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Innovative Sports Venue Colors and Consumers' Satisfaction Based on Multilevel Data: The Mediating Effect of Athletes' Perceived Emotional Value

Yuyang Hou [1,†], Boze Gou [2,†], Jiaping Liao [2,†], Yujie Zhang [1,†], Qian Huang [1] and Bei Sun [3,*]

[1] Graduate Department, Xi'an Physical Education University, Xi'an 710068, China; yuyanghou2424@163.com (Y.H.); zhangyujiegou@163.com (Y.Z.); huangqian@tea.xaipe.edu.cn (Q.H.)
[2] Academy of Fine Arts, Beijing Institute of Fashion Technology, Beijing 100020, China; gbzart@163.com (B.G.); liao-jia@sohu.com (J.L.)
[3] College of Art and Design, Beijing University of Technology, Beijing 100124, China
* Correspondence: iland2009@126.com
† These authors contributed equally to this work.

Abstract: Currently, sports venues are endowed with the important functions of providing sports venues and facilities to the urban public, watching sports events, publicizing the mass sports culture, etc. An in-depth study of how to enhance the attractiveness of sports venue buildings and the competitiveness of the industry to stimulate the public's potential for sports consumption is necessary. Based on the perspective of color psychology, this study constructs a three-level structural equation model based on the nested data obtained from the questionnaire survey to explore the relationship between managers' innovative sports venue colors, athletes' perceived emotional value, and consumers' sports venue satisfaction. The results show that innovative sports venue colors have a significant positive effect on consumers' satisfaction with sports venues, and the perceived emotional value has a positive mediating role in the effect of innovative sports venue colors on consumers' satisfaction with sports venues. This study aims to provide a basis for sports venue managers or event organizers to improve athlete satisfaction, optimize consumer experience, stimulate residents' motivation to attend games, and strengthen the profitability of the venues.

Keywords: stadium management; color design; color psychology; spectator satisfaction

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1. Introduction

Sports stadiums, with their unique and artistic shapes, often become distinctive landmarks in major cities [1]. The competition and performance industry, the fitness service industry, and other industries carried by stadiums play an important role in perfecting the function of urban sports, realizing citizens' right to sports, and promoting sports consumption [2]. As an important part of urban construction, the design of stadiums not only needs to meet functional requirements but also needs to provide a rich aesthetic experience [3]. As the key element of aesthetic experience, the impact of color design on stadiums is objective, as a reasonable internal color design can not only give athletes a sense of comfort but also give spectators a different experience of watching the game and enhance consumer satisfaction.

The concept of "satisfaction" was first proposed by Cardozo in 1965, and the idea of customer satisfaction, such as "the emotion of customer satisfaction generates the desire to repurchase", has been highly valued in the West since it was first proposed [4]. From a marketing perspective, venue satisfaction reflects consumers' overall assessment of their viewing experience and is directly linked to consumer loyalty and the event's influence. From a consumer value perspective, venue satisfaction in sports events stems from an integrated experience of functional and emotional value. Functional value refers to the fulfillment of basic needs, such as the comfort of the venue, while emotional value manifests

in the emotional resonance between spectators, athletes, and the event atmosphere. Intense competitions and athletes' passionate performances often profoundly shape spectators' emotional experiences. In the research on stadium satisfaction, existing studies examine the quality of stadium services [5], the image of the sporting event [6], the image consistency between the sporting event and its host city [7], the image expression level, such as the perceived image fit, the digital level, such as the digital signage system for offline sporting events [8], the physical attributes, such as the attitude towards safety and security measures [9], the convenience of transportation and catering conditions, and the physical attributes, such as the surrounding area of the stadium. The user satisfaction of sports venues is closely related to the radiation effects, such as the convenience of transportation and catering conditions [10]. However, most of the existing studies focus on the macro level, such as stadium development planning, existing difficulties, and program management. A few studies are based on interdisciplinary research, utilizing theoretical perspectives, such as cultural habitus in sociology and emotional cognition in anthropology, to explain the relationship between visual perception and spectator experience [11]. However, there is no study that investigates the effect of athletes' perceived emotional value on spectators' satisfaction in stadiums from the perspective of color psychology in the form of empirical research.

Color psychology is the study of how color affects human behavior, emotions, or physiological processes [12]. Color affects consumers' purchasing choices and feelings. Different people have different color preferences, but the impact of color on the human psyche is often similar, and the design of color, collocation, and other reasonable adjustments can often give full play to the impact of color on the human psyche and then bring to people the corresponding psychological feelings and emotional experience [13]. Based on a review of existing examples of architectural color effects that can be found, reasonable color matching can not only induce people to form a sense of illusion in space but also inspire the building's fashionable and active sense. For example, in Taiwan, China, the Tucheng Sports Center is designed based on three squares piled up by three squares, with three squares in red, blue, and gray, which have similar color collocation and visually alleviate the heaviness of the composition of the square. Therefore, the use of color spatiality can effectively improve the existing space size defects to give consumers a comfortable feeling [14]. At the same time, the color choice of the stadium's playing field will affect the mood and energy level of the athletes and the spectators. For example, red and other bright colors can stimulate vitality, while blue and green are commonly used to create a calm atmosphere [15]. Therefore, the interior color design of sports venues can also enhance the attractiveness of sports venues, which in turn affects the performance of athletes and the participation of spectators. For example, in the interior color design of the Yuetan Gymnasium, which was used as a professional training hall during the Beijing Winter Olympics, cold tones (e.g., blue) are often used in the design of skill classes, such as gymnastics, diving, and other venues, while warm tones with a stronger energy are often used in hockey, track and field, and other more competitive and more intense competitions.

