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Turkish Adaptation of Stadium Atmosphere Scale: A Comparison of Football Spectators and Fans

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ABSTRACT

This study aimed to test the Turkish adaptation of the Stadium Atmosphere Scale (STAS) and reveal its psychometric properties. We collected data from 324 football spectators and fans, which were selected using the convenience sampling method. We carried out four different tests for Turkish adaptation and psychometric properties of the scale after performing Turkish language co-validation. The CFA analysis with varying configurations of the model revealed that the construct of the STAS fit well in both the correlated factor model and the hierarchical model and best fit the data collected from the Turkish population. Additionally, we tested measurement and structural invariance to examine if the scale was also performed for spectators participating for different purposes in the same way and determined that the relevant scale preserved its basic structure in both football spectators and fans and that the scale could be used as an appropriate measurement tool. These results demonstrated that the STAS would be used as a valid and reliable measurement tool for the population in Turkey.

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INTRODUCTION

People usually participate in several activities such as watching a sporting event, attending a technology festival, or going to a restaurant or concert for various purposes (Ramchandani et al., 2017; Weziak-Białowolska et al., 2019). Individuals make statements such as "the atmosphere here was great" about the event and environment after participating in the event, which indicates their satisfaction and happiness and can be effective on the subsequent preference mechanism (Uhrich & Koenigstorfer, 2009). Jones et al. (2017) defined the atmosphere as an emotional response to the totality of stimuli in a particular environment. Therefore, each environment has its unique atmosphere, resulting from the sum of its stimuli. Stimuli lead to a positive or negative evaluation of the space, depending on people's subjective preferences and perceptions (Norris et al., 2010). The research on such subjects has mostly been related to outcome variables such as customers' evaluation of the store atmosphere, purchasing behaviors (Babin & Attaway, 2000), customer satisfaction (Babin & Darden, 1996), approach/avoidance behaviors (Donovan & Rossiter, 1982). Atmospheric experience is often an additional factor contributing to the value created during the shopping process when it is evaluated in merchandising (Donovan et al., 1994). However, such experience in a sporting event is one of the main components of the total perceived service (Woratschek et al., 2020). Hence, the social actors involved in the stadium atmosphere during sporting events and they are expected to be very strong in the retail sector (Uhrich & Benkenstein, 2010).

Researchers have accepted that several factors such as the commitment of the spectators in the stands to the club, their motivation, their level of identification, and their frequency of going to the match in evaluating the stadium atmosphere (Edensor, 2015; Uhrich & Koenigstorfer, 2009). Researchers (Trail et al., 2003; Wann & James, 2018) have noted that it is essential to categorize fans to better understand the antecedents and consequences of these factors and emphasize the distinction between fans and spectators. Sloan (1989) stated that spectators are mere onlookers and observers, whereas fans are enthusiastic participants in a particular pastime. For example, fans could be motivated by the success of their favorite team, while spectators could be more motivated by the aesthetics or skill displayed in sports (Robinson & Trail, 2005). Therefore, Edensor (2015) implied that spectators' perception of the atmosphere could differ from person to person if they are somehow disconnected from the game on the field, the club, and other spectators, and if team identification is low. This reveals the importance of our study in terms of evaluating the stadium atmosphere experiences of football spectators with relatively low team identification and football fans with high team identification by utilizing the same measurement tool when considering the classification of spectators and fans by researchers (Robinson & Trail, 2005; Sloan, 1989; Trail et al., 2003; Wann & James, 2018).

Spectators' experiences in the stadium such as functional, emotional, and social, have an impact on their perception of the atmosphere in the sporting event (Biscaia et al., 2013; Chen et al., 2013). Stadium atmosphere has been defined as the sum of the emotions experienced by spectators because of their interaction with the features and facilities of the stadium during a live sporting event and has implied the perceived quality of the ambient conditions of the stadium (Uhrich & Benkenstein, 2010). Such experiences and perceptual states stimulate the cognitive, emotional, and behavioral responses of the spectators (Balaji & Chakraborti, 2015). According to Jensen et al. (2016), the stadium atmosphere could create a unique and distinctive experience for spectators and be a catalyst for both short-term and long-term spectator behavior. Uhrich and Koenigstorfer (2009) described the stadium atmosphere as "the most important value-creating element of live sports consumption." The research demonstrated that an attractive atmosphere is the most critical factor motivating spectators to watch a sporting event in a stadium (Bauer et al., 2005). Moreover, some authors have stated that the stadium atmosphere influences spectators' intentions to return to the stadium in the future, their willingness to recommend it to others and more purchasing behavior in the stadium (Cho et al., 2019; Hightower et al., 2002; Phonthanukitithaworn & Sellitto, 2018). Thus, people's evaluations of the atmosphere could be related to their intention to participate again and consumer behaviors, which reveals the reason why the atmosphere has been studied in many fields by analyzing it in different contexts based on various theories.

The model called The Stimulus-Organism-Response (S-O-R) psychology suggests that the stimuli in the store affect consumers' emotional states such as pleasure, arousal, and dominance, which leads to approach or avoidance behaviors towards the store (Donovan & Rossiter, 1982). The model, which sports events have also applied in the study about the atmosphere in sports events, explains the relationship between stadium atmosphere and stadium loyalty (Uhrich & Koenigstorfer, 2009). Yoshida et al. (2021) comprehended that spectators' behavioral responses occur because of their exposure to environmental factors in sports stadiums. The fact that these factors include the spectators' experience in the stadium atmosphere explains social relations, reflecting social identity research in spectator sports (Underwood et al., 2001; Watkins, 2014). The research on social identity in spectators' sports has discovered that social experiences (e.g., the interaction of spectators in the stadium) contribute to social relations and increase the values shared between individuals in social identity research in spectator sports (Ashforth & Mael, 1989). Individuals provide a positive identity through positive social relations and thus realize themselves. The fact that the spectators mainly primarily identify themselves with strong teams and star players is the most concrete example to explain this situation. Similarly, spectators' perceptions of their favorite team's stadium also explain their identification with their teams (Decrop & Derbaix, 2010). Therefore, the social identity theory implies that the stronger the interactions of the spectators with each other, the more likely they are to make positive evaluations of the stadium atmosphere (Yoshida et al., 2021).

