

Research on the influence of entertainment on consumer deep engagement in brand-hosted live streaming: The moderating effect of knowledge level and psychological ownership

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Abstract: With the rapid development of brand-hosted live streaming, the live commerce ecosystem has shifted from a super-streamer-dominated model to a more decentralized, brand-driven approach. Drawing on the Stimulus–Organism–Response (S–O–R) model and Brand Co-Creation Theory, this study aims to examine how entertainment in brand-hosted live streaming influences consumer deep engagement through immersive experience, while also testing the moderating roles of knowledge level and psychological ownership. A quantitative survey was conducted, yielding 544 valid responses, and multiple regression analysis was employed to test the proposed hypotheses. The findings indicate that entertainment has a significant positive effect on consumer deep engagement. Immersive experience plays a mediating role in this relationship. Moreover, knowledge level and psychological ownership significantly moderate the relevant pathways. This study extends the application of the S-O-R framework in the context of brand-hosted live streaming and provides practical implications for optimizing entertainment-oriented strategies to enhance consumer deep engagement.

Keywords: Brand-hosted live streaming, Consumer deep engagement, Immersive experience, Knowledge level, Psychological ownership.

1. Introduction

With the deep integration of digital technology and new media platforms, live e-commerce has become an important scene for interaction between brands and consumers [1]. Among them, the brand-hosted live streaming, as a marketing mode in which the brand directly dominates the content production and interaction process, is gradually replacing the live broadcast delivery form with external anchors as the core [2]. The research indicates that brand-hosted live streaming can enhance consumers' sense of participation, thereby influencing purchase intention [3]. Brand-hosted live streaming has also shown significant effects in enhancing consumer knowledge and cognition [4]. Compared with traditional live broadcast marketing, brand-hosted live streaming has significant advantages in information control, brand consistency, and professional credibility, and is considered an important path to promote consumers' long-term participation and deepen the relationship between brands [5–7]. Existing studies mainly focus on the impact of live broadcast marketing on consumers' purchase intention or short-term sales performance, or the selection and comparison of different live and self-broadcast strategies [3, 4, 8]. In contrast, in the context of Brand-hosted live streaming, the internal mechanism of how entertainment can be transformed into deep participation behavior through consumer psychological processes still lacks a systematic theoretical explanation [9, 10]. Therefore, it is important to explore how entertainment affects consumers' deep participation through immersive experience, and further analyze the moderating effect of consumers' knowledge level and psychological ownership to understand the value generation mechanism of brand broadcast.

In the brand-hosted live streaming scene, entertainment constitutes the key stimulus that affects consumers' perception and behavioral response. These elements enhance consumers' deep participation by shaping immersive experiences, which are manifested not only in instant interaction or trading behavior but also as a comprehensive result, including emotional input, cognitive input, and continuous co-creation behavior [11]. Existing studies have shown that psychological ownership, as a psychological state reflecting consumers' sense of belonging to the brand or product, can strengthen their sense of responsibility and continuous participation tendency, and is regarded as an important psychological mechanism connecting interactive experience and participation behavior [12, 13].

With the rapid popularity of brand-hosted live streaming, entertainment has gradually become an important experiential stimulus affecting consumer participation behavior. However, existing research on live e-commerce mainly focuses on entertainment among various content elements, and there is still a lack of systematic analysis of its independent role and internal psychological mechanisms. Especially in the brand-led self-broadcast context, its influence path still needs to be revealed in depth. Based on the S-O-R model and Brand Co-creation theory, this study explores the complex influence mechanism of entertainment on consumers' in-depth participation in brand-hosted live streaming in the new media era, and constructs a theoretical research model. It focuses on how entertainment in brand-hosted live streaming affects consumers' in-depth participation behavior, whether immersive experience plays an intermediary role, and how consumers' knowledge level and psychological ownership regulate the formation of immersive experience and its transformation into deep participation. This study will further expand the explanatory power of traditional marketing theory on consumer behavior.

This study complements and expands existing research in several ways: first, by focusing solely on entertainment as the core stimulus variable in Brand-hosted live streaming, it breaks through the limitations of previous multi-factor parallel research and clarifies its independent behavioral effect; second, under the S-O-R framework, immersive experience is introduced as a key intermediary mechanism to reveal the psychological pathway through which entertainment influences consumers' deep participation; third, from the perspectives of consumer heterogeneity and psychological ownership, knowledge level and psychological ownership are introduced as moderating variables to systematically describe the boundary conditions for the formation of consumers' deep participation in the context of Brand-hosted live streaming. This provides a theoretical basis and practical insights for brand optimization of self-broadcast content and interactive strategies.