In summary, in the design of all kinds of buildings, reasonable color matching and design can not only create a good spatial atmosphere for people but also delight the body and mind and produce a good emotional experience, and sports buildings are no exception. But, can the innovative design of the interior color of sports venues affect the psychological perception of athletes and the consumer satisfaction of spectators? To answer the above questions, based on the theory of color psychology, this paper constructs a three-level nested influencing factor model of stadium managers–users–consumers and explores the effects of the innovative design of sports venue interiors on athletes' perceived emotional value and consumers' sports venue consumption satisfaction. This paper not only bridges the gap in the existing research but also aims to provide a theoretical basis for sports event organizers to strengthen the profitability of venues, optimize the perceived emotional value of athletes, and stimulate the motivation of consumers.

2. Literature Review

2.1. Stadium Managers' Interior Color Innovation Design and Athletes' Perceived Emotional Value

Colors have a direct impact on a person's psychological state, emphasizing that feelings of color are subjective and closely linked to emotions. The fundamentals of color psychology include emotional associations, cultural influences, and psychological responses. Colors can evoke specific emotions, such as the fact that red is often associated with passion, anger, or a sense of urgency, while blue conveys calmness and trust. As research continues, the psychology of color has gained widespread use in a variety of fields, including advertising, interior design, art creation, psychotherapy, and education. In advertising and marketing, color can significantly influence consumers' purchasing decisions; in interior design, the choice of different colors can change the atmosphere of a space and the user's emotional experience. In addition, the use of color not only affects emotions but also cognition and behavior. Color differences affect consumer preferences, and through the rational use of color, they can effectively influence consumers' psychological responses and decision making process [12]. Visual stimulation from light and color underpins most sensory interactions individuals have with their environment. Color arises from specific frequencies of concentrated light, and its vibrational properties can exert distinct psychological effects by influencing mental activity, physical performance, and psychosocial well-being [16]. Color plays a significant role for athletes, influencing both training and competition outcomes. In this field of research, much of the focus has been on individual colors or the comparative effects of different colors. For example, studies have shown that colors, such as red and yellow, can effectively enhance training efficiency among athletes [17], and research has pointed out that in the process of performing sports, different floor colors affect athletes' sports performance [18]. On the other hand, there are relatively few studies on the effect of color combinations or the innovative use of colors different from traditional colors. Building on this foundation, this study proposes that the degree of innovation in stadium interiors, as perceived by stadium managers, is reflected in color choices. Specifically, it considers the extent of managerial innovation in designing interiors that deviate from traditional stadium color schemes or that employ novel combinations of various colors.

The perceived emotional value, as a dimension of perceived value, is often defined as the benefit of the feeling or emotional state of a product [19], and, in practice, emotional value is also used as the benefit that an individual obtains by feeling something new or different [20]. The perceived emotional value is the benefit that an individual perceives as the emotional benefit of a thing from a visual aspect. The perceived emotional value is the benefit that an individual perceives that something brings in terms of emotion. In terms of vision, there have been studies that have found that there is a certain relationship between color and emotion; for example, it has been pointed out that people have different emotional associations with colors [21], and people's emotions will change with the saturation and brightness of colors [22]. When athletes meet different colors, they will produce different emotional changes, and the perception of color in this process also affects their emotional feelings, from which is derived the emotional value of color. From an aesthetic point of view, beauty has an important position in individual perception, and its stimulation of individuals' emotions impacts the process [23]; on this basis, the managers of the stadium's interior use colors with a high degree of innovation so that the impact of color from an aesthetic point of view affects the intuitive feeling of athletes' emotional stimulation, which improves their perception of the emotional value color innovativeness can bring. Therefore, based on the above, hypothesis H1 is proposed as follows:

H1: *There is a positive impact of innovative sports venue colors on athletes' perceived emotional value.*

2.2. Athletes' Perceived Emotional Value and Consumers' Sports Venue Satisfaction

Consumer satisfaction is a key concept in marketing, with scholars offering various definitions. Among them, Oliver's widely accepted definition describes consumer satisfaction as a judgment in which consumers assess the degree to which a product's or service's

characteristics, or the product or service itself, meet (or are meeting) their consumption-related expectations [24]. Subsequently, scholars introduced consumer satisfaction into the field of sports consumption, with spectator sports consumption an important part of it, as spectating is one of the most common behaviors of sports consumers, and the satisfaction of watching the game has become an important part of the development of event consumption. Scholars have conducted extensive research on the influencing factors of spectator satisfaction. For example, Van Leeuwen [25] proposed the Sports Spectator Satisfaction Model (SSSM), which includes club identification, the winning or losing phenomenon, and service as important influencing factors, and Trail [26] proposed the Sports Spectator Intentional Loyalty Model (SSILM) through theories of identity and consumer satisfaction, which provides directions and guidelines for exploring consumers' satisfaction and spectators' satisfaction. However, in the actual activity of game watching, consumers are not always satisfied with the game. However, in the actual activity of game watching, consumers' evaluation of the performance of the consumer object, i.e., the athlete or the sports team, is an important influence on consumer satisfaction with game watching. Earlier studies have also pointed out that in the process of game watching, spectators pay special attention to the core service part of the process, i.e., the game itself, and that enjoying the process of watching the game can help to improve consumer satisfaction with the game [27]. There is a direct relationship between athletes' performance and their emotional state [28], as athletes with a higher level of perceived emotional value are more likely to attain positive emotional states that support enhanced performance, thus delivering a satisfying competition experience for the audience. This, in turn, contributes to a more enjoyable viewing experience and a higher level of spectator satisfaction. At the same time, when the athletes or the sports teams show a higher state of competitive level or obtain good sports results, consumers are more likely to identify with the athletes and the sports teams they care about, thus generating team identity and loyalty, making it easier for them to integrate into the process of watching the game and generating a higher degree of satisfaction with the experience of watching the game [29]. In addition, the consumer's satisfaction with watching the game is not only in the visual experience of the intuitive impact, as the emotional connection with the athlete is also one of the important factors affecting the higher level of satisfaction [27]. When an athlete experiences a heightened level of perceived emotional value, this positively influences audience interactions, thus fostering emotional engagement with spectators. When consumers perceive a sense of empathy with the athlete, it creates a valuable opportunity to enhance their connection with both the game and the team. When athletes have a higher level of perceived emotional value, which has a positive effect on audience interaction and emotional interaction, and when consumers perceive an emotional connection with athletes, they will have a higher level of satisfaction with watching the game. Therefore, based on the above, hypothesis H2 is proposed as follows:

H2: *Athletes' perceived emotional value has a positive effect on consumers' viewing satisfaction.*

2.3. Innovative Sports Venue Colors and Consumer Sports Venue Satisfaction

In recent years, the role of sensory experience in consumer judgment and decision making in management and psychology has received extensive attention from scholars, and the concept of sensory marketing has been formed, which is defined as a marketing tool that mobilizes the senses of consumers and influences their perception, judgment, and behavior [30]. Sensory enjoyment is applied to different aspects, including vision, hearing, smell, taste, etc., and this sensory experience is one of the important factors influencing the satisfaction of consumers. This sensory experience is one of the most important factors impacting consumer satisfaction [31], and color is an important part of visual perception. Its stimulation of consumers is also crucial, and there are many companies that through a more scientific and systematic color design achieve a more effective marketing approach [32]. Meanwhile, in the field of marketing, studies have shown that the innovative use of color

by influencers to attract consumers to spend money has a positive impact on the consumer experience and satisfaction [33]. As people's interest in sports increases, sports enthusiasts are becoming an important group of consumers, and managers in the sports industry are using marketing strategies to try to increase consumer spending on sports, such as purchasing tickets to sporting events. Aesthetic factors have been shown to have a positive impact on consumer participation in sports consumption in existing studies [34], such as the environment, color, and light, which have a positive correlation with the consumption behavior of sports consumers [35]. Research on sensory factors related to stadium consumer satisfaction found that the visual includes the important influence of the stadium's color and design [36,37]. The sensory experience is an important determinant of consumer satisfaction, as a more positive sensory experience provides the consumer with greater satisfaction with their stadium viewing experience [3]. When stadium managers make full use of this sensory experience, provide consumers with a higher level of interior color innovation, and break the traditional color scheme of the original stadium, the new visual impact will provide consumers with a higher level of visual sensory satisfaction, which will improve their satisfaction level of the stadium game. Therefore, based on the above, the proposed hypotheses H3 and H4 are as follows (the final model is shown in Figure 1):

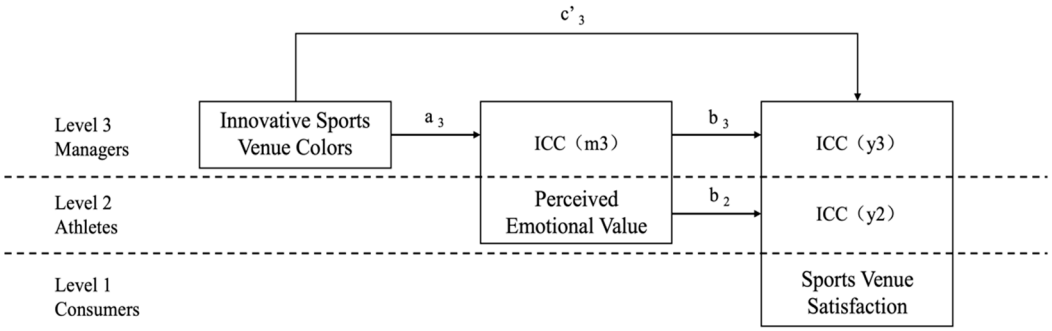

Figure 1. Three-tier hypothetical model diagram.

H3: *Innovative sports venue colors have a positive impact on consumer sports venue satisfaction.*

H4: *The perceived emotional value of athletes mediates the relationship between innovative sports venue colors and consumer sports venue satisfaction.*

3. Study Design

3.1. Data Collection

This paper mainly adopts the questionnaire collection method of field research. Stratified sampling was performed in different stadiums in Beijing, Dongguan, Shenyang, and Urumqi, China because these four places are the cities where the home venues of the four strongest teams in China's CBA League are located and because the CBA League has a strong influence on China's sports leagues and a large fan base. As such, the atmosphere of watching matches in these four places is strong. In total, 11 managers, corresponding to 31 athletes, as well as fans and spectators of athletes were selected as subjects. This paper follows a strict understanding of "affiliation" based on the characteristics of the study population in order to ensure the nested nature of the data. Before completing the questionnaire, each subject was provided with the opportunity to observe eight pictures, as shown in Figure 2 (where A and B are the original interior color designs presented by two different venues and the rest (A1–A3,B1–B3) are renderings of the venue interiors after different color innovations were made to the venues' interiors). This process was designed to provide subjects with a more intuitive understanding of the color innovation designs and to further assist in the variable measurements. In conclusion, a total of 565 questionnaires were recovered, excluding 11 invalid questionnaires, resulting in a total of 554 valid samples, with a validity rate of questionnaire recovery of 98.1%. The specific demographic

distribution of the sample is shown in Table 1. At the gender level, the proportion of this survey is more balanced, as women accounted for 51.8% and men accounted for 48.2%; at the age level, the distribution is also more balanced, as the number of survey respondents aged 26–35 years old is relatively higher, accounting for 34.1%.

