

Sustainable behaviours of athletes and fans at a central american skating and skateboarding championship: determinants and future intentions

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ABSTRACT

This study examines factors that predict sustainable behaviours among participants and spectators during the Central American Championship of Skating and Skateboarding and analyses how these behaviours influence future sustainable intentions. A total of 141 individuals (58.5% spectators, 41.5% participants; M age = 30.33 ± 12.9 years) completed a self-administered questionnaire comprising 40 items adapted from previously validated instruments. Two predictive models were tested using multiple linear regression. The first model assessed the extent to which past sustainable behaviours, internal and external constraints, and perceptions of sustainable initiatives predicted sustainable behaviour during the event. The second model examined whether sustainable behaviour during the event and satisfaction with sustainable initiatives predicted future sustainable intentions. Past sustainable behaviors, internal and external constraints, and perceptions of sustainable initiatives were all significant predictors of sustainable behavior during the event. Sustainable behaviour during the event significantly predicted future intentions to engage in sustainable behaviour. In contrast, satisfaction with sustainable initiatives did not significantly predict future intentions, which may reflect the one-off nature of the event and limited prior exposure to sustainability initiatives. These findings underscore the importance of implementing visible, well-designed sustainability initiatives at sports events and of reducing internal and external constraints to encourage environmentally responsible behaviours among both participants and spectators and to foster future sustainable intentions.

KEYWORDS: event participants; environmental sustainability; sustainable behavior; constraints; Central America; environmental behavior.

INTRODUCTION

The relationship between sport and the environment is bidirectional (McCullough et al., 2020). The environment provides the natural and built spaces where physical activity and sport occur, but these spaces are increasingly affected by climate change and natural disasters (Bernard et al., 2021). This interaction obliges sport practitioners to take responsibility for reducing the environmental impacts of their operations and events (Inoue & Kent, 2012). This responsibility is particularly salient in Central America, a region highly vulnerable to the effects of climate change, including extreme weather events, environmental degradation, and rising temperatures. Outdoor sports are especially exposed to

these pressures, underscoring the importance of integrating sustainability into event planning and management practices to protect both the environment and the continuity of sports events (Hugaerts et al., 2021; Wendtlandt & Wicker, 2021).

Sport events typically involve at least two prominent stakeholder groups (i.e., spectators and participants) whose interactions with the event environment differ substantially. Yet, together they consume considerable natural resources and produce waste (Dolf & Teehan, 2015). Understanding the environmentally sustainable behaviour of both competitors and spectators during sports events is therefore essential for designing interventions that effectively reduce environmental impacts.

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Researchers have examined the environmental impacts of sport events (Collins et al., 2007; Cooper & McCullough, 2021; Dolf & Teehan, 2015) and have evaluated interventions designed to reduce these impacts (Trail & McCullough, 2021). However, much of this work has focused primarily on spectators, with considerably less attention paid to participants as key stakeholders in the sustainability of sport (Trail & McCullough, 2021; Wicker, 2019).

This gap is especially important in small- to mid-scale sport events, such as the Central American Championship of Skating and Skateboarding, where the number of participants is comparable to the number of spectators and where both groups share the event space while experiencing it differently. In this championship, spectators interact freely with public areas and waste-management infrastructure. In contrast, participants often operate within designated competition spaces and adhere to stricter schedules, which may limit their autonomy in environmental decision-making. These structural differences suggest that sustainability initiatives may be perceived, constrained, and enacted differently across stakeholder groups, warranting their joint examination within a single analytical framework.

Existing research on environmentally sustainable behaviours at sport events has identified several factors that shape whether individuals engage in such behaviours. Participation in sustainable behaviours has been linked to prior sustainable actions (Thormann & Wicker, 2021; Trail & McCullough, 2019), as well as to internal and external constraints that may facilitate or limit behavioural engagement (Casper et al., 2020; Martins et al., 2021; Martins et al., 2022; Trail & McCullough, 2018). Internal constraints commonly include limited awareness, low perceived importance of environmental protection, or scepticism regarding the effectiveness of individual action. In contrast, external constraints encompass contextual barriers such as time limitations, financial costs, and inadequate infrastructure. Additionally, recent conceptual papers suggest that sustainability constraints may arise from structural and governance-related pressures within sport systems, reinforcing the need for broader theoretical integration (Gammelsæter & Loland, 2023).

Recent studies further demonstrate that spectators' and participants' environmental intentions are shaped by broader psychosocial mechanisms such as climate-change awareness, subjective norms, and situational cues present at sport events (Hwang et al., 2024). Moreover, contemporary segmentation research shows that event attendees form distinct clusters with different pro-environmental intentions and values, reinforcing the need to examine stakeholder groups separately

when evaluating sustainability outcomes (Konstantopoulos et al., 2024).

