

Article

Green Skepticism? How Do Chinese College Students Feel about Green Retrofitting of College Sports Stadiums?

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Abstract: This paper examined the factors influencing Chinese college students' psychological perceptions of green retrofitting of college sports stadiums. It focused on the roles of green skepticism, future rational cognition, and future perceptual cognition. A total of 551 college students from five universities in Xi'an were tested. The results indicated that college students' green skepticism, future rational cognition, future perceptual cognition, and psychological perceptions of green retrofitting of college sports stadiums were at a moderate level and that green skepticism had a significant and negative influence on college students' psychological perceptions of green retrofitting of college sports stadiums. Green skepticism was a significant negative predictor of environmental values ($\beta = -0.183$, $p < 0.001$), natural empathy ($\beta = -0.164$, $p < 0.001$), and moral elevation ($\beta = -0.187$, $p < 0.001$). In addition, future rational cognition and future perceptual cognition served as parallel mediators in the college students' psychological perceptions of green retrofitting of stadiums. It is notable that the mediating effect of future rational cognition was greater than that of future perceptual cognition. The findings indicate that resolving green skepticism and enhancing transparency and trust are crucial for enhancing college students' psychological perceptions and the behavioral benefits of green retrofitting of college sports stadiums. Furthermore, the facilitating effect of future rational cognition and future perceptual cognition assists college students in making more rational and ethical decisions and in garnering broad support for environmental actions.

Keywords: green retrofitting of college sports stadiums; green skepticism; future orientation; college students' green awareness



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1. Introduction

With the rapid expansion of the global economy, accompanied by uncontrolled industrialization, environmental pollution has become a significant global issue [1]. It is manifested in the increase of air and water pollution [2], the decrease of biodiversity [3], and extreme weather events caused by global warming, floods, droughts, heat waves, and the frequent occurrence of the El Niño phenomenon [4,5]. In addition, the over-exploitation of renewable resources by extractive industries has exacerbated resource scarcity and increased risks in supply chains, such as oil, gas, and mineral resources [6]. The traditional model of economic growth, characterized by high energy consumption and pollution, has proven to be unsustainable. The impacts of environmental pollution on human health are also becoming increasingly significant, such as respiratory diseases caused by deteriorating air quality [7]. The emergence of this series of problems calls for more effective policies and measures to achieve sustainable economic development while protecting the natural environment. A study published in *Nature Sustainability* further emphasizes the current challenges of a low-carbon transition to sustainable development [8].

The construction industry involves the use of heavy machinery, which emits large amounts of air pollutants, including greenhouse gases, particulate matter, and diesel exhaust. These emissions contribute to serious environmental problems and climate change [9]. Fine dust from engineering operations during the construction of buildings has also been shown to be a significant hazard to the human body [10]. With a huge stock of existing buildings, construction is also one of the biggest opportunities to reduce energy waste and to curb air pollution and global warming [11]. In this context, green retrofitting (GR) has come into existence. GR is the process of renovating or adapting an existing building to meet green building requirements, in order to improve the environmental attributes of the building, including energy efficiency and resource utilization, to meet sustainable green building standards [12]. There are two main objectives of green retrofitting, which are to improve energy efficiency and to reduce the carbon emissions of existing buildings by retrofitting these buildings sustainably [13]. For buildings that have already been constructed, the option of demolishing them and rebuilding them can be a very resource-intensive and labor-intensive process. Green retrofitting or upgrading of existing buildings is more economical and practical than complete demolition and reconstruction. Maintaining and improving existing building structures is also often more sustainable than constructing new buildings, from the perspective of environmental protection and resource utilization.

That stadiums, as large-scale-infrastructure facilities, are an important source of carbon emissions cannot be ignored [14]. Conventional stadiums are often built with traditional materials, such as concrete and ceramic tiles, which produce formaldehyde, benzene, ammonia, volatile organic compounds, radon and its daughters, and suspended particulate matter, etc., which have a huge negative impact on athletes, spectators, and the surrounding environment when large-scale events with a large concentration of people are held [15]. And the spread of harmful air and pathogenic micro-organisms in traditional stadiums can easily become a source of cross-infection and plague in public organizations [16]. More importantly, physical pollution, such as noise pollution, light pollution, heat pollution, water pollution, etc., in stadiums also hinders the sustainable process of “green sports” nowadays. Therefore, in order to curb the large amount of carbon emissions and pollution from traditional stadiums, and to ensure the long-term well-being of spectators and athletes, there is an urgent need to advocate the GR of stadiums.

In the pursuit of sustainable development, when high-profile green propaganda does not match actual environmental practices, public trust will be seriously affected. Contemporary college students have been instilled with green concepts since they were young; in higher education, they are often the “vanguard” of environmental protection work, and they are usually more concerned about environmental issues and corporate social responsibility. When they find out that these so-called green renovation projects are only cosmetic, they are often disappointed, and this disappointment may turn into pessimism, making them skeptical of any project claiming to be green or sustainable, or even causing them to believe that it is a scam. College students may believe that even if there are genuine environmental initiatives, they may be overshadowed by the “greenwashing” behavior of managers, making the environmental industry as a whole seem untrustworthy. This perception of green skepticism extends beyond the campus and affects students’ perceptions of green renovation projects for sports facilities in the broader social environment. When gymnasiums and other sports facilities claim to be green, these young environmental pioneers may be wary of the authenticity of the projects, questioning the real motives behind them and their actual effectiveness.

At present, research on green retrofitting of stadiums is often limited to sustainable design [17] and the return on investment of GR [18], etc., and there is almost no research on college students' psychological perceptions of the GR of buildings. Based on this, this study aimed to systematically explore the psychological perceptions of the Chinese college student population towards the green renovation of college sports stadiums, focusing on analyzing the impact of green skepticism on their psychological perceptions. The objective of this study was to construct an empirical model based on the VBN theory, in order to gain an in-depth understanding of the real feelings and attitudes of college students towards the green renovation of college sports stadiums. The model will reveal the psychological perceptions and cognitive behaviors in the process of green renovation, and it will provide scientific evidence and feasible suggestions to help the green renovation project better meet the expectations and needs of the college student population. Additionally, this study aimed to provide green renovation stakeholders with a novel perspective on understanding, to facilitate more efficacious communication and collaboration, and, consequently, to facilitate the seamless implementation and extensive acceptance of green renovation in sports venues. By addressing the deficiencies in existing research, this study contributes to the enrichment of both theory and practice in the field of green building retrofitting, as well as providing substantial support for future green retrofitting projects and helping to realize a more sustainable future.

2. Literature Review and Hypotheses

2.1. Green Skepticism and Psychological Perceptions of Green Renovation of Stadiums

"Green skepticism" is "consumer skepticism about the green features of a product [19]". Some researchers have found that green skepticism can be a potential cognitive response to the exposure of green information, and this response can influence consumers' evaluations of a brand [20,21]. In the field of "green marketing", the theoretical exploration of public attitudes has become somewhat clichéd. When products or services fail to meet public expectations regarding their environmental attributes during the marketing process, it can result in negative public evaluations. This often leads to public skepticism, known as green skepticism, towards the products or practices in question.