2. Literature Review and Hypothesis Development

2.1. S-O-R Model (*Stimulus-Organism-Response Model*)

The S-O-R model (Stimulus Organism Response) was first proposed by Mehrabian and Russell [14] in 1974 to explain how external stimuli affect individual behavioral outcomes through individual psychological responses. The model was then widely introduced into the study of consumer behavior to reveal the mechanism between marketing stimulation, psychological state, and behavioral response. Existing studies have shown that in the context of retail, online shopping, and social media, external stimuli such as content presentation, interactivity, and environmental cues can affect consumers' participation behavior through their emotional and cognitive responses [15, 16]. Existing studies show that entertainment content can enhance consumers' willingness to participate and promote sustained participation behavior by stimulating their immersive experience [9, 17]. Therefore, the S-O-R model provides an important theoretical basis for explaining how entertainment affects deep participation behavior through consumer psychological mechanisms in brand-hosted live streaming.

2.2. Brand Co-Creation Theory

The Brand Co-creation theory was proposed by Prahalad and Ramaswamy [18]. It emphasizes that value is not created by brands in one direction but is generated jointly through interaction between brands and consumers. This theory redefines consumers from passive recipients to active value co-creators, whose co-creation behavior participates in brand value construction through content

production, interactive feedback, and experience shaping. With the development of social media and live e-commerce, brand co-creation has gradually expanded to real-time interactive situations. Consumers can directly influence brand decision-making and brand image through bullet screen interaction, content sharing, and feedback [19, 20]. Existing studies have shown that in the context of digital marketing, co-creation behavior can significantly enhance consumers' immersion experience and brand belonging, further promoting their continuous participation behavior [21, 22]. Therefore, the Brand Co-creation theory provides important theoretical support for explaining the transformation from interactive participation to deep participation of consumers in brand-hosted live streaming.

2.3. Integration of S-O-R Model and Brand Co-creation Theory

Based on the S-O-R model and Brand Co-creation theory, this study constructs an integrated analysis framework of the impact of entertainment on consumers' deep participation in brand-hosted live streaming. The S-O-R model explains how entertainment stimulation in brand-hosted live streaming influences consumers' participation behavior through their immersive experience. Meanwhile, the Brand Co-creation theory emphasizes the active participation role of consumers in live broadcast interactions, compensating for the S-O-R model's limitations in explaining brand-consumer interactions. By integrating these two theories, the study considers immersive experience as the core intermediary variable and introduces consumers' knowledge level and psychological ownership as moderating factors. This approach aims to more comprehensively reveal the internal mechanism through which entertainment influences consumers' deep participation in brand-hosted live streaming.

2.4. The Impact of Entertainment in Brand-hosted live streaming on Immersive Experience

In the context of brand-hosted live streaming, entertainment is regarded as an important factor to attract consumers' attention and enhance the viewing experience. Humorous language, situational performance, game-based interaction, and other entertainment elements can create a relaxed and pleasant viewing atmosphere, making it easier for consumers to invest in live content emotionally. Existing studies have shown that entertainment live broadcast content can help improve consumers' concentration and emotional resonance by stimulating positive emotions and pleasant experiences, thereby enhancing their immersive experience [23, 24]. In addition, entertainment elements can also reduce external interference, enable consumers to focus more on live content during viewing, and form deeper psychological investment in interaction and emotional infection [3, 8]. Based on the above analysis, the following hypotheses are proposed:

H₁: Entertainment positively influences immersive experience.

2.5. Impact of Immersive Experiences on Consumer Engagement

Immersive experience refers to a state of high concentration and emotional engagement formed by consumers during interactions with brands or products. In live shopping situations, it typically demonstrates emotional participation, cognitive focus, and brand identity. Existing studies indicate that immersive experiences can significantly enhance consumers' willingness to participate, further influencing their purchase decisions and brand loyalty [25]. In the live broadcast environment, immersive experiences make consumers more willing to invest time and energy in interactive behavior by enhancing emotional resonance, promoting information understanding, and increasing perceived value, thus facilitating the transition from short-term interaction to continuous, deep participation [8, 23, 26]. In addition, immersive experiences can also reduce decision hesitation through pleasant emotions and entertainment, enhance consumers' psychological connection to the brand, and further strengthen their participation behavior [10]. Based on the above analysis, the following hypotheses are proposed:

H₂: Immersive experiences positively influence consumer engagement.

