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Climate Change Awareness and Pro-Environmental Intentions in Sports Fans: Applying the Extended Theory of Planned Behavior Model for Sustainable Spectating

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Abstract: (1) Background: This study explores the intricate relationship between sports and the environment, underscoring the influence of individual awareness of climate change consequences on fostering eco-friendly behavior among sports spectators. (2) Methods: The research introduces an extended theory of planned behavior model, incorporating climate change awareness. Analyzing data from 431 participants at US professional sports events, the study measured variables like climate change awareness and theory of planned behavior constructs. (3) Results: Sequential multiple mediation analysis validated the model, revealing that climate change awareness positively predicts the intention to reduce single-use plastics in the context of sport spectatorship. This relationship was partially mediated by theory of planned behavior variables, with subjective norms identified as a crucial explanatory factor. (4) Conclusions: The study's originality lies in shedding light on pro-environmental intentions within sports spectatorship. Its insights provide foundational knowledge for researchers and organizations aiming to devise sustainability strategies in the realm of sports.

Keywords: environmental sustainability; spectator sport; fan behavior; single-use plastic



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1. Introduction

Sport and the environment share a two-way relationship, each influencing the other [1]. The pursuit of sustainable sporting events demands focused efforts to alleviate factors negatively impacting the environment. Unfortunately, sports have operated with limited regulation, often neglecting their interconnectedness with the natural environment. Ongoing issues like stadium lighting energy consumption, traffic to games, and substantial single-use plastic waste during sports spectating pose significant threats to the environment [2,3].

The United Nations Environment Program (UNEP) [4] reported major sporting events, like the World Cup and the Olympics, generate about 750,000 plastic bottles as waste, with less than half being recycled. Non-recyclable plastics contribute to climate change, emitting greenhouse gases when improperly discarded [5]. Following this awareness of the problem, a positive trend is emerging in reducing single-use plastics in sports. The Chicago White Sox, since April 2018, have pioneered offering beverages without disposable plastic straws, preventing over 215,000 single-use plastics in one season. Similarly, since 2018, Tottenham Hotspur, an English Premier League team, banned single-use plastics, including straws, in their newly inaugurated stadium.

UNEP [4] recommends that public and private entities, along with governments, focus on “changes in social awareness” to reduce the production and use of single-use plastics. Previous research has emphasized that awareness of climate change significantly influences individuals' actions [6,7]. These studies highlight the pivotal role of individual awareness in

explaining intentions for eco-friendly behavior in daily life. Furthermore, sports spectating is not a routine aspect of daily life but rather an occasional leisure activity experienced as an escape from daily pressures [8]. Therefore, it is essential to explore whether awareness of the consequences of climate change can drive eco-friendly behavior in the context of sports spectatorship.

Related studies have been steadily increasing, primarily concentrating on pro-environmental behavioral intentions, which are a function of salient beliefs divided into behavioral and normative beliefs [9–12]. While these studies have focused on the underlying factors such as needs and value that contribute to the formation of beliefs and their influence on pro-environmental intentions, these approaches have yet to incorporate the specific content of an individual's beliefs about climate change. Additionally, research based on the Value–Belief–Norm framework, a theory that explains pro-environmental behavior using people's values, beliefs, and normative concepts, has also failed to capture the impact of beliefs such as awareness of the consequences of climate change on antecedents of behavioral intention, i.e., attitudes or norms [13–15]. Consequently, these models have not fully verified the impact of individual beliefs about climate change (i.e., awareness of the consequences of climate change) in the context of sports spectating and the antecedents mediating the relationship with pro-environmental intentions. To address this gap, this study aims to investigate the role of awareness of the consequences of climate change as a preceding variable to attitude, norm, and control, which serves as a direct predictor of intentions as described in the Theory of Planned Behavior [16]. By incorporating awareness of the consequences of climate change into the Theory of Planned Behavior framework, our study seeks to examine the psychological mechanisms through which beliefs about climate change affect pro-environmental behavioral intentions.

2. Theoretical Background and Hypotheses

2.1. Awareness of the Consequences of Climate Change and Pro-Environmental Behavior

Awareness of the consequences of climate change refers to individuals' perceptions of the impact of climate change on themselves and the community, shaped by their experiences, knowledge, and interactions [17]. Numerous studies have shown that individuals with a higher level of awareness are more likely to engage in a range of pro-environmental behaviors, such as reducing energy consumption, using public transportation, recycling, and supporting policies for climate change mitigation [18–20].

The Value–Belief–Norm (VBN) theory provides a relevant framework for understanding the connection between individuals' awareness of climate change consequences and eco-friendly behavior. This theory posits that pro-environmental actions are influenced by individuals' values, beliefs, and norms [21,22]. Those who prioritize environmental values are more likely to hold strong beliefs about the consequences of their actions on the environment and the need to protect it for future generations [13]. This, in turn, leads to the development of personal norms, motivating individuals to engage in eco-friendly behaviors that align with their environmental values and beliefs [17].

In the context of sports spectating, existing research has explored various aspects of fans' perceptions of pro-environmental behavior. Some studies have examined the impact of sport organizations' sustainability efforts on fan perceptions [12,14], while others have investigated the role of values and norms in shaping pro-environmental behavior [17,23]. Additionally, previous research has explored the influence of internal and external constraints on sustainability intentions and behaviors related to sport participation [12,24].

Despite the preceding studies, the specific link between climate change awareness and eco-friendly behavior in sports spectating remains underexplored. While prior research suggests awareness plays a role in influencing environmentally friendly behavior in daily life, in the context of sport spectatorship, empirical investigations are still needed. Therefore, this study aims to fill this gap by examining if climate change awareness determines intentions to reduce single-use plastics during sports spectating.

