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Profiling mountaineering in Protected Natural Areas of Spain

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Abstract

In recent years, there has been an increase in the pressure exerted by physical and sporting activities in the natural environment. In Spain, mountaineering, which usually takes place in Protected Natural Areas, is the first option in the order of preference of people who practice sport. Knowing the profile of visitors is a key aspect in managing public use of these environments. The objectives of the study focused on i) characterising the generic profile of mountaineers on Spain's emblematic summits and ii) identifying behavioural patterns with a view to contributing to a more sustainable management of these natural environments. The study was based on a survey of mountaineers who climbed one of the following summits during the summer of 2020: Mulhacén, Monte Perdido, Aneto, Pica d'Estats, and Pedraforca, with a sample of 578 participants. The main results obtained include the identification of an average profile characterised by being: male, between 26 and 35 years old, with a high level of education, with more than 10 years of seniority in mountaineering and a high degree of environmental sensitivity. Another of the results of this study was the observation of common patterns of behaviour when visiting the different summits. The results obtained were analysed in terms of their application to the overall management of mountaineering in this type of protected natural environment.

Keywords: management, mountain summit, mountaineering, practitioner profile, practitioners.

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Two alpinists climbing a
snowy mountain in the Arctic
under the northern lights.
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Introduction

At present, there is a large amount of data supporting the increase in the practice of physical-sports activities in the natural environment. Among these, the results obtained in the latest survey on sporting habits in Spain stand out, where it was found that the outdoor environment is the preferred place to practice sport (45.3%). In this sense, activities such as hiking/mountaineering are in the first position, with 30.8%, in the order of preference of people who practice sport (Ministry of Culture and Sport, 2022).

According to the Spanish Federation of Mountain Sports and Climbing (FEDME), mountaineering is a sporting activity that consists of climbing mountains or trekking in them, which requires specific technical knowledge to perform (FEDME, 2018). This activity mainly takes place in Protected Natural Areas (PNAs) that are home to particularly fragile environments. In recent years, several studies have shown that the pressure on these spaces is increasing, alerting us to the environmental consequences that this has on these environments (Balmford et al., 2015; Múgica et al., 2021).

It should be noted that the general objective of the PNAs, which in Spain represent 27% of the territory, is to conserve natural heritage and biodiversity, as well as to guarantee the right of people to enjoy it (Law 42/2007, of 13 December, on Natural Heritage and Biodiversity). In order to achieve these objectives, the PNAs are responsible for planning their management, taking care of the more social aspect, the public use area. According to EUROPARC-Spain (2005), the term “public use” can be defined as: a set of practices and infrastructures that must be provided by the administration of the protected area with the aim of bringing visitors closer to its natural and cultural values in an orderly and safe way, guaranteeing the conservation, understanding, and appreciation of these values through information, education, and interpretation of the heritage.

With regard to the planning of public use in PNAs, there are various tools available that are articulated in a hierarchical process, with the following plans being considered: (i) natural resource management plan (NRMP), equivalent to the plan for areas of natural interest in Catalonia or island plans in the Canary Islands; (ii) master plan for use and management (MPUM), responsible for setting future guidelines for public use, among others; and (iii) sectoral plans and programmes, which develop the public use model for the protected area, within which the public use plan is situated (EUROPARC-Spain, 2005).