2.6. Mediating Role of Immersive Experience

In the brand-hosted live streaming situation, immersive experience, as a psychological state of high concentration and emotional input, is an important psychological mechanism connecting marketing stimulation and consumer behavior response. Existing studies have shown that immersive experience can promote consumers to invest more attention and emotional resources in the process of interaction by reducing information asymmetry and improving perceived value and trust, thereby enhancing their willingness to participate and participation behavior [17, 27]. In the live broadcast e-commerce environment, entertainment in brand-hosted live streaming can stimulate consumers' immersive experience and further influence their cognitive evaluation of the brand and their tendency to continue participating [28, 29]. Therefore, immersive experience plays a key intermediary role between entertainment and consumers' deep participation in brand-hosted live streaming. Based on the above analysis, the following hypotheses are proposed:

H₅: Immersive experience plays an intermediary role between entertainment and deep consumer participation in brand live-streaming.

2.7. Regulatory Role of Knowledge Level

Although entertainment is usually regarded as a positive factor in self-broadcast marketing, for consumers with a high knowledge level, overemphasizing entertainment may interfere with their careful analysis and understanding of brand information. This means that in self-broadcasts with high entertainment, consumers with high knowledge levels may reduce their immersive experience of products due to information overload [30]. The study found that consumers with a high knowledge level tend to look for specific information rather than just enjoy entertainment in entertainment content [31]. This preference causes them to enjoy entertainment content, and at the same time, they may have an insufficient understanding of the actual value and function of the product. Relatively speaking, consumers with low knowledge levels may be more able to enjoy content with strong entertainment and get a sense of pleasure from it, thus improving the immersion experience [32]. It is necessary to find a balance between entertainment and information transmission to ensure the effective transmission of information and the improvement of consumers' cognition. The following hypothesis can be made:

H₆: Knowledge level exerts a negative moderating effect on the influence of entertainment on immersive experience

2.8. Hypothesis of the Moderating Role of Psychological Ownership

Psychological ownership refers to consumers' psychological sense of ownership and control over a product or brand, even if they do not truly own the product or brand [33]. Existing studies have shown that higher psychological ownership can enhance consumers' emotional identity and trust in the brand, enable them to invest more attention and emotional resources in the interaction process, and reduce their sensitivity to uncertainty and perceived risk [13, 34]. In the context of brand-hosted live streaming, consumers can easily form a psychological connection to the brand through continuous interaction, feedback, and participation in co-creation. This psychological ownership not only strengthens their motivation to participate but also may amplify the impact of immersive experiences on behavioral responses [22]. When consumers have high psychological ownership, immersive experiences are easier to transform into continuous interactive behavior and deep participation willingness; on the contrary, in cases of low psychological ownership, the promotional effect of immersive experiences on participation behavior may be weakened. Based on the above analysis, the following hypotheses are proposed:

H₇: Psychological ownership positively moderates the effect of immersive experiences on Consumer Deep Engagement.

3. Research Methods and Design

3.1 Research Methods

This study adopts the quantitative research method and collects relevant data through a questionnaire survey. It explores how entertainment affects consumers' deep participation through immersive experience and examines the moderating roles of knowledge level and psychological ownership in this process.

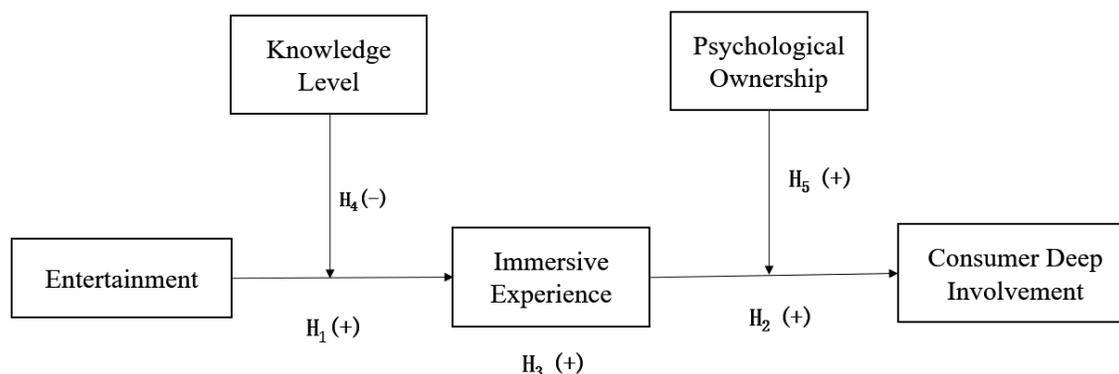


Figure 1.
Research Framework Diagram.

