ORIGINAL RESEARCH

Effects of Background Fitting of e-Commerce Live Streaming on Consumers' Purchase Intentions: A Cognitive-Affective Perspective

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Purpose: The purpose of this paper is to explore the effects of the background fitting of e-commerce live streaming on consumers' purchase intentions and the relevant internal psychological mechanism from the cognitive-affective perspective.

Methods: In this study, a theoretical framework model of SOR comprising six variables is established. SPSS and SmartPLS are used to test the model and analyze data collected from a comprehensive questionnaire survey of 424 Chinese online consumers.

Results: Results demonstrate that the impact of background fitting in e-commerce live streaming on consumers' purchase intentions can be divided into three stages. In the first stage, background fitting (comprised of both product-background fit and anchor-background fit) positively affect consumer cognitive process (perceived trust and perceived value). Perceived trust is mainly affected by anchor-background fit, while perceived value is mainly affected by product-background fit. In the second stage, consumers' cognitive process subsequently affects their affective process (perceived pleasure). Perceived value also has a greater positive effect on consumers' perceived pleasure than perceived trust, although perceived trust is a prerequisite for improving perceived value. In the third stage, the affective process further promotes consumers' purchase intentions.

Conclusion: Combining both SOR theory and cognitive-affective perspective, this study reveals that the internal influence mechanism of background fitting in e-commerce live streaming on consumers' purchase intentions is divided into three stages. Theoretically, this study not only expands the application of SOR theory in the research field of e-commerce live streaming from the perspective of external background stimulation, but also importantly contributes to the application of cognitive-emotional perspective in e-commerce live streaming. Practically, the study suggests optimizing background fitting as an effective way to improve consumer purchase intention in e-commerce live streaming, and it is better to optimize background fitting from the perspective of improving perceived trust, perceived value, and perceived pleasure.

Keywords: e-commerce live streaming, background fitting, cognitive-affective perspective, psychological mechanism, purchase intention

Introduction

E-commerce live streaming is an interactive, consumer-centered synchronous environment.[1] Unlike traditional e-commerce (such as e-commerce websites) which heavily relies on pictures and text, e-commerce live streaming enables anchors to authentically and intuitively display product information and also enables consumers to express their opinions and comments in real-time.[2] Thus, many consumers are more willing to learn about products and services through e-commerce live streaming rather than traditional e-commerce.[3,4] According to the 50th Statistical Report on the Development of China's Internet Network, as of June 2022, the number of Chinese e-commerce live streaming users reached 469 million. Compared to the data from December 2021, this marked an increase of about 5.33 million, thus accounting for 44.6% of the total Internet users. Given the huge consumer flow of e-commerce live streaming activities,

optimizing e-commerce live streaming to cater to consumers' psychology and promote consumers' purchase intention has become an important concern for every e-commerce operator.

Previous studies on e-commerce live streaming have mainly focused on consumers themselves, including consumers' motivations of watching live streaming,[1,5,6] live streaming users' information-sharing motivations and experiences,[1,7,8] and "gift brushing" behaviors.[9–11] The background environment of live streaming is an important part of e-commerce live streaming. However, studies are yet to focus on the important role of the background environment of live streaming in e-commerce live streaming. Looking at physical store marketing, Park et al[12] found that reasonable fitting between background environment and product could effectively stimulate consumers' purchase intention. In traditional e-commerce studies, Parboteeah et al[13] revealed the positive impact of high-quality and suitable website background on consumers' purchase intentions based on stimulus-organic-response (SOR) theory and conducted in-depth analysis on consumers' cognition and affective response. Chi[14] demonstrated how the website's page background fit and consistency significantly affected consumers' purchase decisions from the perspective of cognition and affection. In e-commerce live streaming, no study looks at the influence of background fitting on consumers' purchase intention. Therefore, the purpose of this paper is to explore the impact of background fitting of e-commerce live streaming on consumers' purchase intention and deeply analyzes the cognitive and affective responses of consumers when participating in e-commerce live streaming.

In e-commerce live streaming, the live streaming background, anchors, and products are presented on the screen as a whole. Extant studies have shown the importance of fitting between products and background environment.[15] Discussions in advertising marketing research posit that the fit between embedded advertising and its background could affect consumers' understanding of advertising content.[15] In online shopping, a product type with a low fit with its placement background may lead to a decline in consumer trust and a negative impact on consumer purchase intention.[15,16] Meanwhile, the proper fit of anchors and products could promote consumers' recognition of anchors and have a positive effect on their purchase intentions during live streaming shopping.[17] If the fit between the product and the anchor is inappropriate, consumers are likely to think that the anchor is for commercial motivations; this induces them to hold negative attitudes toward the anchor,[18] which in turn, may affect their purchase intentions. Therefore, we believe that the fitting degree between the live streaming background, the anchor, and the product is very important to consumers' purchase intentions. By studying the effect of the fitting between products and live streaming background (abbreviated herein as product-background fit) and the fitting between anchors and live streaming background (abbreviated herein as anchor-background fit) on consumers' purchase intentions, this study provides an important practical contribution to the optimization design of e-commerce live streaming.

The purpose of this study is to explore the effects of product-background fit and anchor-background fit on consumers' purchase intentions based on the stimulus-organic-response (SOR) theory and the perspective of cognitive-affective response. SOR theory helps our study explore the internal psychological process and mechanism behind consumers' purchase intention. Following SOR theory, we divided "O" (organism) in SOR theory into cognitive and affective component from the cognitive-affective perspective and deeply explored the internal perception process (cognitive response and affective response) of consumers. In sum, we pioneeringly used e-commerce live streaming background as the research object to discuss the impact of background fitting on consumers' purchase intention and further analyze the cognitive and emotional response mechanism behind this influence.

The remainder of this article is arranged as follows. We review the relevant literature in the second section. In the third section, the hypotheses and the research model are proposed. Then, we introduce the methodology and results. Next, we discuss the findings and the contributions of this work to academic researchers and e-commerce practitioners based on our results. The last section points out the limitations of this study and the direction for future research.

Literature Review

In this section, we review the relevant literature and discuss the research objects: e-commerce live streaming, SOR theory, live streaming background fitting, and cognitive and affective responses.

E-Commerce Live Streaming

Cai and Wohn[19] defined "e-commerce live streaming" as online shopping involving real-time social interactions, which has two types: live-streaming shopping integrated into the pure e-commerce platform and live-streaming shopping introduced into the social platform. Recently, e-commerce live streaming on e-commerce platforms (JD, Taobao, etc.) and social platforms (Kwai, Tiktok, etc.) has gradually integrated into consumers' daily shopping life, with most consumers having a rich experience in live streaming shopping on both platforms. Moreover, both types of e-commerce live streaming have similar human-computer interaction mode, essentially creating a virtual shopping environment to make consumers have a "sense of immersion, presence or perceived reality" which influence consumers' purchase intentions.[20] From the perspective of background presentation, there is no obvious difference between both platforms. Therefore, the objects of e-commerce live streaming investigated and studied herein include e-commerce platforms and social platforms.