H1: *Awareness of the consequences of climate change would have a positive association with the behavioral intention of reducing the use of single-use plastics during sports spectating.*

2.2. Theory of Planned Behavior and Pro-Environmental Behavior

According to Ajzen's Theory of Planned Behavior [16], the decision to partake in behavior is predictable through individual intention, shaped by three belief-based factors: attitude, subjective norm, and perceived behavioral control [25]. The strength of these factors determines their influence on the individual's intention, with a more positive attitude, conformity to others' expectations, and confidence in controlling the influencing factors leading to a higher level of individual intention for that behavior.

In sport and environmental psychology studies, the Theory of Planned Behavior has been used to explain pro-environmental behavioral intention in the context of sport (e.g., [9–11,26]). Additionally, Clayton and Myers [27] reviewed factors affecting eco-friendly behavior and identified internal factors such as attitudinal variables and personal capabilities, as well as external factors such as social norms, corresponding to the three predictors in the Theory of Planned Behavior. Therefore, research based on the Theory of Planned Behavior is anticipated to advance our comprehension of the drivers (i.e., attitude, subjective norm, and perceived behavior control) behind the eco-friendly behavior of sports participants [15].

Indeed, McCullough [26] delineated the precursors of pro-environmental behavior, such as recycling, among sport spectators, utilizing the TPB framework and qualitative methodology. The results revealed that recycling practices at large-scale sporting events possess nuances that distinguish this context from others, such as household and workplace recycling. Specifically, attitudes toward recycling intentions are shaped by favorable behavioral expectations, subjective norms pertaining to recycling are influenced by significant others, such as families, and the accuracy/convenience of recycling-related information impacts perceived behavioral control. Despite this robust theoretical foundation, there is a dearth of studies employing the TPB to forecast individuals' eco-friendly behaviors while watching sports.

As described above, the decision-making behind participants' eco-friendly behavior during sports spectating can be explained using the Theory of Planned Behavior (TPB), focusing on antecedents of behavioral intention—attitude, subjective norm, and perceived behavior control [28]. In the context of eco-friendly behavior in sports spectating [9,15,26], intention is defined as “the intention to reduce the use of single-use plastics during spectating sports”. Attitude is an “individual's positive/negative evaluation of disposable things reduction behavior”, subjective norm is the “perception that an important person or group of people will approve and support reducing disposable things”, and perceived behavior control is the “evaluation of how easy it is to conduct the behavior of reducing disposable things”. These predictors are hypothesized to positively correlate with pro-environmental behavioral intentions. Thus, the research hypothesis is formulated as follows:

H2: *An attitude toward pro-environmental behavior would have a positive association with the intention to reduce the use of single-use plastics during sports spectating.*

H3: *A subjective norm on pro-environmental behavior would have a positive association with the intention to reduce the use of single-use plastics during sports spectating.*

H4: *Perceived behavior control regarding pro-environmental behavior would have a positive association with the intention to reduce the use of single-use plastics during sports.*

2.3. Extended Theory of Planned Behavior and Awareness of Climate Change

While the Theory of Planned Behavior has succeeded in predicting pro-environmental behavior, it has notable limitations. A significant drawback is its uncertainty in accurately

predicting intention and behavior beyond the influence of awareness of the consequences of climate change [29]. Given the pivotal role of awareness in guiding behavior related to climate change, it becomes evident that awareness of the consequences of climate change may play a crucial role in actual behavior change. To address this limitation, the extended Theory of Planned Behavior can be considered, as it incorporates awareness of the consequences of climate change as an additional determinant of behavior and recognizes its significance in predicting and promoting pro-environmental behavior.

Prior research has expanded pro-environmental behavior models by incorporating constructs from different contexts [30–33]. Particularly, the Norm Activation Theory (NAT), proposed by Schwartz [34], suggests that pro-environmental behavior is influenced by moral obligation activated through awareness of negative consequences. Studies on this framework have indicated that awareness significantly predicts behavioral intention, along with NAT variables like personal norms about outcome behavior [35–37]. Furthermore, awareness can stimulate pro-social behavior through heightened moral obligation and social pressure from personal norms, aligning with the subjective norm of the Theory of Planned Behavior [38]. However, no empirical study has examined both components together. Hence, extending the theoretical model with awareness of the consequences of climate change can be supported by recognizing the significant effects of subjective and personal norms on behavioral intention [39].

Moreover, a substantial connection exists between an individual's awareness and other variables in the Theory of Planned Behavior, including attitude and perceived behavior control. According to Ajzen [16], attitude can be influenced by salient beliefs that are shaped by an individual's awareness or perception. Do Paco and Raposo [40] suggest that as individuals become more aware of specific issues, their attitude toward behavior tends to become more positive, increasing the likelihood of exhibiting the behavior. Similarly, increased awareness may lead individuals to perceive a greater sense of control over their behavior as they become more knowledgeable about available options and strategies to reduce their carbon footprint [41,42]. Hence, awareness of the consequences of climate change can enhance individuals' understanding of the impact of their actions on the environment and motivate them to actively seek ways to mitigate climate change.

