

Unveiling Socio-Demographic Profile of Rally Attendees in Rural and Depopulating Areas

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Abstract – Sporting events, integral to contemporary societies, not only enrich individual lives and drive economic growth but also profoundly influence the well-being of the communities they engage. This research employs an artificial neural network to investigate variations in the socio-demographic profile of motorsports event attendees, encompassing factors such as prior attendance, gender, age, education level, and income. Through inquiries into motivations, perceptions, experiences, and emotions related to the event, the study aims to construct adaptable ‘identikits’ or estimated profiles of participants. This innovative approach, easily customised by researchers, proves instrumental in developing sustainable products and services tailored to the preferences of high-speed sports event attendees. The results highlight attendance at previous editions of this event as the most influenced variable. Profiles with higher income have a better perception that the event improves the province’s image, although the overall evaluation is lower. Consequently, the practical contributions of this research extend to providing event promoters with comprehensive profiles of their target audience, fostering sustainability and strategic planning in motorsports events.

Keywords – Sporting events, rally, artificial neural networks, socio-demographic profiles, attendees.

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1. Introduction

Motorsport has garnered historical acclaim for its steadfast commitment to innovation and excellence within the competitive domain. The same level of dedication must be extended to fostering sustainability [1]. Amidst this, knowledge of the attitudes of those attending motorsport events held in depopulating communities is useful information for designing strategies to sustainably revitalise territories [2].

Sport is becoming a key element in modern societies. It is increasingly connected with values such as identity and the prestige of a community [3], [4], [5]. Additionally, it contributes significantly to economic and social development and synergises with tourism, education, culture, and physical and mental well-being [6]. Sporting events are essential for promoting participation among spectators and enthusiasts [7]. These events become part of the local community’s sports culture where they take place [8], [9]. The relationship between participants and spectators with the city or territory hosting a sports event often continues beyond the event [10]. Sports, in general, and physical and sports activities, in particular, in any form and modalities, constitute one of the most dynamic sectors in some local economies. They possess significant socio-economic activation power. This consideration has become widespread as research on their impact and trickle-down effects on other sectors of activity have advanced [11], [12], [13]. Among these recent studies, those related to sustainability [14], [15], [16], econometric analysis of data, and the assessment of the benefits that hosting events brings to a city or territory, both regular, small-scale [17], [18], [19], [20], [21] and major or mega-events [22], [23], [24], [25], [26] have investigated the socio-demographic and economic profile of participants and sports enthusiasts [27] reveal that sports events have a positive impact on the economic growth of the hosting location.

The Rallye Sierra Morena is a rally event that has been held since 1978 in the province of Córdoba, Spain. It is a scoring event for the Spanish Rally Championship (S-CER) and is part of the Tour European Rallye. This sporting event's media and economic impact is significant in the province of Córdoba. Additionally, it takes place in a rural area that has experienced a significant socio-economic depression in recent decades, a structural crisis in its traditional economic activities, and a severe demographic decline and ageing resulting from a prolonged and unstoppable rural exodus. As such, it is one of the most representative inland areas of what is referred to as the "Empty Spain" [28], [29].

1.1. Sports Events and Tourism

Following Getz [49], [53], there are various classifications of events. These classifications offer two simultaneous approaches. On the one hand, events are categorized based on their thematic content: business, cultural, or sports. On the other hand, events are categorized based on their scope, which can refer to either attendees or participants: local, regional, national, or international. In general terms, the appeal of sports events has managed to attract tourists to host communities [30]. This phenomenon, known as sports tourism, has been studied since the 1990s [31], distinguishing between active sports tourism (tourists travelling to participate in sports events) and passive sports tourism (tourists travelling to witness sports events) [32]. Motorsports events attract both participants and spectators [33]. These movements impact the residents in the territory where they are held, affecting various dimensions [34]. The different nature of each type of sports event requires establishing a classification [35], [36]. Sports conducted in natural settings, often entailing inherent risks, occur in unaltered environments, where these settings significantly influence their attributes [28]. Within the domain of sporting events, mechanical sports stand out, characterised by the generation of energy through machines. In these events, athletes are tasked with managing these machines and the energy they produce, utilising their exertion, skill, and expertise to attain the specified objectives [37]. This category encompasses disciplines such as aeronautics, powerboating, motorcycling, and motorsport, each dependent on the specific medium of operation [38].