SOR Theory

The stimulus-organic-response (SOR) theory is a classic theory for studying consumers' purchasing decisions.[21] The model includes three parts: a stimulus, an organism, and a response.[13,22] It is a development model of the classical stimulation response (S-R) method.[23] The SOR theory holds that external environmental factors are stimuli which affect individual psychological responses (cognitive or affective responses) and therein lead to behavioral responses. Following SOR theory, extant studies have conducted extensive research on the relationship between environmental stimuli, internal organism, and behavioral responses in website marketing environments. For instance, Parboteeah et al[13] used the SOR model to explore the impact of the cue properties of website interface design on users' internal mechanics and impulse purchase intentions. Chan et al[23] discussed the impact of website stimuli (eg, media format, visual appeal) on consumers' online impulse buying behavior through SOR theory and further discussed consumers' cognitive and affective responses during this process.

Recently, studies have also begun applying SOR theory to research e-commerce live streaming due to its effectiveness and value in understanding consumers' psychology and behavior in online shopping. Lee et al[24] explored the impact of specific stimuli such as attractiveness, credibility and professional knowledge on consumers' internal reaction and behaviors when participating in e-commerce live streaming. Liu et al[25] took perceived diagnostics as the organism (O) in SOR model and explored the important role of the type of streaming media and brand awareness in live streaming recommendation. Based on SOR theory, Guo et al[26] explored the impact of live streaming function on consumers' purchase intention from the perspective of consumers' perceived value and perceived uncertainty. The purpose of our study was to explore the effects of product-background fit and anchor-background fit on consumers' purchase intentions and their internal mechanism. This model can provide an overall visual framework and theoretical basis that would enable us to study the effects of product-background fit and anchor-background fit on consumers' purchase behavior responses and the underlying cognitive and affective mechanisms. Therefore, this paper used the SOR model as its overall research framework.

Live Streaming Background Fitting as an Environmental Stimulus in Shopping

Numerous studies have proven that the relevant marketing environment and shopping background can affect consumers' purchase intentions. For example, Hagtvedt and Patrick[27] proposed that the artistic design in product advertising can affect consumers' attitudes towards certain products. In physical retail shopping, the marketing mode and visual layout of stores has been shown to have certain effects on consumers' purchase intentions.[28] The decoration style of physical stores tends to affect consumers' satisfaction, loyalty, and purchase intention.[29] Moreover, in the online environment, consumers' contact with products is realized through human-computer interaction. Consumers' purchase intentions are affected not only by the characteristics of products but also by those of the online shopping environment.[13] Visually attractive page designs could often attract consumers to visit the website and have a positive effect on their online browsing and purchase intentions.[14] Compared with orderly page design, appropriately disordered website pages are more likely to promote consumers' purchase intentions.[30]

The e-commerce live streaming content that consumers watch and participate in consists mainly of the anchor, the product, and the live streaming background. Consumers' purchase intentions are not only affected by the anchor or product characteristics but also by the background characteristics of live streaming studios, which can be very intuitive. A vivid shopping environment could attract consumers to browse for a longer time and effectively help them find the products or information they need.[31] For example, more and more fruit farmers choose to carry out live streaming activities in orchards, which allow consumers to see the current situation of orchards and learn about the fruits recommended by the anchors. In addition, an intuitive shopping environment could provide consumers with an interesting shopping experience.[32] For instance, e-commerce live streaming in a bread production workshop not only made consumers trust the product quality but also allow consumers to experience the production process of making bread.

At present, the development of live streaming technology has brought unique opportunities and challenges to e-commerce marketing strategy. Previous marketing research believed that optimizing the marketing environment for a product could provide consumers with good experiences.[33–35] From this perspective, if the fit between the products sold in e-commerce live streaming and the live streaming background is appropriate, the shopping experience of consumers may be improved, which in turn, is beneficial in encouraging their purchase behaviors. According to previous research, influencers are more likely to gain consumers' trust when they recommended products in a more realistic environment.[36] Hence, the environment can influence the impacts of recommendations made by influencers, thereby affecting consumers' purchase intentions. Then, when the anchor chooses a live streaming background more in line with the image (eg, actual sales scene related to the anchor's image in real life), it should have a positive effect on consumers' purchase intentions.

Cognitive and Affective Responses

In e-commerce live streaming, interactions with online sellers induce consumers' cognitive and affective responses.[13] The cognitive response to stimuli refers to the mental processes that take place in the human brain when an individual interacts with various stimuli.[37] In particular, it involves how consumers deal with the product-related information presented in a live streaming studio and how consumers select and make purchase intentions among numerous similar live streaming studios. In the research field of online shopping, perceived value and perceived trust are considered the representative cognitive response variables that reflect interactions with external stimuli.[38] "Perceived value" refers to the extent to which a product or service could achieve the expected utility of consumers.[39] Most consumers believe that e-commerce live streaming could significantly improve their shopping efficiency.[40] Another study reported that e-commerce live streaming improved consumers' perceived value by reducing their money, time, and energy costs.[19] "Perceived trust" refers to people's belief or willingness to rely on the expertise and performance of the other.[41,42] E-commerce live streaming has unique advantages in terms of authenticity, responsiveness, and visualization, all of which could alleviate the uncertainties related to seller identity and product quality.[39] Consequently, in the live streaming environment, consumers would have a higher degree of trust in product information and anchors' marketing strategies.

Affective responses capture the emotional response of an individual when interacting with the environment.[43] Related to this, many researchers used the popular affective dimension of perceived pleasure. For example, Eroglu et al[37] defined perceived pleasure as the degree to which a person felt happy or satisfied. Previous studies have investigated the effects of online situational design on consumers' affective state.[44–47] In online shopping, the stimulation from the website page increases users' perceived pleasure.[45] Specifically, a more attractive website page design brings greater perceived pleasure to consumers.[48] When consumers are satisfied with the page design of a website, a positive relationship between perceived pleasure and consumers' purchase intention could be observed.[49]

To better investigate how consumers deal with the information regarding products, anchors, and the background presented in the e-commerce live streaming, we explored their internal cognitive and affective responses from the dimensions of perceived value, perceived trust, and perceived pleasure.

In summary, in our research model, "S" refers to anchor-background fit and product-background fit. "O" refers to consumers' internal cognitive and affective processing, and "R" represents consumers' purchase intention in e-commerce live streaming.

