impulsive buying behavior in live streaming commerce, which is inadequately examined in extant literature.

Keywords Presence, S-O-R theory, Impulsive buying behavior, Live streaming commerce, Flow theory, Social presence

1. Introduction

Live streaming currently gains increasing popularity. Several vendors start to employ live streaming to improve their selling efficiency in China, which has triggered the emergence of a new form of e-commerce termed as live streaming commerce (Sun et al., 2019). According to the China Internet Network Information Center (CNNIC, 2021), by the end of December 2020, China’s live streaming users reached 617 million, accounting for 62.4% of the total Internet users. Among them, live streaming commerce users arrived at 388 million, occupying 39.2% of the total Internet users. China’s live streaming commerce market is expected to reach $305bn dollars in 2021, occupying over 15% of e-commerce sales in China.
in 2021, and more than 20% by 2022 (Hallanan, 2020). A massive potential remains for the growth of live streaming commerce, as it reshapes the way people shop. Consumers can not only view text messages and pictures but also watch real-time video and interact with sellers in real time. Attracted by the real-time interaction and rich content, nearly all major e-commerce platforms in China have developed live streaming commerce, such as Taobao.com, JD.com, and Pingduoduo.com. Additionally, many social media platforms also have joined to the new trend one after another.

The prevalence of live streaming commerce is explained by the fact that it contains the attributes of both social commerce and social media (Cai and Wohn, 2019). Live streaming commerce is defined as a new type of e-commerce integrating real-time social interaction through live streams (Cai et al., 2018). The social commerce and social media attributes are embodied in the real-time interaction among live streamers and viewers. Live streaming commerce allows live streamers to show commodity in real-time videos and enables viewers to ask questions through bullet screen, which offers potential consumers further details of products and provides them a sense of presence, thus affecting viewers’ purchase intention (Wongkitrungrueng and Assarut, 2018). The popularity of live streaming has triggered many scholars’ interest. However, this new social phenomenon of live streaming commerce has not gained sufficient attention probably because it has only developed for a few years in China (Wongkitrungrueng et al., 2020).

Prior research of live streaming commerce has mainly highlighted what motivates live streamers and viewers to participate in live streaming (Chen and Lin, 2018; Zhao et al., 2018). Some studies have investigated utilitarian or hedonic motivations (Cai et al., 2018), perceived values (Wongkitrungrueng and Assarut, 2018), while some have explored the influence of system features in live streaming commerce such as the gift-giving feature (Yu et al., 2018) or user interface design (Xu et al., 2020). However, one of the primary features of live streaming commerce is presence, which is analyzed inadequately in extant literature. The lack of presence in e-commerce is likely to hold down consumers’ participation (Hamari et al., 2016), whereas presence is enhanced in live streaming commerce with the development of technology (Liu et al., 2020). The social presence and telepresence help consumers to develop a closer relationship between e-vendors and better understand the service/product they desire (Ye et al., 2020). Meanwhile, presence can induce impulsive buying behaviors (Shen and Khalifa, 2012), which is quite common in live streaming commerce (Zahari et al., 2021). Nevertheless, few studies have explored the effect of presence on impulsive buying behavior in live streaming commerce.

To close these research gaps, a study on impulsive buying behavior in live streaming commerce was conducted in the context of China by focusing on presence, as the development of live streaming commerce in China is fast and representative (Cunningham et al., 2019). The main objective of this study is to examining how different types of presence (social presence of live streaming platform, social presence of viewers, social presence of streamers and telepresence) exert influences on consumers’ impulsive purchase in live streaming commerce, drawing on the Stimulus-Organism-Response (SOR) framework. SOR model is widely used to examine consumer behavior in behavioral science field (van Zeeland and Henseler, 2018), presuming that stimuli are factors that induce the response of the organism (de Matos and Krielow, 2019). SOR model is suitable for the context of live streaming commerce, as we have stimuli (presence) affecting consumers’ appraisements (consumer trust, flow state), which in turn lead to consumers’ responses (impulsive buying behavior). To reach the objective, the study attempts to address the following research questions:
Q1. How does presence influence impulsive buying behavior in live streaming commerce?

Q2. Does the personal sense of power have a moderating effect on impulsive buying behavior?

The rest of the paper is organized as follows: First, we present a literature review of the relevant constructs followed by the research model and related hypotheses. Second, we describe the research methodology, data analysis, and results. Third, we discuss the study’s findings from the perspective of theoretical and managerial implications, with limitations of the study and future research directions following thereafter.

2. Theoretical background

2.1 S-O-R model

Woodworth (1929) initially put forward the SOR model on the basis of the traditional stimulus-response theory. Later, Mehrabian and Russell (1974) theoretically extended this model, and Jacoby (2002) modified it by incorporating the organism’s element between the stimulus and response. The model constructed a mechanism to explain human behaviors by analyzing humans’ cognitive and affective states influenced by the environmental stimulus (Shah et al., 2020).

The model explains “stimulus” as the environmental factor arousing the internal, organismic states (Song et al., 2021). Previous studies on live streaming commerce have implied that the real-time interactions between viewers and live streamers in live streams bring viewers a strong sense of presence, fulfilling viewers’ needs, which in turn influences the potential consumers’ attitudes and behaviors (Gao et al., 2018). Therefore, presence in live streaming commerce is a strong stimulus to influence consumers’ behaviors.

