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The Impact Factors of User Participation in Fitness Live Streaming on TikTok: A Study from the Perspective of SOR Theory

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Abstract. In the context of fitness live streaming on TikTok, this study investigates the factors affecting user participation as follows: users' health consciousness, interactivity, fitness streamers' attractiveness and professionalism, as well as the perceived usefulness and easy of the live content. This investigation is conducted by constructing an SOR conceptual model. 905 participants from China were invited to participate in the questionnaire survey, and data from 749 valid questionnaires were analyzed. The results indicate that health consciousness, attractiveness, professionalism, interactivity, confirmed usefulness, and confirmed ease of use have significantly positive effects on emotional attachment. Emotional attachment, in turn, has a significantly positive impact on user participation, acting as a mediator in this relationship. This study holds theoretical significance and practical guidance for the development of fitness live streaming on TikTok and for enhancing users' engagement.

Keywords. SOR Theory, Fitness Live Streaming, Emotional Attachment, User Participation

1. Introduction

With the widespread adoption and application of information technology, fitness live streaming has gradually become a popular and innovative form of exercise. Users can acquire fitness-related knowledge through live streaming videos, which can help them get access to enough information for them to make better decisions. In the 52nd Statistical Report on Internet Development in China released in August 2023, it was indicated that as of June 2023, the number of internet users in China had reached 1.079 billion, with 765 million users engaged in online live streaming and 323 million users specifically interested in sports live streaming, accounting for 29.9% of the overall internet user population. Moreover, according to the "TikTok Trendy Fitness Guide," since 2022, the number of fitness live streaming rooms and fitness streamers on the TikTok platform has been rapidly increasing. Online fitness live streaming has become a trend and has gradually become a popular form of exercise and lifestyle for people.

In light of this societal context, fitness live streaming has seized new opportunities

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for development by leveraging data-driven, intelligent, and information-based operational models. In the past, research on fitness has primarily focused on factors such as health consciousness as regulatory factors for continued use of fitness applications (Damberg, 2022) [1], download and usage intentions (M.-F. Chen and Lin, 2018) [2], motivating factors influencing users (Hosseinpour and Terlutter, 2019; Muntaner-Mas et al., 2019) [3][4], the impact of fitness application adoption on users' subjective well-being (Aboelmaged et al., 2022) [5], and fitness applications and customer satisfaction (Ferreira Barbosa et al., 2021) [6]. However, there has been a lack of comprehensive research on fitness live streaming, leading to a gap in understanding this aspect fully.

The purpose of this study is to analyze the factors influencing user participation in TikTok fitness live streaming and to propose corresponding strategies based on the outcomes. To enhance user engagement and provide a long-lasting direction for the development of fitness live streaming, this study aims to sustain the vitality of fitness live streaming and contribute to the advancement of nationwide fitness initiatives. The attempt is to construct a predictive model based on the SOR theory, analyzing the factors influencing user participation in fitness live streaming on the TikTok platform. The study focuses on investigating the variables of health consciousness, streamers characteristics (attractiveness, professionalism, interactivity), and live content (confirmed usefulness, confirmed ease of use) as independent variables. Emotional attachment is considered as the mediating variable, with user participation as the dependent variable.

2. Theoretical background

2.1. SOR Theory

In 1935, Skinner conducted research on the relationship between the environment and stimuli. He pointed out that individuals respond to external environmental stimuli, demonstrating that the environment directly influences human behavior. Shelby posited that humans are emotional beings who evaluate their environment and respond accordingly. Building upon this idea, Mehrabian and Russell (1974) [7] developed a new model from the perspective of environmental psychology that accurately reflects the relationship between environment and behavior. This model, later redefined by Jacoby, is known as the Stimulus-Organism-Response (S-O-R) theory: various aspects of the external environment serve as stimuli (S) that influence an individual's internal state (O) thereby impacting their behavior (R). This framework is used to explain and predict the effects of different environmental stimuli on human cognition, emotions, and behavior. Yu Gu et al. [8] employed the S-O-R model to investigate the influence of live streaming platform features on consumers' willingness to participate in live shopping. They achieved significant success in exploring consumer behavior and technological aspects. Subsequently, research on the S-O-R theory has been introduced into various fields, including the education system, e-commerce, information systems, among others, to explore and explain users' continuous attention, consumption behavior, and repeated use behavior towards products. Therefore, this study utilizes the S-O-R model to explore the impact of fitness live streaming on user participation.