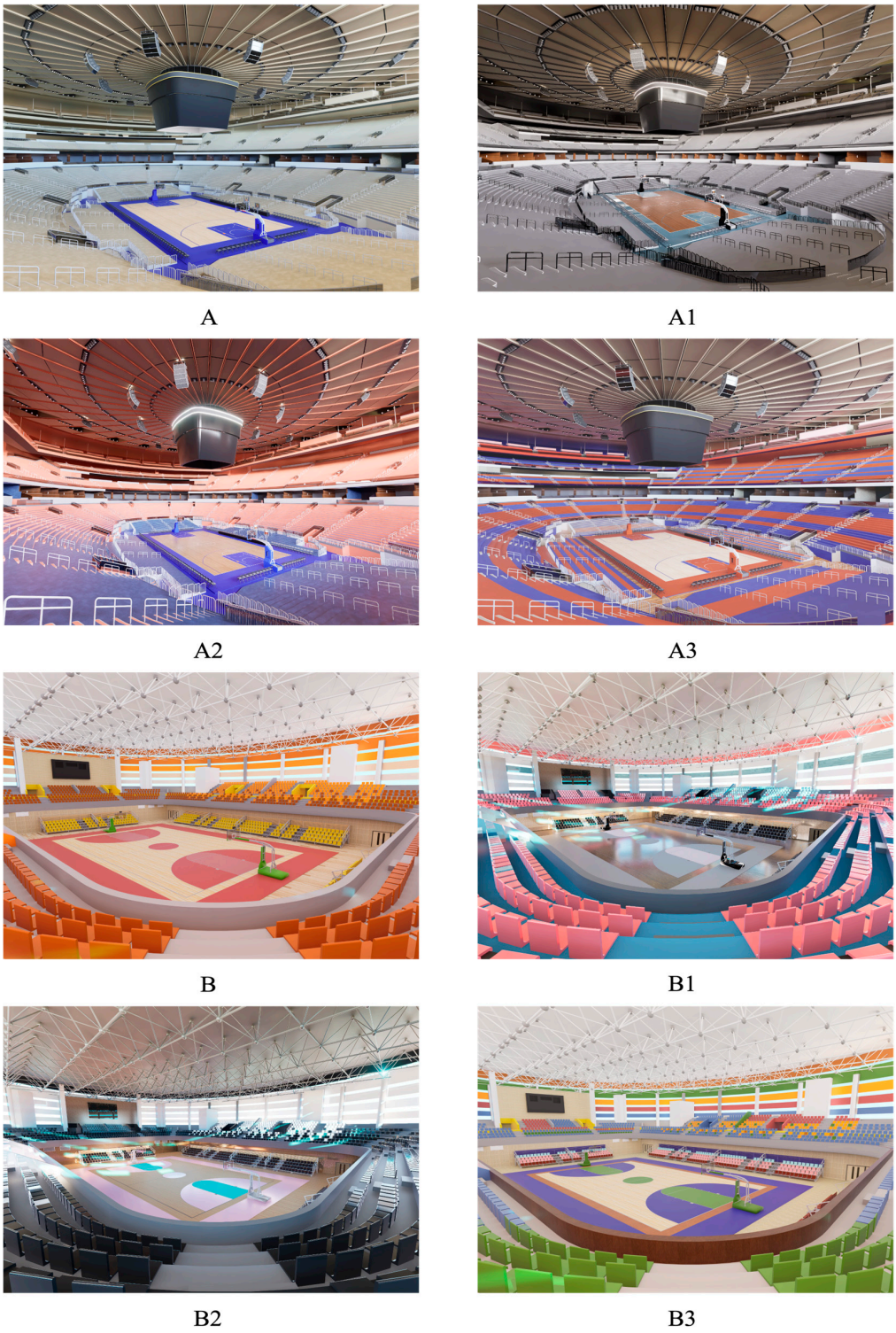

Figure 2. Interior design renderings.

Table 1. Descriptive statistics.

Demographic Variables	Categorization	Frequency	Percentage
sex	female	287	51.8
	male	267	48.2
age	18~25	183	33
	26~35	189	34.1
	35~45	182	32.9
visual discomfort due to color design	ever	143	25.8
	never	411	74.2
the importance of color decoration (managers)	important	7	63.6
	general	4	36.4
change of scene color focus (athletes)	strong	21	67.7
	general	10	32.3