In the model, “organism” refers to humans’ affective and cognitive intermediary states that mediate the influence of the stimulus on individuals’ responses (Wu and Li, 2018). The affective state refers to individuals’ emotional responses to an environmental stimulus (Sun and Zhang, 2015), while the cognitive state is associated with the mental process when facing stimulus (Fu, 2018). This study employs consumer trust and flow state to explore viewers’ affective and cognitive states on the sense of presence in live streaming commerce.

The model defines “response” as individuals’ final decisions and behaviors based on affective and cognitive states (Sherman et al., 1997). Three main kinds of consumer behaviors (purchase intention, unplanned purchase intention and intention to return) exist in e-commerce (Koufaris, 2002). This study focuses on the impulsive purchase. Recent studies have used SOR model to examine consumers’ online behaviors in e-commerce, such as online repurchase intention (Zhu et al., 2019), purchase intention (Liu et al., 2018), and impulsive buying intention (Zhu et al., 2020). These studies have confirmed the inter-relationship of SOR model and enhanced the rationality of this study.

2.2 Flow theory

The term “flow” is used to describe the state of mind where people become deeply engrossed in the current activity (Ghani et al., 1991). Csikszentmihalyi (1975) first introduced flow theory to explain how full engagement in an activity of internal satisfaction or pleasure will stimulate a holistic feeling. The theory is characterized by narrowing the focus of awareness to filter out unrelated perceptions (Csikszentmihalyi, 2020). Previous studies have used flow theory to continuance usage intention (Lee and Kim, 2017), online impulse buying (Wu et al., 2020), purchase intention (Kim et al., 2017). Flow has been recommended as a potential metric of online consumer experience (Ding, 2011). The dimensions of flow are broad and
ill-defined as flow has been operationalized, tested and applied in various ways (Carlson et al., 2017). This study divided flow into two dimensions, namely, concentration and enjoyment according to Ghani et al. (1991).

Concentration happens when individuals are self-unconscious to merely focus on a limited stimulus environment with no irrelevant perceptions and thoughts (Wu et al., 2016), while enjoyment refers to the intrinsic joy that individuals feel when interacting with the environment (Park et al., 2012). In e-commerce, enjoyment can be viewed as shopping enjoyment (Koufaris, 2002), which dramatically affects consumer behavior (Lee and Park, 2014).

2.3 Online impulsive buying behavior
Impulsive buying is stimulated by a sudden, often powerful, and persistent urge to buy something spontaneously, unreflectively, immediately and kinetically (Rook and Fisher, 1995). Online shopping is more likely to lead to impulsive purchases than traditional shopping (Wu et al., 2020), as online transactions leads to the overspending of many consumers due to the virtual process giving them an illusion of not spending their own money (Park et al., 2012).

A considerable amount of external stimuli such as product-related promotion and recommendations from previous purchasers are noticed (Madhavaram and Laverie, 2004), thereby making the live streaming shoppers stand out among online shoppers. Live streamers display every detail of a product, try it out for viewers and interact with them in real-time (Xu et al., 2019). This kind of interaction occurring among live streamers and viewers and detailed presentation of products can easily trigger impulsive buying behavior as both ends of the screen are pulling in the direction of purchase (Wongkitrungrueng and Assarut, 2018).

Nevertheless, impulsive buying behavior in live streaming commerce remains underexplored. Only some studies have investigated the factors that influence consumers to buy impulsively in live streaming commerce from the perspective of the consumer and vendor sides (Leeraphong and Sukrat, 2018; Xu et al., 2019). Therefore, this study attempts to contribute to the literature on online impulsive buying behavior by exploring a significant factor, namely, presence in live streaming commerce.

3. Conceptual model and hypothesis development
3.1 Social presence of live streaming platform, consumer trust and the flow state
Consumer trust in e-commerce covers the trust of the salesperson, vendor, product, channel, and company (Komiak and Benbasat, 2004). Consumer trust in this study refers to the trust in product and streamer in live streaming commerce. Consumer trust on a product describes the extent to which viewers believe that the features, quality and the after-sale service of the products displayed in the live stream are as good as described by live streamers (Wongkitrungrueng et al., 2020), while trust on streamers explains the extent to which viewers believe in streamers’ willingness to put themselves in consumers’ shoes and capability to offer high-quality and personalized service (Wongkitrungrueng and Assarut, 2018). The social presence of live streaming platforms will bridge the psychological distance between buyers and sellers, thus increasing consumers’ trust on both products and streamers (Darke et al., 2016), as ambiguity and risk can be reduced in live streams (Lee, 2018). Previous studies have confirmed the positive effect of the web’s social presence on consumer trust (Lu et al., 2016; Ye et al., 2020). Therefore, a relationship between social presence of live streaming platforms and consumer trust is presumed.
Social presence of live streaming platform can influence the flow state as well. In traditional e-commerce, buyers conduct online transactions by interacting with the website (Lu et al., 2016), whereas, in live streaming commerce, viewers purchase products by sending bullets and gifts to interact with the live streaming platform. Live streaming allows viewers to watch video streams in real-time, enhancing sociability through synchronous communication via chat channels (Bründl et al., 2017). When viewers stay focused and feel pleasant in live streaming, a state of flow comes to being (Chen and Lin, 2018). The transmission technology in live streaming platform can synchronously and instantly send sounds and images from a remote location, thus making viewers feel as if they were physically present during the live streaming. The co-experience with live streamers together enhances viewers' viewing experience (Bründl et al., 2017), thus increasing the concentration and enjoyment of viewers. Previous studies have explored the relationship between the web's social presence and the flow state (Li et al., 2018). Considering the function of the live streaming platform is similar to the website, we suggest that the relationship between social presence of the platform and flow state also exists in live streaming commerce. Hence, the following hypotheses are proposed:

**H1a.** Social presence of live streaming platform is positively related to consumer trust in live streaming commerce.

**H1b.** Social presence of live streaming platform is positively related to flow state in live streaming commerce.

### 3.2 Social presence of viewers’ influence on consumer trust and flow state different

From traditional shopping, in online shopping, consumers cannot physically touch and see the product; instead, they can only imagine goods through pictures or text descriptions of the products (Jiang et al., 2019). However, shopping is a kind of social activity. Communication among consumers makes online shopping more social, thereby reducing the sense of unreality (Pavlou et al., 2007). In live streaming commerce, viewers can know products or live streaming better through other viewers’ e-WOM. If the remarks from peers are positive, viewers tend to trust more in live streamers and the products they display, as persuasion works better when it is made from similar others (Lu et al., 2016). Prior studies have confirmed that buyers’ social presence can positively influence consumer trust (Ye et al., 2020), as live streaming viewers are potential buyers. The relationship also works in live streaming shopping.

Live streaming commerce combines real-time video content with a text-based chat channel (Hamilton et al., 2014). Viewers can co-experience live streams together and affect each other’s viewing experience via the chat channel (Lim et al., 2012). The interactivity between viewers in chat box gives viewers a better sense of social presence (Kim, 2015) thus encouraging them to participate in and be immersed in the information exchange (Li et al., 2018). When they are immersed in a virtual shopping activity, viewers tend to experience a state of pleasure and generate a flow state (Sun et al., 2019). Previous research has confirmed that social presence positively affects flow state in live streaming (Li et al., 2018). Therefore, the following hypotheses are proposed:

**H2a.** Social presence of viewers is positively related to consumer trust in live streaming commerce.

**H2b.** Social presence of viewers is positively related to flow state in live streaming commerce.
3.3 Social presence of streamers, flow state, and consumer trust

Consumer trust in online trading is likely to be affected by the reputation of e-vendors (Oliveira et al., 2017), and the lack of face-to-face communication, reducing psychological connections and human warmth (Ye et al., 2020). Live streaming commerce with new technology offers better sense of social presence, as live streamers are allowed to display products in detail through video, interact with viewers in real-time, and offer personalized service (Wongkitrungrueng and Assarut, 2018). The social presence of streamers closes the psychological distance between viewers and streamers, and can help viewers better understand the product they desire, thus increasing viewers’ sense of trust (Jiang et al., 2019). Previous studies have explored the influence of social presence of sellers exerting consumer trust (Ye et al., 2020). As live streamers can also be viewed as sellers, a connection is assumed to exist between the social presence of streamers and consumer trust.

Social presence of streamers enhances viewers’ concentration in live streaming commerce, as streamers can provide better personalized services according to viewers’ demand (Yim et al., 2017). Additionally, consumers’ shopping enjoyment can be increased by more human elements in live streaming commerce, where viewers can see streamers and contact with them in real-time as if they were communicating face-to-face (Liu et al., 2020). Social live streaming services can be viewed as hedonic information systems (Bründl et al., 2017). Consumers’ perceived enjoyment is an essential motivation for viewers to use live streaming commerce (Wirtz and Göttel, 2016). The increasing concentration and shopping enjoyment can generate flow state. Prior research has confirmed that social presence can increase consumers’ perceived enjoyment (Shen, 2012) and cognitive absorption (Leong, 2011). Therefore, the following hypotheses are proposed:

H3a. Social presence of streamers is positively related to consumer trust in live streaming commerce.

H3b. Social presence of streamers is positively related to flow state in live streaming commerce.

3.4 Telepresence, consumer trust and flow state

Live streamers are allowed to display products in detail and interact with viewers in real time via video. The richness of media such as sound and video will bring a better sense of telepresence among viewers (Sun et al., 2019). A higher sense of telepresence can make consumers feel safer. The live streaming platform with higher telepresence can provide further information to viewers by streamers, other viewers and e-vendors, thus increasing the transparency (Lu et al., 2016), which is positively associated with customers’ perceived security in a shopping environment (Lee and Park, 2014). Previous studies have confirmed that telepresence positively influences consumer trust. Sun et al. (2019) explored that telepresence affects purchase intention through consumer trust in live streaming commerce. Ye et al. (2020) posited that telepresence in online P2P accommodation can lead to consumer trust. Therefore, this study suggests the positive links between telepresence and consumer trust.

In online shopping, a website with a higher sense of telepresence can attract customers’ attention on the virtual environment presented by the website, causing a loss of awareness of the physical environment the consumers are in, thus resulting in a flow state (Bilal et al., 2020). In live streaming commerce, the better telepresence attracts more viewers to participate in the interaction, spontaneously immersing them in the live stream, and thus generates a psychological feeling of concentration and enjoyment (Li and Peng, 2021). Prior
studies have focused on the relationship between telepresence and flow state. Kim and Ko (2019) explored the relationship between telepresence and flow experience in the context of virtual reality. Ma et al. (2021) confirmed that telepresence can stimulate flow in the mobile technology environment. Li and Peng (2021) explored that presence positively contributes to flow in live streaming. Therefore, the following hypotheses are proposed:

\[ H4a \]. Telepresence is positively related to consumer trust in live streaming commerce.

\[ H4b \]. Telepresence is positively related to flow state in live streaming commerce.