Motorsport, therefore, involves the "competition of equivalent machines on designated tracks and circuits," carried out in the context of "series, championships, events, and meetings organised by promoters, circuits, and racing clubs at all levels" [37].

Various definitions and modalities within motorsport are also considered [37], such as autocross, autotest, car racing, drag racing, hillclimb and sprint, karting, off-road racing, or rallies. Rallies, the subject of this research, are characterised by the teamwork of the driver and co-driver. The competition is against the clock, with vehicles starting at intervals, typically one minute apart. Rallies can take place on both asphalt and dirt tracks [33]. The Rallye Sierra Morena is held simultaneously on both asphalt and dirt tracks.

1.2. Sports Events and Sustainability

Sustainability is a multifaceted field of study, and its definition in the context of sports events is shaped by the specific aspects explored by the authors. Consequently, the association between sustainability and encouraging sports participation among young individuals is highlighted [39]. Furthermore, various definitions extend beyond environmental considerations, encompassing social, economic, and governmental dimensions [40]. The economic impact of certain sporting events on tourism has been a widely addressed topic in the scientific literature for the past four decades [41], [42], [43], [44]. Since the inception of these studies, one specific area of focus has been on how sports tourism has contributed to revitalising declining economies [45], [46].

Comprehensively, sports represent a ubiquitous social institution that has evolved into a multibillion-dollar industry [47]. Nevertheless, scientific literature has traditionally focused on conceptualising mega-events [48], the economic impact of major sports events [49], [50], [51], [52], tourist behaviour [53], or the intention to return [54], [55].

Tourist events have become a powerful tool for destinations to complement their tourism offerings [56]. Among motorsports events, rallies have the highest number of spectators, contributing to destigmatising and invigorating tourism due to their year-round distribution [33].

The notion of sports popularity is essentially abstract because no uniform definition exists for it [57]. This concept can be approached from different perspectives and can be divided into objective and subjective components [58]. Therefore, understanding sports event attendees' motivations and socio-demographic profiles is essential for event design [59]. Designing events based on the socio-demographic profile influences attendee satisfaction [60]. In fact, establishing communication strategies and event design on the socio-demographic profile can positively contribute to attracting new attendees [61].

This implies long-term financial support for small host communities [40], thus positively contributing to the region's economic and social sustainability [62].

In this regard, small rural communities must have strategies to counteract depopulation [63], and hosting sports events can positively contribute to this effort [64]. Additionally, sports events contribute to projecting the brand of the host city [65], an important component in a regional marketing strategy [66], [67]. These diversification strategies are particularly useful for revitalising a constantly depopulating territory, as evidenced by previous experiences in Spain [68], specifically in the rural areas of the province of Córdoba [69].

In response to global sustainability imperatives, the Fédération Internationale de l'Automobile (FIA) has introduced a robust environmental accreditation system, categorizing events and entities based on their commitment to reducing environmental impact [70]. This three-tiered system, comprising one, two, and three stars, signifies varying degrees of environmental consciousness and responsible practices within the motorsports community.

In this context, recent advancements exemplified by the Rallye Sierra Morena's reception of the Environmental Accreditation from the FIA [71] underscore the rally's unwavering dedication to environmental sustainability. The strategic points of this environmental plan include the management of resources and the mobility of the members of the organization, effective waste reduction and recycling systems in public areas and in the service park, control of water and electricity consumption, carbon footprint studies, reduction of the use of plastic, use of paper from sustainable forests, and preference in contracting suppliers with sustainability certificates [72]. The itinerary has been agreed upon with the Environmental Department of the Andalusian Regional Government to avoid affecting areas where protected species reside, especially during critical periods such as the nesting season. [73]. This achievement not only positions the Rally Sierra Morena as a trailblazer in the field of motorsports but also accentuates its pioneering role in harmonizing sporting excellence with ecological responsibility. This fact contributes substantively to the on-going discourse surrounding the sustainable impact of motorsports on local communities.

1.3. Socio-Demographic Profile of Attendees

The study of socio-demographic profiles is a recurrent topic in the scientific literature related to sports, events, and tourism [74], [75].

This information is valuable for event organisers to tailor and adapt their marketing strategies to the user profile [76], [77] to enhance user satisfaction [78], [79] and, consequently, their likelihood of repeating the experience [80], contributing to fostering development in host communities.