3.2. Study Subjects and Data Collection Methods

This study uses the questionnaire survey method to collect data, and the questionnaire distribution channel takes into account industry representativeness and platform mainstream, to enhance the diversity and extrapolation value of the sample. First, this study relies on representative brand-hosted live streaming accounts such as China East White, Zhufu Copper Art, and Daughter Bridge to carry out questionnaire distribution. These three types of brands cover agricultural products, craft furnishings, and clothing weaving, effectively covering different consumption scenarios such as food consumption, craft collection, and clothing fashion, ensuring the heterogeneity and representativeness of the sample in the industry structure. Second, a small-scale questionnaire was launched on the self-broadcast platforms of mainstream brands such as Taobao and Douyin to reach a wide range of user groups with different ages, genders, and consumption habits. Through purposive sampling, consumers who have participated in brand-hosted live streaming shopping are selected as research samples. The research requires that the objects can clearly distinguish between brand-hosted live streaming and other types of live broadcasts and have stable online shopping habits [3] so as to ensure that they have the necessary cognitive depth of the brand-hosted live streaming shopping process, interaction mechanism, and consumption decision-making process [24]. At the same time, it is limited that effective samples need to complete live shopping payments through mainstream e-commerce platforms (such as Taobao and Douyin) within nearly 60 days, to ensure the freshness of their experience with the new live marketing model and reduce recall bias [4].

4. Empirical Data Analysis

4.1. Descriptive Analysis

The formal questionnaire for this study was officially launched on the online platform in August 2025, and a total of 759 questionnaires were collected. To ensure the data's scientific validity, respondents who could not clearly distinguish between Brand-hosted live streaming and talent/online celebrity live broadcasts, as well as those who had not viewed Brand-hosted live streaming for more

than 60 days, were eliminated. Ultimately, 544 valid questionnaires were obtained, with an effective questionnaire recovery rate of 71.67%, meeting the quality standards of the online survey [35].

Effective samples: In terms of gender, men accounted for 36.03%, women for 63.05%, and the female group was significantly larger than the male group. This result indicates that women are more involved in brand broadcasting. Regarding age distribution, the 26-35 age group accounted for 38.79%, the highest, followed by the 36-45 group at 25.18%, and the 18-25 group at 23.53%. This suggests that young and middle-aged groups, as the core audience, are more sensitive and receptive to emerging consumption patterns. In terms of education distribution, the undergraduate group made up 55.88%, forming the main segment of this study sample. Concerning income levels, the 10,000-20,000 yuan range accounted for 36.95%, followed by the 5,000-9,999 yuan range at 29.23%. Middle- and high-income groups dominate the sample, indicating that primary consumers of brand-hosted live streaming possess strong purchasing power and stable consumer demand.

4.2. Reliability and Validity Analysis

4.2.1. Reliability Analysis

Cronbach's alpha reliability test was performed on the questionnaire. According to Nunnally and Bernstein [36], Cronbach's α coefficient above 0.7 can be considered acceptable reliability. The statistical results shown in Table 1 indicate that Cronbach's α for each dimension exceeds 0.7, aligning with a good reliability level. This suggests that the measurement tools have high internal consistency within these dimensions.

Table 1.
Reliability Analysis Table.

Dimension	Number of Terms	Cronbach's α Coefficient
Entertainment	3	0.800
Immersive Experience	3	0.794
Consumer Deep Engagement	3	0.807
Knowledge Level	8	0.892
Psychological Ownership	3	0.764

4.2.2. Validity Analysis

The validity of the scale was tested by KMO and Bartlett's test. The test results are shown in Table 2. The KMO value is 0.918, greater than 0.8. Bartlett's sphericity test shows a strong correlation between variables, indicating the data is suitable for factor analysis. The KMO value measures the correlation between variables. If this value exceeds 0.8, the data has an ideal factor structure, and the closer the value is to 1, the better the data structure is [37]; Bartlett's sphericity test is used to determine whether the correlation matrix is an identity matrix. When the test result reaches a significant level, it indicates the presence of common factors between variables, making it suitable for factor analysis [38].

Table 2.
KMO and Bartlett's Test Table.

KMO Sample Adequacy Measure		0.918
Bartlett Sphericity Test	Approximate Chi-Square	6824.498
	Free Degree	406
	Conspicuousness	0.000

Note: A KMO value > 0.7 indicates good validity.

From the perspective of the factor load coefficient, the standardized factor load of each measurement item is above 0.6, indicating that each measurement index can better reflect the corresponding potential variable, and the scale has good convergent validity.

It can be seen from Table 3 that the aggregate validity analysis shows that the entertainment average value is 0.573, the immersive experience is 0.562, the deep participation of consumers is 0.583, and psychological ownership is 0.521, which are all greater than 0.5, indicating that the explanatory ability of variables is strong.