3.5 Consumer trust and flow state
Trust will dispel consumers’ misgivings to attempt new ways of shopping, trust reduces consumers’ perceived uncertainty or concerns in live streaming commerce (Wongkitrungrueng and Assarut, 2018). Being deeply engrossed in a consumption activity is difficult for consumers with perceived uncertainty or worries (Lauterbach et al., 2009). As consumers enhance their trust on live streaming commerce, they are more likely to perceive enjoyment and concentrate on the activities neglecting those negative feelings, thus facilitating the flow state (Shin and Hall, 2018).

Extant research has examined the relationship between trust and flow state. Wang et al. (2019) confirmed that trust positively affects flow experience. Chang et al. (2019) explored how trust relates to flow experience. Therefore, the following hypothesis is proposed:

\[ H5 \]. Consumer trust is positively related to flow state in live streaming commerce.

3.6 Consumer trust and impulsive buying behavior
Based on uncertainty reduction theory, relationships can be built as others’ behavior can be predicted with the decrease in uncertainty (Ballantine and Martin, 2005; Lee and Choi, 2017). The lack of face-to-face communication and physical touch in online shopping leads to social uncertainty (Kim et al., 2019). The uncertainty and risk in online shopping can inhibit consumers’ purchase intention (Ariffin et al., 2018). Whereas, the more sense of trust the potential customers perceive, the less uncertainty and concerns they have (Tonkin et al., 2019), and thus impulsive buying behavior is more likely to be stimulated.

Previous studies have investigated the positive effect of consumer trust on impulsive buying behavior. Wu et al. (2016) posited that consumer trust could trigger impulsive buying. Habib and Qayyum (2018) examined that the enhanced perceived trust will stimulate impulsive purchasing behavior by increasing emotional response. Yi and Jai (2020) confirmed that the sense of trust can trigger consumers’ impulsive buying. We consider that the same logic can be extended to live streaming commerce. Therefore, the following hypothesis is proposed:

\[ H6 \]. Consumer trust is positively related to impulsive buying behavior in live streaming commerce.

3.7 Flow state and impulsive buying behavior
Flow state can motivate unplanned buying, as the increase of positive feelings will enhance consumers’ tendency to purchase impulsively (Wu et al., 2020). In this study, the flow state contains intrinsic enjoyment and concentration. Intrinsic enjoyment can increase customers’ exploratory behavior, such as extra browsing, thus triggering impulsive behavior (Guo and
Poole, 2009), while consumers who concentrate on live streaming shopping are more likely to be stimulated by the marketing promotions on the platform, thus causing impulsive buying (Xu et al., 2020).

Prior studies have investigated the positive connection between flow state and impulsive buying behavior in online shopping. Wu et al. (2016) explored the effect of flow experience on online impulsive buying. Wu et al. (2020) further examined how flow state exerts a direct and indirect effect on online impulsive buying. Considering that live streaming commerce is also a form of e-commerce, we hypothesize that the same logic can be applied to live streaming commerce. Therefore, the following hypothesis is proposed:

H7. Flow state is positively related to impulsive buying behavior in live streaming commerce.

3.8 Consumers’ sense of power as moderator
From the perspective of psychology, power is a psychological state that occurs when individuals are able to affect others, that is, the capacity to encourage or discourage stuff that people value (Morrison et al., 2015). Consumers’ sense of power describes the extent to which consumers perceive their capability to influence other people (Anderson et al., 2012). Consumers with higher sense of power tend to influence others’ attitudes and behaviors (Morrison et al., 2015). If they trust the streamers, they are more likely to buy products to influence other viewers’ attitudes on the live streaming (Liu and Mattila, 2017). However, as consumers with higher sense of power tend to be more optimistic about perceived risk (Anderson and Galinsky, 2006), they may buy product without a second thought, thus leading to impulsive buying. Prior research has confirmed that perceived risk will inhibit consumers’ online impulse buying behaviors (Wu et al., 2020). As consumers who perceive higher sense of power are inclined to influence others neglecting perceived risk, they may conduct an unplanned buying in live streaming commerce. Personal sense of power affects the influence of consumer trust in a positive manner.

Individuals with a high sense of power focus more on short-term goals than those with a low sense of power (Slabu and Guinote, 2010). Impulsive buying is triggered by a short hedonic satisfaction, which can be viewed as a short-term goal (Widagdo and Roz, 2021). Consumers with a high sense of power are inclined to perceive positive feelings overlooking negative emotions (Kim et al., 2018). Those positive feelings can accelerate the transformation from flow state to impulsive purchasing behavior (Flett, 2015).

Previous studies have explored that consumers’ personal sense of power exacerbates the conduct of risky behavior (Kim et al., 2018). Therefore, the following hypotheses are proposed:

H8. Consumers’ sense of power moderates (strengthens) the relationship between consumer trust and impulsive buying behavior.

H9. Consumers’ sense of power moderates (strengthens) the relationship between flow state and impulsive buying behavior.