Eventually, subsequent studies have included stimuli such as the emotions and behaviors of other people, as well as the course of the performance, social stimuli that create the stadium atmosphere, and physical elements (Holt, 1995; Madrigal, 2003; Uhrich & Benkenstein, 2010), although the first studies on stadium atmospheres have primarily focused on the physical aspects of the environment (Hightower et al., 2002; Wakefield et al., 1996). Uhrich and Benkenstein (2010) examined the stadium atmosphere's stimuli with a four-factor structure: organizer, spectators and their behavior, game action, and stadium architecture. However, the scale in this study has been developed with a relatively small number of samples and has been largely based on qualitative study results. Chen et al. (2013) addressed that the items of this instrument were developed with a relatively small number of study groups and were based on qualitative study findings. According to Karataş (2017), generalizability would be limited if the number of samples to represent the population could not be reached in qualitative research. Thus, Chen et al. (2013) developed and empirically validated the Sports Stadium Atmosphere (SSA) scale in a larger study group of basketball spectators based on the study of Uhrich and Benkenstein (2010). Çevik (2020) adapted the measurement tool Chen et al. (2013) developed to Turkish culture in a study group of football spectators. However, the scale has just statements evaluating the stadium atmosphere of fans with high team identification when the sub-dimensions (e.g., cheering groups and team traditions) and items of the measurement tool (e.g., set maneuvers performed by fans waves are frequent in New Eskisehir Stadium and color of team jersey encourages fans in New Eskisehir Stadium) are examined. Roychowdhury (2018) indicated that participants are more likely to be bored when answering the items in the scale form if a scale has of many items and is administered in sports and exercise settings. This could limit the application of the SSA scale, which consists of 10 factors and 30 items in sports settings. Accordingly, we prefer Balaji and Chakraborti's (2015) Stadium Atmosphere Scale (STAS) to the other scales in the adaptation to Turkish culture because of its functional availability.

Balaji and Chakraborti (2015) addressed the STAS in a comprehensive and short form with 14 items and four factors (physical layout, facility aesthetics, entertainment experience, social interaction). They validated the instrument on different samples of spectators, students, non-stadium spectators (those who do not watch matches in the stadium), and the general population. In Turkish literature, we noticed a lack of a measurement tool that will evaluate the stadium atmosphere experiences of both football spectators and fans with a holistic approach. Consequently, we aimed to examine whether the STAS operates way similarly in different spectator groups by testing its Turkish adaptation and determining its psychometric properties. Leitch (2018) reported a steady decline in spectator attendance at many professional and collegiate-level sporting events. Hence, researchers have believed that the stadium atmosphere is a crucial factor affecting the behavioral responses of the spectators. We also predict that this study would be quite critical as suitable a valid and reliable scale to measure the stadium atmosphere levels of spectator groups with different characteristics in Turkish culture.

METHODS

Participant

The study group consisted of football spectators and fans. We determined a total of 324 participants, 100 of whom were female (M_{age}= 30.16) and 224 of whom were male (M_{age}= 30.89) with the convenience sampling method (Yıldırım & Şimşek, 2011). We selected football fans according to a number of criteria related to their spectator experiences, including (I) watching the matches of the favorite team of the football fans in the stadium, (II) being a member of the spectator group of their favorite football team, and (III) considering oneself as a fanatic about the favorite team while we chose football spectators with recreational activity experience criteria such as (a) seeing football matches only as enjoyable social events, (b) not being part of a football team's supporters' group, and (c) not having a sense of winning and losing.

Group 1: Demographic Characteristics of Football Spectators

Table 1 demonstrates that football spectators were predominantly male (Total= 83.6%), and they had an average age of thirty years (M_{age}= 29.91). Most of them were single (Total= 80.8), they had a medium income (Total= 54. 8%), they had a university education (Total= 70.5%), they referred to watch these matches in the stadium not only to support a team (Total= 76.7%) and they would prefer to be a spectator in different stadiums (Total= 58.9%)

Group 2: Demographic Characteristics of Football Fans

Table 1 presents that the football fans were predominantly male (Total= 57.3) and had an average age of thirty-one years (M_{age}= 31.28). Many of them were married (Total= 58.4), they had a high level of income (Total= 60.1), they were educated at the university level (Total= 65.7), they do refer to watch these matches in the stadium to support only one team (Total= 70.8) and they would prefer to be a spectator in different stadiums (Total= 72.5%).

Table 1
Demographic Characteristics of The Participants (n= 324)

Demographic Characteristics	[a]**Group 1** (n = 146)	[b]**Group 2** (n = 178)
	%	%
Gender		
Female	16.4	42.7
Male	83.6	57.3
Age M.	29.91	31.28
Age SD.	7.91	7.80
Education		
Primary school	9.6	10.7
High school	19.9	23.6
University graduate	70.5	65.7
Marital Status		
Single	80.8	41.6
Married	19.2	58.6
Do you prefer to watch these matches in the stadium just to support a team?		
No	76.7	29.2
Yes	23.3	70.8
Would you prefer to be a spectator at different stadiums?		
No	41.1	72.5
Yes	58.9	27.5

Notes. M.= Mean, SD.= Standard deviation, [a]= Group 1: Football spectators, [b]= Group 2: Football fans

Procedure

Firstly, we obtained the approval of the research ethics committee with protocol number 2023-SBB-0717 from the Bartın University Social and Human Sciences Ethics Committee after permission to use the scale from Balaji and Chakraborti (2015), who developed it. Afterwards, a researcher personally visited four different stadiums (I) with the criteria recommended by FIFA and specified in international matches, (II) with a capacity of over 50.000 spectators to reach the participants watching football matches on different dates to carry out all related processes. One researcher personally visited the stadiums during this process to carry out all relevant processes (e.g., providing information regarding the aim of the study, informing the data obtained, storage security, and all other procedures during the survey process). We started collecting the data between October 19, 2023, and November 23, 2023. The researcher explained to the participants that they could fill in the scale items on paper or online and offer a Google Form with a QR code for spectators who wanted to fill in the online scale form so that they could instantly the scale form. We collected data before the match. It took approximately 3 minutes for the participants to fill in the paper or online forms and approximately three weeks to complete all scales. We obtained 205 data through Google Forms with QR, and 166 data from scale forms on paper. 47 missing data were not included in the study and kept analyzing 324 data that were determined to be completed in full. Green (1991) suggested that the number of scale items in the study (n≥ 50+8x items or n≥104+ items) should not be ignored, and a sample size that is larger because of these formulae should be preferred when determining the appropriate sample size in quantitative research. Accordingly, we predicted that several participants (n>50+8x14) = 162 and above would be sufficient for the study with a scale form of 14 items.