2.2. Emotional Attachment

Attachment theory was initially applied in the field of mother-infant relationships, pioneered by the British psychologist Bowlby (1979) [9]. He defined attachment as a significant relationship between a child and a caregiver, representing a close, intense, and enduring emotional bond between an infant and the mother. Subsequent research on attachment theory has continued to deepen, with different scholars offering varying perspectives. Ainsworth et al. (2015) [10] proposed that in initial studies on attachment, emotional attachment to a specific target is one of the most fundamental human needs. Porter et al. (2011) [11] proposed that behavioral expressions are typically driven by people's cognition and emotions. Li Y et al. (2021) [12] proposed that the psychological connection between users and services, termed emotional attachment, exerts a lasting and stable influence on user behavior. Emotional attachment can have positive effects on user motivation and behavior. Therefore, we chose emotional attachment as the mediating variable.

2.3. TikTok Fitness Live Streaming

With rapid technological advancements, China has officially entered the era of new media. In comparison to traditional media, the TikTok live streaming platform can deliver video information to users intuitively through data platforms, and the information contained in live streaming videos is relatively rich. Fitness live streaming is a phenomenon that has emerged in recent years; and thus, academic research on fitness live streaming has been relatively scarce up to this point. By a simple literal breakdown, it can be divided into two concepts: "fitness" and "live streaming." Mark explained from a physiological perspective: fitness refers to the physiological state in which physical activity results in energy expenditure higher than the resting energy expenditure. Chen et al. (2018) and Wang et al. (2019) [13][14] consider live streaming as a medium that allows real-time recording and broadcasting, delivering live videos to the audience through the internet.

2.4. User Participation

Holmes (2000) and Park et al. (2010) [15][16] both mentioned that attachment to a target influences a person's emotions, cognition, and generates motivation and behavior. Aron et al. (2004) [17] argued that once users develop emotional attachment to an object, they are inclined to maintain and strengthen that relationship. Dongmei Li et al. (2021) [18] argue that customers with strong emotional attachment tend to exhibit participatory behavior. In their study on emotions during live streaming, Lin et al. (2021) [19] considered audience rewards, likes, and comments as forms of user participation behavior. Clement Addo et al. (2021) [20] regarded user likes, views, chatting, and time spent on the platform as forms of user participation.

3. Study Models and Hypotheses

This study constructed an S-O-R model depicting the factors influencing user participation in fitness live streaming on TikTok, as illustrated in the diagram.

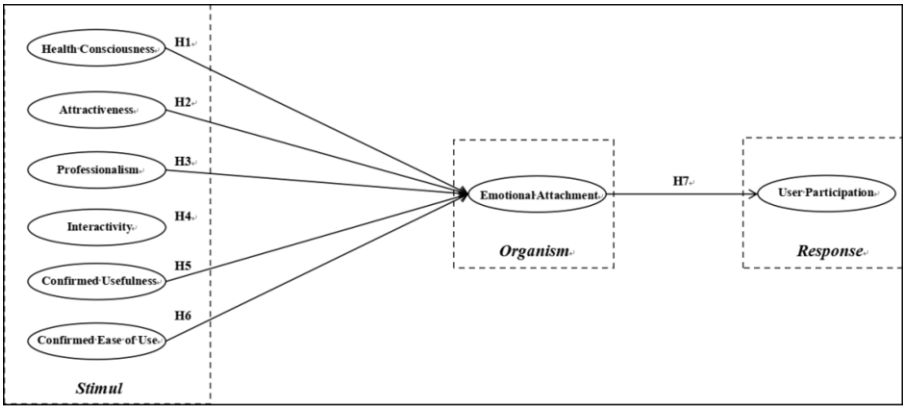

Figure 1. Conceptual Framework of the Impact of TikTok Fitness Livestreams on User Engagement.

3.1. The Influence of Health Consciousness on Emotional Attachment

Health consciousness refers to an individual's awareness and active engagement in protecting their health, as well as their ability to maintain a healthy lifestyle (Hansen et al., 2018) [21]. Users with health consciousness are more willing to engage in activities beneficial to their health, thus developing a positive attitude towards fitness live streaming. Studies have shown a positive correlation between health consciousness and fitness applications (Damberg, 2022) [1]. Debarun Chakraborty et al. considered health consciousness as an independent variable within the S-O-B-C model when studying user purchasing behavior regarding fitness applications [22]. Therefore, this study considers health consciousness as an independent variable to investigate the relationship between health consciousness and user participation.