4. Methodology
4.1 Research background
This study aims at exploring the effect of presence in live streaming commerce on impulsive buying behavior. The telecommunication technology enables vendors to interact with shoppers
through pictures, words and real-time videos. The real-time interaction in live streaming stimulates viewers’ desire to interact with live streamers, and the streaming creates an illusion that they are physically there talking face-to-face with streamers. The enhanced sociality, interactivity, and panic-buying atmosphere in live streaming commerce can easily trigger impulsive buying. Investigating how presence (the social presence of live streaming platforms, of viewers, of live streamers and telepresence) in live streaming commerce stimulate impulsive purchasing behavior has a profound meaning for vendors (Figure 1).

4.2 Research design
We conducted a survey to test our research model. The questionnaire contains two screen questions, six demographic information items, and thirty-two self-report items. The screen questions are applied to ensure that all the respondents have a live streaming shopping experience. The questionnaire includes eight variables: social presence (three dimensions), telepresence, consumer trust, flow state, personal sense of power and impulsive buying behavior. The questionnaire was written in English, but the survey was conducted in China. Therefore, to reduce translation errors, a back-translation approach was used, which is suggested by Brislin (1970). We invited two Chinese graduates who major in English to translate the survey into the Chinese version. Then, we distributed the questionnaire to five consumers with live streaming shopping experience to ensure clarity and ease of understanding of each item. Finally, we invited another two Chinese graduates majoring in English to translate the Chinese version into English version to ensure consistency between the new English version of the questionnaire and the original one.

4.3 Data collection
An online survey was conducted in China to collect data through Weijuanxing website (www.wjx.cn/), the most popular online survey site in China, with a sample database of 26 million Chinese individuals (Fan et al., 2020). We invited live streaming users to fill in questionnaire in different online communities and also sent emails to potential respondents in different mailing lists. The IP address of each respondent was checked to avoid replications once the online questionnaires were received. Two screen questions were designed to identify respondents. If the answer of each question was no, then the answer ended, and the questionnaire was viewed as invalid. In addition, if respondents’ time spent

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**Figure 1.**
Map of hypothesis
in answering the questionnaire was less than half minute, their questionnaires were classified as invalid to guarantee that they faithfully and earnestly answer the questions. We conducted a pilot study with 45 consumers who had live streaming shopping experience to verify the reasonability of the questionnaire’s construct and the clarity of each item. The results showed that all the respondents understood each item well. Then, we started the final formal survey. The data were collected from August 2, 2020, to August 31, 2020. Finally, we collected a total of 451 responses, with 405 valid responses, 46 invalid ones where 31 respondents answered “no” in the first or second screen question, and 15 respondents spent less than half minute in finishing the questionnaire. As shown in Table 1, of all the valid samples, 40.25% were male (n = 163) and 59.75% were female (n = 242). Most of the respondents were between the age of 18 and 35 (n = 363; 89.38%), and most either had a bachelor’s degree (n = 171; 42.22%) or went to college (n = 187; 46.17%) before. Most respondents were office staff (n = 291, 71.85%), while the majority of respondents earned 2000–8000 yuan a month (n = 271, 66.92%). As for the frequency of live streaming shopping, most shopped via live streaming more than once a month (n = 228; 56.3%).

4.4 Measurement

All the items were designed based on prior studies, with minor modifications to ensure face validity in live streaming commerce. Social presence of live streaming platform (five items) was measured on a scale adapted from Sun et al. (2019), while the social presence of viewers (three items), and social presence of streamers (three items) were from Ye et al. (2020). Three measurement items for telepresence were adapted from Lee and Park (2014). Consumer trust was measured on the four-item scale constructed by Sun et al. (2019), while flow state was measured on a four-item scale adapted from Lee et al. (2001).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Items</th>
<th>Frequency</th>
<th>(%)</th>
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</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>163</td>
<td>40.25</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>242</td>
<td>59.75</td>
</tr>
<tr>
<td>Age</td>
<td>Under 18</td>
<td>7</td>
<td>1.73</td>
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<tr>
<td></td>
<td>18–25</td>
<td>199</td>
<td>49.14</td>
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<tr>
<td></td>
<td>26–35</td>
<td>163</td>
<td>40.25</td>
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<tr>
<td></td>
<td>36–45</td>
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<td>7.41</td>
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<tr>
<td></td>
<td>over 45</td>
<td>6</td>
<td>1.48</td>
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<tr>
<td>Education</td>
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<tr>
<td></td>
<td>College</td>
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<td></td>
<td>Bachelors</td>
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<td>42.22</td>
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<td></td>
<td>Masters or above</td>
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<td></td>
<td>Office staff</td>
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<td></td>
<td>Self-employed</td>
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<tr>
<td></td>
<td>Others</td>
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<tr>
<td>Income(RMB/month)</td>
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<td>11.36</td>
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<td></td>
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<td>105</td>
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<td>8001–12000</td>
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<td></td>
<td>Over 12000</td>
<td>29</td>
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<tr>
<td>Frequency of purchase in live streaming</td>
<td>More than once a month</td>
<td>228</td>
<td>56.3</td>
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<tr>
<td></td>
<td>Once every 1–3 months</td>
<td>129</td>
<td>31.85</td>
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<tr>
<td></td>
<td>Once every 4–6 months</td>
<td>44</td>
<td>10.86</td>
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<tr>
<td></td>
<td>Once more than half year</td>
<td>4</td>
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</tr>
</tbody>
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Table 1. Demographics of respondents (N = 405)
measured on the six-item scale established by Koufaris (2002). Four items for the personal sense of power were developed from Anderson et al. (2012), and four items for impulsive buying behavior were adapted from Verplanken and Herabadi (2001). All the items were measured by a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree).