Data Collection Tools

The Stadium Atmosphere Scale (STAS) was developed by Balaji and Chakraborti (2015). The scale consisted of four subscales named (a) Physical Layout, (b) Facility Aesthetics, (c) Entertainment Experience, and (d) Social Interaction with 14 items and a 7-point Likert format. We constituted a demographic information form to determine the demographic characteristics (e.g., age, gender, education) of the participants in the study.

Language Co-Validation: Translate and Back Translate Procedure

The translation and retranslation procedure involve the process of translating texts or sentences from one language into another, involves the process of translating texts or sentences from one language into another, and then retranslating these translations back into the original language. We translated the STAS to ensure the language equivalence validity of the Turkish form from the original language (English) to the target language (Turkish). We performed this process by having the scale items translated into Turkish by a bilingual researcher and then having the relevant items translated back into the original language by another researcher who is both fluent in English and a native speaker of Turkish. Later, we asked a native-speaker researcher to compare the pre-translation and post-translation forms and indicate the differences. The researcher reported that the two scale forms reflected the existing structure similarly after this comparison process. Table 2 presents the Turkish items of the STAS.

Table 2
English and Turkish Versions of the STAS

Factor and item in English		Factor and item In Turkish	
Physical Layout (PL)		**Fiziksel Düzen (FD)**	
PL_1	The general physical condition of the stadium is good	**FD_1**	Stadyumun genel fiziksel durumu iyi
PL_2	The layout of the stadium allows to get where one wants	**FD_2**	Stadyumun düzeni, gitmek istenilen bir yere ulaşmaya olanak sağlamakta
PL_3	The signs (gates, toilets, parking, seat) in the stadium are excellent	**FD_3**	Stadyumdaki işaretler (kapılar, tuvaletler, park yeri, koltuk) mükemmel
PL_4	The stadium's physical facilities are comfortable	**FD_4**	Stadyumun fiziksel olanakları konforlu
Facility Aesthetics (FA)		**Tesis Estetiği (TE)**	
FA_1	The overall design of the stadium is pleasing	**TE_1**	Stadyumun genel tasarımı memnun edici
FA_2	The stadium has an open and airy feeling	**TE_2**	Stadyumun ferah ve konforlu bir hissi var
FA_3	The stadium's decor is appealing	**TE_3**	Stadyumun dekoru ilgi çekici
FA_4	The exteriors of the stadium are visually appealing	**TE_4**	Stadyumun dış cephesi görsel açıdan oldukça etkileyici
Entertainment Experience (EE)		**Eğlence Deneyimi (ED)**	
EE_1	The game is much exhilarating to watch at the stadium	**ED_1**	Maçı, stadyumda izlemek çok heyecan verici
EE_2	Watching the game at the stadium provides an escape from my everyday activities	**ED_2**	Stadyumda maç izlemek, günlük aktivitelerimden bir kaçış sağlıyor
EE_3	Watching the game at the stadium is really entertaining	**ED_3**	Maçı stadyumda izlemek, gerçekten çok eğlenceli
Social Interaction (SI)		**Sosyal Etkiletişim (SE)**	
SI_1	I enjoy socializing with other spectators at the game	**SE_1**	Maçlarda diğer seyircilerle sosyalleşmekten keyif alıyorum
SI_2	It excites me seeing other spectators whistling, singing, chanting, and screaming in the stadium	**SE_2**	Stadyumdaki diğer seyircilerin ıslık çaldığını, şarkı söylediğini, tezahürat yaptığını ve çığlık attığını görmek beni heyecanlandırıyor
SI_3	I enjoy interacting with other spectators at the game	**SE_3**	Maç sırasında diğer seyircilerle etkileşim kurmaktan keyif alıyorum

Data Analysis

The validity and reliability test of the STAS were carried out in four stages. In the first stage, we tested univariate and multivariate data normality. In the second stage, we conducted Confirmatory Factor Analysis (CFA) to assess the conceptuality of the scale. In this stage, we tested the model with four different model configurations, namely single factor model, uncorrelated factors model, correlated factors model, and hierarchical model. Then, we kept analyzing the other analysis processes with the model with the best fit value. In the third stage, we used two types of construct validity such as convergent and discriminant to test the validity of the STAS. For convergent validity tests, we utilized respectively the strength of factor loading, significance of t-values and Average Variance Extracted (AVE). We fixed latent factor correlations to be equal to 1, calculated confidence intervals around latent variable correlation estimates, and AVEs whether they were greater than the squared correlation between latent constructs to test discriminant validity. We performed the internal consistency coefficient (Cronbach's alpha) and the construct reliability of the dimensions Composite Reliability (CR) to examine the reliability coefficient of the STAS. In the final stage, we tested both measurement invariance and construct invariance to ensure that the STAS used in the study are comparable and can be meaningfully compared across different groups or time points. At this stage, we used the chi-square difference test formulae of Satorra and Bentler (2010) to make comparisons between the models. Table 6 demonstrates all the details of the analysis carried out.