3.2. Measurement of Variables

In the current academic research, although there are studies around the relationship between architectural color design and consumer scenarios, by and large they are all based on experimental analysis methods, and there is less research on and development of specific scales to measure color innovation. However, the current research has scholars concerned about developing measurements for architectural design innovation, the innovative design of buildings' interior spaces, product packaging color innovation, and other variables. On this basis, this paper draws on the research scale of Rogers et al. [38,39] for the measurement of the color innovation design of stadium interiors and modifies it appropriately according to the characteristics of the core research object of this paper, e.g., managing long-term perspectives and cost trade-offs, excluding all intervening topics and focusing on the necessity, feasibility, and perceived value of innovative color combinations in stadium interiors. Finally, this paper forms a 6-item scale for the color innovation design of stadium interiors, such as "I think it is necessary to carry out appropriate innovation for the interior color of stadiums (such as venues, facilities, spectator seating, etc.)". The Cronbach's alpha coefficient = 0.805 > 0.7. This paper draws on the previous studies of Vongvit et al. [40] and Shen et al. [41] regarding the perceived emotional value, as the perceived emotional value also frequently appears as one of the dimensions of measurement of perceived value in specific empirical papers, with a focus on the positive emotional impact on individuals. Because the focus of this paper is on the athletes, the perceived emotional value part of this paper is also focused on the athletes. As the focus of the perceived emotional value in this paper is on the athletes, this paper makes some adaptive modifications to the scale contents of the previous scholars to achieve the matching effect, and it finally forms a 5-item scale for perceived emotional value in this study. For example, "The interior of the stadiums, the sports facilities, the lighting of the venues, and the color of the staff's clothes will have a certain influence on my". The Cronbach's alpha coefficient = 0.903 > 0.7. The measurement of sports venue satisfaction in this paper draws on the mature scales of Truong et al. [42], Yoon et al. [43], and Biscaia et al. [44], and the corresponding nomenclature modification is based on these scales. Finally, a 5-item scale was designed to measure consumers' sports venue satisfaction, such as "I am satisfied with my decision to watch the event live in the stadium", and the Cronbach's alpha coefficient = 0.901 > 0.7 was tested, so the scales have high reliability and meet the requirements of the study. The detailed questionnaire items are shown in Appendix A.

3.3. Variable Distribution and Correlation Analysis

The variables of main concern in this paper are all borrowed from well-established measurement tools in domestic and international studies, and the specific questionnaire is based on the Likert 5-point scale. From the overall mean values of the variables, the samples' evaluation of the innovative design of venue interiors and colors (ISVC), the perceived emotional value (PEV), and satisfaction with viewing the games at the venues (SVS) are all

at a moderately high level. In this paper, all of the measurements are continuous variables, and Pearson's method was used to analyze the correlation between ISVC, PEV, and SVS. To determine whether there is a significant correlation between the variables, we determined whether the probability of significance value is greater than 0.05. We determined the degree of correlation between the two variables based on the absolute value of the correlation coefficient, where $|r| < 0.4$ is low correlation, $0.4 < |r| < 0.7$ is medium correlation, and $|r| > 0.7$ is high correlation. The results of the correlation analysis show that there is a significant moderate positive correlation between the two variables in this paper (Table 2).

Table 2. Correlation between variables.

	MEAN	SD	ISVC	PEV	SVS
ISVC	3.698	0.802	1		
PEV	3.676	0.982	0.586 **	1	
SVS	3.611	0.987	0.546 **	0.448 **	1

Note: ** $p < 0.01$; ISVC: innovative sports venue colors; PEV: perceived emotional value; SVS: sports venue satisfaction; the same applies below.

4. Findings

4.1. Validity Analysis

Validity indicates the accuracy of the questionnaire and reflects the extent to which the results of the research are consistent with the expected assumptions. Exploratory factor analysis was performed on the measurement items with a KMO value of 0.920, a Bartlett's spherical test chi-square value of 4975.601, and a probability of significance of 0.000, which indicates that it is suitable for exploratory factor analysis. The factors were extracted using principal component analysis, and factor rotation was performed using the varimax method. The dimensional attribution of the items matched the settings in the questionnaire, and the factor loadings of all of the items were greater than 0.5. Therefore, the questionnaire used in this paper has good structural validity. Validation factor analysis is mainly used to test the relationship between the hypothesized observed variables and the hypothesized latent variables, which is an antecedent step or infrastructure for conducting an integrative structural equation analysis, and it is also the basis for conducting reliability and validity tests with the indicator variables. In this paper, Mplus 8.3 software was used to conduct the validation factor analysis of the measurement model separately, and, based on the results of the factor analysis, the combined reliability, convergent validity, and discriminant validity were analyzed.

The results of the validation factor analysis constructed in this paper were checked for fit using the fit indicators in Table 3. The model fit coefficient was chi-square/df = 4.108, RMSEA = 0.075, CFI = 0.936, TLI = 0.924, SRMR = 0.045, and the fit indices in the model are all within the standard range, with a satisfactory fit.

Table 3. Fitting indicators.

Norm	Standard Value	Model Output Values	Fitness Judgement
Chi-square/df	1 to 5	4.108	reasonableness
RMSEA	<0.05	0.075	reasonableness
CFI	>0.90	0.936	reasonableness
TLI	>0.91	0.924	reasonableness
SRMR	<0.08	0.045	reasonableness

Further calculations based on the factor loadings of the validated factor analysis yielded average extracted variance values (AVE) of 0.414, 0.660, and 0.647 for ISVC, PEV, and SVS, respectively, all of which are greater than the acceptable criterion of 0.36, thus indicating that the questionnaires used in this paper have good convergent validity. Meanwhile, the combined reliability values (CR) of ISVC, PEV, and SVS are 0.809, 0.906, and

0.901, respectively, all of which are greater than the criterion of 0.7, thus also indicating that the questionnaire used in this paper has good combined reliability.

In addition, the AVE square roots and the correlation coefficients between the variables are shown in Table 4, with the numbers on the diagonal lines being the AVE square roots of each variable. The AVE square root of each variable is greater than the correlation coefficients of each variable with other variables. Therefore, the questionnaire used in this paper has good discriminant validity. In conclusion, the formal questionnaires for the variables used in this study have good reliability and validity, and the data from the 554 samples measured are suitable for use in empirical analysis.

Table 4. AVE square roots and correlation coefficients between variables.