In terms of combination reliability, the CR value for entertainment was 0.801, immersion experience was 0.794, consumer participation depth was 0.807, and psychological ownership was 0.765, all above 0.7. This indicates that the aggregate validity and reliability of the measurement model in this study have reached an ideal level [39].

Table 3.
Factor Loadings and AVE/CR Index Results.

Way			Estimate	AVE	CR
A1	<---	Entertainment	0.753	0.573	0.801
A2	<---		0.779		
A3	<---		0.738		
B1	<---	Immersive Experience	0.760	0.562	0.794
B2	<---		0.747		
B3	<---		0.743		
C1	<---	Consumer Deep Engagement	0.751	0.583	0.807
C2	<---		0.773		
C3	<---		0.766		
D1	<---	Knowledge Level	0.713	0.509	0.892
D2	<---		0.708		
D3	<---		0.720		
E1	<---	Psychological Ownership	0.714	0.521	0.765
E2	<---		0.707		
E3	<---		0.745		

Note: The Model Was Performed Using Amos 24.0.

It can be seen from Table 4 that discriminant validity is determined by comparing the square root of AVE of latent variables with their correlation coefficients. According to Fornell and Larcker [40], if the square root of the AVE of each latent variable is greater than its correlation coefficient with other latent variables, the model has good discriminant validity. From the analysis results, the square root of AVE of each latent variable is greater than its correlation coefficient with other variables, indicating that each variable has good discriminant validity and can better measure its conceptual structure.

Table 4.
Discrimination Validity Results.

	1	2	3	4	5
Entertainment	0.757				
Immersive Experience	0.387	0.750			
Consumer Deep Engagement	0.444	0.369	0.763		
Knowledge Level	0.399	0.282	0.330	0.713	
Psychological Ownership	0.402	0.377	0.463	0.257	0.722

Note: The diagonal number is the square root of AVE.

It can be seen from Table 5 that there is a significant positive correlation between the main variables ($p < 0.010$), indicating that the entertainment in the brand-hosted live streaming promotes mutual support and collective action based on consumers' deep participation. The correlation between entertainment ($r = 0.444$) and deep participation is high, indicating consumers are more likely to engage deeply through interactions with anchors and engaging viewing experiences. The correlation coefficient between immersion experience and deep participation is 0.369, demonstrating that immersion significantly contributes to active consumer participation.

Table 5.
Correlation Analysis Table.

	1	2	3	4	5
Entertainment	1				
Immersive Experience	0.387**	1			
Consumer Deep Engagement	0.444**	0.369**	1		
Knowledge Level	0.399**	0.282**	0.330**	1	
Psychological Ownership	0.402**	0.377**	0.463**	0.257**	1

Note: * $p < 0.05$ ** $p < 0.010$.

4.3. Hypothesis Test

4.3.1. Regression Analysis of Entertainment Value in Brand-Hosted Live Streaming for Immersive Experiences

It can be seen from Table 6 that entertainment has a significant positive impact on the immersive experience ($\beta=0.163$, $P<0.01$). When consumers watch the Brand-hosted live streaming, the more entertaining they are, the more likely they are to show a positive immersive experience. The fitting effect of the regression model showed that entertainment could explain 15.1% of the variation in immersive experience. The F test result indicates that the model is significant as a whole ($F(1539)=95.865$, $P=0.000$). This result supports hypothesis H1, demonstrating that entertainment in Brand-hosted live streaming has a significant positive impact on immersive experience.

Table 6.
Regression Analysis of Entertainment in Brand-Hosted Live Streaming on Immersive Experience.

	Non-standardized coefficient		Standardized coefficient	t	P
	B	Standard error	β		
Constant	0.742	0.165		4.505	0.000**
Entertainment	0.165	0.017	0.163	9.791	0.000**
R ²	0.151				
Adjust R ²	0.146				
F	F (1,539)=95.865, p =0.000				

Note: Dependent variable = Immersive experience

* $p < 0.05$ ** $p < 0.010$.

4.3.2. Regression Analysis of Immersive Experiences on Consumer Deep Engagement

Table 7 shows that immersive experience has a significant positive impact on consumers' Deep Participation ($\beta=0.369$, $P<0.01$). When consumers are more immersed in watching the Brand-hosted live streaming, they are more likely to show active participation behavior. The fitting effect of the regression model shows that immersive experience can explain 13.6% of the variation of consumers' deep participation. The result of the F test shows that the model is significant as a whole ($f=85.206$, $P<0.010$). This result shows that if H2 is empirically supported, that is, immersive experience has a significant positive impact on consumers' deep participation.