Here are the chi-square difference test formulae of Satorra and Bentler (2010):

“Compute the difference test scaling correction cd, where d0 is the degrees of freedom in the nested model, c0 is the scaling correction factor for the nested model, d1 is the degrees of freedom in the comparison model, and c1 is the scaling correction factor for the comparison model. Be sure to use the correction factor given in the output for the H0 model.” (Mplus, 2023)

cd = (d0 * c0 - d1*c1)/(d0 - d1)

Compute the Satorra-Bentler scaled chi-square difference test TRd as follows:

TRd = (T0*c0 - T1*c1)/cd

“where T0 and T1 are the MLM, MLR, or WLSM chi-square values for the nested and comparison model, respectively. For MLM and MLR the products T0*c0 and T1*c1 are the same as the corresponding ML chi-square values.” (Mplus, 2023)

To evaluate how well the model fits the data and its ability to explain the differences between the data, we used The Root Mean Square Error of Approximation (RMSEA), The

Normed Fit Index (NFI), The Comparative Fit Index (CFI), Standardized-Root Mean Square Residual (SRMR), Akaike Information Criterion (AIC) goodness of fit indices during the analysis process. Research indicated that these fit values must be between 0.06 and 0.08 for RMSEA (Byrne, 2009), less than 0.08 for SRMR (Hu & Bentler, 1999), and greater than 0.90 for CFI and TLI (Hu & Bentler, 1998). The AIC value is not a meaningful measure on its own but is used when comparing two or more models. The smaller AIC value indicates which model is a better option (Hu & Bentler, 1995). Byrne (2009) suggested that AIC is a measure that can be used to compare non-nested models with each other and reduces the complexity of the model (i.e., the use of excess parameters).

RESULTS

The Testing of Stadium Atmosphere Scale: Validity and Reliability Stages

Stage 1: Screening of the Data

Firstly, we tested the data based on the assumption that they fit univariate and multivariate normal distributions. We provided statistical tests of skewness and kurtosis, with visual screening of item histograms and stem-leaf diagrams through Mplus. According to the results of the analysis, we found that eleven items were positively skewed to a low degree except for three items (ee1, ee2, ee3). Tabachnick and Fidell (1996) suggested that the reflection of each variable should be taken and analyzed with the effect of some transformations such as square root and logarithmic transformation, to correct the medium and high-level skewness. Accordingly, the results of square root and logarithmic transformation revealed that there was no significant skewness in the research data (Z-Scores, $p < 0.05$). We found that the kurtosis and skewness values of all variables were ±2.00, which indicated a univariate normal distribution (George & Mallery, 2019; Tabachnick & Fidell, 2012). However, we calculated Mardia (1970) skewness and kurtosis values to determine whether the data violated the assumption of multivariate normality. We noticed that the results violated the assumption of multivariate normality since the P value of Mardia skewness ($p=0.00>0.05$) and Mardia kurtosis ($p=0.00>0.05$) values were less than 0.05. In such cases, researchers generally prefer Robust Maximum Likelihood (MLR), which is a nonparametric estimation method (Şen, 2020).

Stage 2: Comparison of the Models

In the second stage, we used CFA to test the conceptuality of the atmosphere in the stadium. Noar (2003) implied that CFA can also provide some details such as (I) enabling researchers to go beyond exploratory analytical techniques by confirming that the psychometric properties of a scale are satisfactory, (II) making it possible to compare several competing models reflecting conceptualizations that are variations of each other rather than testing the fit of a single model, (III) getting additional information about the dimensionality of a scale by testing several models against each other, and (IV) ensuring more details about how items-structures in a scale are related to each other to researchers. Thus, we tested four different model configurations, namely single factor model, uncorrelated factors model, correlated factors model and hierarchical model in the study (Table 3).

The single-factor model tests whether the STAS can be measured with a single general factor instead of four separate factors. The literature does not provide any results indicating that the STAS is directly measured as a single factor.

The uncorrelated factors model tests the inference that each of the four dimensions of the STAS is independent. If this model is supported, it will mean that each dimension of the stadium atmosphere is independent and uncorrelated.

The correlated factors model tests the claim that the four dimensions of the STAS are interrelated. If this model is supported, it will show that it is not only concerned with the physical space of the facility, but also with the emotional and sensory elements that make it special.

The hierarchical model tests the idea that a second-order factor explains the relationships between the four stadium atmosphere dimensions. This model recognizes that the STAS dimensions are related to each other, but also concludes that the dimensions are related to a factor at a higher level, as does the correlated factors model. Therefore, this model can be considered as an extension of the correlated factors model. Noar (2003) interpreted such accepted models as an indication that the sum of the whole scale represents an appropriate and meaningful score.

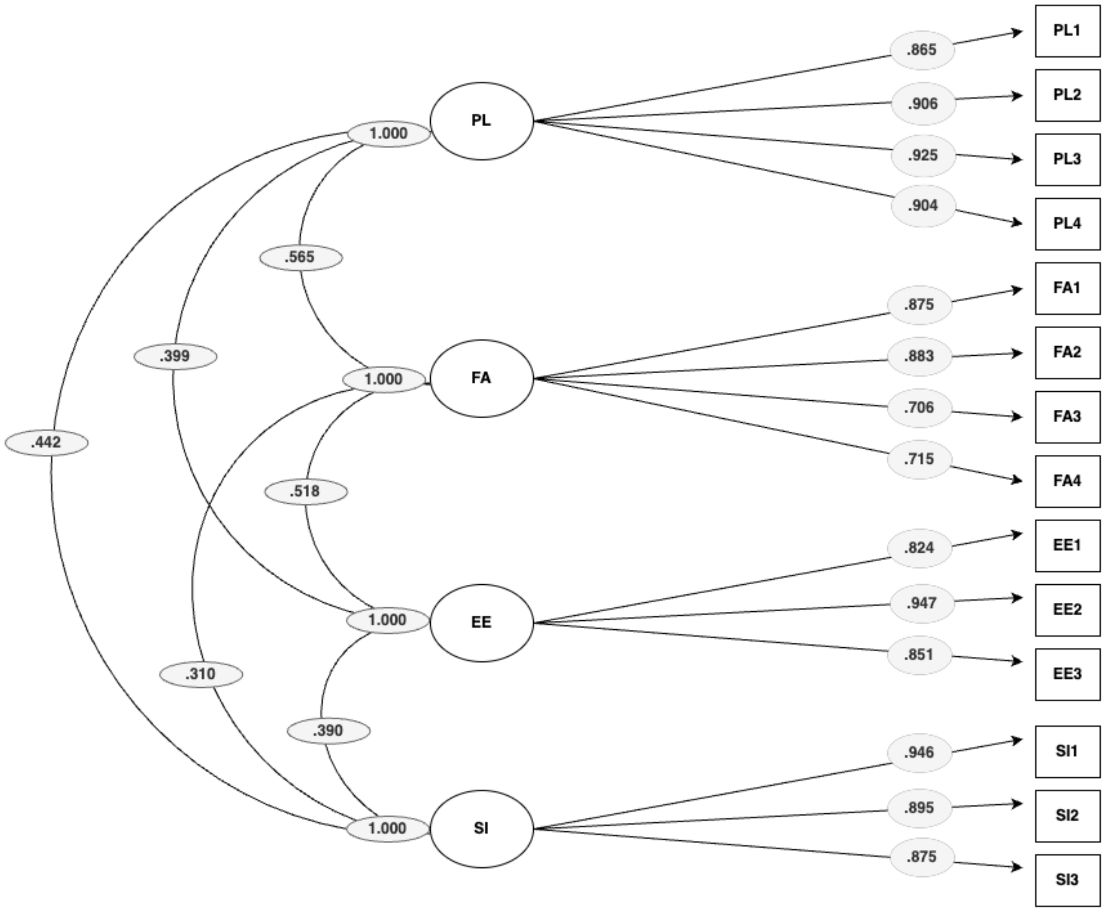
We figured out some results about the fact that the correlated factors model and the hierarchical model give better-fit results than these models in the CFA of the STAS when reviewing the literature (Balaji & Chakraborti, 2015). Similarly, we hypothesized that the correlated factors model would best fit the data collected from the Turkish population in this study.