Therefore, having health consciousness leads to the formation of social attachment based on the conditions of health consciousness and individual participation in specific groups. This acceptance of one's belongingness to the group reflects an identity-based attachment. Thus, individuals with health consciousness tend to develop emotional attachment to the fitness community. Therefore, we hypothesize:

- **H1:** Health consciousness has a significant positive impact on emotional attachment.

3.2. The Influence of Streamers Characteristics on Emotional Attachment

3.2.1. Attractiveness

Gronroos (2000) [23] regarded personal attractiveness as a direct source for others to assess an individual's credibility or capability. Sakib et al (2020) [24], through social psychology research, emphasized the significance of personal attractiveness. Their study indicated that in the context of information dissemination, the attractiveness of a spokesperson can either positively or negatively influence the persuasiveness of the information.

In Chen X's study (2023) [25] investigating the driving mechanisms of impulse

purchasing behavior influenced by e-commerce livestream streamers' characteristics, it was found that the attractiveness of the streamers significantly and positively affects consumers' feelings of pleasure. Therefore, the streamers' attractiveness can enhance users' emotional experience while watching the livestream, thereby influencing emotional attachment. Hence, we propose the following hypothesis:

- **H2:** Attractiveness has a significant positive impact on emotional attachment.

3.2.2. Professionalism

The professional explanations and effective assessments provided by fitness streamers during live streaming increase users' interest and engagement in watching the live broadcasts. Therefore, the stronger the professionalism of the fitness knowledge of the streamers, the more professional information the users will acquire, which contributes to enhancing the users' experience, pleasure, and focus while watching the live broadcasts (Eroglu S A et al., 2001) [26]. On a deeper level, there is often an innate desire for knowledge in unknown domains within individuals. The professional explanations provided by fitness streamers deeply captivate users, immersing them into specific scenarios and eliciting positive engagement experiences.

Professional streamers can provide resources to meet users' needs. Satisfied users will experience strong emotions on the platform, further influencing the emergence of attachment behavior (Thomson, 2005) [27]. Therefore, we hypothesize:

- **H3:** Professionalism has a significant positive impact on emotional attachment.

3.2.3. Interactivity

The social interactivity theory refers to the interactive relationships or processes among individuals, used to predict interaction behaviors in different social contexts (Varey, 2008) [28]. Live streaming creates a highly interactive communication environment where streamers can instantly grasp the current situation through barrage messages and provide timely feedback to the audience. At the same time, viewers can also share their perspectives with other participants (Xue et al., 2020) [29]. This interactive mode encourages users to focus their attention on the streamers. Therefore, this study adopts interactivity to investigate user engagement in fitness live streaming.

In 2006, scholars like Park pointed out that during interactions, if the target object can meet individual needs and establish a connection with the individual, a unique emotional bond is formed between them, known as emotional attachment. When users have extensive participation and communication with others, they are more likely to derive enjoyment and a sense of happiness from interaction, thereby increasing attachment (Quiroz & Mickelson, 2021) [30]. Therefore, we hypothesize:

- **H4:** Interaction has a significant positive impact on emotional attachment.

3.3. The Influence of Live Content on Emotional Attachment

Confirmed usefulness and confirmed ease of use evolved from the factors of the ECM-ISC model, originally proposed by Oliver (1980) [31], serving as the theoretical foundation for studying consumer repurchase intentions. This model posits that an individual's usefulness and ease of use are influenced by the extent of their expectation

confirmation. Zhang et al [32]. suggested that users' genuine experiences and perceptions could be a determining factor. Therefore, they introduced two new constructs: confirmation of usefulness and confirmation of ease of use, serving as the primary factors for hypothesis construction. Therefore, this study posits that confirmed usefulness and confirmed ease of use will influence user engagement.

Zhang et al. [32] demonstrated that confirmed usefulness and confirmed ease of use are positively correlated with user satisfaction. Additionally, Dong-Hee Cho et al. [33] incorporated emotional attachment as a factor influencing emotions into theories of user satisfaction and research related to continued usage. They confirmed that emotional attachment also serves as a mediator between user satisfaction and continued usage. Therefore, we hypothesize:

- **H5:** Confirmed usefulness has a significant positive impact on emotional attachment.
- **H6:** Confirmed Ease of use has a significant positive impact on emotional attachment.