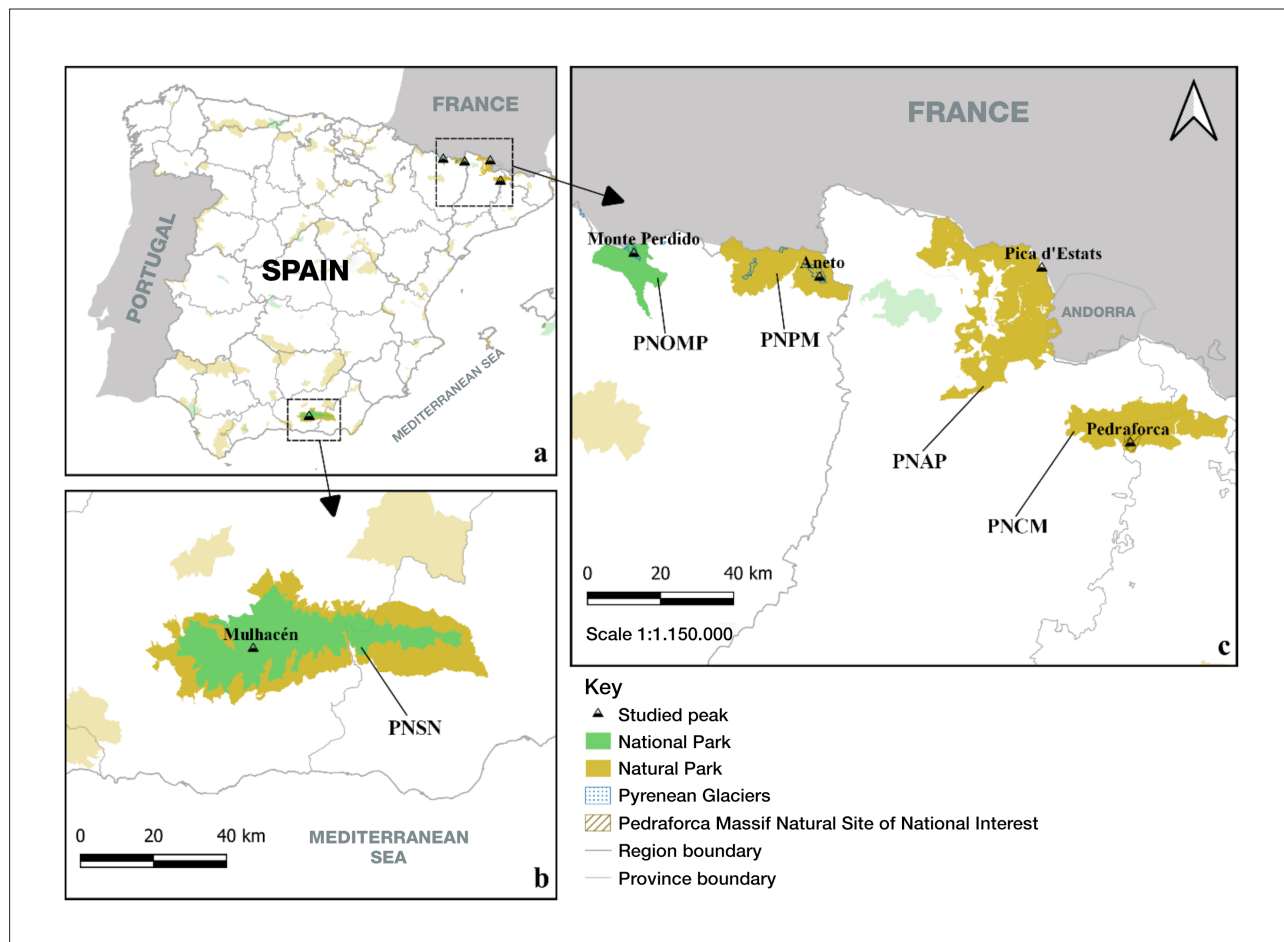
According to the Action Plan for the PNAs of Spain (EUROPARC-Spain, 2002), the main recommendations to be taken into account when drawing up the public use plan include the consideration of at least two basic data sets: characterisation of visitors, as well as the number and frequency of their visits. The characterisation includes aspects such as visitor profile, visitor typology or segmentation, activities carried out during their visit, and demands for infrastructures or services, among other issues.

In relation to the above, several studies advocate segmentation based on visitor needs in order to develop management strategies which are adapted to each segment (Arnberger et al., 2012; Farías-Torbidoni & Monserrat, 2014; Jones & Nguyen, 2021; Jones & Yamamoto, 2016). Some authors have argued that physical-sports practice can be an element of segmentation, as it tends to differentiate themselves on the basis of a common pattern of behaviour derived from the activity carried out during the visit, with the level of intensity of this activity being a clear indicator of segmentation (Farías-Torbidoni & Barić, 2020; Mowen et al., 2012). It therefore seems appropriate to go beyond segmentation by activity, and to go into the analysis of the segment of a particular group of practitioners, similarly to the work carried out by Burns et al. (2020) and Esfahani et al. (2014), in order to achieve a strategy that is more focused on the needs of the segment. However, there are few studies that have gone into the characterisation of the mountaineering practitioner's profile in depth, and most of them are superficial or only partial. A good example of the existing studies in Spain is the one carried out intermittently since 2000 by Montaña Segura (2022) on the summits of the Aragonese Pyrenees which, while providing basic socio-demographic data, experience in mountaineering and safety behaviour in the practice of this activity over time, does not go into such relevant aspects as the characteristics and reasons for visiting. Furthermore, we should not overlook other studies that, without being specific to mountaineering, have made progress in the indirect characterisation of mountaineers (Farías-Torbidoni et al., 2018; Farías-Torbidoni & Monserrat, 2014).

