Global Scientific and Academic Research Journal of Economics, Business and Management
ISSN: 2583-5645 (Online)
Frequency: Monthly
Published By GSAR Publishers
Journal Homepage Link- https://gsarpublishers.com/journals-gsarjebm-home/

SPORT MANAGEMENT - THE COMFORT OF SPORTS FACILITIES "INDOOR SWIMMING POOLS"

BY

VENTURA, PAULO

PhD in Human Motricity - Sociology and Sports Management. Post-Doctorate in Architecture, Researcher at CICEE - Centre for Research in Economic and Business Sciences - Autonomous University of Lisbon, Portugal. Architect, Urban Planner, Technical Civil Engineer https://orcid.org/0000-0003-4365-967

Article History

Received: 01/02/2024
Accepted: 06/02/2024
Published: 08/02/2024

Vol – 3 Issue – 2

PP: -32-43

Abstract

The concept of comfort is fundamental to the quality of life in modern society. It can be stated that it is present in everything we produce, all the services we use, all the luxuries we enjoy, and all the processes that, in some way, are a part of our everyday lives, whether they are visible or hidden. In the modern setting, the utilization of sports facilities is likewise geared towards high-quality standards based on sustainable and environmentally friendly methods. The study's goal is to help students pursuing a degree in sports administration at the Universidade Autonoma de Lisboa, students pursuing a higher technical course in sports tourism and nautical activities at the Instituto Polytechnic do Cavado e do Ave and professionals in the industry. Of sport, to understand their sensitivity on the topic "Sport Management - The comfort of sports facilities, indoor swimming pools" based on a set of criteria that mainly relate to the sustainable practices of sports facilities; the comfort of sports facilities, and future difficulties. The quantitative methodology adopted was descriptive in nature. The findings revealed a consensus among the students and professionals polled that the "constant search for energy efficiency measures and rational consumption cannot sacrifice user comfort, as well as the durability and interior safety of the installation sport." In conclusion, the application of sustainable methods has the potential to significantly improve the sporting comfort of sports facilities, notably indoor swimming pools.

***Keywords**: Management; Comfort; Sports Facilities, Sustainability, Swimming Pools*
JEL Codes: D71, D91, I14, I31, Z2.

INTRODUCTION

This article aims to understand among students of the degree course in sports management at the Universidade Autonoma de Lisboa; students of the higher technical course in sports tourism and nautical activities at the Instituto Polytechnic do Cávado e do Ave and, also professionals in the field of sports, what sensitivity is generated regarding the topic "Sport Management - The comfort of sports facilities, indoor swimming pools *"*, based on whether in a set of variables that essentially relate to the sustainable practices of sports facilities; the comfort of sports facilities and future challenges. In this way, we begin our exploration of the issue under study "The Comfort of Sports Facilities," based on aspects related to F1 - Sustainable practices in sports facilities, indoor swimming pools; F2 - The Comfort of Sports Facilities, Indoor Swimming Pools; and F3 - Future Challenges. Throughout the examination, a diverse group of variables/questions that supported the entire study will be addressed, specifically:

F1 - Sustainable practices of sports facilities, indoor swimming pools:

Q1 - Can the use of efficient lighting and heating systems reduce energy consumption and increase the air quality of an indoor pool?

Q2 - Can the adoption of technologies, such as advanced filtration systems and water recycling, increase water quality and consequently reduce fungi and bacteria that can cause diseases?

Q3 - Could the adoption of more sustainable, vernacular, and environmentally friendly materials provide added value in the conservation and maintenance of sports facilities - indoor swimming pools?

*Corresponding Author: **VENTURA, PAULO**

F2 - The comfort of sports facilities, indoor swimming pools:

Q4 - Could the implementation of recycling and waste reduction practices, as well as the use of sustainable cleaning and maintenance products, be considered an added value for the conservation and maintenance of sports facilities - indoor swimming pools?

Q5 - Could the thermal comfort of a sports facility (indoor swimming pool) influence athletes' sporting performance?

Q6 - In a sports facility (indoor swimming pool) should the indoor air temperature be maintained at least 1.ºC above the pool water temperature, in order to reduce evaporation and maintain user comfort?

Q7 - In a sports facility (indoor swimming pool), does ventilation influence air quality and user comfort?

Q8 - In a sports facility (indoor swimming pool), could the lighting and angles of the fenestrations (windows) influence the comfort of users of the sports facilities and spaces (indoor pools)?

F3 - Future challenges:

Q9 - The incessant search for energy efficiency measures and rational use of consumption cannot sacrifice the comfort of users, as well as the durability and interior safety of the sports facility - indoor pool.

Q10 - Do you consider the use of a "*Chiller* - amount of heat that is not removed by the refrigeration system" to be an added value in terms of reducing energy consumption?

Q11 - Could the future use of sports facilities and spaces - "Indoor swimming pools" involve the installation of thermal covers during periods of unusability?

Q12 - Could the future use of sports facilities and spaces - "Indoor swimming pools" involve pre-heating the water entering the pool with heat exchange with the water extracted from the pool?

Q13 - Could the future use of sports facilities and spaces - "Indoor swimming pools" involve replacing existing boilers with biomass boilers?

Q14 - Could the future use of sports facilities and spaces - "Indoor swimming pools" involve the installation of a solar thermal collector system to heat water?

At the end of the study, the conclusions and future challenges will also be explained.

LITERATURE REVIEW

The literature review allowed us to have a better understanding of the topic at hand while also getting to know the authors and organizations. These comments were sought across numerous categories and were organized based on:

PERCEPTION VERSUS USER SATISFACTION, INDOOR SWIMMING POOLS - Over time, different opinions have emerged regarding the concept of "swimming pool user perception" and "swimming pool user satisfaction", according to the opinion of M. Tucker, A. Smith (2007), the user's perception is different from the satisfaction that the user has, as the user's perception refers only to the observation that the user has, that is, the user's opinion and knowledge about the service they receive, satisfaction, on the other hand, is linked to the comparison between the expectation initially created by the user and their final opinion about the service. Therefore, we can mention that parameters related to the performance of sports facilities combined with satisfaction and use of physical space can have significant impacts on users' sporting performance, as well as their perception (M. Loosemore, YY Hsin, 2001).