In the field of motorsport rallies, there is still limited scientific literature on the socio-demographic profile, and most of the studies that address this topic do so descriptively. Following [81] and [82], some studies describe specific socio-demographic characteristics of attendees at rally sports events.

In Ireland, between 250,000 and 257,000 people attended, mainly between the ages of 21 and 30, with a surprising 93% of attendees being nationals, with British nationality being the primary one. In Portugal, approximately 140,000 people attended, mostly aged 25 to 34, with 68% male and Spanish nationality standing out as the main one among tourists, representing 40%.

Regarding age, in Germany, most attendees were under 35, just like in Ireland, where attendees between 21 and 30 were predominant. In Portugal, the majority were in the age range of 25 to 34. In France, the attending population was mostly under 29, and in New Zealand, attendees were attracted from ages 20 to 35. In Salou, Spain, those under 35 were predominant.

Regarding gender, in Germany, 78% of attendees were male. In Ireland, it was observed that 93% were nationals, and in Portugal, 68% were male. In France, 85% of attendees were male, while in New Zealand, 77% were male. In Salou, Spain, men were predominant, accounting for 83%.

Concerning nationality, 93% of attendees in Ireland were nationals, with British nationality being prominent among tourists. More than half were Portuguese (52%) in Portugal, and Spanish nationality was the primary one among tourists, representing 40%. In France, 95% of attendees were nationals, with 33% coming from other regions. New Zealand mainly attracted national visitors (91%), and in Salou, Spain, 88% were nationals.

Subsequently, [83] established that in the editions of the Neste Rally Finland in 2012, 2013, and 2014, the percentage of female attendees was 26.27%, 20.06%, and 16.25%, respectively. More recently, studies based on the Iberian Peninsula yielded mixed results regarding the gender of attendees. Following other studies, [33] women comprised approximately 14% of the total attendees at rally events in Galicia in 2018. On the other hand, [84] estimated a female attendee proportion of 36% for the Rally de Porto in 2018.

1.4. Objectives

This research aims to determine the variations in the socio-demographic profile (prior attendance, gender, age, education level, and income) of motorsports event attendees based on questions about motivations to attend, perceptions, experiences, and emotions about the event. To this specific purpose, the convenience of developing a model following the artificial neural network (ANN) method has been validated by previous literature [85], [86], [87]. The aim is to construct potential “profile portraits” or estimated profiles of tourists based on the responses incorporated into the ANN, which the researcher can easily customise. This is particularly useful in developing products and services tailored to attendees interested in high-speed sports events. While this methodology has been used to estimate profiles of food tourism visitors [85], attendees at flamenco shows [86], or visitors to UNESCO World Heritage sites [87], according to searches conducted in Scopus, it has never been used for attendees at high-speed sports events. Thus, this work aims to fill the identified gap in this regard.

2. Methodology

One of the most significant contributions of this study is the use of the artificial neural network (ANN) methodology of the multilayer perceptron type for motor sports events to address the study of the socio-demographic profile of attendees and their relationship with the event.

2.1. Data Collection, Questionnaire, and Sample Size

This research is based on the results obtained from fieldwork consisting of providing a structured questionnaire to a representative sample of individuals attending the Rallye Sierra Morena. The data collection for this research was carried out through a questionnaire administered to individuals who attended at the Rallye Sierra Morena Edition 2023. The fieldwork took place on the event's dates (March 17 to 19, 2023). Convenience sampling, commonly employed in this type of research where attendees are available to be surveyed in a specific space and time, was utilised [88]. Convenience sampling has previously been used successfully in studies of sports event tourism in general [89], [90], [91], [92], in studies of Rallye-type motor events [93], [94] and also in Rallye-type events precisely to determine socio-demographic profiles [33]. Stratification by gender, age, education, or any other variable was not performed, as no prior studies supported such stratification. The questionnaire had a low and non-significant rejection rate for any variable, and the survey's duration did not exceed 10 minutes.

The questionnaires were carried out at different places of the Rallye Sierra Morena and at other times to try to have a heterogeneous sample with the premise of having already seen the rally.

The questionnaire was structured into three sections. In addition to questions about attendance at previous editions and knowledge of the event's existence, the first section distinguishes between attendees residing in the city of Córdoba and those who are not, hence considered tourists. The second group was subjected to additional questions such as their country and place of residence, overnight stays, and planned daily average spending. The second section comprises a series of questions using 7-point and 4-point Likert scales, covering attendance motives, opinions on various aspects related to Rallye Sierra Morena, perceptions of the event's impact, experiences, feelings, and the Rallye locations they intend to visit. Finally, the third section addressed socio-demographic factors such as gender, age, education level, professional category, and available household in-come.