As the consumer goods market grows, the phenomenon of "greenwashing" has become more prevalent, leading consumers to easily become skeptical of products that claim to have green attributes or promote green messages [22]. "Greenwashing" refers to the practice of companies misleadingly advertising or marketing themselves as environmentally friendly, or creating a green-oriented image, while actually engaging in environmentally harmful activities [23]. Both actual and perceived instances of "greenwashing" impact the general public, leading to increased skepticism towards environmental claims. As a result, negative practices like "greenwashing" can intensify public distrust of environmental information. Therefore, the negative practice of "greenwashing" can lead to increased public skepticism towards environmental information, which in turn affects willingness to purchase and actual purchasing behavior. Public green skepticism arises partly because people are becoming weary of the green claims made by numerous products. Simply stating "I am green" is no longer sufficient to earn public trust. Instead, it is essential to provide clear and substantial evidence of genuine environmental benefits, to dispel public skepticism. On the other hand, there is still a lack of global environmental regulations that ensure transparency and sustainability standards [24]. As a result, an increasing number of people are questioning the green motives of managers or companies. They express uncertainty about the green attributes and functions of products and even doubt the real environmental benefits. This skepticism is growing in the construction sector [25], in particular.

Stadiums, as a type of sports facility, are characterized by their large footprint and extensive space. Green retrofitting of stadiums involves updating the technology and design of existing structures, to enhance their environmental performance. This includes improving energy efficiency, conserving resources, and reducing environmental impacts. Green retrofitting typically involves adopting energy-efficient technologies, using sustain-

able materials, and implementing measures to enhance the overall sustainability of the facility. Zakaria's study indicates that green retrofitting is the process of refurbishing or redecorating existing buildings, to meet green building standards, thereby improving their environmental attributes [12]. Liu, in his study, describes green retrofitting as an effective way of improving the performance of an existing building, in order to achieve low energy consumption and low carbon emissions [26]. The high emissions from building materials, significant energy consumption from internal energy-consuming equipment during stadium operations, carbon emissions during large-scale events, and concerns about whether building materials can be recycled or if they will cause pollution after a stadium is dismantled, all provide critical directions for the green retrofitting of stadiums. These factors emphasize the need for sustainability measures that address both operational efficiency and end-of-life environmental impact.

College students' psychological perceptions of green retrofitting of college sports stadiums mainly involve attitudes, feelings, and perceptions towards the environmental or sustainable transformation of urban stadiums, including the corresponding impact on college students' environmental values, natural empathy, and moral elevation. For example, by enhancing the energy efficiency of facilities, using sustainable materials, or increasing the use of natural light, stadiums can influence the emotional connection and identification that college students have with the natural environment. These changes can also affect how much importance students place on environmental issues within their own value systems. Conversely, if students perceive green transformations as mere cosmetic work or believe them to be false, this green skepticism may ultimately lead to diminished emotional connection/concern for the natural world. For example, Cheng, in his study [27], found a negative correlation between popular skepticism of green advertising and environmental engagement. Romani's study highlights that green skepticism can diminish moral elevation by influencing the relationship between consumers' perceptions of corporate social responsibility (CSR) motivations and their behavioral responses to CSR initiatives. This skepticism ultimately affects consumers' support for other green products. This suggests that when college students are skeptical about the environmental credentials of building retrofits, they may harbor doubts about the positive impact of these initiatives [28].

Green skepticism stems from the public's distrust of the green-related claims associated with a product. When consumers find that a green product is inferior to a traditional one, or that a company's green claims contradict its actual practices, this can lead to skepticism about both the product and the company [29]. When college students are exposed to such information, it can lead to a negative impression or evaluation of the associated green behaviors. This negative evaluation can adversely affect their future intentions or behaviors, particularly when such negative information resonates strongly with them. The prominence of these negative evaluations can influence their environmental values, natural empathy, and moral elevation, ultimately reducing their acceptance of green policies or behaviors. The effects of emotional expression on observers' affect, cognition, and behavior were overviewed in Van Kleef's study, which found that emotional expression affects observers' affective responses, reasoning processes, and behavior [30]. It is clear that when college students harbor green skepticism, they may find it challenging to develop positive attitudes towards ongoing green renovations in stadiums. This mistrust can diminish their emotional connection to the natural environment and the moral uplift that comes from adopting environmentally friendly behaviors. Ultimately, this can impact their overall attitudes and behaviors towards environmental actions. Based on this, the following hypotheses are proposed:

H1: *Green skepticism negatively affects the psychological perception of green renovation in college sports stadiums.*

2.2. The Mediating Role of Future Rational Orientation Perception

Orientation is the knowledge of determining one's own position relative to different points or objects, while perception is the mental process of attributing sensations to external objects [31]. Orientation perception is the capability of an organism to detect and interpret its own position and the orientation of objects within its environment relative to a spatial coordinate system, using its sensory system. This process involves integrating visual, auditory, tactile, and other sensory information with high-level cognitive processing in the brain. This integration helps determine the orientation and position of objects, which is crucial for everyday activities and spatial navigation. Orientation perception is not merely a straightforward sensory process; it is a complex outcome of multisensory integration and cognitive processing. The term "future rational orientation perception" refers to an individual's cognition and perception involved in rational future planning and decision making. It involves an individual's psychological tendency to make decisions about how to plan and prepare rationally in the present stage, with the aim of achieving expected benefits in the future. Carver's study indicates that individuals with a clear goal orientation are more likely to adopt a rational attitude in their planning and tend to be more consistent and logical in their behavior [32]. Meanwhile, Rappaport emphasizes the importance of future-oriented rational planning in business management and investment, and elaborates on how to maximize shareholder value through a systematic and rational approach to planning a firm's long-term strategy [33].

The phenomenon of green skepticism is gaining prominence as discussions about sustainable development and environmental responsibility deepen. As the backbone of social and environmental change, college students' environmental attitudes and behavioral choices are important for future sustainable development. When green skepticism arises, it can impact college students' perceptions of their own future rationality, potentially altering their long-term views on environmental behavior and diminishing their motivation to pursue green goals. This suggests that green skepticism may indirectly impair individuals' orientation towards perceived future rationality, influencing their commitment to sustainable actions [34]. Mohr et al.'s study further confirms this point: consumers with high levels of skepticism are more likely to harbor negative attitudes toward environmental claims. This skepticism affects their confidence in future environmental planning, impacting their willingness to support or engage in sustainability initiatives [19]. Thus, green skepticism may directly affect college students' trust and acceptance of environmental initiatives, which, in turn, may cause changes in their future rational orientation perceptions.