Hypotheses Development

Live Streaming Background Fitting and Perceived Trust

Shopping background remains a constant focus in the field of marketing, which affects consumers' perceived trust.[50–53] Park et al[12] pointed out that companies generally adjust the physical store's background from a visual consistency perspective to improve product presentation. Compared with physical shopping, online shopping has some fuzziness, and consumers face more product uncertainty and purchase risk.[54–57] To improve consumers' perceived trust, online retailers improve website credibility by designing more attractive webpage environment.[58] Shamdasani et al[15] found that the fitting between the website environment background and the product category in the advertisement could affect consumers' approval and trust of the advertisement. E-commerce live streaming can present shopping backgrounds similar to real shopping, but it still has the fuzziness of online shopping. We thus hypothesize that the fitting between the background of an e-commerce live streaming studio and the products being sold affects consumers' perceived trust. Currently, there is no extant study focusing on the impact of e-commerce live streaming product-background fit on consumers' perceived trust. Accordingly, we propose the following hypothesis:

H1: In e-commerce live streaming, the product-background fit is positively associated with consumers' perceived trust.

In advertising marketing, an advertising message is better recognized by consumers when their perception of the role image of actors in the advertisement fits the scene background.[59] In influencer marketing, Argyris et al[50] found that the outward image design of network influencers (such as anchors and celebrities) improves consumers' perceived trust and purchase intention. Online influencers often create visual harmony in their posted contents (such as photos and videos) to gain consumers' acceptance and trust.[60] We therefore speculate that when the design of an anchor image in live streaming is better fitted to the background, this may have a positive impact on consumers' perceived trust and promote consumers to participate in e-commerce live streaming. Currently however, there are no studies on the impact of anchor-background fitting on consumers' perceived trust in the field of e-commerce live streaming. Accordingly, we propose the following hypothesis:

H2: In e-commerce live streaming, the anchor-background fit is positively associated with consumers' perceived trust.

Live Streaming Background Fitting and Perceived Value

Previous studies have shown that utilitarian value and hedonic value are two important components of consumers' perceived value in online shopping.[61] The "utilitarian value" of online shopping refers to the degree to which the product or service provides the expected utility for consumers (such as saving money, time, and energy), while the"hedonic value" represents an emotional experience related to shopping entertainment.[62] Bridges and Florsheim[63] pointed out that utilitarian value is more closely related to consumers' purchase intentions and behaviors than the hedonic value in online shopping. Hence, consumers are more likely to make purchase intentions based on utilitarian reasons. Therefore, we focus on the value of utilitarianism when exploring the perceived value of consumers.

Gilmore et al[64] believed that higher information perception reduces the cost of time and energy and improved the perceived value of consumers during shopping. Previous studies have found that the correlation between product and background environment can positively affect consumers' perceptions of product information and quality.[65] Balasubramanian et al[66] also believed that displaying products in appropriate advertising scenarios more effectively promotes product information. From this perspective, when e-commerce live streaming displays products in an appropriate live streaming background, consumers may have a higher value perception of the product information. Previous studies of background environment and perceived value mainly focused on traditional online shopping, but there is few related research in the field of e-commerce live streaming. We speculate that in e-commerce live streaming, the fitting of live streaming background and products can improve consumers' perceived value by promoting consumers' information perception. Accordingly, we propose the following hypothesis:

H3: In e-commerce live streaming, the product-background fit is positively associated with consumers' perceived value.

According to the cognitive dissonance theory (Festinger, 1962), if people are exposed to cognitively inconsistent content, they may have cognitive dissonance which may affect their perceived value.[67] Previous research has indicated that the fitting degree of the anchor's identity and persuasion style has different effects on consumers' perceived value.[68] For example, words with absolute meaning, such as "first" and "patent" are used more professionally by experts than ordinary anchors and could generate higher perceived value among consumers. However, existing studies mainly focus on the impact of the anchor on perceived value of consumers, therein largely overlooking the impact of background factors. For example, for the cognitive dissonance theory, when a fruit farmer conducts live streaming, using the orchard rather than a live streaming studio as the live streaming background may be more consistent with consumers' cognition, which may have a positive effect on their perceived value. Hence, we hypothesize that high anchor-background fit may have a positive effect on consumers' perceived value. Therefore, we propose the following hypothesis:

H4: In e-commerce live streaming, the anchor-background fit is positively associated with consumers' perceived value.

Perceived Trust and Perceived Value

Existing studies have two different views on the relationship between perceived value and perceived trust. In e-commerce website research, some studies have reported that consumers' perceived values positively affect their perceived trust in e-commerce websites.[69–71] However, Chang et al[72] believed that obtaining commodity information could improve consumers' perceived trust and affect their perceived value. Meanwhile, Kim et al[73] studied the effects of website quality on information quality, value, and loyalty intention. They found that consumers' perceived trust served as a significant predictor of perceived value. In the field of e-commerce live streaming, few studies have focused on the relationship between perceived value and perceived trust. Thus, the current study would explore the relationship between perceived value and perceived trust under the influence of e-commerce live streaming background fitting.

Unlike website shopping, e-commerce live streaming can intuitively demonstrate the seller's identity and actual products. Hence, consumers obtain more information at the initial stage of shopping when they participate in e-commerce live streaming shopping. Live streaming sellers typically introduce product information comprehensively by providing real-time detection and using products that effectively reduce the risks and uncertainties perceived by consumers in the shopping process.[3,39] From this perspective, consumers are more likely to have perceived trust in live streaming sellers. Kim and Park[74] have shown that if consumers trust sellers, the time and energy costs spent by consumers in searching for seller information and completing transactions would be reduced. Thus, we infer that perceived trust should have a positive effect on perceived value in e-commerce live streaming because the former can actively reduce consumers' time and energy costs. E-commerce live streaming is more active than traditional e-commerce websites in delivering information to consumers. With background fitting, the relationship between consumers' perceived trust and perceived value becomes worth exploring. Accordingly, we propose the following hypothesis:

H5: In e-commerce live streaming, consumers' perceived trust is positively associated with their perceived value.

Perceived Pleasure
Perceived Trust and Perceived Pleasure

When consumers watch e-commerce live streaming, they tend to produce cognitive and affective responses. The cognitive response is related to perceived trust and perceived value, while the affective response is related to perceived pleasure.[13] For consumers, it is more interesting and vivid to watch e-commerce anchors show or try on clothes than simply browsing pictures on the website. E-commerce live streaming has been shown to have interactive functions to respond quickly and openly to consumers' questions and feedback.[75] Shin[76] pointed out that consumers' perceived trust is directly related to social interaction behavior. When consumers realize that their positive interaction behaviors affect the e-commerce live streaming, they are likely to gain more enjoyment from their positive behaviors.[77] Thus, in e-commerce live streaming, a positive relationship may exist between consumers' perceived trust and perceived pleasure. In existing e-commerce live streaming studies, no studies are yet to explore the relationship between consumers' perceived trust and perceived pleasure with consideration of background fitting. Therefore, we propose the following hypothesis:

H6: In e-commerce live streaming, consumers' perceived trust is positively associated with their perceived pleasure.