Against this background, the objectives of this study were i) to characterise the generic profile of mountaineers on Spain's emblematic summits and ii) to identify behavioural patterns with a view to contributing to a more sustainable management of these natural environments.

Figure 1

Location of a) Spain and PNA. b) Penibaetic System: PNSN = Sierra Nevada National Park. c) Pyrenees and Pre-Pyrenees: PNOMP = Ordesa y Monte Perdido National Park; PNPMP = Posets-Maladeta Natural Park; PNAP = Alt Pirineu Natural Park; PNCM = Cadí-Moixeró Natural Park; PNCM = Cadí-Moixeró Natural Park.



Context of the study

Study area: emblematic summits

The study was carried out on five summits in Spain, all of which are considered emblematic. Specifically on the summits of: Mulhacén, Monte Perdido, Aneto, Pica d'Estats, and Pedraforca (Figure 1).

The selection was based on the contemplation of six criteria: i) being included in the lists of main summits of Spain and Catalonia, as appropriate (published by the Institute of National Geography and the Cartographic and Geological Institute of Catalonia, in 2018 and 2015, respectively), ii) being considered an emblematic summit (based on the definition of Sánchez [2018]), iii) having the status of high mountain (> 2,500 m.a.s.l.), iv) being included within a PNA belonging to the Natura 2000 Protected Areas Network, v) representing

different categories of protection, and vi) presenting different characteristics of accessibility and use.

Each of the summits studied is characterised by the following features: Mulhacén, located in the Penibaetic System within the Sierra Nevada National Park, as it is the highest point of the Iberian Peninsula and the most accessible; Monte Perdido, located in the Ordesa y Monte Perdido National Park, characterised by being the highest limestone massif in Europe; Aneto, located in the Posets-Maladeta Natural Park, as it is the highest peak in the Pyrenees and the least accessible; Pica d'Estats, the highest summit in Catalonia, within the Alt Pirineu Natural Park, and in the Pre-Pyrenees, we find the summit of Pedraforca, in the Serra del Cadí, one of the most emblematic mountains in Catalonia, declared a natural site of national interest, under the protection of the Cadí-Moixeró Natural Park. For more details on the different summits, see Table 1.

Table 1
Main characteristics of the summits.

	Mulhacén	Monte Perdido	Aneto	Pica d'Estats	Pedraforca
General characteristics					
Location ¹	30 N 472300 4100841	31 N 256998 4729051	31 N 307853 4722508	31 N 368712 4725071	31 N 392983 4677231
Autonomous Community	Andalusia	Aragon	Aragon	Catalonia	Catalonia
Province	Granada	Huesca	Huesca	Lleida	Barcelona- Lleida
Approximate distance and time to major population centres ²	43 km from Granada (49')	87.1 km from Huesca (1 h 15')	152 km from Huesca (2 h 30')	265 km from Barcelona (3 h 50')	145 km from Barcelona (1 h 50')
	170 km from Málaga (2 h 12')	158 km from Zaragoza (2 h)	162 km from Lleida (2 h 35')	170 km from Lleida (2 h 50')	195 km from Lleida (2 h 10')
Management characteristics					
Management body	Government of Andalusia Department of Sustainability, Environment and Blue Economy. Autonomous Agency of National Parks	Government of Aragon. Department of Agriculture, Livestock and Environment Autonomous Agency of National Parks	Government of Aragon. Department of Agriculture, Livestock and Environment	Government of Catalonia Climate Action, Food and Rural Agenda Department	Government of Catalonia Climate Action, Food and Rural Agenda Department
Level of protection	Natura 2000 Sierra Nevada National Park	Natura 2000 Ordesa and Monte Perdido National Park	Natura 2000 Posets-Maladeta National Park	Natura 2000 Alt Pirineu Natural Park	Natura 2000 Cadí-Moixeró Natural Park Pedraforca Massif Natural Site of National Interest
Access regulation	Unregulated	Temporary parking regulation	Temporary parking regulation	Unregulated	Unregulated
Physical characteristics					
Altitude m a.s.l.	3,479	3,355	3,404	3,143	2,506
Number of access routes	5	3	2	3	3
Distance of the most popular route (km)	16.5	31.1	14.8	18.4	7.6
Positive difference in altitude (m)	1,255	2,889	1,499	1,582	1,059
Singularities of accessibility	Scree	Glacier - Loose rock cliff	Glacier	Scree	Clambering
Difficulty (Sendif method) ³	1,894	4,629	2,076	2,336	1,435
Social characteristics					
Number of visitors to the Park in 2020	418,734	422,570	No data	367,713	363,370
Number of visitors peak year 2020	19,609	17,002	9,912	7,713	27,678