PERFORMANCE OF SPORTS FACILITIES, INDOOR SWIMMING POOLS - Although the performance and comfort of swimming pools are vital for the health and well-being of users, it is still unclear today, and there are uncertainties about an adequate sustainable practice, (A. Castillo -Rodriguez, W. Onetti-Onetti, J.L. Chinchilla-Minguet, 2019). Nonetheless, in recent decades, this topic has become increasingly prominent on the global stage (Kim Taehee, K. Chang, 2018). In conjunction with the topic of performance, investigations were conducted that focused mostly on issues related to the pool's functional performance, with the goal of satisfying its comfort.

COMFORT AND SUSTAINABLE PRACTICES OF SPORTS FACILITIES, INDOOR SWIMMING POOLS - When discussing comfort and sustainable practices of sporting facilities - indoor swimming pools, we will unavoidably have to look at elements such as air quality, thermal condition, heating energy usage, internal assessment, and acoustic condition (Erica Lau, et. al., 2021). Given the variety of technological factors to measure the issues described above, there was a need in some circumstances to resort to computational simulations and physical measurements, also called multi-criteria decision-making approaches (E. Beusker, C. Stoy, SN Pollalis, 2012), such as the AHP (Hierarchical Process Analysis) and TOPSIS (Preferential Ordering Technique by Similarity to the Ideal Solution) methods, very commonly used to evaluate various criteria. These methods help in choosing options for sports facilities.

PREDICTIVE CONTROL ALLIED TO SUSTAINABLE PRACTICES IN SPORTS FACILITIES, INDOOR SWIMMING POOLS - Indoor swimming pools are widely recognized as an important recreational and sporting facility in today's society. However, they consume a lot of energy. Sometimes the costs inherent in energy consumption limit the financial viability of the pool itself, resulting in a high charge for users, which even then, in most circumstances, is insufficient (JP Delgado Maríny, et. al., 2019). One of the most significant issues is predictive control, namely regulating energy consumption (heat) and determining when this energy generation is required. According to the same authors, these energy shortages are essentially linked to factors compensating for heat losses; space heating; supply of hot water for various services. In addition, heat losses must be taken into account, of which we highlight the evaporation of pool water as the most significant and the losses occurring in

*Corresponding Author: **VENTURA, PAULO**

the refrigeration piping (*Chiller* - associated with the amount of heat that is not removed by the cooling system). refrigeration). In this context, it is accepted that energy must be provided 24 hours a day, 365 days a year. However, the pool area must be kept at a higher temperature than the pool water, necessitating more heating and a hot water toilet for showers. According to the parameters defined by the International Swimming Federation, the water temperature in the swimming pool must be between 25 and 28°C (JP Delgado Maríny, et. al., 2019). For example, the Spanish National Sports Council recommends 26 ± 1 °C (CSD, 2005), but most public swimming pools operate at a temperature of 28 °C.

ENERGY EFFICIENCY ALLIED TO SUSTAINABLE PRACTICES IN SPORTS FACILITIES, INDOOR SWIMMING POOLS - If the air humidity is low, the higher the power consumption and the larger the evaporation of water, resulting in an increase in the need for thermal energy (Delgado Marín and García Cascales, 2019). The evaporation load of a swimming pool is around 60% of the overall energy used (Zuccari et al., 2017). We used a study developed by Shah (2014), which was based on a study of 113 laboratory and real tests for indoor swimming pools, having carried out this study and compared it with other classic formulations (Carrier, 1918, Ashrae, 2007 or Smith et al. 1993), it turned out that there was better agreement with the test result when its correlation was used. In this regard, a comprehensive module was created to assess energy consumption (the amount of energy required for an indoor swimming pool with swimming activities). This module was implemented in TRNSYS (Transient System Simulation Tool) and validated using real-world energy consumption data, with an average absolute error of less than 2% (Delgado Marín and García Cascales, 2019). The model was evaluated under real-world conditions using a monitoring system installed at the Archena Public Indoor Swimming Pool in Murcia. The data led us to the conclusion that the boiler serves as the primary heating source at night, while the boiler is turned off during the day if there is enough solar energy. During the day, the pool water may be superheated to one degree over the set temperature if necessary due to solar thermal contribution. This is due to the simple fact that the energy collection equipment using the solar thermal process cannot be interrupted while receiving solar radiation. In brief, and to ensure that this research adheres to a set of guidelines.

The objective of the study is aimed at students on the degree course in sports management at the Universidade Autonoma de Lisboa, students on the higher technical course in sports tourism and nautical activities at the Instituto Polytechnic do Cávado e do Ave, and professionals in the field. of sport, in order to understand among them, what their perception is regarding the topic "*The comfort of sports facilities "indoor swimming pools",* based on a set of variables that essentially relate to sustainable practices of sports facilities, indoor pools; the comfort of sports facilities, indoor pools, and future challenges.

RESEARCH METHODOLOGY

For Cervo and Bervian (2002), scientific methodology is characterized by the study of knowledge methods. According to Lakatos and Marconi (1991), research methodology is defined as a set of techniques that allude to the foundations and assumptions that lead a specific investigation. This perception leads us to an understanding of methodological research, which is distinguished by defined procedures and approaches, namely the type of research and its structuring, bibliographic sources, collection instruments, data processing forms, and time horizon. According to Vilelas (2020), research methodology includes the execution of numerous processes related to the phases and techniques used in a systematic, critical, and empirical manner when conducting an academic study. In terms of methodology selection, this entails developing a strategy that will then impact the techniques and instruments used to gather and process the data obtained (Sousa and Batista, 2014). The research methodology utilized in our study was based on "applied research," which seeks to develop information for practical application in order to solve specific challenges. From the perspective of the technique, we utilize "quantitative research" insofar as everything is measurable, which implies transforming thoughts and facts into numbers in order to categorize and analyze them. It needs the application of statistical resources and techniques (percentage, mean, mode, median, standard deviation, correlation coefficient, among others) (Gil, 2006). In short, quantitative research focuses on quantifying phenomena through the gathering and analysis of numerical data, as well as the use of statistical tests. (Collis and Hussey, 2005). We utilize "descriptive research" to characterize the characteristics of a specific population, phenomenon, or the discovery of correlations between variables. The most popular type of presentation is a survey, which is often conducted using a questionnaire or systematic observation and provides a summary of the environment at the time of study. Methodology is used to guide the collection of data when the goal is to characterize specific events (Gil, 1996). It is intended for scholars with extensive understanding of the phenomena and problems being addressed. Descriptive research involves observing, recording, analyzing, and correlating facts or events (variables) without influencing them. It aims to determine, as precisely as possible, the frequency with which a phenomenon occurs, its relationship and connection to others, as well as its nature and qualities. It develops mostly in the human and social sciences, addressing data and situations that deserve to be studied but are not recorded in papers (Cervo; Bervian, 2002, p.66). The full process of selecting and characterizing the population under analysis (referred to as a sample) will be presented. Next, we described the method of selecting the instrument for data collection, as well as the strategy for processing the information acquired (data) using certain approaches to eventually identify the final results and discussion generated from the study.