Bamberg and Moser [43] highlighted the significance of problem awareness in comprehending the formation of the three variables in the Theory of Planned Behavior. Awareness not only affects internal attributions of responsibility, social norms, and feelings of guilt (c.f., subjective norm) but also directly impacts the level of perceived behavior control and attitude toward choosing pro-social behavior. Furthermore, research in diverse contexts has shown the positive impact of awareness of consequences on attitude, subjective norms, and perceived behavior control [44,45]. Based on these findings, this study posits awareness of the consequences of climate change as a predictor of attitude, subjective norm, perceived behavior control, and behavioral intention to explore its impact on decision-making among sports fans. Accordingly, we hypothesize that awareness of the consequences of climate change positively influences individuals' pro-environmental behaviors, as follows:

H5: *Awareness of the consequences of climate change would positively influence the intention to reduce the use of single-use plastics during sports spectating through attitude.*

H6: *Awareness of the consequences of climate change would positively influence the intention to reduce the use of single-use plastics during sports spectating through subjective norms.*

H7: *Awareness of the consequences of climate change would positively influence the intention to reduce the use of single-use plastics during sports spectating through perceived behavior control.*

2.4. The Current Study

Based on the previous discussion, the purpose of this research is to investigate the relationship between awareness of the consequences of climate change and the intention

of sports fans to adopt pro-environmental behavior. More specifically, the focus is on reducing the use of single-use plastic items, which are commonly utilized during sports spectating and are detrimental to the environment. This behavior, often overlooked by spectators, is readily accessible and open to reflection by individuals. Consequently, this study aims to apply the extended model to examine the extent to which awareness of the consequences of climate change influences the attitude, subjective norm, and perceived behavior control of sports fans, which in turn affects their intention to reduce the use of single-use plastics during spectating sports. By investigating this relationship, the study contributes to the identification of factors that promote pro-environmental behavior and informs the development of targeted policies to foster sustainability in sporting events. The research model is shown in Figure 1.

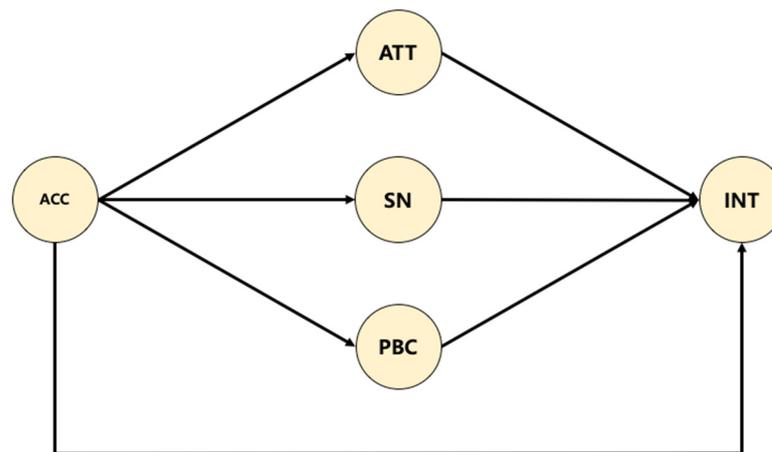


Figure 1. Research model. Note. Variable labels are as follows: ACC = awareness of climate change, ATT = attitudes, SN = subjective norm, PBC = perceived behavioral control, and INT = behavioral intention.

3. Materials and Methods

3.1. Participants and Procedures

The research focuses on individuals who have attended professional sports events in the United States within the past year. To accurately target a demographic relevant to our research aims, we employed a purposive selection strategy using the “Prolific Academic” platform (www.prolific.com, accessed on 15 February 2024). This platform is recognized for its ability to provide access to a wide and diverse participant pool, which is crucial for the specificity of our research criteria. Our participant selection was primarily purposive, aimed at identifying individuals who have actively participated in professional sports events within the past year in the United States. This criterion was pivotal to ensuring that our participants had direct exposure to the context in which environmental sustainability practices at sports events could be observed and evaluated. In addition to our purposive criteria, “Prolific Academic” incorporates a mechanism that introduces a degree of randomness in the allocation of surveys to participants. While our selection was guided by specific research criteria, the platform’s algorithm also randomly assigned our survey to eligible participants from its user base who met our predetermined criteria. This approach allowed us to maintain the focus of our purposive selection while benefiting from the variability introduced by the platform’s random distribution feature.

While this platform offers a diverse participant pool, concerns about careless responses exist [46]. To enhance data reliability, we followed recommendations by Palan and Schitter [47], instituting several screening conditions. Participants were required to (a) currently reside in the United States and (b) have attended U.S. professional sports events in the past year, considering the prevalence of single-use plastics at such events. To minimize careless responses, we included questions about attentiveness (c). Responses under 1 min were flagged for further examination (d). We gathered survey data from 500 participants. After

applying these criteria, 69 participants were excluded, resulting in 431 final participants. Compensation was EUR 1 (approx. USD 0.97). The data was collected between 1 July and 1 August 2023.

Table 1 provides participant demographics: 56.4% males, 42.3% females, and 1.3% undisclosed gender. Most were born in the 1990s (36.2%) and attended sports events ‘at least once a year’ (63.8%). NFL (39.9%) was the primary sport of interest, followed by MLB (28.1%), NBA (15.1%), and other sports (4.6%). All procedures for the current study were approved by the Institutional Review Board of Seoul National University (No. 2303/003-015), Seoul, Republic of Korea.

Table 1. Demographics of the participants ($n = 431$).