Table 7.
Regression Analysis of Immersive Experience on Consumer Deep Engagement.

	Non-standardized coefficient		Standardized coefficient	t	P
	B	Standard error	β		
Constant	2.116	0.145	-	14.6	0.000**
Immersive experience	0.376	0.041	0.369	9.231	0.000**
R ²	0.136				
adjust R ²	0.134				
F	F (1,542)=85.206, p =0.000				

Note: Dependent variable = Consumer Deep Engagement, * $p < 0.05$ ** $p < 0.010$.

4.3.3. Testing the Mediating Role of Immersive Experiences Between Entertainment and Consumer Deep Engagement

According to the regression analysis method proposed by Baron and Kenny [41], this study uses stepwise regression to test the mediating role of immersive experience between Brand-hosted live streaming entertainment and consumers' deep participation. It can be seen from Table 8 that, first of all, entertainment has a significant positive impact on consumers' Deep Participation ($\beta=0.458$, $P<0.01$), which meets the first step of the mediation effect test. Secondly, entertainment has a significant positive impact on immersive experience ($\beta=0.392$, $P<0.01$), indicating that entertainment can significantly improve consumers' immersive experience. Finally, in the regression model of introducing entertainment and immersive experience at the same time, the influence of immersive experience on consumers' deep participation is significant ($\beta=0.236$, $P<0.01$), and the regression coefficient of entertainment decreases from 0.458 to 0.366 but remains significant, indicating that immersive experience plays a partial intermediary role between entertainment and consumers' deep participation. The results support hypothesis H3, suggesting immersive experience mediates the relationship between entertainment and consumers' deep participation in brand-hosted live streaming.

Table 8.

Mediating Effect of Immersive Experience on Entertainment and Consumer Deep Engagement.

	M1 (Standardized Coefficient β)	M2 (Standardized Coefficient β)	M3 (Standardized Coefficient β)
	Consumer Deep Engagement	Immersive Experience	Consumer Deep Engagement
Constant	1.835**	2.065**	1.348**
Entertainment	0.458**	0.392**	0.366**
Immersive Experience			0.236**
R ²	0.197	0.15	0.243
Adjust R ²	0.196	0.148	0.24
F	133.233**	95.596**	86.725**

Note: * $p < .05$ ** $p < .010$.

4.3.4. Adjustment Effect Analysis

It can be seen from Table 9 that in the model M4 without introducing adjustment variables, entertainment has a significant positive impact on immersive experience ($\beta=0.392$, $P<0.010$), indicating that the entertainment attribute in Brand-hosted live streaming content can effectively improve consumers' immersion experience. On this basis, after introducing the knowledge level model M5, the knowledge level also has a significant positive effect on the immersive experience ($\beta=0.175$, $P<0.010$), and the explanatory power of the model has been improved, indicating that consumers' knowledge reserve itself helps them form a deeper experience perception. Further, after adding the interaction item between entertainment and knowledge level in model M6, the interaction effect coefficient was significantly negative ($\beta=-0.166$, $P<0.010$), indicating that knowledge level plays a significant negative regulatory role between entertainment and immersive experience. Combined with Figure 2, it shows that when consumers' knowledge level is low, the promotional effect of entertainment on immersive experience is more significant; when consumers' knowledge level is high, this effect is notably weakened. This result suggests that consumers with high knowledge tend to focus more on the professionalism and informational value of content during information processing, and excessive entertainment may diminish their immersive experience. Conversely, consumers with low knowledge are more likely to be attracted by entertainment cues. Therefore, it is assumed that H4 is empirically supported, meaning that knowledge level plays a negative regulatory role between entertainment and immersive experience.

In the stage of Consumer Deep Engagement, model M7 showed that immersive experience had a significant positive impact on Consumer Deep Engagement ($\beta=0.376$, $P<0.010$), which verified the key role of immersive experience in promoting consumer participation behavior. After introducing

psychological ownership into model M8, psychological ownership also has a significant positive impact on consumers' deep participation, and the overall explanatory power of the model is significantly improved. Further, the interactive item of immersive experience and psychological ownership was added to the model M9, and the results showed that the interactive effect was significantly positive ($\beta=0.130$, $P<0.010$). It can be seen from Figure 3 that when the level of psychological ownership of consumers is high, the role of immersive experience in promoting their deep participation is more significant. The results show that psychological ownership can strengthen the process of consumers' transformation from immersion experience to active participation behavior. That is, when consumers form a strong "psychological sense of belonging" to the brand or live content, their immersive experience is easier to transform into continuous interaction, feedback, and co-creation behavior. Therefore, suppose H5 is empirically supported, that is, psychological ownership plays a positive regulatory role between immersive experience and deep consumer participation.