PARTICIPANTS - One of the phases of a research process involves identifying what we want to study and who we want to analyze, called target population, participants, and/or sample. Depending on this clarification, and given the

*Corresponding Author: **VENTURA, PAULO**

impossibility of analyzing the entire population for different reasons, a group of samples was identified: students on the degree course in sports management at the Universidade Autonoma de Lisboa, students on the higher technical course in sports tourism and activities nautical experts from the Polytechnic Institute of Cavado and Ave and also professionals in the field of sport, in order to understand from them what their perception is regarding the theme " Sport Management - The comfort of sports facilities "indoor swimming pools", which allowed us to obtain data or observations, with the aim of drawing conclusions about the population from whom information was collected (Vilelas, 2020). A valid sample of 56 respondents was obtained, distributed among students of the Autonomous University of Lisbon's degree courses in Sports Management, students of the higher technical course in Sports Tourism and Nautical Activities at the Instituto Polytechnic do Cávado and Ave, and sports professionals.

INSTRUMENT - *Google Forms* form creation tool. According to some descriptors Batista, Moreira, Rodrigues, and Silva (2021), a questionnaire survey is a data collection technique commonly used in educational research, particularly in large-scale studies, that allows observing a significant number of subjects in relation to a specific social phenomenon by quantifying the data obtained and making inferences and generalizations. This instrument appears as a physical thing employed in the various approaches.

PROCEDURE - At the procedural level, a questionnaire survey was created with the use of a five-point Likert scale. It enabled us to find several points of view on a certain topic under investigation. The assessment levels utilized on the Likert scale were as follows: entirely disagree=1, disagree=2, neither agree nor disagree=3, agree=4, and I totally agree=5. The questionnaire is divided into two parts: the first part contains sociodemographic questions about the sample under study (age, gender, household, residence (inside or outside the city of Lisbon); nationality; sports student; sports professional); and the second part contains three groups distributed across 14 items suggested to measure the study variables, which are divided as follows.

F1 - Sustainable practices in sports facilities, Indoor Swimming Pools; F2 - The comfort of sports facilities, Indoor Swimming Pools; F3 - Future Challenges. After a careful and demanding analysis, independent and dependent variables were defined that have the necessary and appropriate dimensions to respond to the objectives of this research, as well as for objective data collection and framed with the topic under study. In the understanding of Vilelas (2020, p.171), "the variables must be in accordance with the definition of the problem, the objectives, the hypotheses and, in line with the theoretical framework". Regarding independent variables, "this type of variable is independent of the research procedures; however, it constitutes determining factors that will influence it", that is, "the researcher uses its manipulation to observe the effects produced on the dependent variables". On the other hand, the dependent variable "is the one that directly connotes the answers sought in the investigation (…)", that is, "(…) the result obtained with the research procedures" (Sousa and Batista, 2014, p.49). Since the main objective of the study is to analyze the "technical considerations of accessibility to sports spaces and facilities", it was necessary to study some indicators closely linked to this multifactorial relationship. For this, several variables were selected that aim to give a direct answer and others that allow them to be related to each other, exploring and describing the different dimensions under analysis (Sampieri et. al., 2014). The variables were selected and included in the questionnaire survey.

DATA PROCESSING - Quantitative data analysis was performed utilizing statistical techniques and procedures that enabled the examination of a large number of variables (Collis; Hussey, 2005). This strategy is centered on the requirement for focused observation in order to identify patterns and correlations between variables. The study enabled the extraction of statistical indicators and parameters capable of identifying trends and defining behaviors for the target population based on a particular sample. The results collected from the questionnaire survey were input and tallied in Microsoft Excel. The arithmetic means of the observations collected for each study variable were calculated. The data were then transferred to the statistical analysis programme JAMOVI version 1.6.23, where descriptive analyses were performed, namely frequencies, measures of central tendency, and dispersion. The distribution's extremes and quartiles were represented using bar graphs and a Boxplot. To assess reliability and internal consistency, the Alpha parameter was used. Cronbach, which is commonly used to assess the intercorrelation of items proposed to measure a specific variable. The Shapiro-Wilk non-parametric test was also used to check whether the variables had a normal distribution. The Spearman test was also employed to assess the degree of correlation and relationship among the variables.

ANALYSIS AND DISCUSSION OF RESULTS

SOCIO DEMOGRAPHIC PROFILE - The sociodemographic analysis of the sample indicates some variation among respondents with regard to a varied set of items, namely: AGE - the results indicate that around 73.2% of respondents are male, which corresponds to 41 of the respondents. For females, the figure was 26.8%, which corresponds to 15 respondents. The minimum age recorded was 19 years old and the maximum age 45 years old. In relation to measures of central tendency, it is noted that the age that was most frequently repeated was 22 years old, meaning that the Mode (Mo=22) for the male gender; on the other hand, the average recorded for the same gender was centered on (Me=24.2) years. Regarding the female gender, an e value (Me=25.1) was obtained and the median had the value of (Md=24.0) in the age variable, Table 1 - Age.