4.5 Data analysis and procedure
This study used the Statistical Packages for Social Science (SPSS) 22.0 version and AMOS 22.0 version to analyze all the measurement items, containing six exogenous variables (i.e. social presence of live streaming, social presence of viewers, social presence of streamers, telepresence, consumer trust, and flow state), one moderator (i.e. personal sense of power), and one endogenous variable (i.e. impulsive buying behavior).

The confirmatory factor analysis (CFA) was first used to organize all the sets of observed variables for testing the hypotheses, internal reliability, validity and structure model. When conducting CFA, items with factor loadings under 0.5 were eliminated, and covariance paths between error items in each factor were added to enhance the model’s fitness. The elimination was conducted with the following rules: on the one hand, the standardized loadings must be less than 0.5; on the other hand, the number of items removed cannot exceed 20% of the items with a single factor (Hair et al., 2010). Finally, all CFA values were suitable and met the threshold value: CMIN/df 2.42 (p < 0.001), TLI 0.859, GFI 0.976, AGFI 0.919, CFI 0.921, SRMR 0.059, RMSEA 0.057.

4.6 Convergent and discriminant validity
As for convergent validity, the study tested internal consistency reliability, which must be over 0.70; composite reliability, which must be over 0.07; and average variance extraction (AVE), which must be over 0.5 (Hair et al., 2010). As presented in Table 2, the results show that all factor loadings of reliability and convergent validity are above 0.7 for all measurement items. Composite reliability (CR) and Cronbach’s alpha score values are all above 0.7, proving excellent scale reliability for the entire constructs. The average extracted variance (AVE) values are all greater than 0.5 (Fornell and Larcker, 1981), indicating the best convergent validity.

The Heterotrait–monotrait ratios of correlations (HTMT) are used to check to discriminant validity. HTMT was put forward by Henseler et al. (2015) to better detect discriminant validity in research. The threshold of 0.85 implies whether discriminant validity is constructed; that is, the value of HTMT should be below 0.85; otherwise, discriminant validity is lacking between two reflective factors (Kline, 2015). Table 3 displays the values of HTMT, and the results reflect that good discriminant validity is established.

<table>
<thead>
<tr>
<th>Key variables</th>
<th>Items</th>
<th>Means</th>
<th>SD</th>
<th>Item loading</th>
<th>CR</th>
<th>AVE</th>
<th>Cronbach’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social presence of live streaming platform</td>
<td>5</td>
<td>4.12</td>
<td>1.31</td>
<td>0.74–0.82</td>
<td>0.92</td>
<td>0.69</td>
<td>0.93</td>
</tr>
<tr>
<td>Social presence of viewers</td>
<td>3</td>
<td>4.31</td>
<td>1.24</td>
<td>0.79–0.85</td>
<td>0.85</td>
<td>0.65</td>
<td>0.87</td>
</tr>
<tr>
<td>Social presence of streamers</td>
<td>3</td>
<td>3.21</td>
<td>1.36</td>
<td>0.82–0.84</td>
<td>0.82</td>
<td>0.75</td>
<td>0.91</td>
</tr>
<tr>
<td>Telepresence</td>
<td>3</td>
<td>4.44</td>
<td>1.29</td>
<td>0.79–0.89</td>
<td>0.91</td>
<td>0.78</td>
<td>0.85</td>
</tr>
<tr>
<td>Consumers trust</td>
<td>4</td>
<td>3.71</td>
<td>1.32</td>
<td>0.81–0.89</td>
<td>0.86</td>
<td>0.64</td>
<td>0.93</td>
</tr>
<tr>
<td>Flow state</td>
<td>6</td>
<td>3.43</td>
<td>1.45</td>
<td>0.84–0.91</td>
<td>0.94</td>
<td>0.74</td>
<td>0.89</td>
</tr>
<tr>
<td>Impulse buying behavior</td>
<td>4</td>
<td>4.17</td>
<td>1.52</td>
<td>0.86–0.93</td>
<td>0.87</td>
<td>0.79</td>
<td>0.94</td>
</tr>
<tr>
<td>Personal Sense of Powers</td>
<td>4</td>
<td>4.27</td>
<td>1.72</td>
<td>0.81–0.86</td>
<td>0.89</td>
<td>0.71</td>
<td>0.97</td>
</tr>
</tbody>
</table>

Table 2.
Reliability and convergent validity
5. Results of proposed hypotheses
This study tested the hypotheses by running the structural equation modeling (SEM). All values of the SEM analysis showed a good fit (CMIN/df 2246.91, df 839, \( p < 0.001 \), CFI 0.899, TLI 0.97, GFI 0.85, RMSEA 0.07, SRMR 0.05). All hypotheses have been supported, as displayed in Table 4. H1a, b Social presence of live streaming significantly influenced consumers’ trust and flow state with coefficient values, a (0.552, \( p < 0.001 \)), b (0.321, \( p < 0.001 \)). The result shows that the Social presence of live streaming develops consumer trust and flow state, hence supporting H1a and H1b. Social presence of viewers significantly influenced consumers trust and flow state with coefficient values (0.289, \( p < 0.005 \)), (0.329, \( p < 0.001 \)). The result represents that live streaming viewers’ social presence enhances the consumers’ trust and flow state, hence supporting H2a and H2b. Social presence of streamers significantly influenced the consumer trust and flow state with coefficient values (0.375, \( p < 0.001 \)), (0.198, \( p < 0.005 \). The result shows that streamers’ social presence enhances the consumers’ trust and flow state, hence, supporting H3a and H3b. Telepresence significantly influenced the consumers trust and flow state with coefficient values (0.276, \( p < 0.001 \)), (0.221, \( p < 0.005 \). The result shows that telepresence develops consumers’ trust and flow state, supporting H4a and H4b. Consumer trust significantly influenced flow state with coefficient values (0.332, \( p < 0.001 \)). The result shows that consumers’ trust increases the flow state, hence supporting H5. Consumer trust significantly