Demographics	Categories	Frequency	%
Gender	Male	243	56.4
	Female	182	42.3
	Prefer not to say	6	1.3
Birth	2000s	63	14.6
	1990s	156	36.2
	1980s	124	28.8
	1970s	57	13.2
	1960s	24	5.6
	1950s	6	1.4
	1940s	1	0.2
Ethnicity	Asian/Pacific Islander	66	15.3
	Black or African American	22	5.1
	Hispanic or Latino	51	11.8
	Native American or American Indian	3	0.7
	Other	14	3.3
Frequency of spectating	White	275	63.8
	At least once a year	264	61.3
	At least once a month	114	26.5
	At least once a week	48	11.1
Primary sports attended	At least once a day	5	1.2
	MLB	121	28.1
	MLS	23	5.3
	NBA	65	15.1
	NFL	172	39.9
	NHL	30	6.9
	Others	20	4.6

3.2. Measurements

Measurement items with established reliability and validity were adapted from previous studies [17,48–50] to assess awareness of the consequences of climate change, attitude, subjective norm, perceived behavior control, and behavioral intention. To avoid median bias, the Likert scale used for measurement ranged from 1 to 6 [51]. Finally, 28 items were used for measurement, including demographic variables such as gender, birth, ethnicity, and the frequency of spectating (see Appendix A).

The questionnaire items were modified and supplemented based on the literature mentioned above to ensure their relevance to the study context. Specifically, we aimed to explore various aspects of single-use plastic usage. For example, we provided details on avoiding items like plastic cups, straws, and food containers as strategies to reduce single-use plastic consumption during sports spectating. Furthermore, we presented alternatives such as tumblers and eco-friendly packaging. These details were provided on the questionnaire’s cover page, and participants completed the questionnaire with the precondition of comprehending disposable plastics and their substitutes while engaging in sports spectating.

3.2.1. Awareness of Climate Change

In this study, awareness of the consequences of climate change was defined as “beliefs about the adverse consequences of one’s actions on the environment and the importance of protecting it for future generations”. This was measured using the questions from Ryan and Spash [17], which were adapted for this study. Six items were assigned (e.g., “Climate change is a serious problem for me and my family”, “Climate change will threaten jobs for people like me”) and measured on a six-point Likert scale (1 = “strongly disagree”, 6 = “strongly agree”).

3.2.2. Theory of Planned Behavior Constructs

In this study, the items of Theory of Planned Behavior (attitude, subjective norm, perceived behavior control, and intention) were modified to measure the cognitive belief level and intention to reduce using single-use plastics [28]. Attitude was defined as the “degree of an individual’s positive or negative evaluation of single-use plastics reduction behavior during spectating sport”. Based on previous research [49], the questions related to attitude were composed of six items (e.g., “What do you think about reducing single-use plastic when you visit sports events?”). Subjective norm was defined as “the degree of perception that an important person or group of people will approve and support a behavior of reducing single-use plastics during spectating sport”. Based on previous studies [48], the questions related to subjective norm consisted of four items (e.g., “Most people who are important to me would want me to reduce using single-use plastic when visiting sports events”). Perceived behavior control was defined as the “degree of how easy it is to conduct the behavior of reducing use of single-use plastics during spectating sports”. Based on previous studies [49], the questions related to perceived behavior control consisted of four items (e.g., “Whether or not I try to reduce using single-use plastics when visiting sports events is completely up to me”). The behavioral intention to examine in this study is the “intention to act of reducing the use of single-use plastics during spectating sports”. Referring to Van and colleagues’ study [50], the questions related to intention were composed of four items (e.g., “When I visit as a sports spectator, I intend to find alternatives instead of using single-use plastics”). All the measurement items of the Theory of Planned Behavior were measured using a six-point Likert scale (1 = “strongly disagree”, 6 = “strongly agree”), except for items of attitude measured using a semantic differential scale (e.g., 1 = “bad”, 6 = “good”).

3.3. Data Analysis

The collected data and the research model were verified using IBM SPSS (Statistics 25.0 and Amos 23.0, IBM Corp., Armonk, NY, USA). The analysis proceeded as follows: Descriptive statistical analysis was initially conducted to assess the normality of the data. Skewness and kurtosis were calculated, and data were considered normally distributed if skewness was within ± 2 and kurtosis within ± 7 [52]. Then, confirmatory factor analysis (CFA) with the maximum likelihood method was conducted to evaluate the validity of the measurement model. The model fit was assessed using a combination of fit indices, including Chi-square (χ^2), standardized root mean square residual (SRMR), comparative fit index (CFI), Tucker–Lewis index (TLI), and root mean square error of approximation (RMSEA), following the criteria proposed by Hu and Bentler [53]. Specifically, a good model fit was indicated by a statistically non-significant χ^2 . However, recognizing that χ^2 can be sensitive to sample size, additional fit indices were considered [54]. As recommended in the literature [55], $SRMR \leq 0.08$, CFI and $TLI \geq 0.90$, and $RMSEA \leq 0.08$ were considered indications of acceptable fit. Also, we examined the overall validity and reliability of the measurement model using the construct reliability ($CR \geq 0.07$) and average variance extracted ($AVE \geq 0.05$; and the square root of the AVE of each construct to its highest correlation with any other construct) for each factor, as well as the Cronbach’s alpha value ($\alpha \geq 0.70$) of each variable [52]. These results supported the use of item parceling in subsequent analyses [56]. Finally, a multiple mediation analysis was conducted using

5000 bootstrapped samples with bias-corrected and accelerated 95% confidence intervals. Following Baron and Kenny's assumption [57], the mediation effects were assessed by examining whether the independent variable (awareness of the consequences of climate change) had a significant impact on the mediator variables (attitude, subjective norm, perceived behavior control), and whether these mediators, in turn, significantly influenced the dependent variable (intention), while controlling for the direct effect of awareness of the consequences of climate change on intention. This analysis was carried out following the multiple mediation analysis framework proposed by Hayes [58], specifically utilizing Model 4 as described in the PROCESS macro for SPSS. The statistical significance (α) was set at 0.05.