Note: ⁽¹⁾ The ETRS89 / UTM coordinate reference system was used. ⁽²⁾ Google Maps was used for the calculation (distance and time). ⁽³⁾ Sendif is a method for determining the difficulty of walking routes, developed by the Institute for the Development and Promotion of the Alt Pirineu and Aran (IDAPA, 2018).

Table 2*Summary of distribution of surveys by case study.*

Summit	Mulhacén	Monte Perdido	Aneto	Pica d'Estats	Pedraforca	Total
No. of surveys	119	116	112	113	118	578

The COVID-19 pandemic

The emergence of COVID-19, declared an international pandemic by the World Health Organisation (2020), led to a series of measures taken by the Spanish government to address the health emergency (Castillo-Esparcia et al., 2020). As a result, during the first months of lockdown and in later periods with mobility restrictions, visitation to the natural areas was reduced to minimum values, and in the case of the National Parks it was reduced by 51.7%. However, after the relaxation of the measures adopted, coupled with the difficulties for international tourism, visitation to PNAs increased, which meant a 7.9% increase in visitors to National Parks compared to the summer of 2019 (Gössling et al., 2020; Medina-Chavarría et al., 2022; Organismo Autónomo de Parques Nacionales, 2020; World Tourism Organization, 2022).

As a result, problems that had been occurring for some time in natural areas intensified, leading to the appearance of some of these problems in others where they had never occurred before, including: overcrowding of visitors, accumulation of waste, collapse of car parks, vandalism (graffiti, destruction of signage, etc.), among others (Dujisin, 2020; Hammitt et al., 2015; Medina-Chavarría et al., 2022; Miller-Rushing et al., 2021; Newsome et al., 2012; Pallathadka, 2020; Vagena, 2021). This triggered a series of responses by the management staff of the different PNAs through the implementation of actions aimed at resolving the situation (Medina-Chavarría et al., 2022).

Methodology

The present study was carried out by implementing a face-to-face questionnaire at the top of the five mountain summits between 3 July and 5 September 2020. The sampling system used in the selection of the sample was simple random, by alternately choosing the first or second person in the group (> 16 years), male or female, to reach the summit. The survey was written in Spanish and translated into 4 languages (Catalan, English, French, and German). Data

collection was carried out through the KoboToolbox platform (offline). In total, 578 surveys were collected over 30 days of fieldwork (Table 2).

The survey

The survey was developed based on the consideration of five dimensions: (i) socio-demographic characteristics (gender, age, occupation, studies, environmental sensitivity, knowledge of environmental impact, place of residence), (ii) sporting habits (habitual practice, time of practice, and affiliation to the federation), (iii) visit characteristics (frequency of visit to the Park, access, group typology, duration of visit, frequency of visit to the summit, photography and dissemination on social networks, importance of COVID-19), logistical preparation of the activity and equipment), (iv), reason for visiting (Likert scale 1-5), and (v) opinion on the perceptual carrying capacity (number of people come across, perception of overcrowding). For more information, see Dorado et al. (2022b).

The survey model was validated at the qualitative level (AERA et al., 2014). Evidence was provided to support the validity of the scale. On the one hand, i) evidence related to content validity through the assessment of an expert judgement (composed of four people), which was carried out using a Likert scale (1 strongly disagree - 5 strongly agree) assessing the degree of univocity and relevance of each and every one of the questions included in the initial survey model and, on the other hand, ii) evidence of validity related to the response process, with the survey having been distributed among the target population to determine the comprehensibility of the questions in the questionnaire, as well as to identify possible practical aspects of its administration.