Perceived Value and Perceived Pleasure

The perceived value in the process of online shopping is often reflected in saving money, time, and energy.[62] One of the reasons why consumers are keen on online shopping is that they could obtain many discount opportunities and derive pleasure from such bargaining.[78] Many anchors in e-commerce live streaming randomly distribute limited shopping subsidies to stimulate consumers' emotions. Arnold and Reynolds[79] have shown that discounts and subsidies obtained in the shopping process can give consumers a higher sense of pleasure. Appropriate product-background fit and anchor-background fit can further promote consumers' perceptions of product quality and reduce their time and effort costs in comparing sellers and products. In turn, this makes consumers feel satisfied and happy. Therefore, we speculate that perceived value brought by reducing shopping costs (money, time, or energy) may have a positive effect on the perceived pleasure when consumers participate in e-commerce live streaming. E-commerce live streaming is a real-time marketing process where the anchor is committed to mobilizing consumers' emotions in various ways (these include issuing discount coupons, recommending preferential packages, etc.) to achieve consumers' purchase intention. This sales method differs from the traditional one in that it can keep consumers' perceived value at a higher level during the shopping process to promote their perceived pleasure more actively. Therefore, we propose the following hypothesis:

H7: In e-commerce live streaming, consumers' perceived value is positively associated with their perceived pleasure.

Perceived Pleasure and Purchase Intention

In general, purchase intentions are stimulus-driven and are made instantaneously because of affective responses.[80] In physical department stores, consumers' shopping enjoyment and pleasure has a certain positive effect on their purchase intentions.[81] Saad and Metawie[82] also confirmed the positive effect of pleasure on consumers' purchase intentions. In online shopping, attractive website interfaces promoted consumers' emotions (perceived pleasure), which in turn, stimulated their positive purchase intentions.[49] Furthermore, the visual congruence of photo or video contents could promote consumers' positive attitudes and enhance their purchase intentions.[60] Hence, we speculate that appropriate product-background fit and anchor-background fit in e-commerce live-streaming could stimulate consumers' perceived pleasure, wherein these positive emotions may ultimately promote their purchase intentions. In physical shopping and traditional online shopping, the impact of perceived pleasure on consumers' purchase intentions has been discussed by various scholars using a background environment perspective. However, in the field of e-commerce live streaming, no study has explored the relationship between perceived pleasure and purchase intentions under the influence of the background environment. Therefore, we propose the following hypothesis:

H8: In e-commerce live streaming, consumers' perceived pleasure is positively associated with their purchase intentions.

In summary, our conceptual model is shown in Figure 1.

Methodology
Measures

We designed an online questionnaire and adopted survey research methods to test the model and construction of this research. All measurement items of the questionnaire used in this work were determined from the results of previous studies. However, we modified the questions, words, and semantics of the measurement items to fit within the context of e-commerce live streaming. Finally, we determined an experimental questionnaire containing 20 items (see Appendix A). We used a 7-point Likert scale (1= "strongly disagree", 7= "strongly agree") to record the participants' responses to the measurement items. Our questionnaire included six variables, a total of twenty self-report items, and eight participant information items.
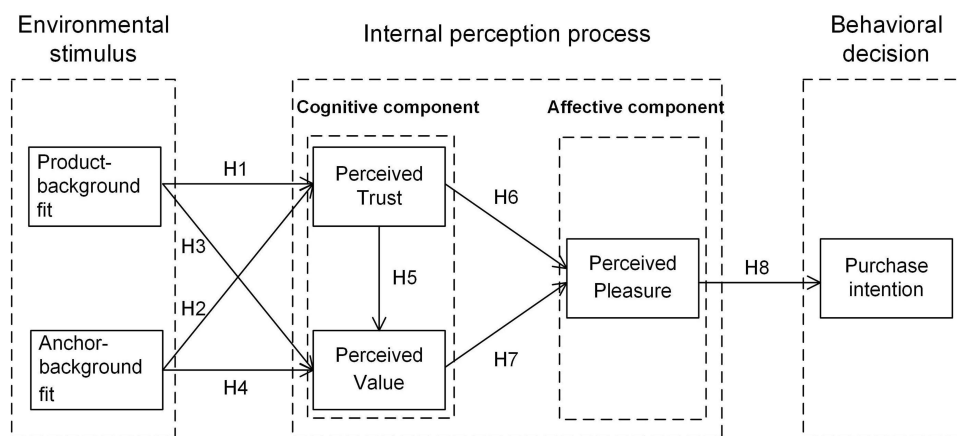
Figure 1 Conceptual model.

Background Fit

Our study has two types of background fit: product-background fit and anchor-background fit. Both types of fit measurement items were adapted from Park and Lin.[18]

Perceived Trust

This involves consumers' perception of trust degree in the anchor, product, and sales information presented in the e-commerce live streaming. The three items measuring perceived trust in this study were adapted from Hassanein and Head,[83] Babin et al.[84] Park and Lin,[18] and Wongkitrungrueng and Assarut.[39]

Perceived Value

It refers to consumers' perceptions of the value of information, product quality, shopping time, and efficiency presented in the e-commerce live streaming content. The current study used five measurement items of perceived value adapted from Park and Lin,[18] and Groß.[62]

Perceived Pleasure

This refers to the emotional perceptions formed by consumers in the process of participating in e-commerce live streaming. The three items measuring perceived pleasure in this study were adapted from Mehrabian and Russell,[21] Groß,[62] and Xu et al.[85]

Purchase Intention

It refers to the willingness of consumers to make purchase intentions when they are participating in e-commerce live streaming. This study used three items to measure consumers' purchase intentions adapted from Sun et al.[20] Hu and Chaudhry,[86] and Park and Lin.[18]

As the original texts of all the measurement items cited in this study were in English, and our questionnaire survey subjects were all Chinese, we adopted a reverse translation method to achieve semantic consistency between the original measurement items in English and the Chinese measurement items.[86,87]

Data Collection

This study investigated the experiences of consumers participating in e-commerce live streaming shopping (eg, Taobao, JingDong, Kuaishou, and Douyin.).