4. Results

4.1. CFA for the Measurement Model

Preliminary analysis results indicated that except for one item of attitude (no. 4; skewness = -2.04), all the items' dimensions achieved univariate normality; skewness values ranged from -1.61 to 0.58 , and kurtosis values ranged from -1.12 to 2.69 . The results of CFA and Cronbach's α for the measurement tool (a questionnaire) were shown as follows: Except for 2 items (no. 2 of awareness of the consequences of climate change and no. 3 of subjective norm) with factor loading (λ) < 0.50 , the CFA for the measurement model (five latent variables with 21 measurement variables) showed acceptable goodness-of-fit ($\chi^2 = 633.03$, $df = 179$, $p < 0.001$, but SRMR = 0.07 , TLI = 0.90 , CFI = 0.92 , and RMSEA = 0.07). All factor loadings were significant ($\lambda = 0.55$ to 0.90 , $p < 0.001$), indicating that the structures of the latent variables explain the data in the model well. Also, Cronbach's alpha values for each variable were acceptable (see Appendix B). On the basis of the above results, item parceling averaging the score for each variable was applied to subsequent analyses.

Table 2 shows descriptive statistics (M, SD), bivariate correlations, and a convergent/discriminant validity index (CR and AVE) of latent variables. All correlation coefficients between variables were significant: First, the independent variable awareness of the consequences of climate change had the highest correlation with attitude ($r = 0.49$, $p < 0.01$). Second, the dependent variable (intention) had the highest correlation with subjective norm ($r = 0.60$, $p < 0.01$), followed by attitude, awareness of the consequences of climate change, and perceived behavior control. In addition, the α , CR, and AVE values supported the convergent and discriminant validity of the measurement mode: $\alpha = 0.83$ to 0.88 (≥ 0.70), CR = 0.85 to 0.89 (≥ 0.70), AVE = 0.59 to 0.67 (≥ 0.50), and each AVE $>$ MSV and ASV.

Table 2. Bivariate correlations and model validity measures.

Variables	ACC	ATT	SN	PBC	INT	α	CR	AVE
ACC	4.88 (1.10)	-	-	-	-	0.87	0.87	0.59
ATT	0.49 **	5.07 (0.96)	-	-	-	0.88	0.89	0.62
SN	0.33 **	0.48 **	4.25 (1.18)	-	-	0.83	0.85	0.67
PBC	0.13 **	0.26 **	0.27 **	4.62 (1.20)	-	0.88	0.88	0.65
INT	0.47 **	0.52 **	0.60 **	0.31 **	4.22 (1.24)	0.85	0.86	0.61
MSV	0.24	0.27	0.36	0.09	0.36	-	-	-
ASV	0.14	0.20	0.19	0.06	0.23	-	-	-

** $p < 0.01$. Note 1. Abbreviations: ACC = awareness of climate change, ATT = attitudes, SN = subjective norm, PBC = perceived behavioral control, INT = intention, α = Cronbach's alpha, CR = composite reliability, AVE = average variance extracted, MSV = maximum shared variance, ASV = average shared variance. Note 2. Italic values in the diagonal indicate mean and (standardized deviation) of each variable.

4.2. Mediation Analyses for the Research Model

Table 3 and Figure 2 show the parallel mediating effect of constructs of the Theory of Planned Behavior between awareness of the consequences of climate change and intention.

Table 3. Path coefficients of direct effects for the mediation model.

Path	B	β	SE	t	Model-Fit
ACC → ATT	0.43	0.49	0.03	11.91 ***	$R^2 = 0.24, F(1, 429) = 141.87$ ***
ACC → SN	0.35	0.32	0.04	7.23 ***	$R^2 = 0.10, F(1, 429) = 52.37$ ***
ACC → PBC	0.14	0.13	0.05	2.84 **	$R^2 = 0.01, F(1, 429) = 8.08$ **
ACC → INT	0.26	0.24	0.04	6.00 ***	$R^2 = 0.49, F(4, 426) = 103.35$ ***
ATT → INT	0.22	0.17	0.05	3.97 ***	
SN → INT	0.42	0.40	0.04	10.06 ***	
PBC → INT	0.13	0.12	0.03	3.46 ***	

** $p < 0.01$, *** $p < 0.001$. Note 1. Abbreviations: ACC = awareness of climate change, ATT = attitudes, SN = subjective norm, PBC = perceived behavioral control, INT = intention. Note 2. All Statistics represent the direct relationship between variables.

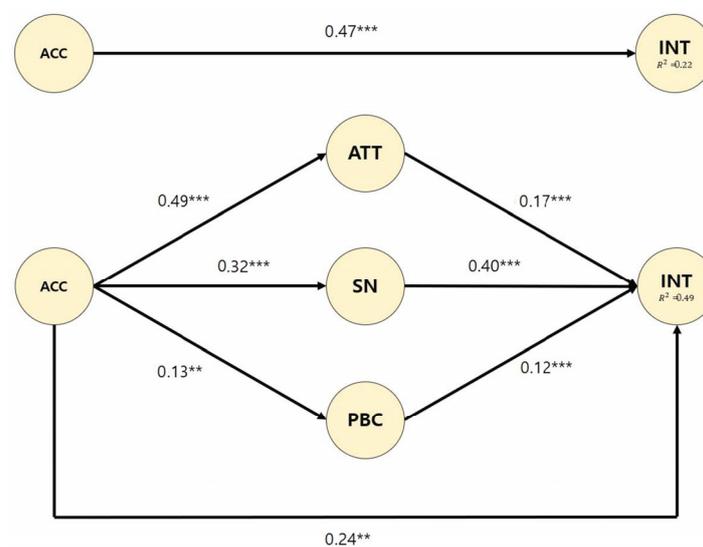


Figure 2. Direct and mediation model with path coefficients. Note 1. Variable labels are as follows: ACC = awareness of climate change, ATT = attitudes, SN = subjective norm, PBC = perceived behavioral control, INT = intention. Note 2. All Statistics represent standardized coefficients for paths. ** $p < 0.01$, *** $p < 0.001$.