While prior studies have demonstrated the relevance of these factors, they have typically examined them within a single stakeholder group, most often spectators, highlighting the need for broader stakeholder inclusion. Much of the literature has focused on large events in North America and Europe (Cury et al., 2022), where sustainability campaigns are frequently institutionalised and repeated across seasons. Recent systematic reviews also highlight a strong geographical bias in sustainability in sport literature, underscoring the importance of expanding empirical work to other regions (Cury et al., 2022).

Less is known about how sustainability initiatives function at smaller, participant-focused events (e.g., running events; McCullough et al., 2023) or at events where the number of participants is close to the number of spectators (e.g., youth sport; McCullough & Cunningham, 2011; Wicker, 2019). In these contexts, athletes and participants may constitute a substantial share of the total event population, and their behaviours and constraints may differ systematically from those of spectators.

Accordingly, this study aims to examine the factors that determine sustainable behaviours among both participants and spectators attending the Central American Championship of Skating and Skateboarding and to explore how these behaviours influence future sustainable intentions. Building on existing theoretical frameworks, we propose two predictive models. The first model examines whether perceptions of sustainable initiatives, past sustainable behaviours, and internal and external constraints predict sustainable behaviours during the event. The second model evaluates whether sustainable behaviours during the event and satisfaction with sustainable initiatives are associated with future intentions to engage in sustainable behaviours. Through this approach, the study seeks to extend the literature on sport sustainability by incorporating multiple stakeholder perspectives, focusing on a small- to mid-scale event, and situating the analysis within an underexplored Central American context.

Conceptual background

For this study, we propose two predictive models to examine sustainability-related behaviours in the context of a sports event. The models are grounded in the Model of Sustainability Behaviour (Belz & Peattie, 2012), the Two-Dimensional Model of Constraints (Kim & Trail, 2010), the Theory of Planned Behaviour (Ajzen, 1991), and the Theory of Reasoned Action (Ajzen & Fishbein, 1980).

The first model, referred to as the Sustainable Behaviour Model, focuses on explaining sustainable behaviours featured during the event. It proposes that individuals' perceptions of sustainable initiatives, their past sustainable behaviours, and their perceived internal and external constraints jointly influence the likelihood of engaging in sustainable behaviours while attending the event. The second model, termed the Future Sustainable Intentions Model, examines whether sustainable behaviours performed during the event and satisfaction with sustainable initiatives are associated with future sustainable behavioural intentions beyond the event context.

The Sustainable Behaviour Model (Figure 1) depicts the hypothesised relationships between perceptions of sustainable initiatives (Hypothesis 1a), past sustainable behaviours (Hypothesis 1b), internal constraints (Hypothesis 1c), external constraints (Hypothesis 1d), and sustainable behaviour during the event. Figure 2 presents the Future Sustainable Intentions Model (Figure 2), in which sustainable behaviour

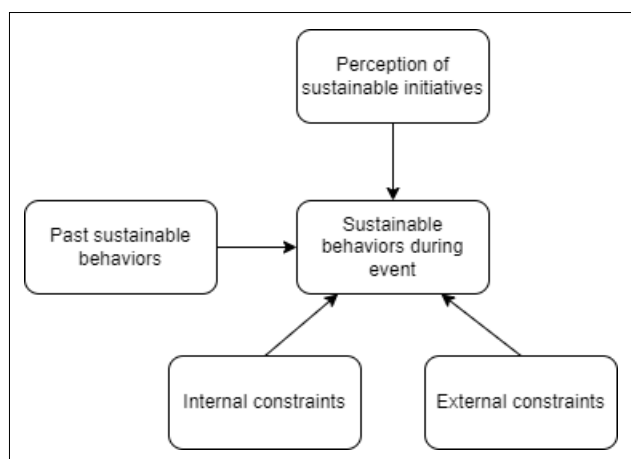


Figure 1. Sustainable Behaviour Model.

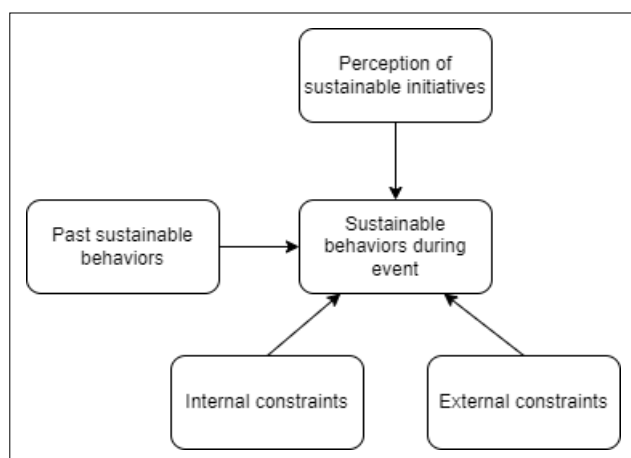


Figure 2. Future Sustainable Intentions Model.

during the event (Hypothesis 2a) and satisfaction with sustainable initiatives (Hypothesis 2b) are proposed as predictors of future sustainable intentions.