The survey and research project received the approval of the Clinical Research Ethics Committee (CEIC) of the Catalan Sports Administration, with the number. 16/CEICGC/2020, in addition to the authorisation of each of the managing bodies of the PNAs where the case studies are located. All the people who participated in the study did

so voluntarily, were informed and accepted the confidential treatment of their answers, subject to the guarantees of Organic Law 3/2018, of 5 December, on Personal Data Protection and guarantee of digital rights.

Analysis of results

The data obtained was transformed and coded using SPSS software, version 25.0. Firstly, data analysis was carried out based on the application of descriptive statistical tests according to the characteristics and distribution (normality test) of the different variables: frequencies, mean values, maximum, minimum, and standard deviation. Contingency tables were used for the observation of categorical data based on the summits studied. Secondly, inferential analysis was carried out to evaluate the data of the respondents according to the study summits and to check whether or not there were significant differences between them. In this step, the chi-square goodness-of-fit was used for qualitative variables. In the results where significant differences were found ($p \leq .05$), the 2×2 chi-square test was performed between summits; for this case, significance was adjusted to $\leq .005$ ($.05/10$); in addition, the effect size index was calculated through the Phi test and V test (Φ), the interpretation of which was based on the following criteria: $\Phi < .30$ = small effect, $\Phi \approx .50$ = medium effect, and $\Phi > .80$ high effect (Cárdenas & Arancibia, 2014; Cohen, 1988). Thirdly, for the quantitative variables, given that the data did not comply with a normal distribution, the Kruskal-Wallis one-factor ANOVA non-parametric test was applied to determine the presence or absence of significant differences between the different summits, and the Bonferroni Post Hoc test was applied in those cases where significant differences existed. The significance level for this procedure was set at $p \leq .05$.

At this point, two casuistries have to be taken into account in the data analysis. On the one hand, the Euclidean distance variable was calculated using ArcGIS Desktop 10.8 from the location extracted from the postcode provided by the respondents and the location created in the main car parks detected in each of the case studies.

On the other hand, in the case of the variables of logistical preparation of the activity (adequate or inadequate) and equipment (complete or incomplete), the Mountain Rescue and Intervention Section (SEREIM) of Granada, the Special Mountain Intervention Rescue Groups (GREIM) of Boltaña and the Special Actions Group (GRAE) of Catalonia were consulted on the minimum aspects necessary for logistical preparation: (i) checking weather conditions, (ii) planning

the route and approximate timetable of the activity, (iii) forecasting sufficient food and water, (iv) informing third parties about the planned activity (route and timetables), and (v) suitable equipment to tackle the climb to the respective study summits during the summer season.

Results

Socio-demographic characteristics

The results obtained showed the presence of a profile of mountaineering practitioners characterised by being predominantly male (78.4%), aged between 26-35 years (35.6%), with an average age of 35.4 (11.8) years, working (77.9%) and with university education (58.8%). In terms of environmental sensitivity, 63.7% considered that their practice can generate some kind of impact on the natural environment, with an average score of 2.2 (1.0) out of 5. In relation to the usual place of residence, there was a predominance of local residents, i.e. from the same region as the summit visited (50.5%), with an average Euclidean distance of over 200 km (Table 3).

Five of the eight variables analysed in this dimension showed significant differences, these being gender ($p < .01$), age ($p < .001$), opinion on the generation of impacts ($p < .001$), place of residence ($p < .001$), and Euclidean distance to the summit ($p < .001$).

In this sense, in the analysis by summits, a predominance of the male gender was observed in the group of summits, with a greater representation of the female gender on the summits of Pedraforca (30.5%), Mulhacén (24.4%) and Pica d'Estats (23.9%), with a small effect size ($\Phi = .17$). In relation to age, it was observed that on Mulhacén the majority age range was over 45 years, at 36.1%, while on the rest of the summits the most predominant age range was between 26-35 years (small effect size $\Phi = .15$). With regard to environmental sensitivity, the results obtained showed the presence of a higher degree of sensitivity among mountaineers on the summits of Monte Perdido (71.6%) and Pedraforca (68.6%), obtaining for the latter a rating of 2.6 (1.1) on a scale of 1 to 5. Finally, in relation to place of origin, the results showed a higher percentage of mountaineers residing outside the summit region on the summits of Monte Perdido (94.0%) and Aneto (93.8%). In contrast, Pedraforca (94.1%) and Pica d'Estats (83.2%) stood out for receiving more mountaineers belonging to the same region, the effect size for this variable being medium ($\Phi = .75$).