Future rational perception orientation, as a psychological tendency to focus on long-term benefits and rationally think about the future, may have an important impact on the psychological perception of green retrofitting of stadiums. For example, college students who are future-oriented in terms of the green retrofitting of stadiums tend to focus more on the long-term environmental benefits. They are more sensitive to the potential long-term value and actual impact of such green retrofits, particularly in terms of reducing energy consumption, lowering carbon emissions, and improving resource utilization efficiency. Simultaneously, these students are better equipped to rationally evaluate the economic benefits of green renovations. While such renovations may require an initial investment, they can lead to reduced operating costs and enhance the economic efficiency of venues over the long term. Therefore, these students are more likely to support and endorse green renovation measures, recognizing that the dual benefits to both the economy and the environment are worth pursuing. For instance, Carrus et al. discovered that perceived future rational orientation significantly enhances environmental behavior. Individuals with a high future rational orientation tend to hold positive psychological perceptions of green retrofit initiatives, seeing them as valuable investments in sustainability [35].

The VBN theory posits that an individual's environmental behavior is shaped by their fundamental values, environmental beliefs, and personal norms. Firstly, the perceived future rational orientation reflects the individual's emphasis on long-term benefits and sustainable development, which is closely related to the basic values espoused in the VBN theory. College students with a stronger future rational orientation are more inclined to prioritize environmental protection and sustainable development, and their attitudes toward green remodeling projects will be more positive. This positive attitude can mitigate their skepticism regarding green remodeling projects, which may be defined as a questioning and distrust of such projects. Secondly, an individual's perception of future rationality orientation can enhance their sense of responsibility and mission towards environmental issues. This belief motivates them to be more willing to accept and support green remodeling projects. Ultimately, an individual's perception of future rational orientation can influence their psychological perception of green remodeling projects by affecting their personal norms. This may lead them to perceive supporting green remodeling as a responsibility or duty. In the VBN theoretical model, future rational orientation perception is interconnected with beliefs and norms. College students' green skepticism can influence their ecological worldviews and beliefs, potentially leading to a decline in personal norms. This decline, in turn, can affect their future rational orientation perceptions and green psychological perceptions, altering how they perceive and react to environmental issues and initiatives. This interconnection underscores how skepticism can fundamentally shift the motivational drivers behind environmentally responsible behaviors. For example, Hansla et al. found that values and beliefs have a significant effect on green energy consumption attitudes based on VBN theory. Personal norms act as a mediating variable affecting consumer attitudes and willingness to pay for green electricity [36]. Luchs et al. showed that green skepticism reduces consumer support for sustainable products, and that future rational orientation perceptions can attenuate this negative effect. Even though skepticism exists, future rational orientation perception can motivate consumers to make more sustainable choices [37]. Based on this, this paper proposes the following hypotheses:

H2: *Perceived future rational orientation mediates between green skepticism and psychological perceptions of green retrofitting of college sports stadiums among college students.*

2.3. The Mediating Role of Future Perceptual Orientation Perception

The term "futuristic orientation perception" refers to the psychological process through which individuals perceive, anticipate, and respond to future emotions and events [38]. This concept encompasses the emotional anticipation of future scenarios, the predictive experiences of those emotions, and the behavioral motivations and decisions that are shaped by future expectations. Futuristic orientation perception involves imagining, planning, and emotionally investing in potential future events. It is a crucial cognitive and affective element for understanding and navigating future human behavior. Distinct from rational orientation perception, which focuses on logical and systematic planning, futuristic orientation emphasizes the impact of emotions and values on behavior, as well as the individual's emotional commitment to and anticipation of future situations. This includes emotional responses to expected future outcomes that align closely with personal values. From a neurocognitive perspective, futuristic orientation perception engages multiple brain regions responsible for prediction, planning, and emotional evaluation. This cognitive process is essential for understanding how individuals anticipate and prepare for future emotional states [39]. From a developmental psychology perspective, future-sensory oriented perception is a skill that individuals develop gradually as they mature. It encompasses how they comprehend, anticipate, and prepare for emotional engagement and behavior in future scenarios. This cognitive and affective ability tends to enhance with age and plays a significant role in self-development, decision making, and social adaptation [40].

In value-belief-norm (VBN) theory, self-transcendent values, such as social justice and harmony, are considered crucial for fostering environmentally responsible behavior [41].

College students' environmental attitudes and behavioral choices serve as the cornerstone of social and environmental change, with profound implications for future sustainable development. Green skepticism, in particular, can significantly influence their trust in and acceptance of environmental protection measures, thereby impacting their future perceptual orientation. Specifically, green skepticism may lead college students to engage in more thorough information gathering and verification to confirm the accuracy of environmental claims. This intensified search for information can heighten students' awareness of environmental issues, thereby deepening their understanding of the importance of environmental protection. Nguyen's study indicates that green skepticism can impact green purchasing intentions by diminishing consumers' environmental knowledge and concerns [42].

Green retrofitting of stadiums has emerged as a significant initiative for promoting sustainable development. While builders often highlight the environmental benefits of these retrofits, college students' psychological perceptions of such green renovations can be influenced by various factors, particularly their skepticism regarding the authenticity and effectiveness of the environmental measures. This green skepticism impacts their value beliefs and reality norms—core elements in VBN theory—including personal environmental values, ecological worldview, and perceived personal responsibility. In this context, green skepticism becomes a pivotal variable that prompts college students to critically reflect on environmental claims at an emotional level, encouraging them to reassess their personal environmental values [43].

This reframing not only alters college students' perceptions of environmental issues but may also bolster their emotional support for green renovation projects in college sports stadiums. For instance, research by Goh [29] suggests that students may experience pride and satisfaction from associating with the potential environmental benefits of green remodeling, stemming from the anticipation of improved environmental quality in the future. College students' skepticism about environmental measures extends beyond questioning their authenticity or effectiveness; it deeply influences their affective expectations and behavioral dispositions towards future environmental conditions, driving them to seek evidence that either confirms or refutes their skepticism. When this evidence is integrated with their perceptual perceptions, it shapes students' future perceptual orientations. As these orientations evolve, so do their psychological perceptions of green retrofit projects in college sports stadiums. If students perceive these renovation measures as effective solutions to future environmental challenges, they are likely to evaluate and support these projects more positively. Conversely, if their green skepticism leads them to doubt the future effectiveness of these projects, even well-publicized green initiatives may fail to secure their approval and support. For example, Khoshbakht et al.'s study indicates that college students' perceptions of green renovations in stadiums may be shaped by their environmental values and future-oriented perceptions. Features that promote environmental sustainability can significantly enhance users' overall satisfaction with the space and their sense of restorative experience, which are vital for advancing green retrofit projects. This research underscores the importance of aligning green initiatives with the values and future expectations of users, to foster greater acceptance and enthusiasm for these projects [44]. Similarly, Malekinezhad et al.'s research suggests that as college students' future orientations towards green retrofits in stadiums evolve, so too do their psychological perceptions of these projects. This indicates a dynamic relationship where changes in students' future-oriented thinking influence their attitudes and emotional engagements with green renovation efforts, potentially leading to more robust support for sustainable practices within their environments [45]. Based on this, the following hypotheses are proposed in this paper (the proposed model diagram for this paper is shown in Figure 1):