*Corresponding Author: **VENTURA, PAULO**

Table 1 – Age

	Gender	N	Mean	Mode	Median	Standard Deviation	Min	Max
Age	M	41	24.2	22.0	23.0	5.62	19	45
	F	15	25.1	30.0	24.0	4.70	19	35

Source: Jamovi (2024)

Regarding the "*Shapiro-Wilk*" normality test for the gender variable, a value p<0.087 was obtained for the male gender, that is, higher than p<0.05, and for the female gender p<0.195 is also higher than p< 0.05, Table 2 shows that both the male and female gender variables, which are both quantitative variables, have a normal distribution.

Table 2 - Variable normality test *gender* " *Shapiro-Wilk"*

	Shapiro-Wilk			
	Gender	N	W	P
ID_	M	41	0.953	0.087
	F	15	0.920	0.195

Source: Jamovi (2024)

Shapiro-Wilk" normality test, based on stratified analysis (age/household/gender), it was possible to verify a record of variation in p-values, namely: a value of p<0.001 was obtained for the male gender, which indicates that the variable does not have a normal distribution. The female gender presents p<0.091, or higher than p<0.005, concluding that in this specific case, there is a normal distribution. In relation to the household, both genders (male and female) present a value p< 0.005, not showing a normal distribution. These data are presented in Table 3.

Table 3 - Normality test (age/household/gender) " *Shapiro-Wilk"*

								Shapiro-Wilk	
	Gender	N	Mean	Mode	Standard Deviation	Min	Max	W	P
Age	M	41	24.22	22.00	5,624	19	45	0.776	<0.001
	F	15	25.13	30.00	4,704	19	35	0.899	<0.091
Household	M	41	3.51	4.00	0.779	two	5	0.747	<0.001
	F	15	3.20	4.00	0.862	two	4	0.771	<0.002

Source: Jamovi (2024)

HOUSEHOLD - Based on the data collected and the sample investigated, it appears that respondents live in households with a maximum of four persons, accounting for around 57.1%. It seems that only one student lives in a family with five members, while approximately 23.2% of respondents live in households with three members and 17.9% in families with two members. In the aggregate with the greatest representation, we have a (Me=23.90) and (Md=22.0), as expressed in Tables 4 and 5 respectively.

Table IV: Household

	Household	N	Mean	Mode	Median
ID	two	10	26.40	30.00	25.50
	3	13	24.50	19.00	24.00
	4	32	23.90	22.00	22.00
	5	1	22.00	22.00	22.00

Source: Jamovi (2024)

*Corresponding Author: **VENTURA, PAULO**

Table V: Frequency Household

	Household	N	%Total	% Accumulated
ID	two	10	17.9%	17.9%
	3	13	23.2%	41.1%
	4	32	57.1%	98.2%
	5	1	1.8%	100.0%

Source: Jamovi (2024)

RESIDENCE - In terms of geography, we attempted to determine the total number of respondents, regardless of whether they lived in Lisbon or elsewhere. According to the statistics, 47 of the respondents live in Lisbon or the municipality of Lisbon, accounting for 83.9% of the total; only 9 of the respondents responded "that they do not live in Lisbon," accounting for 16.1% of the total, as shown in Table 6 and Graph 1 Bars.

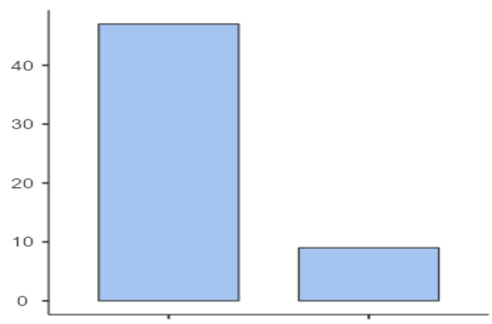
Table 6: Frequency Residence in Lisbon

Residence in Lisbon	N	%Total	% Accumulated
Yes	47	83.9%	83.9%
At the	9	16.1%	100.0%

Source: Jamovi (2024)

Graph 1: Residence in Lisbon

ID



Yes No

Source: Jamovi (2024)

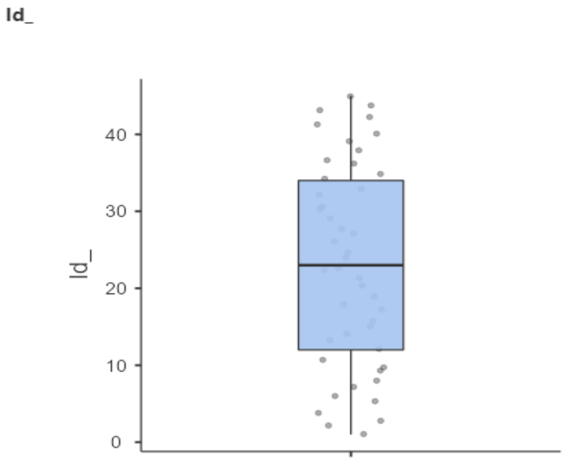
NATIONALITY - Regarding nationality, there are no ambiguities; the statistics show that 100.0% of respondents are Portuguese. Table 7 and Graph 2 Boxplot.

Table 7: Table of nationality frequencies

Nationality	Counts	%Total	%Cumulative
English	56	100.0%	100.0%

Source: Jamovi (2024)

Graph 2 *Boxplot*: Nationality



English

Source: Jamovi (2024)

Frequency analysis was performed, namely on the absolute and relative frequencies of the data gathered. The mean, median, and mode, as well as the standard deviation, variance, maximum, and minimum, were then calculated to determine the central tendency and dispersion. Statistics techniques are widely employed in exploratory data analysis to find hidden trends among grouped data. This analysis favors the assessment of the quality of the data collected (Valladares Neto et al., 2017). Frequency analysis, whether absolute or relative, is one of the fundamental ideas in statistical distribution. The absolute frequency corresponds to the raw data obtained in a study, expressing the number of times a specific phenomenon occurred, which is typically preliminary data in an examination. It is critical to emphasize that absolute frequency data should always be expressed in real values. Regarding the relative frequency, it is obtained by calculating the number of observed occurrences divided by the total sample (represented by the letter “N”), to express a percentage value in relation to the sample size. It should be noted that the sum of observed relative frequencies must correspond to the value of 100%.