3.4. The Impact of Emotional Attachment on User Engagement

In the short video live streaming domain, Stever (2011) [34] proposed that fans' attachment to celebrities can shorten the distance between them. This research finding is equally applicable in the context of fitness live streaming. When users develop emotional attachment to the streamers, they will actively follow the streamers' updates and consequently engage in participation. Therefore, it is hypothesized:

- **H7:** Emotional attachment has a significant positive impact on user participation.

4. Data and Methods

4.1. Questionnaire Design

The questionnaire designed for this study comprises two parts: the first part consists of screening items, with the screening criterion being whether the TikTok platform is used to watch fitness live streams. Only users who meet the above criteria are allowed to proceed with filling out the survey. The second part comprises the main section of the questionnaire, including health consciousness, attractiveness, professionalism, interactivity, confirmed usefulness, confirmed ease of use, emotional attachment, and user participation. The health consciousness items were adapted from Svenja Damberg et al. [1] The attractiveness and professionalism items were adapted from Ohanian and Zheng et al. [35][36] The interactivity items were adapted from Zheng et al. [36] The confirmed usefulness items were adapted from Zhang et al. [37] The confirmed ease of use items were adapted from Zhang and Yao et al. [37][38] Emotional attachment is measured by six items adapted from Y. Li, and Guo et al. [12][39] User participation is measured by three items adapted from Gu et al. [8] All measurement items are assessed using a 5-point Likert scale, where 1 indicates strongly disagree and 5 indicates strongly agree.

The questionnaire for this study was created by the domestic online survey

company "Questionnaire Star" In order to mitigate common method biases (CMV), respondents were informed prior to filling it out that their participation was voluntary, anonymous, and solely intended for academic research purposes. As a result, respondents are not required to speculate about the expectations of the surveyor but can respond based on their own reality. The survey questionnaire is restricted to one submission per IP address.

4.2. Samples and data collection

Before the formal distribution of the questionnaire, experts in the relevant field were invited to participate in semi-structured interviews to adjust statements or questions with ambiguity and ultimately finalize the research questionnaire for this paper. In September 2023, 905 original questionnaires were randomly distributed for this study. Seventy-eight questionnaires were excluded, as the respondents reported never having watched fitness live streams on TikTok. The main reasons for not watching TikTok fitness live streams were: not liking to exercise through live streaming (76.92%), the fitness streamers on TikTok not being appealing (75.64%), and perceived low practicality of fitness live streams (56.41%). Based on this, questionnaires were further screened due to excessively short response times, missing values, and cases where the responses to the main variables were identical. As a result, a total of 749 valid questionnaires were obtained. Finally, data analysis was conducted on the 749 valid questionnaires. The demographic information of the sample is presented in Table 1.

The sample exhibits gender balance, with males comprising 44.32% and females comprising 55.68%. The majority of the sample falls within the age range of 19-30 years (56.21%), indicating a higher proportion of younger participants. Considering that a significant portion of the respondents in the sample have prior fitness experience (80.91%) and have watched fitness live streams similar to those of Genghong Liu on the TikTok app (94.93%), it is deemed suitable for this study.

Table 1. Demographic Characteristics of the Dataset

Project	Type	Frequency	%
Gender	Male	332	44.32
	Female	417	55.68
Age	<18	94	12.55
	19-30	421	56.21
	31-50	175	23.36
	>51	59	7.88
Have you had any fitness experience?	Yes	606	80.91
	No	143	19.09
Have you watched fitness livestreams on TikTok?	Yes	749	100.00
	No	0	0
Have you watched fitness livestreams similar to those of Genghong Liu on TikTok?	Yes	711	94.93
	No	38	5.07

5. Results and Discussion

In this study, we utilized IBM SPSS Statistics 25.0 software to analyze the reliability of the measurement model and calculate Cronbach's Alpha values. Additionally, we used SPSSAU to measure and analyze the correlations and mediating effects within the model. Hypotheses were also tested using these tools.

5.1. Descriptive Statistics and Reliability Tests

From the data in Table 2, it can be observed that the absolute values of skewness are less than 1, the absolute values of kurtosis are less than 7, and Cronbach's Alpha values range from 0.751 to 0.865. These results indicate that the reliability of each variable and Cronbach's Alpha values are acceptable.