<table>
<thead>
<tr>
<th>Key variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Social presence of live streaming platform</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Social presence of viewers</td>
<td>0.432</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Social presence of streamers</td>
<td>0.532</td>
<td>0.421</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Telepresence</td>
<td>0.467</td>
<td>0.342</td>
<td>0.339</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Consumers trust</td>
<td>0.329</td>
<td>0.454</td>
<td>0.441</td>
<td>0.424</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Flow state</td>
<td>0.379</td>
<td>0.457</td>
<td>0.487</td>
<td>0.389</td>
<td>0.412</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7) Impulse buying behavior</td>
<td>0.425</td>
<td>0.479</td>
<td>0.478</td>
<td>0.497</td>
<td>0.374</td>
<td>0.391</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>(8) Personal sense of powers</td>
<td>0.424</td>
<td>0.468</td>
<td>0.449</td>
<td>0.491</td>
<td>0.491</td>
<td>0.497</td>
<td>0.424</td>
<td>–</td>
</tr>
</tbody>
</table>

**Notes:** SE, standard error; CR, critical ratio. **\( p \)-value < 0.01; ***\( p \)-value < 0.001
influenced impulsive buying behavior with coefficient values (0.179, \( p < 0.001 \)). The result shows that consumers’ trust develops impulsive buying behavior, hence, supporting \( H6 \). Flow state significantly influenced the impulsive buying behavior with coefficient values (0.323, \( p < 0.005 \)). The result shows that flow state develops impulsive buying behavior, hence supporting \( H7 \).

As shown in Table 4, the personal sense of power moderates the relationship between consumer trust, flow state, and impulsive buying behavior. SEM was used to organize the moderating effects. The personal sense of power significantly moderates the relationship between consumers’ trust and impulsive buying behavior with coefficient values 0.509, \( p < 0.001 \). Based on the coefficient’s positive value, the personal sense of power has strengthened the relationship between consumer trust and impulsive buying behavior. Hence, \( H8 \) was supported. As expected, the personal sense of power moderates the relationship between flow state and impulsive buying behavior with coefficient values (0.613, \( p < 0.001 \)), showing support for \( H9 \). The result shows a positive value of the coefficient that the personal sense of power strengthened the relationship between flow state and impulsive buying behavior.

6. Theoretical implications
This study has several significant theoretical implications. First, this study extends the literature on live streaming commerce by exploring how impulsive buying behavior is induced. Previous studies have focused on consumers’ motivations in live streaming on the bases of gratification theory, technological-related motivations or consumers’ behavior in live streaming such as purchasing, interacting, and recommending (Cai et al., 2018; Wang and Wu, 2019). However, few studies have delved into impulsive buying behavior in live streaming commerce. Accordingly, the current study enriches live streaming commerce literature.

Second, this study extends the theoretical understanding of presence by investigating the role of presence that intensely plays in live streaming commerce. The majority of extant studies only generally examine presence or investigate one or two forms of presence (Lu et al., 2016; Algharabat et al., 2018; Gao et al., 2018). However, this study divides presence into four groups, that is, the social presence of live streaming platform, of viewers, of streamers, and telepresence and analyzes how they separately affect impulsive buying. Furthermore, this study examines the influence that the four types of presence exert on consumer trust and flow state, thus affecting consumers’ impulsive buying behavior. Few studies have examined the mediating role of consumer trust and flow state in the relationship between presence and impulsive buying behavior. Therefore, this study contributes to the extant literature on presence in live streaming commerce.

Third, our study extends research on the formation mechanism of impulsive buying behavior in live streaming commerce by exploring consumers’ sense of power as a moderator. The decision-making process of consumers is affected by consumers’ personal traits and the impulsive behavior is easily influenced by personal sense of power (Atulkar and Kesari, 2018). However, research on how personal sense of power influences impulsive buying behavior is still inadequate. Therefore, this study enriches the existing literature on how impulsive buying is affected by consumers’ personal traits.

7. Managerial implications
The findings of this study have several notable implications for live streamers and e-retailers. First, the empirical research proves that four types of presence exert important influences on live streaming commerce. The sense of presence can be produced through real-time interactions as the latter can reduce the physical and psychological separation among
live streamers, viewers, and products (Wang and Wu, 2019). Live streaming commerce owns
the advantage of high interactivity over traditional e-commerce. Therefore, to benefit from
such distinction, live streamers are expected to offer viewers an active atmosphere and raise
viewers’ willingness to interact with them. For e-retailers, they should select live streamers
with a good appearance, brilliant salesmanship, and good communication skills to help sell
goods.