The questionnaire's design and item wording were based on previous research on motorsports events, and the constructs were analysed to ensure the questionnaire's validity. Thus, studies focused on sports tourism and events [95], [96], [97], [98], [99], marketing and consumer behavior [100], [101], [102], [103], and customer satisfaction and experience [104], [105], [106], [107], [108] [104], [107] have served as the starting point for this study. The resulting structure consisted of three sections. The first section included questions related to the place of origin to distinguish between residents and tourists and, for the latter, questions about accommodation and spending in the locality during their stay. The second section included nine items related to motivations for attending the event, 11 items about their opinions, 13 items about perceived value, seven items on the perception of the event's impact on the province of Córdoba, six items related to the experience and satisfaction with attendance, and seven items about emotions. Therefore, the second section comprised a total of 53 items. The last section aimed to identify specific socio-demographic traits of the attendees: gender, age, education, professional category, and income level.

Questions in the first section were dichotomous, while those in the third section were closed-ended and, in most cases, polytomous questions. Regarding the questions in the second section, they were answered using a seven-point Likert scale, with one indicating “strongly disagree,” four showing “neutral,” and seven indicating “strongly agree.”

Before its incorporation into an online survey platform, the survey underwent a purification and validation process consisting of three stages. In the first stage, experts in the events field reviewed the items to be used.

Likewise, throughout the process of preparing the survey, the President of the Automobile Club of Córdoba collaborated in its implementation due to his deeper knowledge of this event and the most suitable questions for those attending it. In the second stage, the items were analysed by academic experts in events. Finally, in the third stage, a pilot study of 30 surveys was conducted to confirm no discrepancies or interpretation errors. The purpose of this entire process of developing the provisional questionnaire was to achieve an easy understanding of the survey and the greatest adjustment of the responses to achieve the objectives set in the research. The questions aimed to be as specific as possible so as not to lengthen the time needed to complete them. The total number of surveys obtained was 812, of which 790 were valid. Assuming an infinite population and simple random sampling, and for purely indicative purposes as convenience sampling was used, the sample would offer a margin of error of $\pm 3.486\%$ and a confidence level of 95%.

2.2. Data Analysis

Rumelhart and McClland [109] define an artificial neural network (ANN) as a network composed of multiple processing elements (PE) or nodes with limited storage capacity. These units are made up of a vector of inputs (x_1, x_2, \dots, x_n) and synaptic weights (w_1, w_2, \dots, w_n), which are applied to these input vectors using a propagation rule based on the corresponding linear combination. Applying an activation function to this propagation rule yields the output value of these nodes. The nodes are organised into different layers, including input, output, and one or more intermediate or hidden layers.

Using SPSS statistics software version 23, a multilayer perceptron (MLP) type of ANN is developed, where the input values correspond to the responses obtained in the survey, and the output values correspond to the network's estimates regarding various socio-demographic characteristics of the rally attendees. From a broader set of questions, a selection is made using regressions to determine the inputs that influence the outputs,

discarding the others. More than 30 different networks are tested, including the ones that follow the radial basis function. All these models are tested by comparing the real output values with the estimated by the network using mean absolute percentage error (MAPE) and root mean square error (RMSE); ultimately selecting the one (an MLP type, in this case) that exhibits a higher level of adjustment, that is, the model with the lower MAPE and RMSE reached.

3. Results and Discussion

The results obtained through the application of the ANN provide useful information for the organizing entity, the involved public administrations, tourism and sports management companies interested in the world of motor sports.

3.1. Socio-Demographic Tourist's Profile and Question Collection

The socio-demographic profile obtained from the sample is presented in Table 1. There is a majority of men. Most of them have moderate incomes (almost two out of three earn between €1,001 and €2,500 per month), possess higher education qualifications, three out of four have educational backgrounds beyond secondary education, and nearly half have completed university-level studies (or higher). In terms of age, more than two-thirds fall within the range of 21 to 50 years. Attendance history at the event is primarily divided between regular attendees (four times or more, representing over 40% of the sample) and those who had never attended (around 30%). The average profile of the attendee corresponds to a young man with moderate income and a high level of education who has attended the event on multiple occasions. The results section describes the obtained findings gathered from your research. Provide appropriate figures and tables to effectively illustrate your results. Figures are used to present data trends or other visual information while tables are particularly useful when the exact values are important.