Table 9.

Analysis of the Moderating Effect of Knowledge Level on Entertainment and Immersive Experience.

	M4(β)	M5(β)	M6(β)	M7(β)	M8(β)	M9(β)
	Dependent Variable: Immersive Experience			Dependent Variable: Consumer Deep Engagement		
Constant	3.397**	3.397**	3.462**	3.392**	3.392**	3.343**
Entertainment	0.392**	0.331**	0.295**			
Knowledge Level		0.175**	0.115**			
Entertainment*Knowledge Level			-0.166**			
Immersive Experience				0.376**	0.230**	0.284**
Psychological Ownership					0.443**	0.431**
Immersive Experience*Psychological Ownership						0.130**
R ²	0.15	0.169	0.196	0.136	0.258	0.272
Adjust R ²	0.148	0.166	0.192	0.134	0.255	0.268
F	95.596**	55.100**	43.937**	85.206**	94.17**	67.262**

Note: * $p<0.05$ ** $p<0.010$.

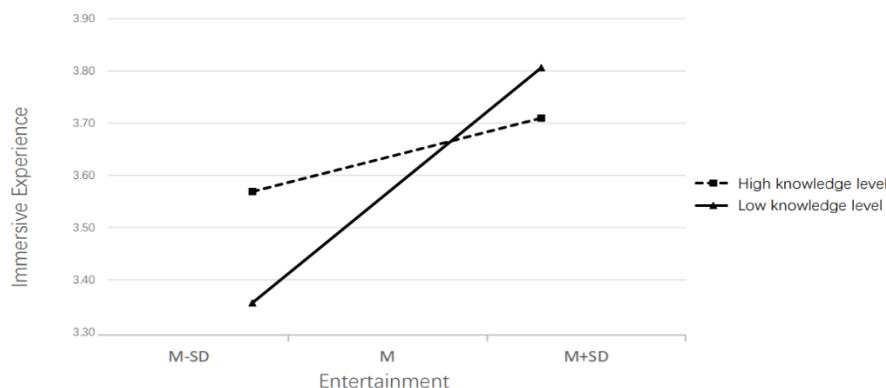


Figure 2.

Effect of Knowledge Level on the Moderating Effect of Entertainment and Immersive Experience.

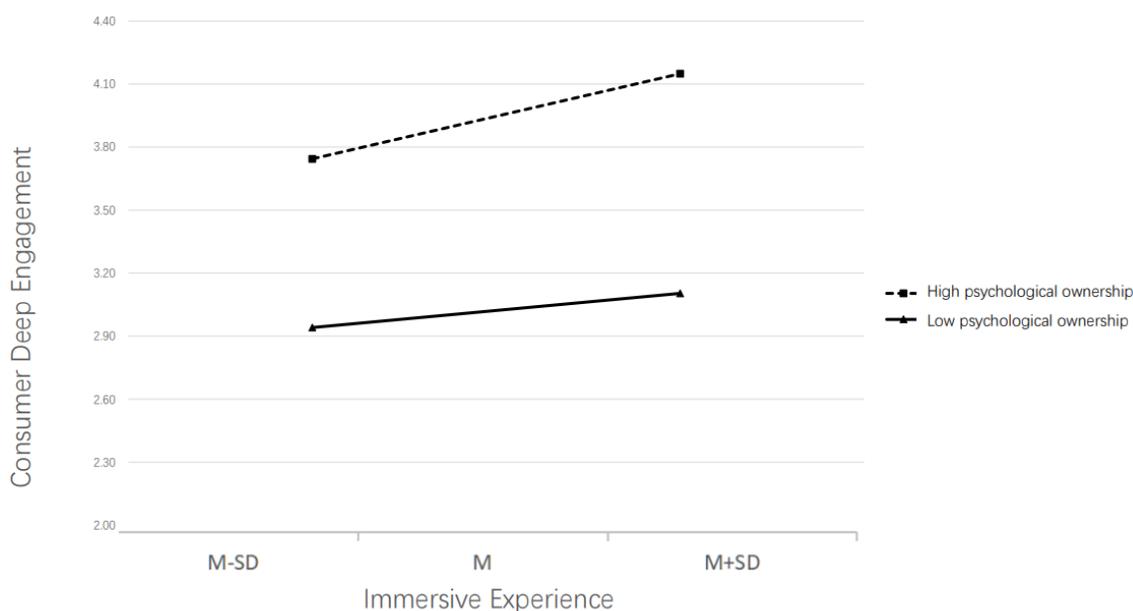


Figure 3.
Moderating Effect of Psychological Ownership on Immersive Experience and Consumer Deep Engagement

5. Discussion and Conclusion

5.1. Main Research Findings

Based on the empirical analysis in the context of Brand-hosted live streaming, this study systematically tested the mechanism of entertainment influencing consumers' deep participation through immersive experience in Brand-hosted live streaming, and introduced knowledge level and psychological ownership as moderating variables to build a relatively complete theoretical model. The results show that the entertainment in Brand-hosted live streaming has a significant positive impact on consumers' immersive experience, which verifies that Brand-hosted live streaming, as a highly situational and interactive marketing model, has unique advantages in stimulating consumers' psychological investment.