Second, the findings show that flow state and consumer trust positively affects impulsive
buying behavior. If a live stream is interesting and trustworthy, viewers are more likely to
focus on it with satisfaction, thus possibly leading to impulsive purchase. E-retailers and live
streamers should select beautiful background music, exciting pictures, funny videos and
humanized interactive design to ensure that consumers feel at ease and relaxed when they shop
via live streaming. In the meanwhile, live streamers should promote products with honest and
e-retailers should provide products with high quality to enhance consumers’ trust.

Third, the findings suggest that an increase in the sense of power among consumers
strengthens their likelihood of experiencing positive feelings, which may stimulate them to
purchase impulsively. Therefore, live streamers should interact with viewers in a friendly
and warm way to build a good relationship with them and offer more initiative to viewers in
live streams to make consumers perceive higher sense of power.

Fourth, live streaming commerce develops well in China, but it is still in the early stage in
lots of developing and developed countries. Those countries should highlight the importance
of live streaming commerce and apply new technologies to offer better sense of presence to
consumers to trigger their buying intentions.

8. Limitations and future research
This study has some limitations, which also suggest directions for future research. First, live
streaming commerce has two categories. One refers to e-commerce sites or applications with
live streaming features, and the other refers to social networking platforms with commercial
activities. However, this study only investigates live streaming commerce, generally without
differentiating and comparing the two groups. Therefore, future studies can analyze how
presence separately plays a role in the two categories of live streaming commerce. Second, a
slight difference exists between impulsive buying behavior and impulsive buying intention.
Impulsive purchase intention does not necessarily lead to impulsive buying behavior, as some
other factors such as psychological factors influence the process. Nevertheless, this study does
not examine the difference between the two parts nor views them differently. Therefore, future
studies can examine how impulsive buying intention turns into real buying behavior. Third, as
all the respondents are limited to Chinese consumers, the findings in this study may not suit
other countries, because of cultural differences. Therefore, future studies can extend the extant
literature by exploring live streaming commerce in other cultural contexts.

References
brand engagement: an empirical study of non-profit organizations”, *Journal of Retailing and


Further reading

Appendix. Questionnaire

**Part 1 screen questions**
Have you ever watched live streaming in websites or applications such as Taobao.com, JD.com, Pingduoduo.com, mogujie.com, Tik Tok, Kwai and so on?
- Yes
- No
  Skip to: end of survey if the answer of this question is no.
Have you ever bought product that live streamers sell in live streams?
- Yes
- No
  Skip to: end of survey if the answer of this question is no.

**Part 2 demographic information**
What is your gender (square male; □18–25 female).
- What is your age (square Under 18; □18–25; □26–35; □36–45; □over 45)
- What is your education level (square High school or below; □College; □Bachelors; □36–45; □Masters or above)
- What is your occupation (□student; □office staff; □self-employed; □others).
- What is your income level (RMB/month) (square Less than 2000; □2000–4000; □4001–8000; □8001–12000; □Over 12000)
  - How many times do you shop in live streams (square More than once a month; □Once every 1–3 months; □Once every 4–6 months; □Once more than half year)

**Part 3 self-report items**
Social presence of live streaming platform:
1 There is a sense of human contact in live streaming platform.
2 There is a sense of personalness in live streaming platform.
3 There is a sense of sociability in live streaming platform.
4 There is a sense of human warmth in live streaming platform.
5 There is a sense of human sensitivity in live streaming platform.

Social presence of viewers:
1 I am aware of other viewers in the live stream who are interested with the product.
2 I am aware of other viewers in the live stream who share information regarding the product.
3 I am aware of other viewers in the live stream who have purchased the product.

Social presence of streamers:
1 I can make sense of the attitude of the streamers by interacting with them via live streaming.
2 There is a sense of human touch when communicating with the streamers via the live streaming.
3 Communication with the sellers via the streamers via the live streaming is warm.

Telepresence
1 When watching live streaming, I felt that as if I was shopping in a brick-and-mortar store.
2 When watching live streaming, I felt that I was more in the “computer world” than the “real world” around me.
3 When watching e live streaming, although my body was in the room, I felt that my mind was inside the world created by live streamers.

Consumer trust:
1 I believe in the information that streamers provide through live streaming.
2 I believe live streamers in live streaming are trustworthy.
3 I do not think that streamers would take advantage of me.
4 I trust that the products I receive will be the same as those shown on live streaming.

Flow state:
(Concentration)
1 When watching e-commerce live streaming, I didn’t want to take my eyes off the live.
2 When watching e-commerce live streaming, I overlooked what was going on around me.
3 When watching e-commerce live streaming, I forgot what I had to do.
(Shopping enjoyment)
4 When watching e-commerce live streaming, I found it enjoyable.
5 When watching e-commerce live streaming, I found it interesting.
6 When watching e-commerce live streaming, I found it fun.

The personal sense of power:
1 I can get him/her/them to listen to what I say.
2 My ideas and opinions are often valued.
3 If I voice them, my views have much sway.
4 If I want to, I get to make the decisions.

Impulsive buying behavior:
1 When watching live streaming, I find it difficult to pass up a bargain.
2 When watching live streaming, I am a bit reckless in buying products.
3 When watching live streaming, I buy products displayed by live streamers spontaneously even though I don’t need them.
4 When watching live streaming, I sometimes can’t suppress the feeling of desiring to buy products.

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