Table 3
Comparisons of the Models

Model	X^2	df	RMSEA	SRMR	TLI	CFI	AIC
The single-factor model	1926.43	77	0.27	0.16	0.41	0.50	10413.77
The uncorrelated factors model	415,41	77	0.11	0.18	0.86	0.88	2988.75
[a]The correlated factors model	205.50	71	0.07	0.03	0.95	0.96	8704.83
[b]The hierarchical model	222.76	73	0.08	0.05	0.95	0.96	8718.10

Note. [a]= The model with the best fit value, [b]= The model with acceptable fit value

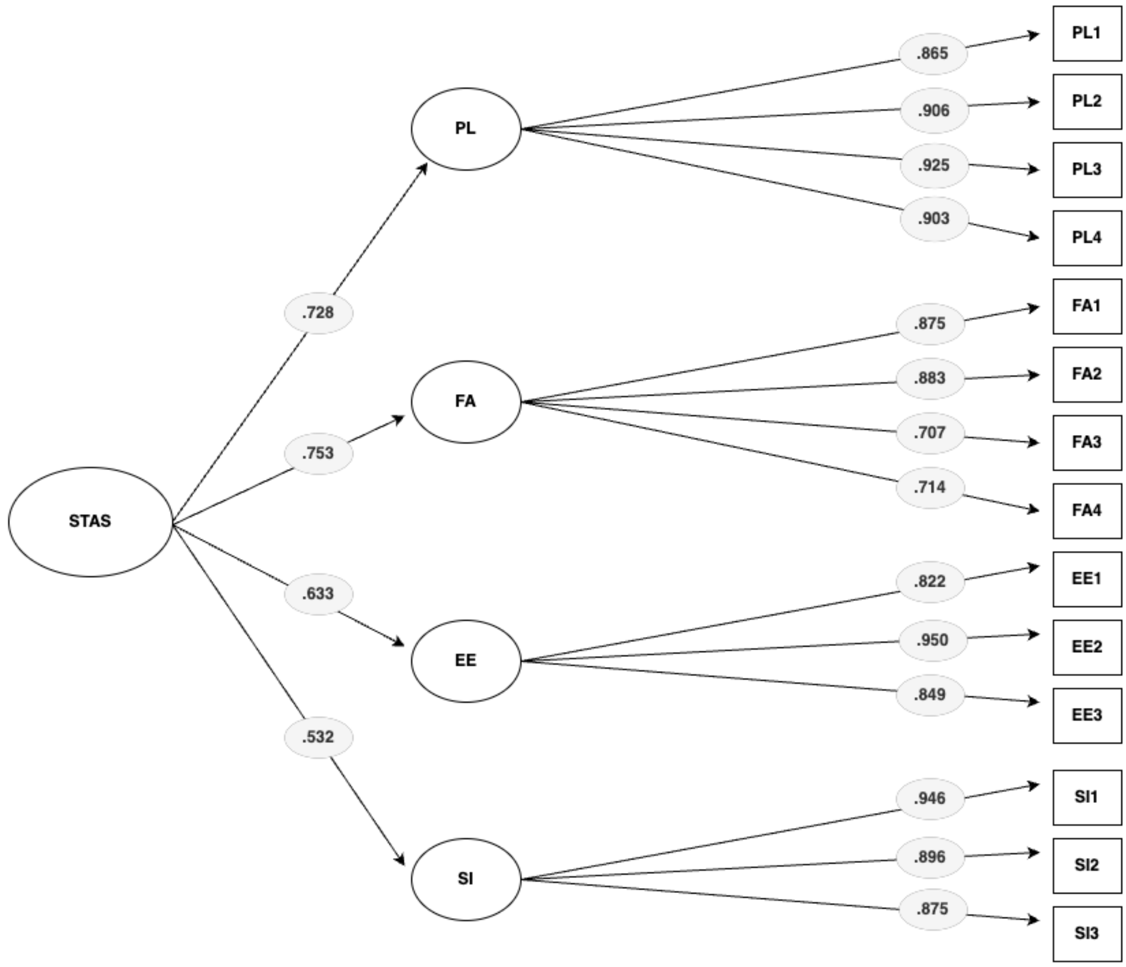
Figure 1
The Correlated Factors Model



Note. PL= Physical layout, FA= Facility aesthetics, EE= Entertainment experience, SI= Social interaction

The goodness of fit indices revealed that the correlated factors model best fit the data (Table 3). The correlated factors model had the best-fit indices and a significant chi-square difference ($\Delta\chi 2 = 17.26$, $\Delta df = 2$, $p < 0.001$), while the goodness of fit indices for the hierarchical model remained within acceptable ranges. We would expect the dimensions of the STAS to be similarly related to other variables if the STAS were truly a unidimensional measure. Some authors (e.g., Danes & Mann, 1984; Hunter & Gerbing, 1982) clarified this situation as external consistency or parallelism, which also provides evidence that the scale is unidimensional. According to Rubio et al. (2001), the criterion should be evaluated multidimensionally if this cannot be achieved.