4.2.1. Testing the Direct Effect

Table 3 shows the direct path between variables. First, awareness of the consequences of climate change showed a significant and positive effect on all variables of the Theory of Planned Behavior (attitude: $\beta = 0.49, p < 0.001$, subjective norm: $\beta = 0.32, p < 0.001$, perceived behavior control: $\beta = 0.13, p < 0.01$). Second, attitude ($\beta = 0.17, p < 0.001$), subjective norm ($\beta = 0.40, p < 0.001$), perceived behavior control ($\beta = 0.12, p < 0.001$), and awareness of the consequences of climate change ($\beta = 0.24, p < 0.001$) had a significant and positive effect on intention, which supported H1–H4.

Figure 2 shows that the direct effect of the independent variable (awareness of the consequences of climate change) on the dependent variable (intention) decreased when the mediators (attitude, subjective norm, and perceived behavior control) were included in the model ($\beta = 0.47, p < 0.001 \rightarrow \beta = 0.24, p < 0.001$), along with the increases in the amount of explanation for the total variance of intention ($R^2 = 0.22 \rightarrow R^2 = 0.49$). These results indicated that the variables of the Theory of Planned Behavior partially mediated the relationship between awareness of the consequences of climate change and intention, given the assumption of Baron and Kenny [57].

4.2.2. Testing the Indirect Effect

Table 4 shows the (total/specific) indirect effect of the variables in the Theory of Planned Behavior by applying bootstrapping ($n = 5000$) with 95% confidence intervals. First, the total indirect effect was significant and positive ($B = 0.26$, C.I. = 0.18 to 0.34). Second, the specific indirect effects through attitude ($B = 0.09$, C.I. = 0.03 to 0.16) and subjective norm ($B = 0.15$, C.I. = 0.09 to 0.20) were significant because the confidence interval does not include 0, but perceived behavior control does ($B = 0.01$, C.I. = 0.00 to 0.04). Consequently, H5 and H6 were supported, while H7 was not supported.

Table 4. Path coefficients of indirect effects for the mediation model.

Path	B	Boot SE	Bootstrapping 95% C.I.		
			Lower	Upper	Significance
ACC → ATT → INT	0.09	0.03	0.03	0.16	Sig.
ACC → SN → INT	0.15	0.02	0.09	0.20	Sig.
ACC → PBC → INT	0.01	0.01	0.00	0.04	Not sig.
total	0.26	0.04	0.18	0.34	Sig.

Note 1. Abbreviations: ACC = awareness of climate change, ATT = attitudes, SN = subjective norm, PBC = perceived behavioral control, INT = intention. Note 2. All Statistics represent indirect relationships between variables. Note 3. Bootstrapping $n = 5000$.

5. Discussion

Firstly, the study confirmed H1, revealing a significant positive link between awareness of the consequences of climate change and intention to engage in eco-friendly behavior, consistent with prior research [36,59–61]. Awareness is a crucial first step in promoting environmental-related behavioral change, as it alters default human reactions [62]. Eco-friendly behavior stems from personal judgments shaped by beliefs, desires, economic factors, and ethical considerations [63,64]. Concerns about climate change evoke awareness of negative economic and ethical repercussions, driving a preference for pro-environmental actions. Our study explored whether awareness of the consequences of climate change extends to contexts like sports spectating, probing awareness of the consequences of climate change's role as a predictor of eco-friendly behavior intention.

Secondly, the study affirmed H2–H4, indicating significant contributions of all variables (attitude, subjective norms, and perceived behavior control) to behavioral intention in sports spectating. Particularly, subjective norm emerged as a crucial factor, aligning with the findings of [9] regarding environmentally friendly behavior among sports club members. Their study identified Theory of Planned Behavior variables as influential, with the subjective norm being the most robust predictor. This finding resonates with previous research by McCullough and Cunningham [11] and Greaves and colleagues' study [65]. Given that subjective norms are shaped by conformity to others' expectations, fostering a shared belief among sports fans regarding the link between eco-friendly behavior and sustainable sports spectating can instill a sense of obligation, motivating spectators to curtail the consumption of single-use plastics.

Moreover, the study found support for H6, indicating that subjective norms have the strongest significant mediation path in mediating the relationship between awareness of the consequences of climate change and intention. This finding is consistent with previous research that has explored the role of environmental awareness in activating personal and social norms related to eco-friendly behavior [60,66–68]. According to the NAT [34], individuals' awareness of the consequences of their behavior on others and the environment can activate moral norms, leading to compliance with prosocial behavior. Therefore, higher levels of awareness of social and environmental issues are associated with a greater sense of personal responsibility [36,69]. The current study provides empirical evidence that the perception of injunctive norms (i.e., subjective norms) given by others in the social context

mediates the relationship between awareness of the consequences of climate change and eco-friendly behavioral intentions during sports spectating (i.e., intention).

The study also found that awareness of the consequences of climate change had a significant indirect effect on intention through attitude, supporting H5. This finding aligns with previous research that has shown how individuals' evaluations of eco-friendly behavior are influenced by concerns about climate change outcomes [70–72]. In other words, a positive attitude towards environmental-related behavior, which stems from awareness of the consequences of climate change, can facilitate eco-friendly behavior [73]. This is because the cognitive process of awareness involves evaluating the positive or negative valence of stimuli, leading to the formation of specific attitudes that guide behavior [74]. Thus, individuals with high levels of awareness of the consequences of climate change are more likely to develop a specific attitude towards environmental issues, which can influence their decision to engage in eco-friendly behavior during sports spectating.