To ensure the rationality of the questionnaire results, we designed pre-selected questions in the questionnaire to check whether respondents had any experience in participating in e-commerce live streaming. Only those who reported that they had participated in e-commerce live streaming were marked as valid questionnaires. The respondents were asked to recall their experience of participating in an e-commerce live streaming and completed our questionnaire based on these experiences. Our measurements showed that it took at least 45s to complete a questionnaire. Therefore, the questionnaires completed in less than 45s were considered invalid questionnaires.

Table 1 Descriptive Statistics of Survey Respondents (N = 424)

Category	Items	Numbers	Percentage (%)
Gender	Male Female	192 232	45.3 54.7
Age	<18 18–24 25–29 30–39 40–49 >50	13 347 30 9 13 12	3.1 81.8 7.1 2.1 3.1 2.8
Education	High school and below Specialty Undergraduate Graduate and above	28 13 321 62	6.6 3.1 75.7 14.6
Purchase experience	Less than 6 months 6 months–1 year 1–1.5 years 1.5–2 years More than 2 years	20 32 38 47 287	4.7 7.5 9 11.1 67.7
Monthly consumption (RMB)	Less than 1000 1000–2000 2000–3000 3000–4000 4000–5000 More than 5000	36 240 86 27 17 18	8.5 56.6 20.3 6.4 4 4.2

The questionnaire was distributed on the platform Wenjuanxing (https://www.wjx.cn/), which is a professional data collection website in China.[31,86,88] To ensure that there are no regional differences among the participants, we distributed questionnaires through this platform in 28 regions such as Zhejiang, Jiangsu, Jilin, Guangdong, and Sichuan. A WeChat account can only fill out one questionnaire to ensure that the questions were answered only by valid users. Data collection period started from December 31, 2020 to June 15, 2021. Ultimately, 424 valid questionnaires were collected. The demographic information of respondents is summarized in Table 1. Among the 424 valid questionnaires collected, 54.7% were women and 45.3% were men. Moreover, 81.8% of the respondents were between 18 and 24 years old. Approximately 90.3% of respondents were undergraduate or had higher educational levels. Most of the respondents (67.7%) had more than two years of experience in participating in e-commerce live streaming shopping. In addition, most of the respondents (86.9%) spent between 1000 yuan and 3000 yuan a month.

Data Analysis and Results

The statistical software used in this study were SPSS and SmartPLS. SPSS and SmartPLS were first used to perform analysis of reliability, validity, multi-collinearity and common method bias to estimate the measurement model. Then, we used SmartPLS to test the hypothesis to evaluate the structural model.

SmartPLS uses the PLS-SEM research method, which has been widely used in recent research.[2,89–91] It is a component-based method that deals with the minimum sample size, residual distribution, and the information and reflection structures. The PLS model could predict endogenous structure for quality assessment.[92] Therefore, it has often been used to test the structure model.[90,93]

Table 2 KMO and Bartlett Test

Kaiser–Meyer–Olkin	Measure of Sampling Adequacy.	0.967
Bartlett test of sphericity	$\sim\chi^2$	10,384.014
	df	190
	Sig	0.000

Analysis of Measurement Model

KMO Test, Bartlett Spherical Test, Multi-Collinearity Test and Common Method Bias

We first used SPSS to conduct the KMO test and Bartlett sphericity test on the questionnaire data. The questionnaire had structural validity only when P <0.05 and KMO test coefficient >0.5. The test results indicated that the KMO value was 0.967, the Chi-square value was 10,384.014, the degree of freedom was 190, and P <0.001 (see Table 2). Hence, our sample variables had good structural validity[89] and was suitable for factor analysis.

Variance inflation factor (VIF) measures the severity of multicollinearity in multiple linear regression models, which was used herein to detect multicollinearity problems. The VIF value should generally be less than 10.[68,69] In this study, the VIF of each measurement item of the external model is less than 10, indicating no serious multicollinearity problems in the measurement model.

The approach of common method factor was widely used to examine the degree of common method bias,[94–97] which was applied in this study. This approach adds a common method factor to the structural model, whose indicators include the indicators of all major structures and calculates the variance of each indicator.[98] The average variance of the method factor was 0.012 and the average variance of the substantive indicator was 0.865. The ratio of method variance to substantive variance is 1: 72, suggesting a small degree of common method bias.[97,99] Therefore, common method bias is not a problem in this study.

Reliability and Validity

In this study, we used four indicators (Cronbach's alpha (CA), Composite Reliability, Convergence Validity, and Discriminant Validity) to evaluate reliability and validity.

First, we used CA to test the reliability of the study model. CA is the most commonly used index to evaluate the internal consistency reliability coefficient of a psychological assessment scale; it reflects the degree of consistency and stability among the items of a scale.[100] In Table 3, we present the test results of each measurement item index. Various studies have recommended that the value of CA for all measured items should exceed the threshold of 0.7.[100,101] The CA

Table 3 Measurement Model

Variables	Items	Loadings	CA	CR	AVE
Product-background fit (PF)	PF1	0.933	0.937	0.959	0.887
	PF2	0.942			
	PF3	0.952			
Anchor-background fit (AF)	AF1	0.942	0.953	0.969	0.914
	AF2	0.965			
	AF3	0.960			
Perceived Trust (PT)	PT1	0.939	0.929	0.955	0.875
	PT2	0.932			
	PT3	0.935			
Perceived Value (PV)	PV1	0.889	0.935	0.951	0.794
	PV2	0.835			
	PV3	0.894			
	PV4	0.922			
	PV5	0.913			

(*Continued*)

Table 3 (Continued).

Variables	Items	Loadings	CA	CR	AVE
Perceived Pleasure (PP)	PP1	0.933	0.935	0.959	0.886
	PP2	0.951			
	PP3	0.939			
Purchase intention (PI)	PI1	0.935	0.933	0.958	0.883
	PI2	0.937			
	PI3	0.946			

value of each item in our research was greater than 0.7, indicating that the reliability of the model has passed the test and its internal consistency reliability is satisfactory. We also used Compound Reliability (CR) to test the reliability of the study model. As for the CR test, Bagozzi and Yi pointed out that when the value of compound reliability is ≥0.7, the model has high internal consistency reliability.[102] In this research, the CR coefficients ranged from 0.951 to 0.969 (shown in Table 3), which meet the requirements.

The convergence validity was evaluated in this study using the average variance extraction value (AVE). Fornell and Larcker believed that it should be ≥0.5.[103] In Table 3, the AVE value of our study was between 0.794 and 0.914, indicating good convergence efficiency.

The discriminant validity was evaluated with the widely used Fornell-Larcker criterion. In terms of discriminant validity, Fornell and Larcker[103] pointed out that the square root AVE of each construct should exceed the correlation between the construct and other model constructs. Results in Table 4 show that the square root of AVE values of the potential structures in our research is always higher than the off-diagonal elements in the corresponding rows and columns. This indicates that all structures have an acceptable level of discriminant validity, and our model has good discriminant validity.