Figure 2
The Hierarchical Model



Note. STAS= Stadium atmosphere scale, PL= Physical layout, FA= Facility aesthetics, EE= Entertainment experience, SI= Social interaction

Stage 3: The Testing of Validity and Reliability

At this stage, we carried out the validity and reliability tests of the STAS through the correlated factors model, and used two types of construct validity, convergent and discriminant. Byrne (2009) explained convergent validity as the extent to which independent measures agree in assessing the same construct, while discriminant validity is interpreted as the extent to which independent measures differ in assessing these constructs. We used the strength of factor loading, significance of t-values, and AVE for convergent validity tests in the study (Table 4).

Some researchers have accepted standardized factor loading as more (>0.70) since low factor loading means that the latent factor captures less than 50% of the variation in the indicator. This means that the variance due to error will be larger than the variance captured by the latent construct (Fornell & Larcker, 1981). We tested the significance level of the t-value of each item in the study after standardized factor loading power. Anderson and Gerbing (1988) stated that convergent validity could also be assessed by determining whether the estimated model coefficient of each indicator on the hypothesized basic structure factor is significant (i.e., the significance of t-values). Eventually, we concluded that all item loading of the STAS was statistically significant (t-values ≥ ± 1.96), and the null hypothesis that the factor loading was equal to zero was rejected in the results (Table 4). These results provided evidence in favor of convergent validity. Additionally, we calculated AVE values within the study. Fornell and Larcker (1981) accepted AVE as an important statistical criterion used to evaluate the internal consistency and validity of a measurement tool, to evaluate the fit of the model to the data in structural equation modelling analyses and to ensure the reliability of measurement tools. The AVE value below 0.50 could create doubt on the validity of the construct measured. Table 5 presented that all AVEs are above Fornell and Larcker's limit value.

Table 4
The Results of Confirmatory Factor Analysis

Variables	**λ**	***t*-value**	**SE**	R^2	**M**	**SD**
Physical Layout (PL)					4.59	1.02
PL_1	0.86	50.74	0.017	0.73	4.63	1.10
PL_2	0.90	67.23	0.013	0.81	4.51	1.04
PL_3	0.92	80.68	0.011	0.84	4.63	1.12
PL_4	0.90	67.91	0.013	0.81	4.61	1.13
Facility Aesthetics (FA)					4.59	1.02
FA_1	0.87	47.71	0.018	0.75	4.43	0.94
FA_2	0.88	49.63	0.018	0.77	4.35	0.90
FA_3	0.70	22.45	0.031	0.49	4.26	0.78
FA_4	0.71	23.27	0.031	0.50	4.48	0.80
Entertainment Experience (EE)					4.39	0.72
EE_1	0.82	39.74	0.021	0.67	4.47	0.76
EE_2	0.94	69.83	0.014	0.88	4.32	0.76
EE_3	0.85	44.67	0.019	0.72	4.37	0.85
Social Interaction (SI)					4.31	0.93
SI_1	0.94	86.32	0.011	0.88	4.34	0.91
SI_2	0.89	63.76	0.014	0.79	4.34	1.02
SI_3	0.87	55.33	0.016	0.75	4.26	1.03

We utilized some discriminant validity tests to evaluate the structure of the STAS after the convergent validity tests. In the first stage of the validity test, we individually fixed the correlations between the latent constructs so that each could equal 1. Then, we used the chi-squared difference test to provide an indication of whether this restriction influenced the model fit and to determine discriminant validity. All the differences between the fixed and free solutions were statistically significant, indicating that discriminant validity was satisfied, as shown by the results in Table 5 (Bagozzi & Phillips, 1982). Furthermore, we provide further evidence of discriminant validity since all confidence intervals did not include a value of 1.0 as reported in Table 5. Indeed, it has been suggested that the confidence interval (± two standard errors) around the correlation estimate between two factors is 1.0. could be determined by a complementary assessment of discriminant validity, according to Anderson and Gerbing (1988). We used AVE values in the final analysis for convergent validity. Fornell and Larcker (1981) stated that the AVE calculated for each latent construct should be greater than the squared correlations between each construct. All squared correlations were below each of the structure AVEs in Table 5.

Table 5
The Reliability of The Constructs and Factor Correlations of The STAS

Variables	1	2	3	4	α	CR	AVE
1. Physical Layout (PL)	-	0.50 (403.59) [0.30-0.59]	0.39 (211.14) [0.13-0.34]	0.42 (318.44) [0.22-0.50]	0.94	0.94	0.80
2. Facility Aesthetics (FA)		-	0.47 (520.00) [0.17-0.36]	0.28 (176.87) [0.10-0.34]	0.87	0.87	0.63
3. Entertainment Experience (EE)			-	0.39 (365.26) [0.11-0.30]	0.90	0.90	0.75
4. Social Interaction (SI)				-	0.92	0.92	0.81

Note. Chi-square values in brackets (p<0.001), confidence intervals reported in square brackets

We assessed the reliability of the STAS, analyzing the internal consistency coefficient (Cronbach's alpha) and the CR of its dimensions. Table 5 presents that all Cronbach's alpha values were above 0.70. Various studies have reported reliability coefficients equal to or higher than 0.70 as acceptable (Nunnally, 1978). Besides, we calculated the CR value, which is frequently used to evaluate the reliability of measurement instruments containing multiple variables, to evaluate the reliability of measurement instruments containing multiple variables in the study (Fornell & Larcker, 1981; Li et al., 1996). According to Bagozzi and Yi (1988), the CR value should be a minimum value of <0.60. After all, we could interpret that the STAS could be used as a valid and reliable measurement tool in the evaluation of the atmosphere created during sports activity by researchers.

Stage 4: The Testing of Measurement Invariance and Structural Invariance

At this stage, we tested measurement invariance and construct to ensure that the STAS used in the study are comparable and can be meaningfully compared across different groups or time points. Gardner and Qualter (2011) referred to measurement invariance as the ability of a measurement to produce repeatable and stable results under different conditions. Measurement invariance is extremely important for the reliability and validity of measurement. The results are expected to be similar when the invariance of measurement is ensured when the same object or event is measured at different times or by different observers. Şen (2020) stated that structural invariance is used to evaluate whether a measurement tool or structural model maintains the same basic structure between different groups or time intervals. Table 6 demonstrates the fit values of the models in measurement and structural invariance analyses.