Sustainable behaviours

Behaviour refers to the observable actions that individuals engage in, which can be influenced and limited by both internal and external factors (Trail & McCullough, 2018). In this study, sustainable behaviour refers to actions that safeguard environmental resources and demonstrate individuals' commitment to responsible engagement with the natural world (Triantafyllidis & Darvin, 2021). Such behaviours typically include recycling, waste separation, composting, and broader practices related to waste management, energy and water conservation, and transportation. In the context of sports events, sustainable behaviours are often situational. They depend not only on individuals' predispositions (e.g., environmental values, habits) but also on the opportunities and constraints created by event infrastructure (e.g., availability and placement of waste bins) and organisational practices (e.g., communication and signage). Exposure to sustainability campaigns during sports events can encourage desired behaviours (Trail & McCullough, 2021). In the present study, the event organisers did not implement a formal sustainability campaign but did introduce specific environmental protection initiatives (e.g., waste-separation infrastructure). This context allows us to test whether exposure to such initiatives, without a comprehensive campaign, is associated with sustained behaviour change during the event. Accordingly, we propose:

Hypothesis 1a: Perceived support for sustainable initiatives predicts sustainable behaviours during the event.

Past behaviour

The Theory of Planned Behaviour (Ajzen, 1991; Ajzen & Madden, 1986) posits that current behaviour is influenced by attitudes, subjective norms, and perceived behavioural control, and it also recognises past behaviour as an important predictor of future actions. In sport and environmental contexts, several studies have confirmed that prior sustainable behaviours influence subsequent sustainable behaviours and intentions (McCullough & Cunningham, 2011; Shapiro et al., 2013; Thormann & Wicker, 2021; Trail & McCullough, 2019; 2020). Past sustainable behaviours can be understood as routine, environmentally responsible actions performed in everyday life (e.g., consistently recycling, separating waste, or avoiding single-use plastics). At sports events, these prior habits may shape how individuals respond to sustainability initiatives and whether they engage in similar behaviours in

a new context. In this study, past sustainable behaviours refer to environmentally responsible actions performed before attending the event, while sustainable behaviours during the event capture context-specific actions shaped by the event environment. We are particularly interested in how these relationships manifest when both spectators and competitors are taken into account. Thus, we propose:

Hypothesis 1b: Past sustainable behaviours predict sustainable behaviours during the event.

Internal and external constraints

The Model of Sustainability Behaviour (Belz & Peattie, 2012) suggests that sustainable behaviour arises from the interaction among three sets of factors: individual, contextual, and intervention-related. For sport organisers, understanding these factors is vital because it enables the design of sustainability initiatives that help spectators and participants overcome perceived barriers, align their actions with their values and social norms, and thereby foster sustainable behaviour during sport events. Consistent with this model, prior research indicates that sustainable behaviour can be influenced by internal and external constraints (Trail & McCullough, 2018) and highlights the importance of sustainability campaigns in promoting desirable behaviours (Trail & McCullough, 2021). The Two-Dimensional Model of Constraints (Kim & Trail, 2010) classifies barriers as internal or external. Internal barriers, which appear first in the hierarchy, generally include unawareness and a lack of value placed on the behaviour. In contrast, external barriers encompass social and environmental factors, such as cost, time, and infrastructure constraints.

Empirical studies have shown that sustainable behaviours at sport events are both encouraged and constrained by these internal and external factors (Casper et al., 2020; Martins et al., 2021; Martins et al., 2022; Trail & McCullough, 2018). In this study, internal constraints refer to the lack of value participants place on environmental care and their limited awareness of proper waste and recyclable disposal. External constraints include perceived economic costs, limited time, and environmental structural limitations (e.g., insufficient or poorly located waste bins) that impede sustainable action. By examining both spectators and competitors within the same event, we aim to gain a more comprehensive understanding of how these constraints operate across stakeholder groups.

The evidence emphasises that internal qualities such as connectedness to nature and prosocial values may reinforce or mitigate internal constraints, influencing sustainable behaviours even in controlled sport environments (Jansen et al., 2024). Structural limitations such as infrastructure design, resource availability,

and organisational prioritisation have also been identified as major external constraints shaping behaviour during sport events (Hautbois & Desbordes, 2023). Therefore, we propose:

Hypotheses 1c and 1d: Internal and external constraints predict sustainable behaviours during the event.