H3: *Perceived future skepticism orientation mediates between green skepticism and psychological perceptions of green retrofitting of college sports stadiums for college students.*

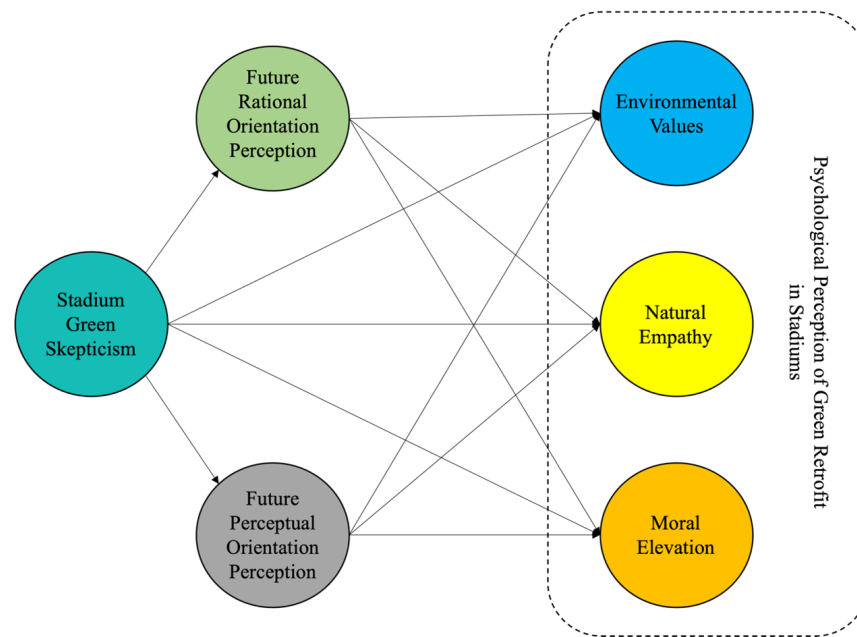


Figure 1. Diagram of the proposed model.

3. Methods

3.1. Subjects

Formal research was conducted on 23 April 2024, in five general colleges and universities in Xi'an City. 600 questionnaires were issued, and 592 questionnaires were recovered, of which 551 were valid questionnaires, with a validity rate of 93.07%, of which 267 were male and 284 were female; the age was 20.475 ± 1.158 years old, with a balanced proportion of the sample.

3.2. Measurement of Variables

Green skepticism mainly highlights the skepticism of consumers or social groups towards the green characteristics of a certain building or thing or green environmental protection publicity information. As the basis of this study, we organized and analyzed the focus of green skepticism by combining the similarities and differences between green skepticism and other variables, and incorporating them into the question items. Specifically, the measurement of green skepticism in this paper drew on the more mature scales of Mohr et al. [19], Laufer et al. [46], and Yeung et al. [47] in previous scientific research. We modified and improved the questions according to the characteristics of the research object in this paper, and we ultimately formed a 4-question scale for green skepticism in this study, such as “I have a conservative or skeptical attitude toward the real environmental protection effect of the stadium that can be achieved by the green renovation. I am conservative or skeptical about the real environmental effect that can be achieved after the green renovation of the stadium”.

The measurement of the future orientation of green retrofitting of college sports stadiums in this paper drew on the specific scale of Heimberg [48], who first summarized the variable of future orientation for research and measurement. On this basis, we referred to scholars' studies on future orientation measurement in different fields (such as the future orientation scale for adolescents and the developmental orientation scale, etc.), screened out the scale items with high reliability and validity, and combined them with the core connotation of green retrofitting of stadiums to make streamlining modifications. Finally, a two-dimensional (future rational cognition, future perceptual cognition) six-item scale for green retrofitting of stadiums was developed, such as “When I hear about the green retrofitting of stadiums, I will outline in my mind what the transformed stadiums will look like”. In this paper, the measurement of the variable of psychological perception of green retrofitting of

stadiums was more innovative. We did not want to limit our perspective to traditional variables, such as the perceived value, perceived usefulness, or perceived environmental awareness of the green retrofitting of stadiums. This paper fully examined the scales of the variables from different sides, focused on the scales of the related studies of Lee [49] et al. and Diessner [50] et al., and, finally, drew the scales of this paper for a 10-item 3-dimension (environmental values, natural empathy, moral elevation) scale of the psychological perception of green renovation of stadiums, such as “After learning about the advantages of green renovation of stadiums, I will try to increase and persuade my friends and relatives to make more pro-environmental behaviors in my future life”. A 5-point Likert scale was used, with scores ranging from 1 to 5, from “strongly disagree” to “strongly agree”.

3.3. Questionnaire Distribution

Based on the stratified random sampling method, the questionnaires were filled out and recovered on-site by administrative classes in five general colleges and universities in Xi'an City, and the initial test and retest were conducted (the official questionnaires were distributed 2 weeks after the initial test questionnaires were distributed, in order to check the reliability of the retests); 150 questionnaires were distributed for the initial test, 122 valid questionnaires were obtained, and 100 valid questionnaires were obtained in the retests. The initial questionnaire was then subjected to item analysis, which was designed to determine the validity and appropriateness of the items on the questionnaire scale. The principle was to first sum up the analyzed items, then divide them into high and low subgroups (bounded by the 27% and 73% quartiles), and then use the t-test to compare the differences between the high and low subgroups. If there was a difference then it meant that the scale items were appropriately designed, and if vice versa then it meant that the scale items were unable to differentiate the information, that the design was irrational, and that it should be deleted. As shown in Table A1, 20 items—GS1, GS2, GS3, GS4, FROP1, FROP2, FROP3, FPOP1, FPOP2, FPOP3, EV1, EV2, EV3, EV4, NE1, NE2, NE3, ME1, ME2, ME3—were analyzed and summed up into high and low groups. The differences were compared, using the t-test, and the high and low groups showed significance for GS1, GS2, GS3, GS4, FROP1, FROP2, FROP3, FPOP1, FPOP2, FPOP3, EV1, EV2, EV3, EV4, NE1, NE2, NE3, ME1, ME2, and ME3, all of which were significant ($p < 0.05$), implying that a total of 20 items were well differentiated and did not need to be deleted from the analysis. Table A2 shows the decision value CR alone, as well as the correlation coefficient between the analyzed items and the total score of the scale; in this paper, the decision value CR of the scale showed significance, which meant that all items should be retained, and the correlation coefficients were all >0.2 , which also meant that all the items in this study could be retained.