	ISVC	PEV	SVS
ISVC	0.643		
PEV	0.586 **	0.812	
SVS	0.546 **	0.448 **	0.804

Note: ** $p < 0.01$.

4.2. Empirical Analysis

4.2.1. Overview of Multilayer Linear Models

When processing data to construct a model, the sample data often do not come from the same stratum but across strata. If the data from multiple levels are put into the same model for analysis at this time, the difference between different levels is likely to cause great interference with the research results. The multilevel linear model can distinguish the sample data levels, and the problem of data across levels is solved through reasonable processing. The data in this paper are different from the common multilevel linear model, and the data come from three levels: administrators, athletes, and the fan audience. As such, it is necessary to fit a multilevel linear model with three levels. Multi-level linear models can be analyzed using many types of software, among which Mplus software has advantages in testing the cross-level mediation effect, and this paper needs to verify the mediation effect in the three-level linear model, so Mplus 8.3 was chosen for the analysis.

4.2.2. Zero Model

A null model is one in which no independent variables are considered in the model, only the dependent variable, i.e., ANOVA. The intra-class correlation (ICC) is a measure of how much of the overall variation in the dependent variable of the overall model is due to differences in the second or third level, so the ICC is often used to measure whether it is possible to construct a multi-level linear model. In this paper, the ICC of the second layer is 0.074, indicating that 7.4% of the effect comes from the second layer of athlete factors, and the ICC of the third layer is 0.141, indicating that 14.1% of the effect comes from the third layer of managerial factors, both of which are greater than the critical value of 0.059, which indicates that the model is suitable for three-layer linear models and that it is possible to construct and analyze multilayer linear models.

4.2.3. Hypothesis Testing

After controlling for basic variables, including demographics and color views at each of the three levels, this paper establishes a three-level linear model to validate the relationships among the variables in the hypotheses. Specifically, the control variables CAGE, CSEX, and C1 (Do you experience visual discomfort caused by architectural color design?) from fan audiences are introduced at the first level (level 1), and C2 (Do you experience visual discomfort caused by color design in buildings?) and C2 (Do you pay attention to the color design of the interior and exterior of the stadium?) at the second level (level 2) introduce the control variable A1 (Do you think that specific colors have unlucky meanings?) from athletes and the mediator variable PEV, while the third level (level 3) introduces the control variable L1 from management (Do you have experience in

interior design or decoration fitting?) and the independent variable ISVC. The results of the model are shown in the table below. ISVC significantly and positively affects PEV (β = 921, SE = 0.177, $p < 0.001$), PEV significantly and positively affects SVS (β = 0.575, SE = 0.202, $p < 0.01$), and ISVC significantly and positively affects SVS (β = 0.994, SE = 0.041, $p < 0.001$). Therefore, the hypotheses H1, H2, and H3 in the earlier part of this paper were all verified (see Table 5 for details).

Table 5. Table of model results.

	PEV		**SVS**	
	Estimate	**SE**	**Estimate**	**SE**
fixed effect				
level1				
CAGE	−0.048	0.134	−0.096	0.051
CSEX	0.094 **	0.034	0.119 *	0.049
C1	0.014	0.037	0.132 ***	0.033
C2	0.03	0.048	−0.095 **	0.035
level2				
A1	0.403 **	0.126	0.536 **	0.205
PEV			0.575 **	0.202
level3				
L1	0.152	0.156	0.103	0.084
ISVC	0.921 ***	0.177	0.994 ***	0.041
stochastic effect				
level1	0.412		0.74	
level2	0.141		0.007	
level3	0.069		0.002	
model evaluation				
AIC	3507.155			
BIC	3632.353			
Deviance	3331.536			

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Based on the verification that the path is valid, the mediating effect of PEV in the relationship between ISVC and SVS is further tested. The results of the mediation effect are shown in the table below; the amount of the mediation effect is 0.348, the lower limit of the 95% confidence interval is 0.726, and the upper limit is 0.901. The 95% confidence interval of the mediation effect does not contain 0, so the mediation effect is established (Table 6).

Table 6. Intermediary test table.

Trails	**Effect**	**Efficiency Value**	**SE**	**95% CI**	
ISVC→PEV→SVS	direct effect	0.813	0.045	0.057	0.64
	indirect effect	0.348	0.149	0.726	0.901
	aggregate effect	1.161	0.176	0.817	1.506

5. Analysis and Discussion

5.1. Innovative Sports Venue Colors Have a Positive Impact on Athletes' Perceived Emotional Value

Recent research has increasingly emphasized the psychological and behavioral implications of color design in stadium interiors. Traditionally, stadium colors were considered primarily for the visual enjoyment of spectators and brand recognition. However, as research advances, growing evidence shows that color choices affect not only the visual experience of audiences but also significantly influence the psychological states, emotions, and performance of athletes. The degree of innovation in stadium interior colors has thus emerged as a critical factor shaping athletes' psychological and emotional responses. In this process, decision makers and managers play an essential role; their perception of

color innovation directly impacts the final design choices. Stadium managers often aim to create a contemporary, motivating environment that encourages peak performance through innovative color design. Here, color innovation is no longer viewed merely as an aesthetic choice but as a strategic tool for eliciting positive psychological effects in athletes. By fostering positive emotions and enhancing self-confidence, innovative color design may create an inspiring environment that improves athletes' performance.