Table 2. Descriptive Statistics and Reliability Tests

		Minimum Value	Maximum Value	Average Value	Standard Deviation	Skewness	Kurtosis	Cronbach's Alpha
Health Consciousness	Health Consciousness1	1	5	3.99	.982	-.724	.017	.850
	Health Consciousness2	1	5	3.84	1.129	-.757	-.190	
	Health Consciousness3	1	5	3.79	1.129	-.701	-.299	
Streamers Characteristics	Attractiveness1	1	5	3.83	1.008	-.583	-.173	.794
	Attractiveness2	1	5	3.75	1.034	-.559	-.177	
	Attractiveness3	1	5	3.81	1.036	-.743	.158	
	Professionalism1	1	5	3.84	1.007	-.745	.234	.802
	Professionalism2	1	5	3.79	1.015	-.629	.022	
	Professionalism3	2	5	3.73	1.037	-.591	-.092	
	Interactivity1	1	5	3.81	1.042	-.722	.096	.841
	Interactivity2	1	5	3.76	1.020	-.585	-.187	
	Interactivity3	1	5	3.73	1.039	-.584	-.135	
	Interactivity4	1	5	3.73	1.061	-.581	-.233	
Live Content	Confirmed usefulness1	1	5	3.72	1.085	-.671	-.081	.751
	Confirmed usefulness2	1	5	3.76	1.004	-.544	-.107	
	Confirmed usefulness3	1	5	3.80	1.055	-.758	.074	
	Confirmed ease of use1	1	5	3.77	1.041	-.663	.010	.794
	Confirmed ease of use2	1	5	3.83	.990	-.624	-.022	
	Confirmed ease of use3	1	5	3.83	1.040	-.685	-.070	
Emotional Attachment	Emotional Attachment1	1	5	3.73	1.071	-.568	-.270	.865
	Emotional Attachment2	1	5	3.67	1.073	-.529	-.274	
	Emotional Attachment3	1	5	3.79	1.015	-.668	.068	
	Emotional Attachment4	1	5	3.72	1.071	-.578	-.247	
	Emotional Attachment5	1	5	3.75	1.044	-.651	-.011	
	Emotional Attachment6	1	5	3.75	1.078	-.637	-.183	
User Participation	User Participation1	1	5	3.75	1.045	-.563	-.205	.813
	User Participation2	1	5	3.72	1.109	-.641	-.222	
	User Participation3	1	5	3.77	1.022	-.608	-.053	

5.2. Correlation Analysis

From Table 3, it can be observed that correlation analysis was conducted to explore the relationships between health consciousness, attractiveness, professionalism, interactivity, confirmed usefulness, confirmed ease of use, emotional attachment, and user participation, represented by Pearson correlation coefficients indicating the strength of these relationships. Specifically, the analysis is as follows: Health consciousness and emotional attachment both exhibited significance, with a correlation coefficient of 0.690, indicating a positive correlation between health consciousness and emotional attachment. Attractiveness and emotional attachment also showed significance, with a correlation coefficient of 0.792, suggesting a positive correlation between attractiveness and emotional attachment. Professionalism and emotional attachment exhibited significance with a correlation coefficient of 0.803, indicating a positive correlation between professionalism and emotional attachment. Similarly, interactivity and emotional attachment were also significant, with a correlation coefficient of 0.809, signifying a positive correlation between interactivity and emotional attachment. Confirmed usefulness and emotional attachment also demonstrated significance, with a correlation coefficient of 0.792, indicating a positive correlation between confirmed usefulness and emotional attachment. Likewise, confirmed ease of use and emotional attachment were significant, with a correlation coefficient of 0.794, suggesting a positive correlation between confirmed ease of use and emotional attachment. Emotional attachment and user participation exhibited a significant positive correlation with a correlation coefficient of 0.820, indicating a positive relationship between emotional attachment and user participation.