All the samples were divided into two categories, according to number parity, which were used for exploratory and validation factor analysis, respectively. The KMO was 0.776, which was greater than 0.6, meeting the prerequisite requirements for factor analysis, meaning that the data could be used for factor analysis research, and the data passed the Bartlett's sphere test ($p < 0.05$), which indicated that the research data were suitable for factor analysis. A total of six factors were extracted from the factor analysis of this paper, and the eigenroot values were all greater than 1. The variance explained by the rotation of these six factors was 13.511%, 12.846%, 11.306%, 10.698%, 10.634%, and 9.648%, respectively, and the cumulative variance explained by the rotation was 68.643%. The data for this study were rotated, using the maximum-variance rotation method (varimax), in order to establish the correspondence between the factors and the study items. The above table shows the information extraction of the factors for the research items and the correspondence between the factors and the research items. From the above table, it can be seen that all the research items correspond to a common degree value higher than 0.4, which means that there is a strong correlation between the research items and the factors and that the factors can effectively extract the information. According to the results of factor analysis and the meanings of the items, the six common factors are named green

skepticism, future rational orientation perception, future perceptual orientation perception, environmental values, natural empathy, and sense of moral elevation.

Subsequently, the paper was analyzed by validated factor analysis (CFA) for a total of six factors, as well as 20 analysis items. As can be seen from Table A3, the AVE values corresponding to a total of six factors were all greater than 0.5, and the CR values were all higher than 0.7, which meant that the data of this analysis had good convergent validity. From Table A4, the AVE square root value of each variable in this paper was greater than the maximum value of the absolute value of the correlation coefficient between the factors, implying that the variables in this paper had good discriminant validity.

4. Results

4.1. Common Method Bias Test

The Harman one-way test was used to test for common method bias. It was found that five factors had eigenvalues >1 and that the first factor explained 31.874% of the variance. The critical criterion of 40% was not reached. In the validation factor analysis of adding a method factor to the full factor model, CMIN/DF, which is the relative ratio of chi-square and degrees of freedom, was less than 3, TLI, CFI was greater than 0.9, RMSEA and SRMR were less than 0.08, which indicated a good fit, and all of the above indicators were up to the standard. Taken together, most of the model fit indicators met the standard full factorial model fit status, indicating that this study did not have common method bias.

4.2. Descriptive Statistics and Correlation Analysis of Variables

As can be seen from Table 1, the variables involved in this study were generally at the medium level, and all of them showed significance between GS and FROP, FPOP, EV, NE, ME, with correlation coefficient values of -0.154 , -0.129 , -0.165 , -0.139 , -0.154 . All of them had correlation coefficient values of less than 0, implying that there was a negative correlation between GS and FROP, FPOP, EV, NE, ME. All of them showed significance, with correlation coefficient values of 0.448 , 0.380 , 0.403 , 0.523 , and the correlation coefficient values were greater than 0, implying that there was a positive correlation between FROP and FPOP, EV, NE, ME, a total of 4 items. All of them showed significance between FPOP and EV, NE, ME, and the values of the correlation coefficients were 0.344 , 0.400 , 0.501 , which meant that there was a positive correlation between FPOP and EV, NE, and ME.

Table 1. Means, standard deviations, and Pearson's correlation statistics for each variable.

	Average Value	(Statistics) Standard Deviation	GS	FROP	FPOP	EV	NE	ME
GS	3.287	1.06	1					
FROP	3.714	0.85	-0.154^{**}	1				
FPOP	3.642	0.862	-0.129^{**}	0.448^{**}	1			
EV	3.661	0.892	-0.165^{**}	0.380^{**}	0.344^{**}	1		
NE	3.677	0.865	-0.139^{**}	0.403^{**}	0.400^{**}	0.363^{**}	1	
ME	3.77	0.803	-0.154^{**}	0.523^{**}	0.501^{**}	0.441^{**}	0.468^{**}	1

Note: $^{**} p < 0.01$.

4.3. Parallel Mediation Effect Tests

(1) A latent variable direct effect model with GS as the independent variable, FOP dimensions as the dependent variable, and no mediator variables (FROP, FPOP) was developed, using Mplus, and the model was well-fitted, with $\chi^2/df = 1.201$, RMSEA = 0.019, CFI = 0.996, TLI = 0.995, and SRMR = 0.022. The direct-effect modeling showed that GS had a significant negative predictive effect on EV ($\beta = -0.183$, $SE = 0.05$), NE ($\beta = -0.164$, $SE = 0.05$), and ME ($\beta = -0.187$, $SE = 0.05$) ($p < 0.001$), and hypothesis H1 of this paper was established.

(2) Parallel mediation effect test: FROP and FPOP were used as mediating variables, to establish the full model of the parallel mediation structural equation (as in Figure 2). The bias-corrected nonparametric percentile Bootstrap method was used, with 5000 repetitions of sampling, and 95% confidence intervals were computed, to test the differences between the specific mediation effect, total mediation effect, and total effect. The model fit data showed that $\chi^2/df = 2.04$, RMSEA = 0.043, CFI = 0.969, TLI = 0.962, SRMR = 0.081, SRMR was greater than 0.08 but less than 0.1 standardized qualification, and the model indicators were up to standard. The amount of change compared with the direct effect model was $\Delta\chi^2 = 232.96$, $\Delta df = 84$, $p < 0.001$, indicating that the mediator model fit was significantly better than the direct effect model, and the inclusion of the mediator variables was reasonable.

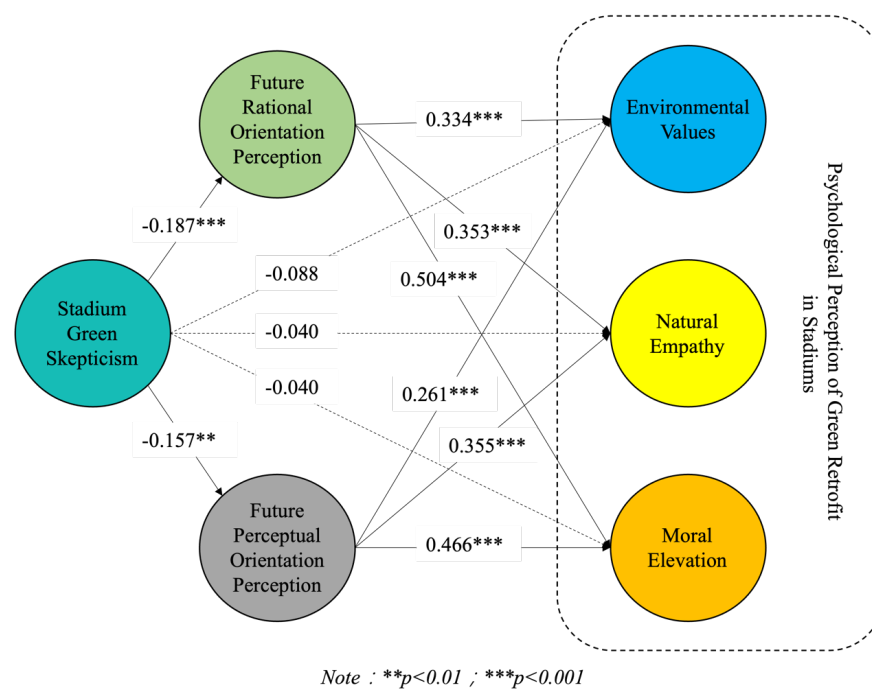


Figure 2. Estimated structural equation model.