Analysis of the Structural Model

We evaluate the structural model based on the following criteria: coefficient of determination (R^2), cross-validation redundancy (Q^2), path coefficient, effect size (f^2), and standardized root mean square residual (SRMR).

The results of adjusted R^2 shown in Table 5 revealed that the variance of the model for perceived trust, perceived value, perceived pleasure, and purchase intention accounted for 64.3%, 77.2%, 70.9%, and 63.1% respectively, indicating that the model had good explanatory power. For the endogenous structure, when the Q^2 value is greater than 0, it means that we can detect the prediction correlation between the path model and a specific structure. The higher the Q^2 value, the higher the prediction accuracy.[92] In this study, the Q^2 values of the four endogenous structures of perceived trust, perceived value, perceived pleasure, and purchase intention were 0.560, 0.608, 0.623, and 0.553, respectively.

Table 4 Discriminant Validity

Constructs		1	2	3	4	5	6
PF	1	**0.942**					
AF	2	0.873	**0.956**				
PT	3	0.761	0.789	**0.935**			
PV	4	0.775	0.786	0.856	**0.891**		
PP	5	0.716	0.755	0.789	0.828	**0.941**	
PI	6	0.684	0.710	0.767	0.839	0.795	**0.939**

Notes: Diagonal elements (in bold) are the square root values of the average variance extracted (AVE). Off-diagonal elements are the correlations among constructs.

Table 5 Strength of the Model

Constructs	Cross-Validated Redundancy			Coefficient of Determination	
	SSO	SSE	Q² (=1–SSE/SSO)	R²	Adjusted R²
PT	1272	559.927	0.560	0.645	0.643
PV	2120	830.871	0.608	0.773	0.772
PP	1272	479.786	0.623	0.710	0.709
PI	1272	569.200	0.553	0.632	0.631

Table 6 The F² Values

Path	f² values	P values
PF→PT	0.063	0.050
PF→PV	0.038	0.159
AF→PT	0.184	0.002
AF→PV	0.021	0.205
PT→PP	0.083	0.021
PT→PV	0.539	0.000
PV→PP	0.302	0.001
PP →PI	1.716	0.000

The effect size of the omitted structure of the endogenous structure can be determined based on the value of f².[92,104] Hair et al[92] recommended that the f² value of 0.02, 0.15, and 0.35 represented small, medium, and large effects, respectively. Table 6 shows that the value of f² in this study has a great and valid effect.

The standardized root means square residual (SRMR) is often used to evaluate the average size of the difference between the observed and expected correlation matrices and belongs to absolute goodness-of-fit indices.[89,90] According to the standard of Hu and Bentler[91] and Henseler et al.[90] SRMR<0.8 is considered acceptable In our study, the SRMR value obtained was 0.072, which is less than 0.08.

These results showed that the explanatory power of the structural model was acceptable, and the fit of the model was also satisfactory. Figure 2 presents the analysis results of the structural model using SmartPLS.

We organized and summarized the results of path and hypothesis analyses. As shown in Table 7, all eight paths were significant. Specifically, product-background fit had a positive effect on consumers' perceived trust (β=0.305, p<0.001) and perceived value (β=0.195, p<0.01) in e-commerce live streaming, thereby supporting H1 and H3, respectively. Anchor-background fit had a positive effect on consumers' perceived trust (β=0.523, p<0.001) and perceived value (β=0.153, p<0.01) in e-commerce live streaming, indicating support for H2 and H4, respectively. Furthermore, consumers' perceived trust was found to be positively related to consumers' perceived value (β=0.587, p<0.001) and
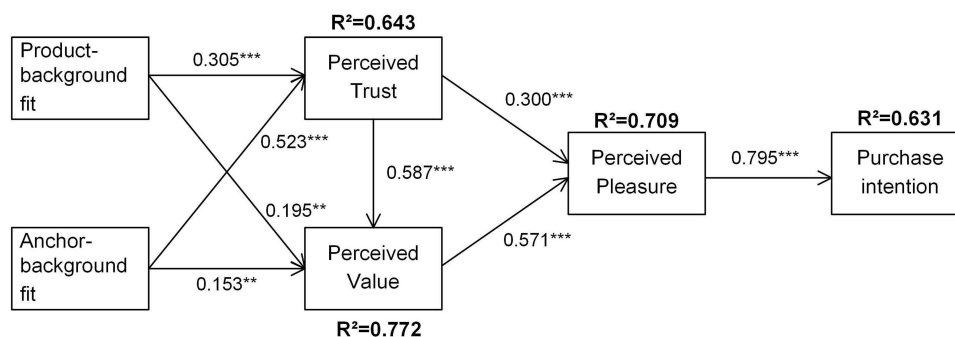

Figure 2 Result of the structural equation model (**p<0.01, ***p<0.001).

Table 7 Results of Path and Hypothesis Testing

Hypothesis	Path	Path Coefficient	SD	t-value	Result
H1	PF—>PT	0.305	0.073	4.157***	Supported
H2	AF—>PT	0.523	0.071	7.329***	Supported
H3	PF—>PV	0.195	0.062	3.156**	Supported
H4	AF—>PV	0.153	0.058	2.629**	Supported
H5	PT—>PV	0.587	0.043	13.669***	Supported
H6	PT—> PP	0.300	0.065	4.624***	Supported
H7	PV—> PP	0.571	0.067	8.478***	Supported
H8	PP—> PI	0.795	0.025	31.601***	Supported

Notes: Path coefficient significance level **P < 0.01, ***P < 0.001.

consumers' perceived pleasure (β=0.300, p<0.001), thereby supporting H5 and H6, respectively. In addition, the results showed that consumers' perceived value had a significant positive effect on consumers' perceived pleasure (β=0.571, p<0.001), supported by findings from the H7 path. We also found that the effects of consumers' perceived pleasure on consumers' purchase intentions were highly significant (β=0.795, p<0.001), thus supporting H8.

Discussion
Research Findings
The main purpose of our study was to explore how background fit affected consumers' purchase intentions while participating in e-commerce live streaming. Combining both SOR theory and cognitive-affective perspective, we built a research model and examined the relationship between background fit (external stimulus: product-background fit and anchor-background fit), consumers' internal perception (internal organism: cognitive and affective perception), and consumers' purchase intentions (behavior response). Our study found that the influence of background fitting in e-commerce live streaming on consumers' purchase intentions could be divided into three stages: the first stage is that background fitting positively affects consumers' cognitive process. The second stage is when consumers' cognitive process subsequently affects their affective process. The third stage is that affective process further promotes consumers' purchase intentions.