Stadium management's psychological approach to color innovation is multi-dimensional, encompassing brand differentiation and competitive positioning alongside concerns for athletes' psychological well-being and emotional regulation. These perspectives drive managers to pursue innovative color designs that indirectly enhance athletes' emotional value and performance by shaping their environment. First, stadium managers typically recognize that color serves not only as decoration but also as an essential means of conveying brand values, cultural depth, and psychological cues. Through innovative color choices, managers seek to create stadiums that are both modern and visually compelling while fostering an atmosphere that inspires athletic potential. Consequently, they often select unconventional color schemes with unique symbolic meanings to build a distinctive athletic environment. This color innovation is perceived as a strategic investment aimed at indirectly enhancing athletes' psychological state and performance by positively shaping the environment.

Second, management's perspective of color innovation is also driven by competitive considerations. In today's highly commercialized sports industry, stadiums function as both competition venues and branding platforms for clubs and events. Through innovative color schemes, managers aim to distinguish their stadiums within a competitive market by establishing a unique brand identity. Color innovation not only attracts spectators and sponsors but also reinforces athletes' sense of belonging and pride by creating an energetic, vibrant setting that promotes better game performance. Furthermore, advances in sports psychology have heightened awareness that environmental factors subtly impact athletes' emotions and performance. Innovative color choices provide effective tools for mood regulation; warm tones like orange and red are thought to stimulate energy and competitiveness, while cool tones like blue and green are believed to support calmness and focus. Stadium managers, therefore, consider these psychological effects in their color decisions by strategically employing color innovation to optimize athletes' mental states.

5.2. Positive Impact of Athletes' Perceived Emotional Value on Consumers' Satisfaction with Watching the Game

This study reveals that athletes' perceived emotional value has a direct and positive impact on consumer viewing satisfaction, diverging from much of the current literature that predominantly emphasizes game intensity, outcome uncertainty, and athletes' skill as the primary enhancers of spectator experience. Existing research often explores how spectators' expectations of victory or fear of defeat shape their viewing satisfaction, focusing mainly on spectators' psychological reactions rather than the indirect influence of athletes' emotional states on audiences [45]. In contrast, this study centers on athletes' perceived emotional value, examining how this perception affects spectators' emotional responses through psychological mechanisms. By shifting attention from athletes' direct performance to the indirect effects of their emotional states, this study offers new perspectives and contributes to a more comprehensive understanding of the factors that drive spectator satisfaction.

In sporting events, athletes' emotional states and on-field performance profoundly impact the viewing experience, extending beyond game outcomes. Positive emotional states athletes experience during competition significantly influences their body language, in-game interactions, and the overall event atmosphere. Psychological studies show that emotional states directly impact cognition, behavior, and social dynamics. For athletes, positive emotional perceptions, such as heightened self-efficacy and focus, enhance performance and increase their appeal and contagion. According to social cognitive theory, spectators often develop emotional empathy by observing athletes' emotional states and

behaviors during sports events. This empathy fosters spectators' sense of commitment and excitement, thereby enriching the viewing experience [46]. Observing athletes who are visibly confident and fully engaged in the game elicits similar positive emotions in spectators, subsequently enhancing their satisfaction with the event. Emotional Contagion Theory (ECT) further posits that emotions can be transferred between individuals through observation and social interaction. In sports settings, athletes' positive emotions not only inspire teammates but also transmit to spectators through visual and auditory cues [47]. This emotional contagion effect allows spectators to experience the intensity and excitement of the game more deeply, thus heightening their satisfaction. When athletes demonstrate strong determination and fighting spirit, spectators also feel this emotional transfer, reinforcing their engagement with the game.

Spectator satisfaction, however, is a multifaceted psychological construct influenced by various factors, such as game intensity, event organization quality, and personal expectations. Nonetheless, an athlete's performance and emotional state often serve as pivotal factors in shaping spectator satisfaction. When athletes perform well and exhibit positive emotions, spectators are more likely to perceive the event as entertaining and engaging, and this positive experience translates into higher satisfaction. According to experience economy theory, the emotional experience that consumers undergo during the consumption process plays a crucial role in shaping their satisfaction. In the context of emotionally charged events, such as sports competitions, spectators' emotional experiences are particularly impactful [48]. Athletes' perceived emotional value amplifies spectators' emotional involvement by intensifying the performance and contributing to a more thrilling and intense game atmosphere. This enriched emotional experience ultimately leads to elevated spectator satisfaction.

Recognizing the positive effect of athletes' perceived emotional value on consumer satisfaction holds strategic importance for event managers and marketers. Event organizers could enhance spectator satisfaction indirectly by focusing on athletes' emotional management and psychological training to amplify their perceived emotional value during games. Furthermore, marketing strategies could highlight athletes' positive emotional expressions to foster spectators' emotional resonance, thereby enhancing the event's market appeal.

5.3. Positive Impact of Innovative Sports Venue Colors on Consumers' Satisfaction with Game Attendance

The innovative use of color in stadium interiors significantly enhances consumer satisfaction with game attendance by fostering positive emotions among spectators, strengthening the venue's brand identity, and shaping the event's unique atmosphere. Color, as a crucial element in environmental psychology, directly influences spectators' emotional and cognitive systems via visual stimuli. Beyond traditional functional purposes, innovative color design enhances sensory enjoyment and psychological satisfaction by crafting a distinctive visual experience and emotional ambiance. Such design often piques spectators' curiosity and interest, thus enhancing their overall assessment of the venue. Studies indicate that novel color combinations can elicit positive emotional responses—such as pleasure and excitement—which further amplify audience attention and engagement. Additionally, innovative color design can establish a unique brand identity for venues, setting them apart from other stadiums and thereby increasing spectators' sense of belonging and loyalty.