According to the invariance analyses, we figured out that all the models tested respectively have good fit values, and the chi-square difference test results, which were used for comparison between models at different levels at the measurement invariance stage, are also significant ($p>0.05$), and measurement invariance is ensured (Table 6). Table 6 presents that equal factor variances have fit values with $X^2(15) = 345.66$, $p<0.0001$; RMSEA= 0.07, CFI= 0.95; TLI= 0.94; SRMR= 0.12, equal factor means has fit values with $X^2(11) = 286.43$, $p<0.0001$; RMSEA= 0.06, CFI= 0.96; TLI= 0.95; SRMR= 0.06. We determined with the chi-square difference test that the fit of the equality restriction in the factor variance invariance model was significantly worse than in the scalar model. However, the factor variance invariance model has an adequate fit. We calculated the chi-square value of the difference test= 52.71, degrees of freedom= 15 and the p-value obtained was 0.00 when we compared the two models. Similarly, we determined that the equality restriction in the factor mean invariance model significantly worsens the fit compared to the factor variance model with the chi-square difference test ($p<0.05$) and detected the chi-square value of the difference as 43.74, the degree of freedom as 11, the p-value as 0.00 in this model comparison. The chi-square difference test was significant ($p<0.05$), which indicates that the more restricted factor variance invariance model significantly worsened the fit.

Table 6
Fit Values of The Models in The Invariance Analyses

Analysis	X^2	*df*	ΔX^2	Δsd	*p*	RMSEA	SRMR	TLI	CFI	AIC
Single group solution										
[a]Group 1 (n= 146)	138.45***	71				0.08	0.04	0.93	0.94	4143.83
[b]Group 2 (n= 178)	119.96***	71				0.06	0.03	0.96	0.97	4530.73
Measurement invariance										
Equal form (Configural)	257.66***	142				0.07	0.04	0.95	0.96	8674.56
Equal factor loading (Metric)	264.63***	152	8.63	10	0.56	0.06	0.05	0.95	0.96	8665.34
Equal indicator intercept (Scalar)	280.84***	162	16.11	10	0.09	0.06	0.05	0.95	0.96	8661.14
Equal indicator residual variance (Strict)	344.00***	176				0.07	0.06	0.95	0.95	8680.39
Structural invariance										
Equal factor variances	345.66***	177	64,82	15	0.00	0.07	0.12	0.94	0.95	8716.02
Equal factor means	286.43***	166	59.23	11	0.00	0.06	0.06	0.95	0.96	8659.28

Note. ***p<0.0001, a= Group 1: Football spectators, b= Group 2: Football fans, Δ= Difference

Kline (2016) predicted that the chi-square test is more likely to be significant in large samples, which could cause the chi-square difference test to produce incorrect results in measurement and structural invariance. In such cases, Cheung and Rensvold (2002) stated that CFI values are relatively unaffected by model characteristics such as the number of indicators per factor and suggested that changes of 0.010 or less in the CFI value could be evidence for the rejection of the more restricted invariance to obtain accurate results in some cases, there are no precise criteria for how much the difference between these indices should be. Similarly, some researchers (e.g., Cheung & Resnvold, 2002; Chen, 2007; Meade et al., 2008) suggested that the difference between the fit indices should be considered instead of the chi-square test when large sample groups are analyzed. Table 6 exhibits that the difference between CFI and RMSEA values, which are the fit indices of "Scale Model X Factor Variance" and "Factor Variance X Factor Mean" model comparisons, is 0.010. We could be interpreted as providing evidence that structure invariance is achieved.

DISCUSSION

The atmosphere's components in the stadium impact a significant part of the service provided to consumers in spectator sport event organizations (Yoshida & James, 2011). Once the atmosphere in the stadium is clearly understood, it will be very useful for researchers to study the relevant experiences of consumers who prefer this type of service. Therefore, the study aimed to test the Turkish adaptation of the stadium atmosphere scale (STAS) developed by Balaji and Chakraborti (2015) and to reveal its psychometric properties.

The STAS includes some factors that are common with other studies on measuring stadium atmosphere. For example, Chen et al. (2013) performed a study on sports stadium atmosphere at spectator sporting events, in which the research examined entertainment and facility dimensions, which are common factors in assessing stadium atmosphere. Uhrich and Benkenstein (2010) conducted a study with stimuli emanating from the spectators and their behavior and game progress stimuli on the Multiple Indicators Multiple Causes (MIMIC) of stadium atmosphere. These reflect the dimensions of social interaction and entertainment experience in our study. These stimuli are related to the spectators' support behavior for their team. In our study, the social interaction factor includes the sharing of emotions and experiences with each other in addition to the supportive behavior of the spectators for their team. Baker et al. (1994) examined the atmosphere in the context of the store with the dimensions of ambient, design and social, which design dimension in this study includes visual elements such as the architecture and aesthetics of the store and functional elements such as layout and comfort. Therefore, we could imply that the STAS measures constructs similar to the dimensions of facility aesthetics and physical layout. Additionally, Baker et al. (1994) focused on the number of other customers and staff as social factors in the store environment and the clothing style of salespeople. According to Nash (2000), some rituals, such as cheering, whistling, choreographing, etc., create emotional bonds in sporting event spectators. Thus, the STAS focuses on audience interactions with each other, unlike social factors in the store environment.

The researchers have addressed the physical layout factor in their previous studies examining the atmosphere in the stadium in different contexts (Rosenbaum & Massiah, 2011; Yüce et al., 2020; Wakefield et al., 1996). This factor in the STAS relates to the fan's assessment of the functional aspect of the stadium, signage, easy accessibility, and attractiveness of the environment. Therefore, the literature on atmosphere supports the four-factor model of the STAS. These factors are the physical layout of the stadium, which provides ease of access and comfort for spectators; the aesthetics of the facility, which assesses its design and decor of the entertainment experience, which stimulates spectators' experiences and the social interaction, which involves spectators’ communication with each other, respectively. Overall, we presented a short form (14 items) to measure the stadium atmosphere in this study. Groups of spectators could complete the STAS in 5 minutes and has good psychometric properties. We suggested that researchers could utilize the scale after testing the scale on different spectator groups in different sporting facility to assess their ambient atmosphere although we adapted the STAS for just football spectators and fans.