In the first stage, our result showed that background fitting has a positive impact on consumers' cognitive responses. Primarily, background fitting significantly affected consumers' perceived trust in cognitive responses, and the anchor-background fit had a greater positive effect on consumers' perceived trust than the product-background fit. This result may be due to the influence of the anchor's language persuasion. For example, through the continuous use of terms such as "research team", "brand history", and others, the anchors took the initiative to convey information regarding product reliability, special terms, and personal user experience to consumers. To a certain extent, anchors' verbal persuasiveness may affect consumers' subjective perception and purchase intentions in live streaming shopping.[68] Second, background fitting significantly affected consumers' perceived value in cognitive responses, and the product-background fit had a greater positive effect on consumers' perceived value than anchor-background fit. This finding indicated that consumers' perceived value came more from product-related influences (eg, price or quality) while participating in e-commerce live streaming. The findings of Rintamäki et al[105] also supported this finding. They pointed out that a positive relationship existed between product prices and consumers' perceived value. Our findings explain how both background fittings specifically affect the two cognitive responses of consumers (perceived trust and perceived value). In an e-commerce live streaming, optimizing the anchors-background fitting helps promote consumers' perceived trust, while optimizing the product-background fit is more conducive to promote consumers' perceived value. These findings importantly contribute to the optimization design of e-commerce live streaming background and the effective enhancement of consumers' positive cognitive responses.

In the second stage, our result showed that consumer's cognitive response positively affected their affective response. Specifically, consumers' perceived trust and perceived value had positive effects on their perceived pleasure. The

atmosphere in a successful e-commerce live streaming studio is usually cheerful. Anchors often cultivate consumers' sense of trust and value through various ways to make them feel positive and happy. Simultaneously, we found that perceived value played a more important role in promoting consumers' pleasure than perceived trust. This means that e-commerce can improve the impact of background fitting on consumers' perceived pleasure from the perspective of perceived value. Moreover, we found that consumers' perceived trust significantly affected their perceived value during the cognitive process. This shows that their perceived trust is an important prerequisite for perceived value in e-commerce live streaming. If consumers have low trust in e-commerce live streaming, they may choose to switch to other live streaming studios, which will not generate more perceived value. Extant studies on e-commerce live streaming rarely explores the specific impact relationship between cognition and affective responses. Our studies deeply explore the relationship between consumers' cognitive and affective responses in e-commerce live streaming and reveals that consumers' perceived trust significantly improves perceived pleasure by influencing perceived value. These findings provide important contributions to explaining consumers' cognitive and affective mechanism when they participate in e-commerce live streaming.

In the third stage, our results showed that consumers' affective process further promotes their purchase intentions. Consumers' pleasure perceptions triggered by the online shopping environment tend to increase their purchase intentions.[106] In particular, Wu et al[107] found that the pleasure brought by the online store environment (background color and music) may increase consumers' purchase intentions. Perceived emotions caused by store environment colors have also been shown to be positively correlated with consumers' purchase intentions.[84] These previous research results confirm that consumers' perceived pleasure in an online or offline shopping environment has a positive effect on their purchase intentions. These results support our research findings. Specifically, in the e-commerce live streaming environment, consumers' perceived pleasure, which is aroused by the fitting degree of live streaming background, also plays a positive role in their purchase intentions. With background fitting affecting consumers' purchase intentions, background fitting first inspires consumers' cognitive responses and then affects their affective responses, ultimately actively promoting consumers to make purchase intentions.

Theoretical Implications

Our research findings contribute to the related research in the field of e-commerce live streaming. The combination of e-commerce and live streaming has gradually changed the ways by which consumers shop. Consumers make purchase intentions by directly watching real-time e-commerce live streaming. However, how consumers make purchase intentions in the process of participating in e-commerce live streaming has not been fully explored. This study, therefore, increased understanding of how e-commerce live streaming backgrounds influence consumers' purchase intentions.

First, following SOR theory, our research explored the impact of background fitting on consumers' purchase intention in e-commerce live streaming from the perspective of shopping environment. Existing e-commerce live streaming research of external stimuli mainly focus on the live streaming function, personal image of the host, brand awareness and other variables.[18,26,36,50] However, from the perspective of shopping environment, this study chooses the background fitting (product-background fit and anchor-background fit) as the external stimulus to explore its impact on consumer' purchase intention. Results shows that the background fitting (product-background fit and anchor-background fit) has a positive impact on consumers' purchase intentions, and the effects of both background fittings on consumers' purchase decisions are significantly different. Results enrich the application of SOR theory in the research on external stimulus (S) in the field of e-commerce live streaming.

More importantly, we combined both cognitive-affective perspective and SOR theory to further reveal the internal mechanism behind the impact of background fitting on consumers' purchase intentions in e-commerce live streaming. The internal influence mechanism of background fitting on consumers' purchase intentions was divided into both cognitive process and affective process. Background fitting positively affects consumers' cognitive process, which in turn affect consumers' affective process. Then, the affective process further promotes consumers' purchase intentions. This study also provides a specific explanation of the relationship between consumers' cognitive components (perceived trust and perceived value) and affective components (perceived pleasure). This reveals that perceived value is more important than perceived trust in inducing consumers' perceived pleasure, and consumers' perceived pleasure in

e-commerce live streaming is more utilitarian, which parallels with previous studies.[63] Additionally, for cognitive mechanism, traditional e-commerce research has some disputes about the specific relationship between perceived trust and perceived value.[70,88,108,109] However, there were few studies on the relationship between the two in the field of e-commerce live streaming.[71] This study fills this research gap and finds that consumers' perceived trust positively affects their perceived value under the influence of background fitting. Results make a breakthrough in explaining consumers' cognitive process in e-commerce live streaming. Together with cognitive-affective perspective and SOR theory, this study makes an in-depth analysis of the internal mechanism of background fitting affecting consumers' purchase intention and provides exploration experience and guidance for future e-commerce live streaming research regarding consumers' cognition and affective response.

Practical Implications

E-commerce live streaming is in a period of vigorous development, and many online platforms and e-commerce sellers have begun to use this format to maintain competitiveness. Because the operation and participation mode of e-commerce live streaming differs from its traditional website e-commerce, the research on the impact of website background fitting on consumers' purchase intentions and internal mechanisms cannot effectively guide e-commerce live streaming to optimize the background fitting. Results herein provide more practical suggestions for e-commerce operators on improving e-commerce live streaming and promote consumer purchase intention.