Future sustainable intentions

Researchers have found that sport organisations can influence future fan intentions through targeted engagement campaigns (Casper et al., 2020; Inoue & Kent, 2012). The Theory of Reasoned Action (Ajzen & Fishbein, 1980; Fishbein, 1979) posits that behavioural intentions are the most immediate predictor of behaviour and that stronger intentions increase the likelihood that a behaviour will be performed.

In the context of sports events, identifying the factors that predict future sustainable intentions is essential if organisers wish to extend the influence of event-based initiatives beyond the event itself. Prior work suggests that both behaviours performed during the event and evaluations of sustainability initiatives (e.g., satisfaction) can shape future intentions (Casper et al., 2017; Trail & McCullough, 2021).

Sustainable behaviours enacted during the event may reinforce environmental norms and self-perceptions (e.g., “I am the kind of person who recycles”), which in turn strengthen intentions to engage in similar behaviours in the future. At the same time, satisfaction with sustainability initiatives—understood as an evaluative judgment based on expectations and perceived performance (Oliver, 1980)—can also influence future intentions. Expectation-disconfirmation theory suggests that when experiences meet or exceed expectations, satisfaction increases, which may encourage continued engagement. Based on this literature, we propose the following hypotheses in the Future Sustainable Intentions Model:

Hypothesis 2a: Sustainable behaviours during the event predict future sustainable intentions.

Hypothesis 2b: Satisfaction with sustainable initiatives predicts future sustainable intentions.

In this study, we examine sustainable behaviour and future intentions related to waste management, composting, waste separation, and recycling.

The results are expected to inform sport organisations about how event-based sustainability initiatives influence different stakeholder groups and to provide evidence to guide the planning and execution of more effective, context-appropriate interventions. Although existing literature supports the relationships embedded in the proposed models, the novelty of this study lies in the joint examination of spectators and participants within the same event and its location in an underexplored Central American context. Most prior

studies have focused on a single stakeholder group and have been conducted primarily in North America and Europe. By contrast, this research provides a more integrated framework for understanding sustainability-related behaviours and intentions across stakeholder groups in a small- to mid-scale sport event in Central America

Together, the Sustainable Behaviour Model and the Future Sustainable Intentions Model provide an integrated conceptual foundation for examining how event-based sustainability initiatives function across stakeholder groups and how they may contribute to longer-term sustainable intentions beyond the event itself.

METHOD

Participants

This study was conducted with spectators and competitors of the XXI Central American Championship of Skating and Skateboarding, which took place in San Jose, Costa Rica, from December 1st to 4th, 2022. A total of 141 participants who attended the XXI Central American Championship of Skating and Skateboarding were included in the study, with a mean age of 30.33 ± 12.9 years. Of these, 58.5% (82) were spectators and 41.5% (59) were participants. The response rate could not be determined because the researchers lacked access to the total number of individuals who received the survey invitation. The federation distributed the survey

independently to protect participants' privacy; therefore, the exact size of the distribution list was not available.

Furthermore, 72.5% (103) of participants self-identified as environmentalists, whereas 27.5% (39) did not. This classification was based on participants' self-identification using a single item asking whether they considered themselves environmentally conscious or committed to environmental protection. Table 1 shows the main characteristics of the study subjects.

Procedures

The current study was conducted with approval from the lead author's institution. To obtain the necessary data, the Costa Rican Skating and Related Sports Federation was initially contacted to provide information about the study objectives and to request collaboration. Following approval, the federation distributed an online survey via email to all registered spectators and competitors who attended the event. Data collection took place after the event concluded (December 2022). The survey invitation was sent once after the event and included a brief description of the study purpose, emphasised the voluntary nature of participation, assured respondents of anonymity, and clarified that no personally identifying information would be collected. This approach was adopted to protect participants' privacy and comply with Costa Rican Law No. 8,968 on personal data protection. Importantly, the researchers did not have access to personal contact information, and participation was entirely voluntary.

Table 1. Characteristics of participants.

		Frequency	Percentage (%)
Gender	Male	89	62.7
	Female	53	37.3
Country of origin	Costa Rica	103	72.5
	El Salvador	18	12.7
	Nicaragua	13	9.2
	Panamá	8	5.6
Education Level	Elementary School	33	23.2
	High School	36	25.4
	Technical school	19	13.4
	College graduate	54	38.0
Marital Status	Single	70	49.3
	Married	46	32.4
	Divorced	14	9.9
	Other	12	8.5
Socio-economic Status	Lower middle class	64	45.1
	Middle class	78	54.9

Instrument

A self-administered questionnaire was developed to collect data, incorporating modified and/or adapted items from various validated instruments, as well as items specifically created for the study. The instrument comprised 40 items (Table 2), each rated on a seven-point Likert scale, with 7 indicating “completely agree” and 1 indicating “completely disagree.” In addition, the questionnaire collects socio-demographic data from participants, including age, gender, country of origin, marital status, educational level, and socioeconomic status.