Table 1. Socio-demographic profile of the respondents

Gender (GEN)		Monthly household income (INC)	
Male	63.54%	Less than 700€	10.25%
Female	36.46%	701€ to 1.000€	9.87%
Previous attendance (PAT)		1.001€ to 1.500€	30.38%
Never	29.75%	1.501€ to 2.500€	29.75%
Once	14.30%	2.501€ to 3.500€	11.01%
Twice	8.61%	More than 3.500€	8.73%
Three times	4.05%	Age (AGE)	
Four times or more	43.29%	Less than 20 years old	19.11%
Educational level (ELV)		21–30 years old	29.62%
Primary education	5.95%	31–40 years old	21.65%
Secondary education	19.75%	41–50 years old	15.95%
Professional/vocational training	28.99%	51–60 years old	8.61%
University graduate	30.38%	61–70 years old	4.30%
Masters/PhD	14.94%	More than 70 years old	0.76%

The different questions posed in the survey, along with their means and standard deviations, are presented in Table 2. They are grouped according to whether they refer to the reasons for attending the event, the socio-economic impact of the event, its organisation, as well as the experiences and emotions felt during it. Experiencing the event live (Q06) stands out regarding the reasons for attendance. There is a belief among the population that the economic impact will be positive for the area (Q12, Q13). The most highly rated aspects include the level of show (Q19), overall evaluation (Q21), and the organisation (Q14). Additionally, there is a sense of making the right choice by attending the rally (Q30) and an intention to return (Q32) and recommend (Q33). In terms of emotions, enthusiasm (Q34) and admiration (Q36) are prominent.

3.2. Artificial Neural Network Performance

The structure of the ANN is detailed in Table 3 and graphically represented in Figure 1. The input values correspond to the questionnaire questions. These values are normalised and subsequently multiplied by their respective synaptic weights (Figure 1). These values undergo an activation function, a hyperbolic tangent (Table 3).

In this way, the values of the hidden layer of the ANN are obtained. These are then multiplied by their respective synaptic weights (Figure 1), resulting in the output values, which do not require additional transformation (identity function - Table 3, i.e., no transformation). Finally, these output values are reversed in their normalisation to obtain estimates within the original data range (e.g., MHI values from one to six).

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Table 2. Rally reasons, perceptions and experiences question set

Code	Question	Mean	Std. Dev.
Attendance motivations (7 points' scale)			
Q01	I am interested in it being part of the Super-Spanish Rally Championship (S-CER)	5.75	1.90
Q02	I am interested in it being part of the International Iberian Rally Trophy	5.62	1.95
Q03	Seeking sports experiences	5.95	1.62
Q04	Knowing and enjoying the essence of the sports event within an attractive territorial environment and landscape	6.22	1.46
Q05	The emotions it generates in me	6.06	1.59
Q06	Living and experiencing this event in person	6.26	1.48
Aspects related to the socio-economic impact of the event (6 points' scale)			
Q07	The rally improves the image of the province of Córdoba	5.59	0.99
Q08	The rally allows me to see what speed events are really like	5.57	1.00
Q09	The rally attracts more tourists to this destination	5.59	1.00
Q10	The rally is a unique experience	5.53	1.08
Q11	The rally is an identity symbol of the province of Córdoba	5.29	1.27
Q12	It opens up new possibilities for tourism in the affected areas	5.61	0.98
Q13	It promotes the areas affected by the route at both a national and international level	5.61	0.94
Aspects related to the development of the event (4 points' scale)			
Q14	Organisation	3.41	0.67
Q15	Parking	2.68	0.96
Q16	Safety level	3.35	0.74
Q17	Compliance with safety rules by the public	3.00	0.86
Q18	Environmental care by the event organisers	3.19	0.83
Q19	Level of show	3.60	0.62
Q20	Parallel activities	3.01	0.87
Q21	Overall rating of the event	3.48	0.66

Aspects related to the Socio-economic Impact of the Event (4 points' scale)

Q22	This rally will increase the sports prestige of Córdoba	3.40	0.78
Q23	This event will showcase Córdoba's ability to host sports events	3.46	0.73
Q24	The organisation of this event will promote sports among the youth	3.28	0.85
Q25	The event will provide a greater national exposure opportunity for Córdoba	3.41	0.76
Q26	This event will boost tourism in the municipality	3.39	0.78
Q27	Public administrations should support sports events	3.69	0.59
Q28	Sports events benefit local businesses	3.61	0.65