Contrary to H7, this study did not find support for the mediating role of perceived behavior control between awareness of the consequences of climate change and intention. This could be because, in the context of eco-friendly behavior during sports spectating, awareness of the consequences of climate change seems to work independently of resource availability or opportunities. To illustrate, individuals possessing elevated levels of awareness may still encounter barriers to executing eco-friendly behaviors (i.e., perceived behavior control) if they lack experience on how to reduce single-use plastics at the stadium. This could involve not being familiar with the stadium's items (e.g., straws, water bottles, bags, etc.) that are replaceable with reusable alternatives or lacking the experience of preparing such items appropriately. If the constraints associated with proenvironmental behavior during sports events and various levels of competition could be controlled, it would enable us to obtain a purer variance in perceived behavioral control. However, the researchers determined that collecting objective data from anonymous respondents might pose limitations. Instead, it is possible that environmental knowledge, which refers to general knowledge about the natural environment and its ecosystems [75], could be associated with perceived behavior control. Similar to awareness of the consequences of climate change, knowledge is seen as a means to overcome psychological barriers like ignorance and misinformation, and is considered a necessary precondition for successful action [76]. Previous studies have found that environmental knowledge directly influences changes in eco-friendly behavior and intention [77–79]. Therefore, instead of awareness, which involves subjective judgments about climate change, knowledge that includes specific guidelines for eco-friendly behavior in response to climate change could be a meaningful antecedent to perceived behavior control and behavioral intentions. Further investigation of this potential association is warranted.

5.1. Academic Contributions

The current study significantly advances the literature by empirically demonstrating the pivotal role of awareness of the consequences of climate change in predicting pro-environmental intentions within the Theory of Planned Behavior framework, providing novel insights into sustainability in sports spectating. It is worth noting that, following McCullough's study [26], there has been a lack of research that extends and explores the components of TPB within the realm of sports spectatorship. While several studies have employed TPB, they primarily focused on direct participants (i.e., club members) of sporting events, neglecting to address the behaviors of indirect participants (i.e., spectators) [9]. Of particular significance, our study replicates the Theory of Planned Behavior alongside the Value–Belief–Norm Theory and Norm-Activation Theory, which have previously been amalgamated and applied within the domain of tourism services and product sales, now contextualized within the sphere of sports viewing [29,31,39,49].

Our extension of Theory of Planned Behavior, which includes awareness of the consequences of climate change alongside traditional constructs of Theory of Planned Behavior (i.e., attitude, subjective norm, and perceived behavior control), is well-aligned with pre-

vious research highlighting the profound impact of awareness of the consequences of climate change on environmental attitudes, norms, and behaviors [43,80,81]. This extension validates the augmented Theory of Planned Behavior framework, which incorporates elements of Value–Belief–Norm theory and Norm-Activation Theory, within the context of eco-friendly behavior. Specifically, these theories posit that individuals who hold strong environmental values and beliefs are more likely to develop personal norms that motivate pro-environmental behaviors. In our study, we found that awareness of the consequences of climate change plays a crucial role in shaping these constructs (i.e., attitude and subjective norm) as well as pro-environmental behavioral intention. Our findings validated this concept within the context of sports spectating. Future research is anticipated to explore the applicability of our model in various contexts or adapt our model to forecast a broader range of environmental behaviors among sports spectators.

5.2. Practical Implications

This study has practical implications. Firstly, it empirically underscores awareness of the consequences of climate change's importance in explaining eco-friendly intentions among sports spectators. According to the Sustainability Campaign Pathway [24], sport consumers develop sustainability awareness via various channels, and they cannot progress to involvement and decision-making capabilities without that awareness. In line with this, our study examined awareness of the consequences of climate change as a precursor to attitude and subjective norm, implying that raising fans' eco-friendly awareness is vital for sustainable sporting events. Therefore, understanding the level of sports fans' awareness of the consequences of climate change can help sport organizations determine how that awareness affects positive attitudes and subjective norms towards eco-friendly behavioral intentions [11]. Furthermore, while this study primarily focuses on reducing the use of single-use plastics as a measure of eco-friendly intentions among sports spectators, if the categories of eco-friendly behaviors expand to include other types of actions (such as using public transportation to attend games or saving water within the stadium), there is also the possibility that PBC will play a significant role in explaining the eco-friendly behavioral intentions of sports spectators. Therefore, considering this aspect may be necessary when formulating strategies to encourage eco-friendly behavior among sports fans.

Past studies have linked awareness formation to knowledge about the target behavior and its context [82–84]. According to the Information-Processing Model of Persuasion and Behavioral Change [85], continuous information acquisition induces the formation of a specific standpoint of awareness by improving individual knowledge of related issues. Therefore, sport organizations will be able to promote eco-friendly behavior during sport spectating by fostering favorable awareness of eco-friendly behavior through strategies that expose sports fans to climate change-related information and knowledge. Conversely, for fans who have reached a certain level of awareness, the focus should shift from awareness to attitude and subjective norms, as if associations exist for need, value, and internal constraints [12]. The findings of the current study can play an essential role in fostering eco-friendly behavioral intentions, even in the context of sport spectatorship, making them valuable foundational data for organizations seeking to establish strategies for sport sustainability.