The past sustainable behavior (5 items), internal constraints (5 items), external constraints (5 items), sustainable behaviors during sport event (6 items), and future sustainable intentions (5 items) were evaluated using questions adapted from Trail and McCullough (2018; 2020). Adaptations primarily involved rewording items to reflect the sport event context (e.g., replacing references to everyday behaviour with behaviours enacted during the event) while preserving the original conceptual meaning and response structure. Perceptions of sustainable initiatives during the sport event (7 items) and satisfaction with these initiatives (4 items) were evaluated using items developed specifically for this study, drawing on prior literature and the characteristics of the event context.

Data analysis

Preliminary data analyses included descriptive statistics and normality tests of the main study variables. The means, standard deviations, asymmetry, and kurtosis were calculated. The normality of the data was assessed using a normal distribution. Additionally, to assess the instrument’s validity and reliability, Cronbach’s alpha, average variance extracted (AVE), and composite reliability (CR) were calculated. As the primary analyses for fulfilling the proposed objective, we first calculate a T-student test, and the multiple linear regression technique (forward) was used to establish the relationship between the study variables. Regression assumptions were evaluated prior to model testing. Visual inspection of standardised residuals and scatterplots suggested no major violations of normality or homoscedasticity, and Durbin–Watson statistics indicated independence of errors. Multicollinearity was assessed using variance inflation factor (VIF) values, all of which were close to 1, indicating no multicollinearity concerns.

To test the study hypotheses, independent t-tests were conducted comparing spectators and participants. Subsequently, a forward stepwise multiple linear regression approach was employed to examine the predictive relationships proposed in the two models. This approach was selected to identify the most parsimonious set of predictors given the exploratory nature of the study and the inclusion of multiple theoretically

relevant variables. IBM SPSS Statistics 24.0 was used to perform all calculations.

RESULTS

Two models were proposed for this study to predict “sustainable behaviours during events” and predict “future sustainable initiatives.” The items employed in the questionnaire showed univariate normality. Values for asymmetry and kurtosis are shown in Table 2. Cronbach’s alpha, composite reliability (CR), and average variance extracted (AVE) values demonstrated adequate internal consistency and construct validity for most studies (Table 3). Acceptable AVE values are approximately .70, whereas acceptable Cronbach’s alpha values range from .80 to .90 (Streiner, 2003). Although internal and external constraints exhibited slightly lower AVE values, their CR values exceeded recommended thresholds, indicating acceptable reliability for exploratory research (Bagozzi & Yi, 1988). Appropriate AVE values should be higher than 0.5 (Hair *et al.*, 2006).

Group differences between spectators and participants

To better understand the behaviour of spectators and participants, we conducted comparisons across all variables. We found a significant difference between spectators and participants in perceptions of sustainable initiatives, perceptions of sustainable behaviours during events, satisfaction with these initiatives, and intentions to pursue future initiatives (Table 4). Specifically, spectators reported significantly higher perceptions of sustainable initiatives, higher levels of sustainable behaviour during the event, greater satisfaction with these initiatives, and stronger future intentions to engage in sustainable behaviours than participants. Participants, in contrast, reported significantly lower levels of perceived external constraints.

Effect size estimates (Cohen’s *d*) ranged from small to moderate (approximately .30–.55), suggesting meaningful but not large differences between spectators and participants across these variables.

Model 1: Predictors of sustainable behaviours during the event

To test our hypothesis, our results suggested that the first model proposed fit adequately well ($R^2 = .642$; $F = 61.309$; $p < .001$; Durbin–Watson = 1.950; VIF values around 1). All hypotheses were supported (Table 5).

The results indicate that perceptions of sustainable initiatives ($\beta = .643$, $p < .001$), past sustainable behaviours ($\beta = .164$, $p = .002$), internal constraints ($\beta = .159$, $p = .022$), and

Table 2. Variables and items of the applied questionnaire.