Firstly, improving background fitting is an effective way to promote consumers' purchase intentions in e-commerce live streaming. The essence of live streaming interaction mode is to create a virtual shopping environment for consumers to have more "immersion, sense of existence or sense of reality". Improving background fitting effectively enhances consumers' cognitive response and affective response during live streaming shopping, promoting them to make purchase intentions. For one thing, e-commerce live streaming operators can improve product-background fit to promote consumers' purchase intention. For instance, when choosing suitable production workshops rather than offices as the live streaming background of food products, consumers may be more confident in product quality and thus, more willing to buy. Another thing, e-commerce live streaming operators can improve anchor-background fitting to promote consumer purchase intention. E-commerce live streaming initially sold products by inviting stars as anchors. However, the number of stars is not enough to meet the huge e-commerce live streaming market and the cost of inviting stars is high. This problem can be alleviated by improving the anchor-background fitting. For example, with tea sales, if the image of the anchor is biased toward the workplace, they can design modern office tea tables and tearooms as the background. If the image of the anchor is biased toward the classic, they should design ancient Chinese tea sets and tearooms as the background. In short, improving background fitting helps promote consumers' purchase intentions and develop e-commerce live streaming.

Second, improving consumers' perceived trust should be the main goal of designing the background fitting of e-commerce live streaming. With the development of Internet technology, it is now easier and more convenient to switch between e-commerce live streaming studios than to switch between shop pages on e-commerce websites. A low sense of trust makes consumers switch to other live streaming studios. It is difficult for the e-commerce platform to ensure that consumers would revert. Our study also found that the premise for increasing consumers' perceived value is to increase their perceived trust in e-commerce live streaming. This means that determining how to improve consumers' perceived trust should be the focus of the design of products, anchors, and background in e-commerce live streaming. As a visual presentation method, sellers should present a marketing environment that is closer to real life. For example, because cameras are expensive photographic equipment, consumers will be cautious when shopping online. Sellers who use physical stores as the live streaming background are more likely to gain consumers' recognition and trust. In addition, the professional degree of the anchor and the background of the physical store should be proportional to the price of the camera. Unprofessional anchors selling advanced cameras in simple scenarios could have a negative effect on consumers' perceived trust and generate negative perceived value. In sum, it is an effective way to promote consumers to participate in e-commerce live streaming activities by reasonably adjusting the product-background fit and anchor-background fit to improve consumers' perceived trust, thus improving perceived value.

Moreover, inducing consumers' perceived pleasure is a key factor in promoting consumers' purchases in e-commerce live streaming. The results showed that product-background fit and anchor-background fit affected consumers' perceived pleasure through perceived trust and perceived value, and this ultimately affected their purchase intentions. Anchors could actively mobilize consumers' emotions is a feature of e-commerce live streaming. Based on the goal of gaining consumers' perceived trust and value, sellers should choose a live streaming background with a high fitting degree that could maximize the emotional value of live streaming background according to product features and anchor image. For example, several food anchors have chosen to conduct live streaming in actual production plants rather than build a scene. For consumers, observing a food factory in operation is a pleasant experience, one that may have a positive effect on consumers' purchase intentions. Several anchors (who were originally teachers) chose desks to place products and wrote product information on blackboard in live streaming studio whose backgrounds were similar to classrooms. This design of anchor-background fitting greatly improves consumers' perceived pleasure and has a significant impact on consumers' purchase decisions.

Limitations and Future Research

This research has several limitations, which can point to directions for future research. First, this paper did not consider the effects of specific product categories. Anchor-background fit or product-background fit may have varying effects on different products due to the differences in product market demand and product value. For example, consumers may pay more attention to the fit between food and the live streaming background than anchor-background fit. Similar to art products, consumers may pay more attention to anchor-background fit rather than product-background fit. Therefore, the relationship between product category and anchor-background fit or product-background fit could be examined further in future studies.

Second, the influence of brand effect was not mentioned in this paper. An increasing number of small studios and individual sellers have emerged with the development of e-commerce live streaming. Meanwhile, consumers pay more attention to product quality than brand when shopping online. However, there is no denying the fact that brand effect has a positive effect on consumers' perceived trust, perceived value, and perceived pleasure. Therefore, one topic worth discussing further is whether the brand effect would still promote consumers' purchase intentions when product- or anchor-background fit is less.

Finally, although this study had explained the differences and commonalities of live streaming shopping between e-commerce and social platforms, we did not study them separately. Notably, some differences between live streaming shopping on e-commerce platforms and live streaming shopping on social platforms exist; thus, consumers may have different shopping behaviors and psychological mechanisms among them. Therefore, some interesting findings from the comparison of consumers' purchase behaviors and psychological mechanisms while participating in e-commerce live streaming on the two different platforms could be observed in future studies.

Conclusions

By combining cognitive-affective perspective and SOR theory, this study explores the impact of background fittings of e-commerce live streaming on consumers' purchase intention and their internal psychological mechanism. Findings reveal that the impact of background fitting in e-commerce live streaming on consumers' purchase intentions can be divided into three stages: background fitting positively effect consumers' cognitive process (stage1), consumers' cognitive process then affects their affective process (stage 2), and the affective process further promotes consumers' purchase intentions (stage 3). In the first stage, both background fittings (product-background fit and anchor-background fit) show different effects on consumers' cognitive response (perceived trust and perceived value), where perceived trust is mainly affected by anchor-background fit and perceived value is mainly affected by product-background fit. In the second stage, consumers' cognitive process affects their affective process (perceived pleasure). Perceived value has a greater positive effect on consumers' perceived pleasure than perceived trust, but perceived trust is a prerequisite for improving perceived value. In the third stage, inducing perceived pleasure is a key factor in promoting consumers' purchase intentions in e-commerce live streaming. Theoretically, this study deeply explores the influence mechanism of background fitting on consumers' purchase intention in e-commerce live streaming, thus not only expanding the

application of SOR theory in the field of e-commerce live streaming from the perspective of external background stimulation, but also making an important contribution to the application of cognitive-emotional perspective in e-commerce live streaming through revealing the interaction mechanism between consumers' internal cognition and emotional responses. Practically, this study suggests that optimizing background fitting is an effective way to improve consumers' purchase intention in e-commerce live streaming, making it better to optimize background fitting from the perspective of improving perceived trust, perceived value, and perceived pleasure. This study provides concrete practical guidance and important evidence for optimizing the background fitting of e-commerce live streaming to promote consumers' purchase intention and makes important contributions for e-commerce operators to promote the development of e-commerce live streaming.

Ethics Statement
This study was approved by the Ethics Committee of Hangzhou Dianzi University. We declare that participant was fully informed of the purpose and plan of the present study before the beginning of the research and provided informed consent in accordance with the Declaration of Helsinki. All the participants were anonymous and their data was protected.

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Disclosure
The authors report no conflicts of interest in this work.

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