F1 - SUSTAINABLE PRACTICES OF SPORTS FACILITIES, INDOOR SWIMMING POOLS

F1 - Sustainable practices of sports facilities, indoor swimming pools, regarding: Question Q1 - “Can the use of efficient lighting and heating systems reduce energy consumption and increase the air quality of an indoor swimming pool?” The development of forms of sustainability is an essential condition of today's sports facilities and places, as evidenced by the findings collected, which show that 55.4% of respondents reacted (totally agree), 37.5% responded (agree), and approximately 7.1% disagreed. Table 8 - Q1.

Table 8 - Q1

Q1 - Frequencies			
Q1	Counts	%Total	%Cumulative

*Corresponding Author: **VENTURA, PAULO**

Disagree	4	7.1%	7.1%
Agree	21	37.5%	44.6%
I totally agree	31	55.4%	100.0%

Source: Jamovi (2024)

Question Q2 - "Can the adoption of technologies, such as advanced filtration systems and water recycling, increase water quality and consequently reduce fungi and bacteria that can cause diseases?", 64.30% of respondents said (I absolutely agree), while 35.7% responded (I agree). Based on the findings, there is a universal consensus that technology adoption can improve the quality of water in swimming pools while also reducing fungal emissions and production. Table 9 - Q2.

Table 9 - Q2

Q2 - Frequencies			
Q2	**Counts**	**%Total**	**%Cumulative**
Agree	20	35.7%	35.7%
I totally agree	36	64.3%	100.0%

Source: Jamovi (2024)

Question Q3 - "Can the adoption of more sustainable, vernacular, and environmentally friendly materials provide added value in the conservation and maintenance of sports facilities - indoor swimming pools?", 30.4% of respondents responded (totally agree), whereas around 69.6% responded (agree), with no discordant responses. In short, everyone agrees that using more sustainable materials can improve the conservation of sporting facilities such as indoor swimming pools (Table 10 - Q3).

Table 10 - Q3

Q3 - Frequencies			
Q3	**Counts**	**%Total**	**%Cumulative**
Agree	39	69.6%	69.6%
I totally agree	17	30.4%	100.0%

Source: Jamovi (2024)

As we continue our study, we seek to find out what correlation exists between the questions Q1 "Can the adoption of technologies, such as advanced filtration systems and water recycling, increase water quality and, consequently, reduce fungi and bacteria susceptible to cause disease?" and question Q2 "Can the adoption of technologies, such as advanced filtration systems and water recycling, increase water quality and consequently reduce fungi and bacteria that can cause disease?". To determine the correlation between these two variables, we used the "*Pearson"* non-parametric correlation matrix, where it was possible to obtain the following results: for Q1 the value of $p<0.686$ was higher than $p<0.005$, obtaining a very significant correlation, with *Pearson's R value* corresponding to a value of 0.055, that is, moderately far from 0, considered an average correlation of Q1 with Q2, expressed in Table 11.

Table 11: Matrix of Corrections from Q1 to Q3

		Q1	Q2	Q3
Q1	R de Pearson	—		
	p-value	—		
Q2	R de Pearson	0.055	—	
	p-value	0.686	—	
Q3	R de Pearson	−0.236	−0.237	—
	p-value	0.080	0.078	—

Source: Jamovi (2024)

F2 - THE COMFORT OF SPORTS FACILITIES, INDOOR POOLS

The comfort of sports facilities, indoor swimming pools, in relation to:

Question Q4 - "Could the implementation of recycling and waste reduction practices, as well as the use of sustainable cleaning and maintenance products, be considered an added value for the conservation and maintenance of sports facilities - indoor swimming pools?", 58.9% of respondents responded (totally agree), whereas 41.1% agreed. There is considerable support for the implementation of sustainable recycling and trash reduction techniques. Table 12- Q4.

Table 12 - Q4

Q4 - Frequencies			
Q4	**Counts**	**%Total**	**%Cumulative**
Agree	23	41.1%	41.1%
I totally agree	33	58.9%	100.0%

Source: Jamovi (2024)

Question Q5 - "Could the thermal comfort of a sports facility - indoor swimming pool, influence the sports performance of athletes?", 73.2% of respondents responded (completely agree), 26.8% responded (agree), and no discordant responses were recorded. Once again, there is widespread agreement that thermal comfort in a swimming pool can affect athletic performance. Table 13 - Q5.

Table 13 - Q5

Q5 – Frequencies			
Q5	**Counts**	**%Total**	**%Cumulative**
Agree	15	26.8%	26.8%
I totally agree	41	73.2%	100.0%

Source: Jamovi (2024)

Question Q6 - "In a sports facility - indoor swimming pool, should the indoor air temperature be maintained at least 1.ºC above the pool water temperature, in order to reduce

*Corresponding Author: **VENTURA, PAULO**

evaporation and maintain user comfort?", 44.6% of respondents answered (I absolutely agree), 30.4% stated (I agree), and 25.0% said (I neither agree nor disagree). Once again, we get a general consensus on the question stated.

Table 14 - Q6

Q6 – Frequencies			
Q6	**Counts**	**%Total**	**%Cumulative**
I do not agree or disagree	14	25.0%	25.0%
Agree	17	30.4%	55.4%
I totally agree	25	44.6%	100.0%

Source: Jamovi (2024)

Question Q7 - "In a sports facility - indoor swimming pool, does ventilation influence air quality and user comfort?", 55.4% of respondents responded (completely agree), 44.6% responded (agree), and no answers were contradictory. In summary, everyone believes that ventilation affects the air quality and comfort of a pool (Table 15 - Q7).

Table 15 - Q7

Q7 – Frequencies			
Q7	**Counts**	**%Total**	**%Cumulative**
Agree	25	44.6%	44.6%
I totally agree	31	55.4%	100.0%

Source: Jamovi (2024)

Question Q8 - "In a sports facility (indoor swimming pool), could the lighting and angles of fenestrations (windows) influence the comfort of users of sports facilities and spaces (indoor pools)?", 67.9% of respondents responded (totally agree), 25.0% agreed, and 7.1% did not agree or disagree. More over half of respondents expressed a positive impression about the question asked (Table 16 - Q8).