Variable	Item	M	SD	Asymmetry	Kurtosis
Past sustainable behaviours	Avoiding single-use plastic.	1.27	.44	1.02	1.02
	Separating organic and inorganic waste.	3.63	1.76	.73	.73
	Composting organic waste.	4.22	2.06	.06	.06
	Sorting inorganic waste into glass, plastic, aluminium, and paper.	3.23	2.31	.58	.58
	Recycling recyclable materials.	4.13	2.11	.029	.03
Internal constraints	Caring for and protecting the environment is not a priority.	4.66	2.03	-.36	-.36
	Proper waste disposal is not prioritised.	2.28	2.42	1.42	1.42
	Recycling is not a priority.	1.94	2.08	1.87	1.87
	I am not familiar with proper waste disposal methods.	1.37	1.41	3.68	3.68
	My individual efforts to properly dispose of waste are not sufficient to make a difference.	2.32	2.32	1.42	1.42
External constraints	It requires a significant amount of money.	2.63	2.33	1.10	1.10
	It requires a significant amount of time.	1.72	1.62	2.30	2.30
	It is very challenging.	1.77	1.68	2.06	2.06
	I do not have enough space at home to properly sort and recycle waste.	1.72	1.62	2.25	2.25
	I don't have enough space at home to compost organic waste.	1.84	1.26	1.31	1.31
Perception of sustainable initiatives.	The waste bins made it easy to separate waste.	3.08	2.12	.67	.67
	The number of waste bins was adequate.	3.01	1.87	1.02	1.02
	The location of the waste bins was suitable	3.11	2.04	.86	.86
	The size of the bins was sufficient to accommodate waste.	3.38	1.90	.71	.71
	Recycling options were available.	4.33	1.99	.37	.37
	Composting options were available.	3.35	1.78	.66	.66
	The organisation's waste management practices were satisfactory.	2.75	1.88	1.03	1.03
Sustainable behaviours during a sports event.	I avoided from using single-use plastic items.	3.66	1.80	.36	.36
	I separated organic and inorganic waste.	3.56	2.32	.23	.23
	I composted organic waste.	2.65	2.32	.98	.98
	I sorted inorganic waste into different categories (glass, plastic, aluminium, paper).	2.05	2.04	1.8	1.79
	I recycled recyclable materials.	2.61	2.25	1.03	1.03
	I disposed of my waste properly.	3.12	2.65	.56	.56
Satisfaction with sustainable initiatives	Recycling initiatives.	2.94	2.01	.73	.73
	Waste collection initiatives.	3.37	2.18	.43	.43
	Waste separation initiatives.	2.99	2.10	.64	.64
	Overall waste management initiatives.	3.57	2.24	.35	.35
Future sustainable intentions	I will reduce single-use plastic.	4.73	1.76	.08	.08
	I will separate waste into organic and inorganic.	5.32	1.95	-.52	-.52
	I will compost organic waste.	4.90	1.99	-.26	-.26
	I will sort inorganic waste into glass, plastic, aluminum, and paper.	5.32	2.08	-.64	-.64
	I will recycle recyclable materials.	5.32	2.08	-.64	-.64

external constraints ($\beta = .192, p = .005$) were all significantly associated with sustainable behaviours during the event. Thus, all hypotheses related to Model 1 (H1a–H1d) were supported.

Given the observed differences between spectators and participants, participant type was initially included as a potential predictor, and interaction terms between participant type and the main predictors were examined. These interaction terms were not statistically significant and did not improve model fit. Consequently, participant type was excluded from the final model to preserve parsimony.

Table 3. Alpha's Cronbach, AVE, and CR.

Variable	Alpha's Cronbach	AVE	CR
Past sustainable behaviours	.88	.71	.92
Internal constraints	.62	.45	.71
External constraints	.58	.44	.72
Perception of sustainable initiatives	.88	.61	.91
Sustainable behaviours during the event	.91	.85	.93
Satisfaction sustainable initiatives	.97	.92	.98
Future sustainable initiatives	.96	.85	.97

Model 2: Predictors of future sustainable intentions

In our second proposed model, we stated in Hypotheses 2a and 2b that “sustainable behaviour during the event” and “satisfaction with sustainable initiatives” predict “future sustainable intentions.” We found a significant model ($R^2 = .122; F = 9.651; p < .001$; Durbin-Watson = 2.428; VIF values around 1), but our results do not support Hypothesis 2b, “satisfaction with sustainable initiatives” is not a significant predictor. Moreover, our results supported Hypothesis 2a, indicating that “sustainable behaviour during the event” significantly predicts “future sustainable intentions” (Table 5). Sustainable behaviours during the event were significantly associated with future sustainable intentions ($\beta = .220, p = .022$), supporting Hypothesis 2a. In contrast, satisfaction with sustainable initiatives was not statistically significantly associated with future sustainable intentions ($\beta = .176, p = .066$); therefore, Hypothesis 2b was not supported.