Moreover, innovative color design heightens spectators' emotional experience by cultivating a distinctive venue atmosphere. For example, warm color tones create an uplifting and welcoming ambiance, promoting spectators' sense of participation and emotional resonance during the event. In contrast, cooler tones foster calmness and composure, helping alleviate tension and enhancing spectators' comfort and satisfaction. Variations in light, dark contrasts, and saturation shifts also sustain audience attention and reduce visual fatigue by diversifying visual stimuli, ultimately extending audience engagement and enriching their overall viewing experience.

In addition, perceived emotional value arising from innovative color design in sports venues positively mediates consumers' satisfaction with game attendance. Such designs can elevate athletes' emotional value by providing an environment that psychologically stimulates them. In sports settings, colors serve beyond mere decoration; they profoundly impact athletes' mental states by provoking emotional responses. Bright hues and dynamic color combinations often boost athletes' excitement and positivity, fostering greater engagement, energy, and competitive spirit and enhancing overall performance. This elevation in athletes' emotional value not only positively impacts their own performance but also indirectly influences spectators through the effect of emotional contagion. According to Emotional Contagion Theory, spectators often absorb athletes' emotions during high-intensity games; athletes' heightened emotions are more likely to trigger spectators' emotional resonance. Witnessing athletes' positive performance and emotional investment often induces similar feelings of excitement and thrill in spectators, thus strengthening their sense of engagement and fulfillment in the game.

Furthermore, perceived emotional value can enrich the spectator experience by intensifying the stadium's atmosphere. Athletes performing in a vibrant, innovative color setting tend to exhibit greater positivity and confidence, which not only energizes other players but also influences spectators, thus cultivating an overarching positive environment. In such a dynamic and energetic setting, spectators experience both visual pleasure and profound emotional engagement. This interaction deepens spectators' emotional connection with the venue and the event, significantly enhancing their satisfaction with the game experience.

6. Conclusions and Outlook

Through field research and questionnaire collection, this study explored the effects of stadium interior color design on athletes' psychological perception, spectators' satisfaction, and the overall attractiveness of stadiums, revealing the important role of color design in the management of stadiums. Previous studies have mostly focused on the effects of single factors on consumers' viewing experience or examined the effects of stadium design and athletes' emotions on spectators' experience separately, but few studies have integrated the relationship between these three into a holistic framework. This study sets out three levels to be included in the integration model, observing how the emotional effects generated by innovative color design interact among different groups, thus providing a deeper understanding of the complex relationship between color and experience. At the same time, the results of this study also show that design is not only a static experiential element but also indirectly enhances the overall atmosphere of the game by affecting the psychological state of athletes, which not only reveals the key role of color design in the transmission of emotional values but also provides a theoretical reference for the design of stadiums to consider the multilayered experience.

However, this study has certain limitations. First, the sample is confined to four cities in China, and while sample characteristics were controlled for and these cities provide some representativeness, the geographical limitation may restrict the generalizability of our findings. This limited scope may not fully account for the potential effects of different regions, cultural backgrounds, and economic levels. To enhance the broader applicability of the findings, future studies should include more diverse samples from various countries and cultural contexts. Second, our study primarily relied on questionnaire data, which did not comprehensively capture all potential influences on sports venue user satisfaction, such as spatial layout, facility quality, and venue services. Future research should consider incorporating these variables to ensure a more thorough analysis. Third, as this study used cross-sectional data, it could not assess the long-term effects of color design on users. A longitudinal approach in future studies could enable tracking of the enduring impact of color design on the emotions and behaviors of athletes and spectators, thus offering a clearer understanding of its ongoing role in stadiums. Fourth, the study did not include objective measures, such as physiological indicators, to supplement the questionnaire data, which may leave the results vulnerable to subjective bias. Future studies should integrate

physiological measurements, such as heart rate and skin conductance, to mitigate this bias and obtain more objective insights. Future research should address sample diversity, comprehensiveness of variables, methodological depth, and data objectivity to deepen our understanding of the impact of stadium color design on users, thus providing more robust theoretical support for stadium design and management practices.

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Appendix A. Questionnaire

Variant	Subject	Score
Innovative sports venue colors	I think it's useful to design innovative color schemes for stadium interiors	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	I think it's wise to have an innovative color palette for stadium interior spaces	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	I think it's a good idea to make brand new color scheme choices for stadium interiors	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	I believe that the innovative design of the interior color of the stadium will have a positive impact on all subjects related to the event.	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	I think it is necessary to make appropriate and innovative matching designs for the interior colors of stadiums (e.g., venues, facilities, spectator seating, etc.)	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	I think it makes sense to make adjustments to the venue's interior colors based on the theme of the event	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
Perceived emotional value	The innovative design of stadium interior spaces (e.g., the red and orange color scheme of corridor pathways leading to the field of play) will affect my sport psychology to a certain extent	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	I think stadium interiors are more infectious with innovative color combinations	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	The innovative treatment of hue, lightness and purity of colors in stadium interiors will bring me different emotional feelings	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	The right innovative color palette for stadium interiors would be visually appealing without looking monotonous to me	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	Stadium interiors, athletic facilities, venue lighting, and staff clothing colors all have some effect on my mood for exercise	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
Sports venue satisfaction	Elements such as the interior color scheme of the arena and the excitement of the game were consistent with my expectations	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	I am satisfied with the decision I made to watch the event live at the stadiums	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	Overall, I am satisfied with the service provided by the venue organizer for the offline event.	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	In the future, I will recommend more friends to go to the arena to watch the game offline!	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree
	I would make this stadium my first choice for the next game over other stadiums!	1. strongly disagree 2. somewhat disagree 3. generally 4. somewhat agree 5. strongly agree

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