Limitations

There are some limitations in the study. Firstly, the validity and reliability of the STAS have been tested based on the responses obtained from spectators with different purposes (recreational or fanatic purposes) in a single sport (football) in a single country (Turkey). This situation reveals its limitation in terms of sample. For this reason, the STAS could also be analyzed in the context of other sports competitions (e.g., basketball, volleyball, handball) that can be held in facilities with different atmospheric characteristics, both in different countries and with spectators with different participant characteristics. Testing the stadium atmosphere scale in intergroup, intercultural, and international studies is very important. This would also ensure the generalizability of the STAS. The other limitations are the assessment of the STAS with just four dimensions (physical layout, facility aesthetics, entertainment experience, social interaction) and testing its psychometric properties. This situation reveals the STAS's limitations in size and test. It is important to consider the atmosphere in the stadium in different dimensions and to explain the relationship between the stadium atmosphere scale and the spectator outcomes. For this reason, it is recommended to carry out studies that include the audience's demographic characteristics and conduct different test methods. Finally, we have considered that several variables influence spectators' decision to attend a live sporting event in a stadium and have suggested that researchers should examine the effect of the STAS on other consumer behavioral outcomes such as spectators' loyalty, motivation, and interest/involvement in future studies.

CONCLUSION

In conclusion, we determined that the STAS maintained a high internal consistency in various groups, preserved its 14-item 4-factor structure in its Turkish form, and could be used as a valid and reliable measurement tool in the Turkish population. The STAS differs from other related scales such as leisure involvement and spectator motivation, due to its components and the psychometric properties it assesses. The STAS with four-dimension combinations is crucial in predicting how spectators evaluate the stadium atmosphere. We also made significant theoretical and managerial implications in the Turkish adaptation of the STAS tested through a rigorous scale validity and reliability process approach.

PRACTICAL IMPLICATIONS

Most atmospheric studies have focused on store atmospheres, with few studies evaluating atmospheres in the context of spectator sporting events. In current studies, stadium atmosphere has been addressed with the dimensions of parking, aesthetics, scoreboards, seat comfort, accessibility, space allocation, signage and desire to stay (Wakefield et al., 1996), organizer, spectators, and their behavior, game action and stadium architecture (Uhrich & Benkenstein, 2010), entertainment, electronic equipment, facility, team traditions, team performance, spectator passion, professional staff, spectator behavior, team competition. In this study, we contributed to the literature by addressing the social interaction of the spectators with each other, unlike the existing measurement tools (Chen et al., 2013; Çevik, 2020; Wakefield et al., 1996).

Compared to previous studies, we have provided a more concise and comprehensive overview of the factors that spectators use to evaluate the atmosphere in a stadium. Additionally, we examined the reliability and construct validity of this adapted measurement tool with measurement invariance and structural invariance, unlike the measurement tools used to assess stadium atmosphere in Turkey. This is crucial to reveal the generalizability and comparability of the psychometric properties of the STAS across groups (spectators versus fans). Indeed, we believe our current research could expand the existing stadium atmosphere measurement tools in Turkey as different fan groups evaluate the stadium atmosphere.

Service quality has been accepted as another construct that evaluates the stadium environment in the sports marketing literature. Researchers have evaluated service quality with the dimensions of parking, food and beverages, cleanliness, fan control, crowd and spent time (Hill & Green, 2000), employees, price, facility access, concessions, fan comfort, game experience, showtime, convenience, and smoking (Kelley & Turley, 2001). However, service quality in sports environments and stadium atmosphere could be accepted as similar. However, service quality focuses on access, aesthetics, layout, and interaction with staff. In contrast, stadium atmosphere involves the social interactions of spectators in the consumption of a sporting event. We believe that the difference between these two structures demonstrates the value of the STAS adapted.

Compared to previous studies (Gençer, 2005; Soygüden, 2021), the study's results were expected to contribute to the understanding of the factors used by the spectators and fans to assess the atmosphere. We also believe that methodologically, these research results have extended existing cross-cultural stadium atmosphere measurement research. Strong empirical evidence was also provided to test and validate the four-factor model of the STAS with data from different samples using robust psychometric procedures. In particular, the results of the study have revealed both the stability and generalizability of the factor structure by replicating and validating it in different samples and studies. In addition, it has extended our knowledge of what constitutes the atmosphere in a stadium through some of the dimensions of stadium atmosphere identified in this study, as they have been overlooked in previous studies. In addition to such theoretical inferences, we assume that managerial inferences can be made with this study. For example, the fact that the STAS addresses the consumption of a live sporting event for both spectators and fans is very important for the sports marketing and recreation literature as well as for the relevant sector managers.

For example, the stadium architecture, the stadium layout, the match features, and the attitudinal and behavioral patterns of the spectators and fans during the match could all play a role in improving attendance and spectators and fans' satisfaction. Positive results could be achieved if stadium managers focus on these. Furthermore, organizers of sports events would be able to determine how consumers value and consume sporting events by being able to measure the atmosphere in the stadium. As the spectator experience is rooted in the stadium, where the sport is simultaneously "produced, consumed and delivered to the sports spectator," this could have a profound impact (Westerbeek & Shilbury, 1999). Consequently, research into spectators and fans' behavior could help us to better understand why people care about the sports and what factors encourage them to attend sporting events in the stadiums. This will allow sports marketers to identify different audience segments better and allocate resources to create a sport offering which is relevant to them. Finally, researchers and practitioners would gain further insight into cultural and geographical differences in the spectator experience by measuring the stadium atmosphere. The stadium atmosphere could guide sports managers and sports marketers to effectively modify both management and marketing strategies for export, as cultural meanings and individual dispositions influence each other.

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Authors' contribution

All authors have been involved in revising the manuscript and interpreting the results. The final version of the manuscript was read and approved by all authors.

Declaration of conflict interest

The authors have not reported any potential conflicts of interest.

Ethics Statement

We obtained the approval of the research ethics committee with protocol number 2023-SBB-0717 from the Bartın University Social and Human Sciences Ethics Committee.

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