Although the explained variance in Model 2 was modest, this effect size is consistent with prior research on behavioural intentions in environmental and sport contexts, in which future intentions are influenced by multiple situational, contextual, and individual-level factors beyond a single event experience.

Table 4. Descriptive statistics and t-test.

Variable	Spectators (n = 83)	Participants (n = 59)	t	p-value
	M ± SD	M ± SD		
Past sustainable behaviours	4.16 ± 1.72	3.71 ± 1.69	1.55	.415
Internal constraints	1.95 ± 1.35	2.33 ± 1.33	-1.62	.083
External constraints	2.14 ± 1.12	1.87 ± 0.86	1.56	.023*
Perception of sustainable initiatives	3.69 ± 1.49	2.93 ± 1.29	3.17	.017*
Sustainable behaviours during events	3.38 ± 2.10	2.92 ± 1.65	1.40	.000*
Satisfaction sustainable initiatives	3.76 ± 2.07	2.45 ± 1.74	3.97	.002*
Future sustainable initiatives	5.32 ± 1.67	4.83 ± 1.99	1.57	.000*

M: Mean; SD: Standard deviation; t: t value; * $p < .05$.

Table 5. Path coefficients for two proposed models.

Model 1	Hypothesis	β	T	p-value
Internal constraints	1a - supported	.159	2.316	.022*
External constraints	1b - supported	.192	2.837	.005*
Past sustainable behaviours	1c - supported	.164	3.113	.002*
Perception sustainable initiatives	1d - supported	.643	12.303	.000*
Model 2	Hypothesis	β	T	p-value
Sustainable behaviour during event	2 ^a - supported	.220	2.314	.022*
Satisfaction with sustainable initiatives	2b - not supported	.176	1.853	.066

β : standardized coefficients; t: T-value; * p -value < .05.

As with Model 1, participant type and interaction terms were examined but did not significantly contribute to model fit and were therefore excluded from the final model.

In summary, for the first model, we supported all proposed hypotheses, indicating that internal and external constraints, past sustainable behaviours, and perceptions of sustainable initiatives predicted sustainable behaviours during the event. The second model, one of the two hypotheses proposed, was supported, indicating that sustainable behaviour during the event predicts future sustainable intentions.

DISCUSSION

The purpose of this study was to examine the factors associated with sustainable behaviours during a sports event and their relationship with future sustainable intentions among spectators and participants attending a Central American sports event. Overall, the findings suggest that sustainable behaviours during the event are associated with a combination of prior behavioural tendencies, perceived constraints, and contextual factors related to the implementation of sustainability initiatives. This study contributes to the sport management literature by extending existing frameworks to an underexplored regional context and by examining two key stakeholder groups simultaneously.

Consistent with previous research (Hristov & Chirico, 2019; Hugaerts et al., 2021; Inoue & Kent, 2012), perceptions of sustainable initiatives emerged as the strongest correlate of sustainable behaviour during the event. This finding highlights the importance of visible, accessible, and well-communicated sustainability initiatives in shaping behaviour within the event context. From a theoretical perspective, this result aligns with the Model of Sustainability Behaviour (Belz & Peattie, 2012), which emphasises the role of contextual and intervention-related factors in enabling sustainable actions.

Past sustainable behaviours were also significantly associated with sustainable behaviours during the event, supporting prior findings in sport and environmental research (Martins et al., 2022; Shapiro et al., 2013; Trail & McCullough, 2020). Rather than indicating a causal relationship, this association suggests that individuals who routinely engage in sustainable practices may be more receptive to opportunities for sustainable action when attending sports events. This finding is particularly relevant in the Costa Rican context, where sustainability has long been integrated into national discourse and policy (André & Valenciano-Salazar, 2020; Castro-Arce et al., 2019).

In addition, both internal and external constraints were significantly associated with sustainable behaviours during

the event. These findings are consistent with previous studies demonstrating that sustainable behaviours are shaped by individual beliefs and awareness, as well as by structural and contextual barriers (Casper et al., 2020; Martins et al., 2021; Trail & McCullough, 2018). Importantly, these results underscore that even individuals with strong pro-environmental intentions may be limited in their behaviour if event infrastructure or organisational practices do not adequately support sustainable actions.

Sustainable behaviours during the event were positively associated with future sustainable intentions, supporting the assumptions of the Theory of Reasoned Action (Ajzen & Fishbein, 1980; Fishbein, 1979). This finding suggests that engaging in sustainable behaviours within the event context may reinforce environmental norms and self-perceptions, thereby strengthening intentions to perform similar behaviours in the future. However, satisfaction with sustainable initiatives was not significantly associated with future intentions. One plausible explanation is that satisfaction may require repeated exposure to sustainability initiatives across multiple events to develop into a meaningful evaluative mechanism. In one-off events, participants and spectators may be aware of initiatives yet lack sufficient interaction to form evaluations strong enough to influence future intentions (Trail & McCullough, 2021).