Table 16 - Q8

Q8 – Frequencies			
Q8	**Counts**	**%Total**	**%Cumulative**
I do not agree or disagree	4	7.1%	7.1%
Agree	14	25.0%	32.1%
I totally agree	38	67.9%	100.0%

Source: Jamovi (2024)

If followed, we seek to know, for example, what correlation exists between questions Q4 "Could the implementation of recycling and waste reduction practices, as well as the use of sustainable cleaning and maintenance products, be considered an added value for conservation and maintenance of sports facilities - indoor swimming pools?" and question Q5 "Could the thermal comfort of a sports facility - indoor pool, influence athletes' sporting performance?". To determine the correlation between these two variables, we used the "*Pearson"* non-parametric correlation matrix, where it was possible to obtain the following results: for Q4 the value of p<0.084 was higher than p<0.005, obtaining a very significant correlation, with *Pearson 's R-value* corresponding to 0.084, that is, a correlation far from 0, considered an acceptable correlation of Q4 with Q5, expressed in Table 17.

Table 17: Matrix of Corrections from Q4 to Q8

		Q4	Q5	Q6	Q7	Q8
Q4	R de Pearson	—				
	p-value	—				
Q5	R de Pearson	0.233	—			
	p-value	0.084	—			
Q6	R de Pearson	0.202	0.445	—		
	p-value	0.135	< .001	—		
Q7	R de Pearson	−0.020	−0.219	0.040	—	
	p-value	0.886	0.105	0.768	—	
Q8	R de Pearson	0.115	0.007	0.118	0.069	—
	p-value	0.397	0.959	0.385	0.616	—

Source: Jamovi (2024)

F3 - FUTURE CHALLENGES

Question Q9 - "The incessant search for energy efficiency measures and rational use of consumption cannot sacrifice the comfort of users, as well as the durability and interior safety of the sports facility - indoor pool?" 23.2% of respondents responded (completely agree), 69.6% responded (agree), 5.4% responded (neither agree nor disagree) and only one respondent responded (completely disagree) which corresponds to 1.8%. Once again, a confirming opinion is obtained from more than 50% of respondents to the question asked. Table 18 - Q9.

Table 18 - Q9

Q9 – Frequencies			
Q9	**Counts**	**%Total**	**%Cumulative**
Totally Disagree	1	1.8%	1.8%
I do not agree or disagree	3	5.4%	7.1%
Agree	39	69.6%	76.8%
I totally agree	13	23.2%	100.0%

Source: Jamovi (2024)

Question Q10 - "Do you consider the use of *a Chiller* to be an added value - the amount of heat that is not removed by the refrigeration system", in what concerns the reduction in energy consumption?", 28.6% said (I absolutely agree), 55.4% responded (agree), and around 16.1% responded (neither agree nor disagree). The majority agrees with the question posed in Table 19 - Q10.

Table 19 - Q10

Q10 – Frequencies

*Corresponding Author: **VENTURA, PAULO**

Q10	Counts	%Total	%Cumulative
I do not agree or disagree	9	16.1%	16.1%
Agree	31	55.4%	71.4%
I totally agree	16	28.6%	100.0%

Source: Jamovi (2024)

Question Q11 - "Could the future use of sports facilities and spaces - "Indoor swimming pools" involve the installation of thermal covers during periods of unusability?", Table 20 - Q11 shows that 46.4% of respondents responded (absolutely agree), while 53.6% responded (I agree) to the deployment of thermal coverings during periods of inactivity.

Table 20 - Q11

Q11 – Frequencies			
Q11	**Counts**	**%Total**	**%Cumulative**
Agree	30	53.6%	53.6%
I totally agree	26	46.4%	100.0%

Source: Jamovi (2024)

Question Q12 - "Could the future use of sports facilities and spaces - "Indoor swimming pools" involve pre-heating the water entering the pool with heat exchange with the water extracted from the pool?", 46.4% of respondents responded (totally agree), 48.2% responded (agree), and around 5.4% indicated that they did not have an opinion by saying (I neither agree nor disagree). Most people feel that the future of sports facilities, namely indoor swimming pools, should include pre-heating the water entering the pool by heat exchange with the water retrieved from the pool. Table 21 - Q12.

Table 21 - Q12

Q12 – Frequencies			
Q10	**Counts**	**%Total**	**%Cumulative**
I do not agree or disagree	3	5.4%	5.4%
Agree	27	48.2%	53.6%
I totally agree	26	46.4%	100.0%

Source: Jamovi (2024)

Question Q13 - "Could the future use of sports facilities and spaces - "Indoor swimming pools" involve replacing existing boilers with biomass boilers?", 26.8% of respondents responded (completely agree), 53.6% said (I agree), and around 19.6% indicated that they did not have an opinion by responding (I neither agree nor disagree). Similar to the preceding question, most people agree that the future of sports facilities, including indoor swimming pools, could require replacing existing boilers with biomass boilers (Table 22 - Q13).

Table 22 - Q13

Q13 – Frequencies			
Q13	**Counts**	**%Total**	**%Cumulative**
I do not agree or disagree	11	19.6%	19.6%
Agree	30	53.6%	73.2%
I totally agree	15	26.8%	100.0%

Source: Jamovi (2024)

Question Q14 - "Could the future use of sports facilities and spaces - "Indoor swimming pools" involve the installation of a solar thermal collector system for water heating?", 42.9% of respondents responded (totally agree), 57.1% responded (agree), leaving no room for disagreement, leading us to believe that we are on the right track when considering installing sustainable energy production systems for heating indoor swimming pools (Table 23 - Q14).