Specific mediating effects Ind1 to 6 (mediating effect sizes $ES = ab/c$, 32.3%, 21.4%, 37.7%, 32.0%, 46.1%, and 34.3%, respectively, $p < 0.001$) corresponded to confidence intervals that did not contain 0, indicating that all six specific mediating effects were significant (e.g., Table 2). After the inclusion of the mediating variables, none of the three direct effects were significant (confidence intervals all containing 0), indicating that FROP and FPOP played a fully mediating role. The total indirect effects, TIE12 (−0.104), TIE34 (−0.122), and TIE56 (−0.164), and the total effects, TE12 (−0.192), TE34 (−0.175), and TE56 (−0.204), were significant (none of the confidence intervals contained 0). The confidence intervals corresponding to the dimension-specific indirect effects DIFF1, DIFF2, and DIFF3 analyzed in comparison all contained 0, indicating that there was no significant difference in the parallel mediated effects of Ind1 and Ind2, Ind3 and Ind4, and Ind5 and Ind6, and that hypotheses H2 and H3 of this paper are valid.

Table 2. Bootstrap test for concurrent mediated effects and comparison of specific mediated effects.

Trails	Efficiency Value	Magnitude of Effect	95% CI	
			Lower Limit	Limit
EV				
Ind1: GS→FROP→EV	−0.062 **	32.3%	−0.110	−0.026
Ind2: GS→FPOP→EV	−0.041 *	21.4%	−0.084	−0.013
Total indirect effect TIE12	−0.104 **	54.2%	−0.171	−0.046
Direct effect DE12	−0.088		−0.188	0.011
Total effect TE12	−0.192 ***		−0.289	−0.086
diff1=Ind1-Ind2	−0.017		−0.055	0.019
NE				
Ind3: GS→FROP→NE	−0.066 **	37.7%	−0.119	−0.029
Ind4: GS→FPOP→NE	−0.056 *	32.0%	−0.106	−0.019
Total indirect effect TIE34	−0.122 **	69.7%	−0.284	−0.054
Direct effect DE34	−0.054		−0.155	0.051
Total effect TE34	−0.175 **		−0.284	−0.061
diff2 = Ind3-Ind4	−0.007		−0.043	0.029
ME				
Ind5: GS→FROP→ME	−0.094 **	46.1%	−0.154	−0.041
Ind6: GS→FPOP→ME	−0.070 *	34.3%	−0.131	−0.023
Total indirect effect TIE56	−0.164 ***	80.4%	−0.254	−0.073
Direct effect DE34	−0.040		−0.129	0.050
Total effect TE34	−0.204***		−0.308	−0.090
diff3 = Ind5-Ind6	−0.016		−0.055	0.026

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

5. Discussion and Analysis

5.1. Current Status of College Students' Green Skepticism, Future Orientation of Green Retrofitting of Stadiums, and Psychological Perceptions of Green Retrofitting of Stadiums

(1) The findings of this study indicate that Chinese university students exhibit moderate levels of green skepticism, future orientation, and psychological perceptions of green retrofitting of sports venues. In contrast, Western countries have achieved higher levels in green initiatives, green purchasing, and other green behaviors. This discrepancy may be attributed to the pivotal role that education and advocacy have played in raising public environmental awareness in Western nations. Although various sectors of Chinese society are also striving to enhance public environmental consciousness through school education and media campaigns, the overall impact requires further improvement. Specifically, the promotion efforts at the grassroots community level need to be strengthened [17,51]. The findings of this study indicate that college students exhibit a moderate level of skepticism regarding about environmental issues, yet their overall stance remains neutral. College students are situated within a social environment and are susceptible to the influence of their peers, families, and society at large. Some college students may be influenced by the skeptical voices of their classmates or friends, which may result in a neutral attitude towards environmental issues. Furthermore, the advent of online media, which are accessible to all, has led to the dissemination of exaggerated or misleading information about the effectiveness of environmental protection measures. The inconsistency of such information further exacerbates the cognitive dissonance of college students, prompting them to doubt the effectiveness and truthfulness of environmental protection activities [52].

(2) The level of future orientation exhibited by college students is moderate. This indicates that students are not only concerned with the rational aspects of the environmental program, such as quality testing, environmental monitoring, and government planning,

but also have a clear vision of the renovated venue and are optimistic about the future development of the environmental cause. The incorporation of enhanced environmental education and the demonstration of positive social and environmental impacts can further stimulate college students' intrinsic motivation and sense of responsibility, prompting them to participate more actively in environmental protection behaviors and, consequently, to increase their support for green renovation projects. (3) In conclusion, the overall psychological perception of green remodeling of college sports stadiums is moderate. Among the aforementioned values, environmental values and natural empathy are at a medium level, indicating that the subjects demonstrate a certain degree of attention to environmental protection and an ability to empathize with the natural environment. However, there is still room for improvement in these aspects. In contrast, moral elevation is observed to exhibit a moderate-to-high level. According to the VBN theory, an individual's environmental behavior is driven by three key factors: their environmental values, ecological worldview, and sense of personal responsibility [53]. The results indicate that respondents perceive green retrofit in a morally elevated manner. This perception may have stimulated a normative sense in college students, prompting them to show more support and participation in green retrofit projects after recognizing the moral and ethical values behind them [54].

5.2. Influence of College Students' Green Skepticism on Psychological Perceptions of Green Renovation of Stadiums

Green skepticism can have a negative impact on college students' psychological perceptions of green renovations in college sports stadiums. The primary reason for this skepticism is that the environmental benefits of such projects often take a long time to manifest. This finding aligns with the results of other scholars' research. Goh and Balaji found that green skepticism affects consumers' purchase intentions for green products by reducing their environmental knowledge and concern, leading to a more negative attitude towards environmental initiatives. Similarly, He et al., in their study of Chinese residents' skepticism towards green retrofitting projects, discovered that green skepticism weakened their identification with green retrofitting, reduced their enthusiasm for participating in environmental projects, and negatively impacted their environmental values and empathy towards nature [29,55]. One primary reason for this skepticism is that the environmental benefits of such projects often take a long time to manifest. As a result, students may doubt the claims and actual effects of the renovations if they do not directly experience or perceive the outcomes. Furthermore, if the results of green retrofits are not quantitatively demonstrated, students may struggle to grasp the specific benefits of these initiatives intuitively. Additionally, students' expectations for green retrofits often encompass significant enhancements to their immediate experience of using the facility, such as improved comfort and functionality. When these expectations are not met, it can lead to increased skepticism about the efficacy of green retrofit projects. This disconnect between expectations and actual outcomes can undermine support for such initiatives among the student body.