When compared with findings from studies conducted primarily in North America and Europe, where sustainability campaigns are often institutionalised and repeated across seasons (Casper et al., 2020; Trail & McCullough, 2021), the present results suggest that in Central American sport event contexts, immediate behavioural engagement during the event may play a more critical role than post-event satisfaction in shaping future intentions. This regional distinction underscores the importance of examining sustainability across diverse geographic and institutional contexts. These regional differences align with recent reviews showing substantial variation in environmental impacts, behavioural determinants, and constraints across event contexts and geographic regions (Liebhart et al., 2026). Furthermore, recent climate-related sport management research stresses that sport organisations must adapt sustainability strategies to local environmental vulnerabilities and resource constraints to ensure effectiveness and equitable implementation (Cayolla et al., 2025).

Limitations

Despite its contributions, this study is subject to several limitations that should be acknowledged. First, the cross-sectional design does not permit causal or temporal inferences; the identified associations should be interpreted accordingly.

Second, the reliance on self-reported measures introduces the potential for social desirability bias, particularly in the context of environmentally responsible behaviours. Additionally, because data were collected after the event had concluded, participants' responses may be influenced by recall bias, which could affect the accuracy of reported behaviours and perceptions. Finally, the sample size and specific event context may limit the generalizability of the findings to other sport settings. Future research should address these limitations by employing longitudinal designs, objective behavioural measures, and larger, more diverse samples.

Implications

The findings of this study offer several implications for sport management practice and sustainability planning. At the policy level, sport governing bodies and event organisers may consider integrating specific sustainability guidelines into event regulations to ensure that environmental practices are systematically addressed across events, rather than implemented on an ad hoc basis. From an event operations perspective, organisers can reduce external constraints by improving the availability, visibility, and accessibility of waste management infrastructure. This includes providing clearly labelled recycling and composting stations in both public and athlete-only areas and ensuring that these stations are conveniently located and easy to use. Such interventions may be particularly effective in encouraging sustainable behaviours among participants, whose environmental opportunities are often structurally constrained by competition schedules, restricted access zones, and performance-related demands.

For future sustainability campaigns, the results suggest that even in low-resource event contexts, small-scale, low-cost interventions (e.g., consistent, easy-to-understand signage; volunteer support near waste stations; brief, well-timed sustainability messages) can meaningfully support sustainable behaviours without substantial financial investment. By making sustainable choices the easiest and most visible options during the event, organisers can foster immediate behavioural engagement and, in turn, promote longer-term environmental intentions that extend beyond the event setting. Collectively, these implications highlight the importance of aligning policy, infrastructure, and communication strategies to reduce both internal and external constraints. Doing so can help sport organisations create event environments that not only facilitate sustainable behaviours in the moment but also contribute to the development of enduring pro-environmental norms and intentions among spectators and participants.

CONCLUSIONS

This study examined the factors associated with sustainable behaviour during a Central American sports event and their relationship with future sustainable intentions among both spectators and participants. The findings demonstrate that sustainable behaviours at sport events are shaped by individual predispositions, perceived constraints, and contextual sustainability initiatives, underscoring the importance of a holistic approach to sustainability in sport event planning and management.

By focusing on an underexplored geographic region and incorporating multiple stakeholder groups, this study contributes meaningful insights to the sport management and sport ecology literatures. In particular, it highlights how sustainability initiatives, past sustainable behaviours, and internal and external constraints jointly influence sustainable actions in a small- to mid-scale event context in which participants and spectators share the same space yet experience it differently.

Despite the study's limitations, the findings suggest several important directions for future research, including longitudinal investigations that track changes in sustainable behaviours and intentions over time, as well as comparative studies across regions, event types, and levels of competition. Such work would help clarify the extent to which the patterns observed here hold in other socio-cultural and organisational contexts. While generalisation beyond Central America should be approached with caution, the results may inform sustainability strategies at similar small- to mid-scale sport events in other settings. In particular, the evidence that visible, well-designed initiatives and reduced constraints are associated with sustainable behaviours, and that these behaviours are linked to future intentions, offers a practical foundation for sport organisations seeking to design more effective, context-appropriate sustainability interventions.

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CREDIT AUTHORSHIP CONTRIBUTION STATEMENT

Karla Chaves Castro — Conceptualisation; Data curation; Formal analysis; Investigation; Methodology; Project administration; Software; Validation; Visualisation; Writing – original draft; Writing – review & editing. Brian McCullough — Conceptualisation; Methodology; Project administration; Supervision; Validation; Writing – review & editing.

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