Table 3. Correlation Matrix

	Health Consciousness	**Attractiveness**	**Professionalism**	**Interactivity**	**Confirmed usefulness**	**Confirmed ease of use**	**Emotional Attachment**	**User Participation**
Health Consciousness	1							
Attractiveness	.666**	1						
Professionalism	.715**	.767**	1					
Interactivity	.666**	.754**	.789**	1				
Confirmed usefulness	.637**	.738**	.756**	.762**	1			
Confirmed ease of use	.669**	.760**	.763**	.772**	.770**	1		
Emotional Attachment	.690**	.792**	.803**	.809**	.792**	.794**	1	
User Participation	.612**	.709**	.738**	.746**	.741**	.747**	.820**	1

5.3. Path Analysis and Hypothesis Testing

After constructing the model, structural equation modeling (SEM) was employed to examine the relationships among variables in the model. This analysis was conducted to verify the hypotheses proposed in this study, considering the significance level. From Table 4, it can be observed that health consciousness has a significant positive impact on emotional attachment, with a beta coefficient of 0.595 and $p < 0.001$. Thus, hypothesis H1 is supported. Attraction has a significant positive impact on emotional attachment, with a beta coefficient of 0.751 and $p < 0.001$. Therefore, hypothesis H2 is supported. Professionalism significantly and positively influences emotional attachment, with a beta coefficient of 0.762 and $p < 0.001$. Thus, hypothesis H3 is supported. Interactivity significantly and positively influences emotional attachment, with a beta coefficient of 0.774 and $p < 0.001$. Therefore, hypothesis H4 is supported. Confirmed usefulness significantly and positively influences emotional attachment, with a beta coefficient of 0.757 and $p < 0.001$. Thus, hypothesis H5 is supported. Confirmed ease of use significantly and positively influences emotional attachment, with a beta coefficient of 0.754 and $p < 0.001$. Thus, hypothesis H6 is supported. Emotional attachment significantly and positively influences user participation, with a beta coefficient of 0.906 and $p < 0.001$. Thus, hypothesis H7 is supported.

Table 4. Path Coefficients of the Structural Model

Mediating variable	Independent variable	Unstandardized Coefficient		Standardized Coefficient	T-Value	P-Value	R^2
		Beta	Standard Error	Beta			
Emotional Attachment	Health Consciousness	.595	.023	.690	26.034	.000	.476
	Attractiveness	.751	.021	.792	35.414	.000	.627
	Professionalism	.762	.021	.803	36.797	.000	.644
	Interactivity	.774	.021	.809	37.638	.000	.655
	Confirmed usefulness	.757	.021	.792	35.413	.000	.627
	Confirmed ease of use	.754	.021	.794	35.668	.000	.630

Dependent Variable	Independent Variable	Unstandardized Coefficient		Standardized Coefficient	T-Value	P-Value	R^2
		Beta	Standard error	Beta			
User Participation	Emotional attachment	.906	.023	.820	39.152	.000	.672

5.4. Mediation Analysis

To further examine whether the mediating variable (emotional attachment) plays a mediating role between the external variables (health consciousness, attractiveness, professionalism, interactivity, confirmed usefulness, confirmed ease of use) and user participation, the percentile bootstrap method was employed to test the significance of the mediation effects, and the results are presented in Table 5.

Table 5. Mediation Analysis

Item	c Total Effect	a	b	a"b Mediation Effect Value	a*b (Boot SE)	a*b (z-value)	a*b (D-Value)	a*b (95% BootCI)	c Direct Effect	Test Conclusion
Health Consciousness=>Emotional Attachment=>User Participation	0.009	0.059**	0.496**	0.029	0.015	1.941	0.052	0.003 ~ 0.063	-0.020	Complete Mediation
Attractiveness=>Emotional Attachment=>User Participation	0.105**	0.179**	0.496**	0.089	0.018	4.989	0.000	0.050 ~ 0.120	0.016	Complete Mediation
Professionalism=>Emotional Attachment=>User Participation	0.179**	0.163**	0.496**	0.081	0.020	4.124	0.000	0.039 ~ 0.116	0.098*	Partial Mediation
Interactivity=>Emotional Attachment=>User Participation	0.211**	0.209**	0.496**	0.103	0.019	5.403	0.000	0.062 ~ 0.139	0.108**	Partial Mediation
Confirmed usefulness=>Emotional Attachment=>User Participation	0.225**	0.182**	0.496**	0.090	0.018	4.965	0.000	0.052 ~ 0.122	0.135**	Partial Mediation
Confirmed ease of use=>Emotional Attachment=>User Participation	0.226**	0.150**	0.496**	0.074	0.016	4.656	0.000	0.040 ~ 0.104	0.152**	Partial Mediation

The mediation effects were tested using the percentile bootstrap method. If the 95% confidence interval includes 0, it indicates no mediation. Conversely, if it does not include 0, it suggests the presence of mediation.