Table 23 - Q14

Q14 - Frequencies			
Q14	**Counts**	**%Total**	**%Cumulative**
Agree	32	57.1%	57.1%
I totally agree	24	42.9%	100.0%

Source: Jamovi (2024)

In the continuation of our study, we seek to find out what correlation exists between question Q9 "The incessant search for energy efficiency measures and rational use of consumption cannot sacrifice the comfort of users, as well as the durability and interior safety of the sports facility - indoor pool?" and question Q13 "Could the future use of sports facilities and spaces - "Indoor swimming pools" involve replacing existing boilers with biomass boilers?". To determine the correlation between these two variables, we once again used the "*Pearson*" non-parametric correlation matrix, where it was possible to obtain the following results: for Q9 the value of $p<0.659$, that is, greater than $p<0.005$, obtaining a strong correlation, with *Pearson's R value* corresponding to the value of 0.0659, that is, slightly far from 0, considered an acceptable correlation of Q9 with Q13 expressed in Table 24. On the other hand, we also correlated the question Q13 "Could the future use of sports facilities and spaces - "Indoor swimming pools" involve replacing existing boilers with biomass boilers?" and question Q14 "Could the future use of sports facilities and spaces - "Indoor swimming pools" involve the installation of a solar thermal collector system for heating water?". To determine the correlation between these two variables, we again used the "*Pearson"*

*Corresponding Author: **VENTURA, PAULO**

non-parametric correlation matrix, where it was possible to obtain the following results: for Q13 the value of p<0.911, greater than p<0.005, obtaining a correlation strong, with *Pearson's R-value* corresponding to 0.015, that is, moderately far from 0, considered an acceptable correlation of Q13 with Q14, Table 24.

Table 24: Matrix of corrections from Q9 to Q14

		Q9	Q10	Q11	Q12	Q13	Q14
Q9	R de Pearson	—					
	p-value	—					
Q10	R de Pearson	−0.368	—				
	p-value	0.005	—				
Q11	R de Pearson	−0.068	0.041	—			
	p-value	0.618	0.765	—			
Q12	R de Pearson	0.420	−0.224	0.201	—		
	p-value	0.001	0.096	0.137	—		
Q13	R de Pearson	0.060	−0.020	−0.362	0.016	—	
	p-value	0.659	0.883	0.006	0.907	—	
Q14	R de Pearson	0.110	0.055	0.134	0.192	0.015	—
	p-value	0.420	0.687	0.323	0.156	0.911	—

Source: Jamovi (2024)

After examining the frequency of replies to the supplied assertions (items suggested for measuring the study variables). In terms of central tendency, the mean and median values for all variables in this study were found to be 4. The most common Fashion value is 4 (I agree). The minimum observed values are between 2 (disagree) and 4 (agree), with a maximum of 5 (total agreement). The data also demonstrates that the sample includes some extremes between the highest and minimum values, which supports a certain degree of data dispersion. Table 25 summarizes the descriptive statistics for the variables used in this investigation.

Table 25 - Descriptive Statistics (F1, F2, F3)

	N	Mean	Median	Mode	Standard Deviation	Var.	Min.	Max.
F1 - Escala Likert	56	2.86	3.00	3.00	0.353	0.125	2	3
F2 - Escala Likert	56	4.13	4.00	4.00	0.384	0.148	3	5
F3 - Escala Likert	56	4.29	4.00	4.00	0.456	0.208	4	5

Source: Jamovi (2024)

F1 - Sustainable practices in sports facilities, indoor swimming pools;
F2 - The comfort of sports facilities, indoor swimming pools;
F3 - Future challenges.

Reliability and internal consistency analysis (Cronbach's Alpha):

Internal consistency is a method used in scientific research to assess the relationship between distinct test items. It determines whether the several items designed to measure the same construct yield similar findings. Cronbach's Alpha Coefficient, which is determined by combining item correlations, is commonly used to assess internal consistency. According to Almeida, Santos, and Costa (2010), Lee Joseph Cronbach, a North American psychologist, described this coefficient in 1951 as a tool for measuring the reliability of educational and psychological exams. This allowed new interpretations of the reliability index. It can be said that *Cronbach's Alpha* is the average of the correlations of the items that are part of an instrument (Almeida et al., 2010). The internal consistency index varies between 0 and 1. Normally, a degree of consistency of α> 0.7 is expected for reliability to be acceptable; the critical value proposed by Nunnally (1978) was taken as a reference. If values in the order of 0.8 and 0.9 are observed, this indicates a high degree of acceptance. Average values in the order of 0.3 and 0.7, an acceptable degree, lower than 0.21 means poor consistency, which in turn is not accepted. Thus, in summary form, it can be seen in the following table that the degree of internal consistency of the Likert items proposed to measure the variables of this study has a value of 0.299, which means a very acceptable degree of reliability, Table 23 and Correlation Map by Pearson.

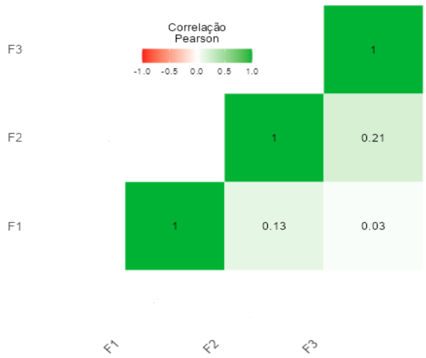
Table 23 - Cronbach's alpha coefficient (F1, F2, F3)

Scale reliability statistics

	Mean	**Standard deviation**	**Cronbach's α**	**McDonald's ω**
Scale	3.76	0.258	0.299	0.448

Source: Jamovi (2024)

Pearson correlation map (F1, F2, F3)



Source: Jamovi (2023)

CONCLUSIONS

This investigation aimed to intercede with students of the degree course in sports management at the Universidade Autonoma de Lisboa, students of the higher technical course in sports tourism and nautical activities at the Instituto Polytechnic do Cávado e do Ave and also professionals in the field of sports, in order to understand their sensitivity regarding the topic " *Sport Management - The comfort of sports facilities, indoor swimming pools",* based on a set of variables that essentially relate to the sustainable practices of sports facilities; the comfort of sports facilities and future challenges. To summarize, for each of the groups of questions raised, F1, F2, and F3, a mixture of individualized responses were received, from which the following conclusions can be drawn: From the total of 56 respondents to the set of questions asked in variable F1 - Sustainable practices of sports facilities, indoor swimming pools; it is concluded that overall, 48 responded (neither agree nor disagree) corresponding to 85.7% of the sample; around 8 respondents responded (disagree) which corresponds to 14.3% of the responses. As a result, the results show that the majority of respondents have no view on the question stated in F1, which is not surprising given that this is still a little-studied topic in academia. Regarding the conclusions obtained in F2 - "The comfort of sports facilities, indoor swimming pools"; 14.3% of respondents completely agree with the questions asked, around 83.9% responded I agree and only 1.8% do not have an opinion. Given the responses to the battery of questions, we may conclude that when asked more technical questions concerning sustainable comfort practices in sports facilities, particularly indoor swimming pools, most respondents are unsure of their application. The results indicate a positive consensus among all responders to the topics posed in F3 - "Future Challenges". Approximately 28.6% of respondents said completely agree, while 71.4% responded agree. In short, and based on the total of the concerns mentioned, such as rational resource usage, sports facility comfort, the installation of ecological alternative systems, and the implementation of sustainable thermal energy production systems. Everything will only make sense if we understand how to protect the planet's resources and ensure their use for future generations.