Table 3
Socio-demographic characteristics of mountaineering practitioners.

Variables	Mulhacén (n = 119)	Monte Perdido (n = 116)	Aneto (n = 112)	Pica d'Estats (n = 113)	Pedraforca (n = 118)	Total (n = 578)
Gender $\chi^2 = 16.06, p < .01, \Phi = .17$						
Male (%)	75.6	81.0	90.2	76.1	69.5	78.4
Female (%)	24.4 A	19.0	9.8 M PE P	23.9 A	30.5 A	21.6
Age $\chi^2 = 38.34, p < .001, \Phi = .15$						
16-25 (%)	11.8	25.9	16.1	23.9	31.4	21.8
26-35 (%)	28.6	38.8	35.7	38.9	36.4	35.6
36-45 (%)	23.5	21.6	24.1	23.0	16.9	21.8
45+ (%)	36.1 MP PE P	13.8 M PE	24.1	14.2 M MP P	15.3 M MP	20.8
Age (years). Average (SD)	40.6 (12.7)	33.4 (11.0)	37.2 (11.4).	33.8 (11.3)	32.1 (11.8)	35.4 (11.8)
Occupation $\chi^2 = 7.43, p = .115, \Phi = .11$						
Unemployed (%)	17.6	25.0	16.1	23.0	28.8	22.1
Employed (%)	82.4	75.0	83.9	77.0	71.2	77.9
Studies $\chi^2 = 3.17, p = .530, \Phi = .07$						
Non-university students (%)	45.4	35.3	42.0	38.9	44.1	41.2
University students (%)	54.6	64.7	58.0	61.1	55.9	58.8
Environmental sensitivity $\chi^2 = 8.29, p = .082, \Phi = .12$						
Considers that it has no impact (%)	41.2	28.4	43.8	37.2	31.4	36.3
Considers that it does have an impact (%)	58.8	71.6	56.3	62.8	68.6	63.7
Environmental impact $H(4)=26.64, p < .001$						
Impact (Likert scale 1-5). Average (SD) ¹	1.8 (1.0) P	2.2 (0.9)	2.0 (1.1) P	2.1 (1.0) P	2.6 (1.1) M A PE	2.2 (1.0)
Place of residence $\chi^2 = 322.98, p < .001, \Phi = .75$						
Does not belong to the autonomous community of the summit (%)	38.7	94.0	93.8	16.8	5.9	49.5
Belongs to the autonomous community of the summit (%)	61.3 MP A PE P	6.0 M P	6.3 M PE P	83.2 M A	94.1 M MP A	50.5
Euclidean distance $H(4)=187.84, p < .001$						
Euclidean distance (km). Average (SD)	224.7 (248.1) MP A P	269.5 (224.7) M PE P	278.2 (157.1) M PE P	141.4 (64.2) MP A P	99.9 (82.5) M MP A PE	200.7 (186.8)

Note: SD = standard deviation; χ^2 = chi-square; Φ = effect size; H = Kruskal-Wallis. M = Bonferroni *post hoc* is statistically significant with Mulhacén. MP = Bonferroni *post hoc* is statistically significant with Monte Perdido. A = Bonferroni *post hoc* is statistically significant with Aneto. PE = Bonferroni *post hoc* is statistically significant with Pica d'Estats. P = Bonferroni *post hoc* is statistically significant with Pedraforca. ⁽¹⁾ These data were calculated for a $n = 368$.

Table 4
Sports habits of participants.