From the table, it can be observed that the path from health consciousness to emotional attachment to user participation (a = 0.059) falls within the 95% confidence interval [0.003-0.063], which does not include 0 (p = 0.052). At the 0.05 significance level, this meets the criteria for complete mediation. Similarly, it can be observed that the path from attractiveness to emotional attachment to user participation (a = 0.179) falls within the 95% confidence interval [0.050-0.120], which does not include 0 (p = 0.000). At the 0.01 significance level, this meets the criteria for complete mediation. The path from professionalism to emotional attachment to user participation (a = 0.163) falls within the 95% confidence interval [0.039-0.116], excluding 0 (p = 0.000). At the 0.01 significance level, this indicates partial mediation. The path from interactivity to emotional attachment to user participation (a = 0.209) falls within the confidence interval [0.062-0.139], excluding 0 (p = 0.000). At the 0.01 significance level, this indicates partial mediation. The path from confirmed usefulness to emotional attachment to user participation (a = 0.182) falls within the confidence interval [0.052-0.122], excluding 0 (p = 0.000). At the 0.01 significance level, this indicates partial mediation. The path from confirmed ease of use to emotional attachment to user

participation (a = 0.150) falls within the confidence interval [0.040-0.104], excluding 0 (p = 0.000). At the 0.01 significance level, this indicates partial mediation.

6. Conclusions and Limitations

6.1. Conclusion

This study conducted an analysis on the mediating effect of emotional attachment and concluded that emotional attachment plays a complete mediating role in the influence of health consciousness and streamers' attractiveness on user participation. Furthermore, emotional attachment acts as a partial mediator in the impact of streamers professionalism and interactivity, as well as the Confirmed usefulness and ease of use of live content on user participation.

Users with health consciousness tend to feel a sense of belonging to the fitness community, forming an identity-based attachment. This study has found a significantly positive impact of health consciousness on emotional attachment. These results align with the definition of attachment nature as proposed by Park et al. (2010). [16] This not only helps enhance the image and influence of the broadcaster but also attracts more users to pay attention to fitness live streams, thereby broadening the channel through which users obtain fitness information and knowledge. By gaining in-depth insights into users' emotional attachment, not only can fitness broadcasters formulate effective promotional strategies and select high-quality broadcasters, but it can also drive the development of fan economy. Moreover, it enhances users' trust in the broadcasters, further strengthening their fitness motivation and active participation in fitness live streams.

Under the influence of the concept of nationwide fitness, fitness live streaming has emerged. Users' demands for fitness vary, leading to increasingly higher expectations for live streaming content. This study quantifies the impact of live streaming content on users' emotional attachment based on the concepts of usefulness confirmation and ease of use confirmation proposed by Zhang et al. (2020). [32] The research demonstrates that usefulness confirmation and ease of use confirmation have a positive and significant impact on emotional attachment. Therefore, the live streaming content of fitness broadcasts needs to directly address users' fitness pain points, delivering more useful and user-friendly fitness exercises and concepts.

6.2. Limitations and Future Research Directions

There are certain limitations in the current study. Firstly, this study only examines six factors influencing user participation in TikTok fitness live streams. However, there are other factors in TikTok fitness live streams that may impact user engagement, such as the credibility of fitness streamers, communication style, or popularity. Future research will delve deeper into investigating these aspects. Secondly, fitness live streaming is more popular in China at the moment, so data was collected only from Chinese TikTok users. Therefore, the findings of this study may not be generalizable to other cultural backgrounds. Future research might focus on Asian contexts, such as South Korea and Japan. Hence, the effectiveness of the model in this study could be enhanced by collecting data from users in different countries. Thirdly, users' behavioral intentions do not always translate into actual actions. Therefore, future research could further explore

factors influencing users' actual engagement behaviors. Fourthly, the sample size and representativeness are relatively small. The sample is primarily concentrated among highly educated college and young students, with fewer participants from other demographics. The reasons are as follows: (1) Fitness live streaming is a relatively new phenomenon emerging during the pandemic, and younger individuals have more exposure and quicker acceptance; (2) Younger people are more likely to be exposed to TikTok and the format of fitness live streams. Therefore, while this study has to some extent validated the interplay of different variables, given the dissemination of the national fitness concept and the trend of population aging, attention should be directed toward understanding the perspectives of users across different age groups regarding fitness live streaming. This would broaden the societal significance of the research. Hence, future research will conduct differentiated studies targeting various demographic groups and age ranges to make the study more forward-looking and inclusive.

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