Green skepticism can adversely affect the environmental values, natural empathy, and moral elevation in students' psychological perceptions of green renovations in college sports stadiums. For instance, research by Leonidou and Skarmeas found that consumers' skepticism towards corporate environmental activities leads to more negative reactions to environmental information, reduces their empathy towards nature, and diminishes their willingness to share green information with others [43]. Firstly, students' environmental values may be compromised when they doubt the authenticity and validity of the promoted green features. If students perceive that green retrofits are primarily driven by motives like obtaining government subsidies or enhancing image, rather than genuine intentions to mitigate environmental impacts, their view on the importance of environmental protection could become more cynical. Secondly, green skepticism may also weaken students' emotional connection to the natural world. If they suspect that college sports stadium green remodeling projects do not genuinely contribute to environmental protection, their likelihood of taking personal actions to support or improve the environment may decrease.

Lastly, skepticism regarding the effectiveness and sincerity of green projects can lead to diminished interest among students in participating in or supporting future green initiatives. This erosion of trust and enthusiasm could significantly hinder the progress and acceptance of sustainable practices in college sports stadium management and beyond.

5.3. Parallel Mediation of Future Rational Orientation Perception, Future Perceptual Orientation Perception

In the context of how green skepticism affects the psychological perception of green retrofits in college sports stadiums among college students, both future rational orientation perception and future perceptual orientation perception serve as important mediatory roles. Contrary to the findings of this study, some scholars argue that the influence of rational cognitive orientation on green behavior is limited. For instance, Zarei discovered that green purchase intentions are more influenced by environmental attitudes and corporate capabilities rather than environmental knowledge. Similarly, Matthes' research on green advertising found that green consumers rated the informational utility of advertisements highly, while emotional appeals did not significantly affect their skepticism towards advertisements. This suggests that emotional factors also play a limited role in green skepticism [56,57]. On the one hand, rational orientation perception evaluates the scientific basis and actual benefits of green renovations by analyzing logic and evidence. If a retrofitted stadium can provide concrete data demonstrating improvements in energy efficiency and evidence of cost savings, those with a rational orientation perception are more likely to accept the positive impacts of the retrofit and consequently reduce their skepticism. On the other hand, affective orientation perception evaluates the social and cultural significance of the green retrofit through the resonance of emotions and values. College students' perceptions of perceptual orientation can help them overcome green skepticism when faced with green retrofitting of college sports stadiums. This is particularly effective if the retrofit project clearly communicates its positive social and environmental impacts. These emotional and value-based considerations play a crucial role in shaping students' acceptance and support for green initiatives.

Specifically, after learning about the green retrofit of college sports stadium projects, college students with a future rational orientation may focus on the tangible environmental benefits of these transformations, such as reduced energy consumption and carbon footprint, aligning these benefits with their core environmental values. The environmental beliefs of these students aid them in assessing the actual effects of these renovation measures through data and scientific evidence. This evaluative process aligns with the pathway described in VBN theory, which illustrates how beliefs influence behavior. By grounding their assessment in concrete evidence, these students can form a more informed and supportive stance towards the environmental initiatives undertaken in stadium renovations [58]. This evidence-based assessment can mitigate disapproval stemming from skepticism, resulting in a more substantial impact on psychological change. Conversely, future perceptions of perceptual orientation primarily derive from emotions and personal values, making college students more vulnerable to emotional influences. While individuals with a perceptual orientation may experience a sense of moral elevation when the green retrofits align with their personal environmental values, this sense of moral elevation may not be as strong or enduring as that experienced by rationally oriented individuals. The latter group's moral elevation is bolstered by logical and evidentiary support, which provides a more stable and compelling basis for their positive perceptions and actions towards green initiatives.

6. Conclusions and Shortcomings

6.1. Conclusions

Unlike other studies, such as green online purchasing behavior, green product trust, and green design of sports stadiums, this study integrated VBN theory into the analysis of how college students' green skepticism affects their psychological perceptions of green

remodeling of college sports stadiums, introduced two mediating variables, future rational cognition and future perceptual cognition, and we adopted a structural equation modeling approach to investigate the parallel mediating mechanisms of future rational cognition and future perceptual cognition. The structural equation modeling method was used to study the parallel mediating mechanism between green suspicion and psychological perception of green renovation of college sports stadiums. The empirical results proved the following: that green skepticism negatively affects the psychological perception of green renovation in college sports stadiums; that future rational orientation perception mediates between green skepticism and psychological perception of green renovation in college sports stadiums; and that future perceptual orientation perception mediates between green skepticism and psychological perception of green renovation in college sports stadiums.

Starting from different perspectives and adopting a multidisciplinary and comprehensive approach, this study specifically classified college students' psychological perceptions of green renovation of college sports stadiums into three core components—environmental values, natural empathy, and sense of moral enhancement—and introduced two mediating variables—future rational perception and future perceptual perception—in order to analyze the complexity of the relationship between green skepticism and psychological perception of green renovation of college sports stadiums through the establishment of structural equation modeling. This model not only provides a novel theoretical framework for studying the complexity of green building remodeling, but also offers unique theoretical assumptions and avenues of exploration for future research on the phenomenon of green skepticism. At the level of practical contribution, the results of this study provide a special educational pathway for advocating the reduction of green skepticism in the college student population, increasing their green future orientation.

When college students or the community at large question green practices, they may have a more negative view of the importance of environmental protection, which may further cause them to take less personal action to adopt environmentally friendly behaviors. Therefore, all sectors of society should avoid the proliferation of green skepticism, and businesses, governments, and individuals should make efforts to take meaningful actions to protect the environment. For example, the government should strive to increase public trust in green behaviors or products, and, ultimately, promote widespread support for environmental actions.

6.2. Shortcomings and Prospects

Although this paper explored college students' green skepticism, future rational orientation cognition, future perceptual orientation cognition, and their psychological perceptions of green retrofitting of college sports stadiums in a more detailed way, it had some shortcomings. This paper mainly focused on the investigation of college students of some colleges and universities in the city of Xi'an, China, and the representativeness was not strong enough. At the same time, it failed to completely include college students from other universities. The link between green suspicion and psychological perception of green renovation of college sports stadiums among college students of different subdivided majors, whether there is any difference, and whether there is any difference in other psychological changes, due to that difference, need to continue to be explored in the future.

Future research should strive to improve the model, broaden the existing research ideas, and find out whether other variables play an influential role in the proposed model. For example, family culture variables should be taken into account, based on the original study, such as the family structure of college students and how the economic and cultural background of their parents plays a key role in their growth process. At the same time, the family atmosphere in the environment in which college students grow up and the family education they receive have a similar effect on their social cognition and psychological cognition. Based on this, future research can take this as a reference to further improve the completeness and timeliness of the topic of green retrofitting.