5.3. Limitations and Future Directions

This study has limitations warranting attention in future research. First, the findings are constrained by focusing solely on reducing single-use plastics as a measure of eco-friendly intentions among sports spectators. Subsequent studies should encompass various aspects of eco-friendly behavior in sports, including lighting, water usage, and transportation. Second, the study does not consider participants' knowledge about climate change, a factor known to influence awareness. This should be explored in future research to augment the findings. Third, the data were collected through a professional survey agency, potentially introducing sample contamination due to financial incentives. Furthermore, this

approach relies on survey results based on self-reporting, which may lead to discrepancies when explaining actual human behavior. For future research, it is recommended to employ empirical data to measure environmentally friendly behaviors, going beyond sole reliance on surveys. Lastly, while this study conducted surveys exclusively targeting American sports spectators, considering the generalizability of the research, alternative sampling methods for sports fans and spectators should be considered in future studies.

6. Conclusions

This study explored awareness of the consequences of climate change's role in eco-friendly behavior intention in the context of sport spectating, revealing all paths from variables of the Theory of Planned Behavior to behavioral intention remained significant, with subjective norm as the strongest predictor. Additionally, mediation analysis confirmed that awareness of the consequences of climate change indirectly influenced intention through attitude and subjective norms. These findings can guide targeted strategies to promote environmental awareness and sustainability among sports fans, serving as a foundation for more direct efforts beyond climate change awareness.

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Institutional Review Board Statement: All procedures for the current study were approved by the Institutional Review Board of Seoul National University (No. 2303/003-015), Seoul, Republic of Korea.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data that support the findings of this study are openly in Google Sheets at https://bit.ly/climatechage_sw (accessed on 15 February 2024).

Conflicts of Interest: The authors declare there was no conflict of interest.

Appendix A. Survey Items

Variables	Content of Items
Demographics	Gender; Male/Female/Prefer not to say Birth; 2000s/1990s/1980s/1970s/1960s/1950s/1940s Ethnicity; Asian or Pacific Islander/Black or African American/Hispanic or Latino/Native American or American Indian/Other/white Primary sports attended; MLB/MLS/NBA/NFL/NHL/Others(describe) Frequency of spectating; At least once a day/week/month/year
Awareness of the consequences of Climate Change (ACC)	Climate change is a serious problem for me and my family. Climate change will threaten jobs for people like me. Climate change will deteriorate our quality of life. The effects of climate change on public health are worse than we realize. Over the next several decades, thousands of species could become extinct due to the effects of climate change. Claims that current levels of pollution are changing earth's climate are exaggerated. (R)

	What do you think about reducing single-use plastic when you visit sports events? (1) Bad–(6) Good (1) undesirable–(6) desirable (1) unenjoyable–(6) enjoyable (1) foolish–(6) wise (1) unfavorable–(6) favorable (1) unpleasant–(6) pleasant
Attitude (ATT)	
Subjective Norm (SN)	Most people who are important to me would want me to reduce single-use plastic when visiting sports events. Most people who are important to me would think I should reduce single-use plastic when visiting sports events. Other spectators seem to be responsible for reducing single-use plastic. Other spectators would expect me to reduce single-use plastic
Perceived Behavioral Control (PBC)	Whether or not I try to reduce single-use plastic when visiting sports events is completely up to me. I have resources, time, and opportunities to try to reduce single-use plastic when you visit sports events. I am confident that if I want, I can try to reduce single-use plastic when visiting sports events. I feel in complete control over whether I will reduce single-use plastic.
Behavioral Intention (INT)	When I visit as a sports spectator, I intend to find alternatives instead of using single-use plastic items. When I visit as a sports spectator, I am willing to persuade other individuals to reduce using single-use plastic. When I visit as a sports spectator, I intend to educate my relatives about the way of reducing single-use plastic. I am willing to switch to using plastic-free accessories and tools.

Appendix B. Measurement Items with Descriptive Statistics, Factor Loadings, and Cronbach's Alpha Values ($n = 431$)

Variables	Item No.	Mean	SD	Skewness	Kurtosis	Factor Loading	α
Awareness of the consequences of Climate Change (ACC)	1	4.52	1.404	−0.836	−0.099	0.766	0.873
	2	2.81	1.766	0.587	−1.012	-	
	3	4.93	1.378	−1.436	1.300	0.817	
	4	5.03	1.303	−1.432	1.394	0.899	
	5	5.04	1.248	−1.417	1.588	0.741	
	6 *	4.91	1.474	−1.362	0.782	0.610	
Attitude (ATT)	1	5.24	1.238	−1.878	2.973	0.671	0.885
	2	5.26	1.111	−1.763	2.869	0.846	
	3	4.63	1.234	−0.586	−0.329	0.731	
	4	5.42	0.968	−2.041	4.613	-	
	5	5.33	1.058	−1.995	4.133	0.839	
	6	4.90	1.197	−1.030	0.554	0.839	
Subjective Norm (SN)	1	4.58	1.291	−0.691	−0.202	0.916	0.833
	2	4.57	1.353	−0.726	−0.253	0.933	
	3	3.60	1.467	−0.002	−0.926	-	
	4	3.63	1.452	−0.022	−0.857	0.570	
Perceived Behavioral Control (PBC)	1	4.57	1.437	−0.887	−0.102	0.689	0.881
	2	4.63	1.386	−0.897	−0.076	0.848	
	3	4.87	1.269	−1.064	0.372	0.863	
	4	4.44	1.502	−0.655	−0.692	0.829	
Behavioral Intention (INT)	1	4.17	1.506	−0.520	−0.686	0.795	0.851
	2	3.71	1.642	−0.135	−1.129	0.834	
	3	3.83	1.671	−0.310	−1.076	0.904	
	4	5.19	1.085	−1.610	2.696	0.559	

* Revers coded.

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