Experience with Event Attendance (4 points' scale)

Q29	My level of satisfaction with attending the Rally has been very important	3.33	0.82
Q30	My choice to attend the Rally was correct	3.48	0.78
Q31	I will encourage my family and friends to attend the next edition of this Rally	3.44	0.81
Q32	Based on my experience, I believe I will attend this Rally in future editions	3.47	0.79
Q33	I would recommend attending this Rally if someone asked for my advice	3.53	0.73

Emotions Experienced at the Event (6 points' scale)

Q34	Enthusiasm	5.51	1.08
Q35	Surprise	5.28	1.19
Q36	Admiration	5.47	1.08
Q37	Amazement	5.33	1.15
Q38	Disappointment	2.30	1.77

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Table 3. ANN's architecture

Input Layer	Bias Covariates Number of Units (excluding bias)	Value=1 Q01 to Q38 38
Hidden Layer	Rescaling Method for Covariates Number of Hidden Layers Number of Units in Hidden Layer (excluding bias) Activation Function	Standardised 1 9 Hyperbolic tangent
Output Layer	Dependent Variables Number of Units Rescaling Method for Scale Dependents Activation Function Error Function	PAT (from 1 to 5) GEN=1 (male) GEN=2 (female) AGE (from 18 to 78) ELV (from 1 to 5) MHI (from 1 to 6) 6 Standardised Identity Sum of Squares

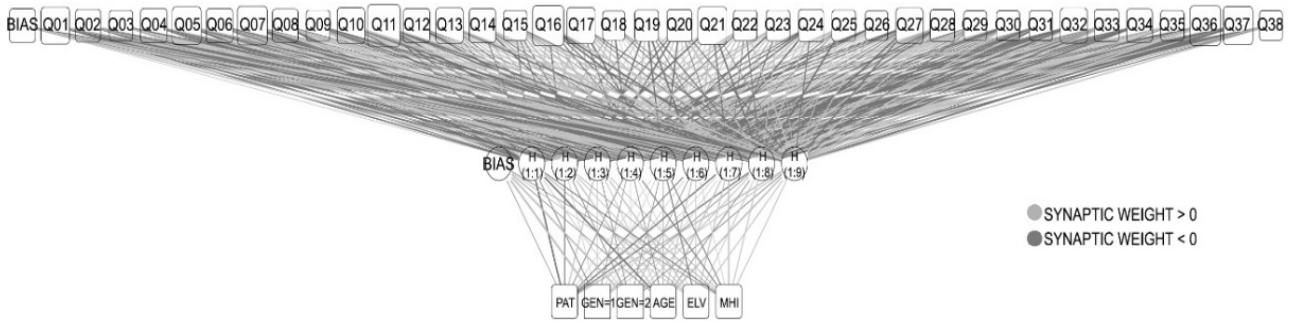


Figure 1. ANN's graphic representation

The development of the ANN and the data obtained in this regard are presented in Table 4. The sample is divided into training and testing groups to construct the model, with an approximate weighting of 70%-30%, respectively. While the training group is generating the synaptic weights, the test group detects the errors that the training group is making. When the test group notices that the error cannot be reduced further, the stopping rule (Table 4) is triggered, and the model is established. Table 4 displays the errors made in the output items for both the training and testing groups, the stopping rule and the time taken for model generation. The goodness of fit of the ANN achieved for each output item and as a whole is presented in Table 5. MAPE represents the percentage difference between actual and estimated values, with values around 38%. On the other hand, RMSE is the square root of the mean squared errors.

It is presented in its absolute form and to facilitate relative understanding, values around 24% are obtained. The methodology allows us to understand the relative importance of each input value to the ANN (Figure 2). Thus, among the most relevant inputs in obtaining the model are that the Rallye is a sign of identity for the province of Córdoba (Q11), the safety level of the event (Q16), the feeling of admiration (Q36), and the perception that the Rallye improves the image of the province of Córdoba (Q07). The least important questions in the development of the network are related to aspects of environmental care by the organisation of the event (Q18), the perception that the event will promote tourism in the province (Q26), the high degree of satisfaction with attendance (Q29), and the feeling of disappointment (Q38).