REFERENCES

1. Almeida, D.; Santos, M. d.; Costa, AFB (2010). Application of Cronbach's alpha coefficient to the results of a questionnaire to evaluate public health performance. XXX National Meeting of Production Engineering, Brazilian Association of Production Engineering São Paulo, v. 15, p. 1–12, 2010.
2. Ashrae (2007). ASHRAE Handbook HVAC Applications, ASHRAE, Atlanta, GA.
3. A Castillo-Rodriguez, W. Onetti-Onetti, J. L. Chinchilla-Minguet (2019). Perceived quality in sports centers in southern Spain: an acse study, Sustainability 11 (14).
4. Batista, B., Moreira, EV, Rodrigues, D., & Silva, FP (2021). Data Collection Techniques in Research: Inquiry through questionnaires and/or Interviews (1st ed.). Aveiro, Portugal: UA Editora. doi:10.34624/ka02-fq42.
5. Carrier, W. H. (1918). The temperature of evaporation. ASHVE Trans. 24, 25–50.
6. Cervo, AL; Bervian, PA. (2002). Scientific methodology. 5. ed. São Paulo : Prentice Hall, 2002.
7. Collis, J.; Hussey, R. (2005). Management research: a practical guide for undergraduate and postgraduate students. 2nd ed. Porto Alegre: Bookman.
8. Delgado Marín JP, García Cascales JR. (2019). Dynamic Simulation Model and Empirical Validation for Estimating Energy Demand in Indoor Swimming Pools. Submitted to Energy Efficiency. Springer. Under review.
9. Erica Lau, Huiying (Cynthia) Hou., Joseph HK Lai, David Edwards, Nicholas Chileshe (2021). User-centric analytical approach to evaluate the performance of sports facilities: A study of swimming pools. doi:10.1016/j.jobe.2021.102951.
10. E. Beusker, C. Stoy, S. N. Pollalis (2012). Estimation model and benchmarks for heating energy consumption as schools and sport facilities in Germany, Build. Environ. 49, 324-335.
11. Gil, Antônio Carlos . (1996). How to design research projects. 3rd ed. São Paulo: Atlas.
12. Gil, Ant ônnio C. (2006). Methods and techniques of social research. 5. ed. São Paulo: Atlas.
13. JP Delgado Marín, F. Vera García, JR García Cascales (2019). Use of a predictive control to improve the energy efficiency in indoor swimming pools using solar thermal energy. SolarEnergy. Universidad Politécnica de Cartagena, Dr. Fleming s/n – E30202, Cartagena, Spain. doi:10.1016/j.solener.2019.01.004.
14. Lakatos, E. M., Marconi, M. A. (1991). Fundamentals of scientific methodology (3rd ed.). São Paulo: Atlas.
15. M. Loosemore, Y. Y. Hsin. (2001). Customer-focused benchmarking for facilities management, Facilities 19 (13/14) 464–475.
16. Moreira, MA; Rosa, PRS (2013). An introduction to quantitative research in teaching. UFMS publisher.
17. M. Tucker, A. Smith (2007). User perception in workplace productivity and strategic FM delivery, Facilities 26 (5/6) 196-212.
18. Nunnaly, J. (1978). Psychometric theory. New York: McGrow-Hill Publishing Company; 1978.
19. KIM Taehee, K. Chang, (2018). Developing a measure of user-perceived universal design for sport facilities, South Afr. J. Res. Sport, Phys. Ed. Recreation. 40 (1).
20. Shah, M. M., (2008-2014). Methods for calculating evaporation from swimming pools and other water surfaces. ASHRAE Trans. 120 (2).
21. Shapiro, S. S., & Wilk, M. (1965). An Analysis of Variance Test for Normality (Complete Samples). *Biometrika*, *52* (3/4), pp. 591-611. Retrieved

*Corresponding Author: **VENTURA, PAULO**

September 2022, from https://doi.org/https://doi.org/10.2307/2333709.
22. Sampieri, R., Collado, C., & Lucio, M. (2014). Definitions of quantitative and qualitative approaches, their similarities and differences. Porto Alegre, RS: I think
23. Sousa, A. (March 2019). Pearson's Correlation Coefficient and Spearman's Correlation Coefficient: What they measure and in which situations they should be used. Correio dos Açores, 1. Retrieved in September 2022, from http://hdl.handle.net/10400.3/5365
24. Sousa, M., & Baptista, C. (2014). How to carry out research, dissertations, theses, and reports - according to Bologna (5th ed.). PACTOR.
25. Smith, C. C., Jones, R., Lof, G. (1993). Energy requirements and potential savings for heated indoor swimming pools. ASHRAE Trans. 99(2), 864–874.
26. Valladares, N., Santos, C., Torres, E., Estrela C. (2017). Boxplot: a graphical resource for the analysis and interpretation of quantitative data. doi.org/10.36065/robrac.v26i76.1132
27. Vilelas, J. (2020). Research - The Knowledge Construction Process (3rd ed.). Silabo Editions.
28. Zuccari, F., Santiangeli, A., Orecchini, F. (2017). Energy Analysis of swimming pools for sports activities: cost-effective solutions for efficiency improvement. Energy Procedia 126, 123-130.

*Corresponding Author: **VENTURA, PAULO**