Further analysis found that immersive experience played a significant intermediary role between entertainment and consumers' deep participation in brand-hosted live streaming. Brand-hosted live streaming does not directly promote consumers' participation through a single stimulus but by improving consumers' emotional investment, cognitive focus, and situational empathy in the viewing process, making them more willing to invest time and energy in interactive and co-creative behavior. This result supports the applicability of the S-O-R model in the context of digital marketing and live broadcasting, and also reveals the key bridging role of immersive experience in the formation of consumer participation.

The results show that knowledge level plays a significant negative regulatory role in the relationship between entertainment and immersive experience. Specifically, with the improvement of consumers' knowledge level, the promotional effect of entertainment on their immersive experience shows a weakening trend. This result indicates that consumers with high knowledge levels tend to interpret content based on rational judgment and information processing in the context of brand-hosted live streaming and have relatively low dependence on entertainment cues. In contrast, consumers with low knowledge levels are more vulnerable to the influence of entertainment presentation, and their immersion experience is more significantly driven by entertainment stimuli. Additionally, the results show that psychological ownership has a significant positive moderating effect on immersive experience

and consumers' deep participation. When consumers develop a strong sense of psychological belonging and control over the brand, the immersive experience is more likely to translate into continuous interactive behavior and a willingness. Conversely, in cases of low psychological ownership, the promotional effect of immersion experience on participation behavior is relatively weakened. The findings demonstrate that consumers do not experience live broadcast content in a "neutral state," and their existing brand psychological connection significantly affects the marketing effect.

5.2. Theoretical Contribution and Practical Enlightenment

The theoretical contribution of this study is mainly reflected in three aspects. First, this study introduced Brand-hosted live streaming as an independent research context into the study of consumer in-depth participation, breaking through the limitations of existing live broadcast marketing research focused on purchase intention or short-term performance, and enriching the research perspective on the formation mechanism of consumer participation behavior in digital marketing. Second, by integrating the S-O-R model and the Brand Co-creation theory, this study constructed the functional path of "marketing elements - immersive experience - deep participation," revealed the intermediary mechanism of immersive experience in Brand-hosted live streaming situations, and expanded the interpretation boundary of the traditional S-O-R model in high-interactive digital scenes. Third, from the perspective of individual differences, this paper systematically analyzes the moderating effect of consumer psychological ownership, providing a new theoretical perspective for explaining the heterogeneous responses of consumers in Brand-hosted live streaming.

At the practical level, the research conclusion provides the following enlightenment for brand optimization of the self-broadcast marketing strategy. First of all, when carrying out self-broadcast marketing, brands should systematically improve the quality of content and the level of product display, and enhance consumers' immersion experience through professional explanation, authentic demonstration, and situational presentation, rather than relying solely on price incentives. Secondly, the brand should pay attention to the rational design of interactive mechanisms and entertainment elements, and enhance consumers' sense of participation and emotional investment through real-time feedback, interactive tasks, and emotional infection, so as to promote the transformation from passive viewing to active participation. Thirdly, the brand can gradually cultivate the psychological ownership of consumers by guiding consumers to participate in co-creation behavior, strengthening identity and emotional connection, so that the immersive experience can be more effectively transformed into continuous in-depth participation and brand loyalty.

5.3. Research Limitations and Future Research Directions

Although this study has made some progress at the theoretical and empirical levels, there are still some research limitations. First, this study uses cross-sectional questionnaire data, which makes it difficult to fully describe the dynamic evolution process of consumers' psychological states and participation behaviors. Future research can further verify the causal relationships through longitudinal designs or experimental methods. Second, the sample mainly consists of consumers from Brand-hosted live streaming on mainstream e-commerce platforms, and the applicability of the research conclusions across different platform types or cross-cultural contexts still needs further testing. Third, this study focuses on the moderating variable of psychological ownership. Future studies can introduce variables such as consumer knowledge level, involvement, or risk preference to further enrich the interpretive framework of consumer behavior in the context of Brand-hosted live streaming.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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