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Appendix A. Questionnaire

Variant	Dimension (Math.)	Subject	Score
Stadium green skepticism	Green skepticism	I'm not a big believer in most of the environmental and safety claims on some stadium green renovation package labels or advertising messages.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
		I believe that most of the environmental information related to the green renovation of stadiums has been publicized to mislead the public and gain other benefits rather than for the true cause of green development.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
		I am conservative or skeptical about the true environmental results that can be achieved after a green renovation of a stadium.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
		I believe that the green renovation process of some stadiums has been described or publicized with misleading words, in order to exaggerate their own green features.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
Future orientation of green retrofit of stadiums	Future rational orientation perception	When I hear about a green renovation of a stadium, I look out for information about the quality testing, environmental monitoring, and parametric performance indicators of that green renovation project.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
		When I hear about green retrofitting stadiums, I focus on what green value can be delivered by greening stadiums.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
		When I hear about the green retrofit of stadiums, I will pay more attention to the government's environmental plans or programs.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree

	Future perceptual orientation perception	When I hear about the green renovation of stadiums, I sketch in my mind what the renovated venues will look like.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
		When I hear about the green retrofit of stadiums, I'll have something to look forward to.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
		When I hear about the green retrofit of stadiums, I will have more confidence in the upgrading of the environmental cause.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
Psychological perception of green retrofit in stadiums	Environmental values	For the survival and growth of future generations and the preservation of urban resources, I believe that green renovation and upgrading of stadiums and other buildings is very necessary.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
		I think if we don't green our stadiums, we're bound to have insurmountable environmental problems in the future.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
		I believe that environmental pollution problems in one place can affect the health of residents in other areas and even globally.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
		I believe that the green retrofit of stadiums is a practice that respects nature and harmonizes with the natural environment.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
		I think that although people have the ability to modify nature, they should also follow the laws of nature.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
	Natural empathy	I believe that people's participation in sports or watching services needs to be based on the preservation of the natural environment.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
		I believe that greening stadiums is a sign of the harmonious development of man and nature.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree

Sense of moral elevation	After learning about the advantages of greening stadiums, I will try to increase and persuade my friends and family to do more pro-environmental behaviors in the future as well.	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
	With the general trend of low carbon emission reduction, I hope I can become a more environmentally conscious person too!	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree
	Would a green renovation of stadiums lead me to believe that the world is a more stable and better place?	1. strongly disagree 2. somewhat disagree 3. generally agree 4. somewhat agree 5. strongly agree

Appendix B

Table A1. Results of the item (differentiation) analysis.

	Group (Mean $\pm$ Standard Deviation)		<i>t</i> (Decision Value)	<i>p</i>
	Low Grouping (<i>n</i> = 61)	High Subgroup (<i>n</i> = 61)		
GS1	2.69 $\pm$ 0.92	4.33 $\pm$ 0.79	10.541	0.000 **
GS2	2.59 $\pm$ 0.88	4.33 $\pm$ 0.72	11.888	0.000 **
GS3	2.52 $\pm$ 0.87	4.31 $\pm$ 0.81	11.774	0.000 **
GS4	2.72 $\pm$ 1.02	4.15 $\pm$ 0.81	8.546	0.000 **
FROP1	2.74 $\pm$ 0.87	4.15 $\pm$ 0.93	8.639	0.000 **
FROP2	2.54 $\pm$ 0.96	4.21 $\pm$ 0.99	9.501	0.000 **
FROP3	2.48 $\pm$ 0.94	4.20 $\pm$ 0.96	9.981	0.000 **
FPOP1	2.84 $\pm$ 0.97	4.08 $\pm$ 0.88	7.429	0.000 **
FPOP2	2.72 $\pm$ 0.93	4.00 $\pm$ 0.84	7.968	0.000 **
FPOP3	2.90 $\pm$ 1.14	4.31 $\pm$ 0.81	7.902	0.000 **
EV1	2.61 $\pm$ 0.86	4.18 $\pm$ 0.81	10.415	0.000 **
EV2	2.59 $\pm$ 0.84	4.30 $\pm$ 0.67	12.377	0.000 **
EV3	2.61 $\pm$ 0.94	4.21 $\pm$ 0.82	10.09	0.000 **
EV4	2.66 $\pm$ 0.87	4.20 $\pm$ 0.87	9.751	0.000 **
NE1	2.70 $\pm$ 0.97	4.10 $\pm$ 1.01	7.757	0.000 **
NE2	2.70 $\pm$ 0.86	3.93 $\pm$ 1.14	6.723	0.000 **
NE3	2.77 $\pm$ 0.99	3.93 $\pm$ 1.15	5.983	0.000 **
ME1	2.49 $\pm$ 0.94	3.98 $\pm$ 0.99	8.519	0.000 **
ME2	2.59 $\pm$ 0.84	4.07 $\pm$ 1.03	8.65	0.000 **
ME3	2.52 $\pm$ 0.79	4.20 $\pm$ 1.03	10.073	0.000 **

Note: ** *p* < 0.01.

Table A2. Correlation of analytic items to total scale scores.

Sports Event	Decision Value (CR)	p-Value (CR)	Correlation with Scale Total Score	p-Value (Correlation with Scale Total Score)
GS1	10.541 **	0.000	0.596 **	0.000
GS2	11.888 **	0.000	0.640 **	0.000
GS3	11.774 **	0.000	0.628 **	0.000
GS4	8.546 **	0.000	0.581 **	0.000
FROP1	8.639 **	0.000	0.559 **	0.000
FROP2	9.501 **	0.000	0.616 **	0.000
FROP3	9.981 **	0.000	0.638 **	0.000
FPOP1	7.429 **	0.000	0.555 **	0.000
FPOP2	7.968 **	0.000	0.583 **	0.000
FPOP3	7.902 **	0.000	0.614 **	0.000
EV1	10.415 **	0.000	0.548 **	0.000
EV2	12.377 **	0.000	0.592 **	0.000
EV3	10.090 **	0.000	0.637 **	0.000
EV4	9.751 **	0.000	0.577 **	0.000
NE1	7.757 **	0.000	0.584 **	0.000
NE2	6.723 **	0.000	0.529 **	0.000
NE3	5.983 **	0.000	0.518 **	0.000
ME1	8.519 **	0.000	0.599 **	0.000
ME2	8.650 **	0.000	0.589 **	0.000
ME3	10.073 **	0.000	0.612 **	0.000

Note: ** $p < 0.01$.**Table A3.** Model AVE and CR indicator results.

Factor	Mean Variance Extraction AVE Value	Combined Reliability CR
Green skepticism	0.635	0.874
Future rational orientation perception	0.636	0.84
Future perceptual orientation perception	0.532	0.773
Environmental values	0.654	0.883
Natural empathy	0.623	0.832
Moral elevation	0.634	0.838

Table A4. Distinguishing validity: Pearson correlation and AVE square root values.

	Green Skepticism	Future Rational Orientation Perception	Future Perceptual Orientation Perception	Environmental Values	Natural Empathy	Moral Elevation
green skepticism	0.797					
future rationality oriented cognition	0.501	0.798				
futuristic oriented cognition	0.568	0.481	0.730			
environmental values	0.514	0.468	0.465	0.809		
natural empathy	0.380	0.428	0.420	0.436	0.789	
moral elevation	0.509	0.366	0.519	0.428	0.380	0.796

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