Table 4. ANN's development summary

	Sum of Squares Error		1.020.646
	Average Overall Relative Error		0.838
	Percent Incorrect		
Training (N=547; 69.24%)	Predictions for Categorical Dependents	GEN	35.28%
	Relative Error for Scale Dependents	PAT	0.605
		AGE	0.864
		ELV	0.885
		MHI	0.945
	Stopping Rule Used	1 consecutive step(s) with no decrease in error	
	Training Time		0:00:01.02
Testing (N=243; 30.76%)	Sum of Squares Error		499.364
	Average Overall Relative Error		0.911
	Percent Incorrect		
	Predictions for Categorical Dependents	GEN	32.51%
	Relative Error for Scale Dependents	PAT	0.714
		AGE	0.904
		ELV	0.966
	MHI	1.048	

Table 5. ANN's goodness of fit

	PAT	GEN	AGE	ELV	MHI	Overall
MAPE	56.56%	20.82%	34.22%	34.73%	43.18%	37.90%
RMSE	1.43	0.59	12.79	1.09	1.37	-
Relative RMSE	28.54%	29.34%	19.68%	21.76%	22.88%	24.44%

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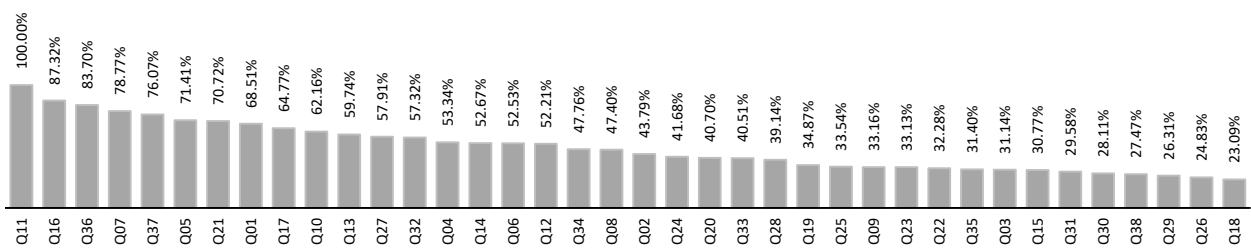


Figure 2. ANN exogenous variables' relevance

It is also possible to individually determine the effects of each input variable on the output variables. To do this, the input variable being analysed is set to its minimum value (while the rest of the inputs remain at their mean), and the output values are recorded. The process is repeated when the analysed variable is set to its maximum value. This entire procedure is followed for each of the input variables. Then, the out-put values are compared for each minimum and maximum input value, calculating the variations experienced. For representativeness, Table 6 shows the ten most significant increases caused by

the input variables on the output variables, and Table 7 shows the ten largest decreases.

Thus, in Table 6, it can be observed that the most influenced variable is attendance at previous events (PAT). On the other hand, among the attendees, factors such as the reinforcement of identity (Q11), safety (Q16), and the intention to repeat (Q32) stand out as attendance at previous editions of this event increases. Furthermore, there is a greater perception that the rally improves the province's image (Q07) as the attendee's purchasing power (MHI) increases, and the organisation (Q14) is viewed more positively as the attendee's age (AGE) increases.

Table 6. Questions with the most direct influence in profiles socio-demographic items

Question	SocDem	Var.
Q11 The rally is an identity symbol of the province of Córdoba	PAT	44.06%
Q16 Safety level	PAT	35.86%
Q01 I am interested in it being part of the Super Spain Rally Championship (S-CER)	PAT	33.03%
Q05 The emotions it generates	PAT	31.92%
Q32 After my experience, I believe I will attend this rally in future editions	PAT	26.71%
Q19 Level of show	PAT	21.08%
Q07 The rally improves the image of the province of Córdoba	MHI	20.45%
Q14 Organisation	AGE	17.69%
Q02 I am interested in it being part of the International Iberian Rally Trophy	PAT	17,18%
Q13 It promotes the areas affected by the route at both a national and international level	PAT	16.95%

The ten most intense inversely proportional relationships between input and out-put values are presented in Table 7. Similar to Table 6, the output variable most significantly influenced is previous attendance (PAT). Thus, there is a decreased feeling of amazement (Q37) and surprise (Q35) as attendance in prior editions of this event (PAT)

increases. The same is observed for the perception that the audience adheres to safety rules (Q17), is interested in parallel rally activities (Q20), and believes that the event will enhance the province's image (Q07). Additionally, there is a reduced overall evaluation of the event (Q21) as the attendee's purchasing power (MHI) increases.

Table 7. Questions with the most inverse influence to profiles' socio-demographic items

	Question	SocDem	Var.
Q37	Amazement	PAT	-44.73%
Q17	Compliance with safety rules by the public	PAT	-31.14%
Q35	Surprise	PAT	-26.28%
Q20	Parallel activities	PAT	-19.64%
Q12	It opens up new possibilities for tourism in the affected areas	PAT	-19.64%
Q03	Seeking sports experiences	PAT	-19.18%
Q07	The Rally improves the image of the province of Córdoba	PAT	-18.04%
Q21	Overall rating of the event	MHI	-15.45%
Q23	This event will showcase Córdoba's ability to host sports events	PAT	-15.42%
Q08	The Rally allows me to see what speed events are really like	PAT	-14.93%

4. Conclusion

Sporting events have emerged as crucial elements in contemporary societies, playing an integral role in various aspects. First and foremost, they have strengthened their connection with fundamental values such as the identity and prestige of a community, reflecting the deep rootedness of sports culture in today's society. Additionally, they significantly contribute to economic and social development by boosting the tourism industry, education, and culture, promoting individuals' physical and mental well-being. Sporting events not only enrich the experience of spectators and fans but also strengthen the local community's relationship with the place they are held, creating a lasting legacy. Moreover, these events have a positive economic impact, activating multiple sectors and serving as an engine for growth in various local economies. In summary, sporting events enhance individuals' lives and drive economic growth and the well-being of the communities in which they occur.

This study focuses on discerning the perception of socio-economic impacts by examining socio-demographic profiles. Through this analysis, the research elucidates both the direct and indirect consequences of the rally on rural communities, shedding light on the intricate ways in which the staging of sporting events influences the local economy, employment rates, and income levels. Such insights contribute significantly to the advancement of local development.

A thorough comprehension of event attendees offers crucial information that can be instrumental in tailoring strategies aimed at attracting a larger audience, fostering rural tourism, and diversifying economic opportunities within the region to preserve sustainably its natural heritage.

Furthermore, determining demographic profiles serves as a tool to evaluate the environmental consciousness of participants. This evaluation, in turn, facilitates the formulation of strategies to advocate for sustainable practices during the event and promotes awareness within the community regarding the imperative nature of environmental conservation. Additionally, from a societal standpoint, identifying economic disparities is a foundation for developing strategies that foster social inclusivity and community engagement.

Thus, the results of this research allow for a well-adjusted estimation of variations in the socio-demographic profile of attendees at motorsport sporting events based on their motivations, perceptions, experiences, and emotions regarding the event. The theoretical implications obtained primarily highlight attendance at previous editions of this event as the most influenced variable. Thus, as attendees repeatedly participate in earlier editions of this event, the idea that the celebration of this sports event is a symbol of the province's identity is reinforced, along with attending the event again in future editions. However, this type of attendee loses the capacity for amazement, surprise, and perception that this sports event will improve the province's image.

As for the conclusions of those attendees with higher purchasing power, this type of attendee has a better perception that the event enhances the province's image, although the overall evaluation of the event is lower.

Consequently, the findings presented herein hold practical implications for local authorities and event organisers, offering a basis for formulating policies geared towards promoting sustainable practices. Such policies should be tailored to accommodate the specific attributes of the rural population and visitors to these areas. Consequently, gaining insights into how rally-type motorsports event attendees engage with their surroundings provides valuable information on community resilience. This understanding is indispensable for the development of strategies that enhance the ability of rural communities to confront challenges in both economic and environmental dimensions.

The practical contributions of this research focus on providing event promoters with the profile of the target audience attending the event. This information can be used to define the communication strategy to try to attract a female audience. Furthermore, the model obtained in this research allows for the estimation of personalised profiles. Thus, a set of input values defined in the research will result in a well-adjusted estimation of a profile of a potential attendee at high-speed sporting events, which can be useful in determining promotion and event organisation strategies, optimising them, and potentially improving their economic impact.

The main limitation of this research is that the study is based only on attendees, making it difficult to extrapolate the results to other stakeholder groups, such as the local community or businesses related to this event. As a future line of research, it is recommended to strengthen investigations that address activities related to events in the province of Córdoba from the supply-side perspective.

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