Variables	Mulhacén (n = 119)	Monte Perdido (n = 116)	Aneto (n = 112)	Pica d'Estats (n = 113)	Pedraforca (n = 118)	Total (n = 578)
Regular practitioner			$\chi^2 = 8.66, p < .070, \Phi = .12$			
No (%)	18.5	20.7	8.0	18.6	20.3	17.3
Yes (%)	81.5	79.3	92.0	81.4	79.7	82.7
Practice time^a			$\chi^2 = 15.21, p = .231, \Phi = .11$			
Less than 1 year (%)	3.1	4.3	1.9	5.4	5.4	4.0
Between 1 and 5 years (%)	15.5	26.1	13.6	27.2	19.4	24.1
Between 6 and 10 years (%)	18.6	16.3	23.3	21.7	24.7	21.0
More than 10 years (%)	62.9	53.3	61.2	45.7	50.5	54.9
Seniority (years). Average (SD)	19.07 (14.09)	15.81 (12.44)	18.43 (12.79)	14.15 (12.57)	14.55 (11.06)	16.48 (12.75)
Affiliation to the federation			$\chi^2 = 18.35, p < .01, \Phi = .18$			
No (%)	58.8	62.9	54.5	69.0	78.8	64.9
Yes (%)	41.2 P	37.1	45.5	31.0	21.2 M	35.1

Note: SD = standard deviation; χ^2 = chi-square; Φ = effect size. M = Bonferroni *post hoc* is statistically significant with Mulhacén. MP = Bonferroni *post hoc* is statistically significant with Monte Perdido. A = Bonferroni *post hoc* is statistically significant with Aneto. PE = Bonferroni *post hoc* is statistically significant with Pica d'Estats. P = Bonferroni *post hoc* is statistically significant with Pedraforca. ^(a) These data were calculated for a $n = 477$.

Sporting habits

In relation to the sporting habits of the visitors surveyed, it is worth highlighting the identification of a profile characterised by a long history of mountaineering. More than 82% declared to be regular mountaineers, to have some kind of affiliation to the federation (35.1%), and to have more than 10 years of mountaineering experience (54.9%), with an average value of 16.48 (12.75) years (Table 4).

In this case, one of the three variables analysed showed significant differences: affiliation to the federation ($p < .01$).

In particular, visitors to Aneto had a higher percentage of regular mountaineers (92%). With regard to the length of time spent mountaineering, visitors to Mulhacén and Aneto stood out as those with the most years of mountaineering experience, with an average of 19.07 (14.09) and 18.43 (12.79) years, respectively, and these two summits were the ones with the highest rate of affiliation to the federation among the visitors who frequented them: Aneto (45.5%) and Mulhacén (41.2%), representing a small effect size ($\Phi = .18$).

Characteristics of the visit

Among the main characteristics of the visit, a high frequency of first visits to the PNA was observed (40.1%), with private transport (63.1%) being the most frequently used means of access. The majority of the visiting group format consisted of more than two people (57.8%), with an average of 3.8 (4.2) people per group, and a duration of visit in the area of more than one day (60%), with an average stay of 2 days (Table 5).

In terms of summit behaviour, it was noted that 55% of respondents stated that it was their first ascent, with the average number of climbs to the summit being 4.1 (9.9) and the average time spent on the summit being 25.7 (16.4) minutes. 96.5% of visitors surveyed reported taking photographs during their visit, of which 67.2% stated that they intended to post them on social media. Regarding the importance that COVID-19 had on the fact of having visited the summit (cancellation of other plans, mobility restrictions, etc.), the results obtained showed a low influence on the choice of visit destination, as an average of 2.02 (1.46) was obtained, on a scale of 1 to 5.

Of the total number of visitors surveyed, 69.7% made adequate logistical preparation for the activity. However, in terms of equipment for the activity (taking into account the needs of each of the summits to determine this variable), it was observed that only 26% carried the complete equipment based on the recommendations provided by the rescue groups (SEREIM, GREIM and GRAE).

Of the eleven variables analysed in this dimension, six showed significant differences: frequency of visit to the Park ($p < .001$), access to the Park ($p < .001$), duration of visit ($p < .001$), frequency of visit to the summit ($p < .001$), time at the summit ($p < .001$), and equipment ($p < .001$).

Regarding the analysis by summits, a higher frequency of first visit was observed in the PNAs where the summits of Monte Perdido (52.6%) and Aneto (46.4%) are located, the effect size being small ($\Phi = .18$). Regarding access to the park, the results obtained showed a predominance of private transport use over public transport at the summits of Pedraforca (95.8%), Pica d'Estats (94.7%) and Mulhacén (80.7%), showing a medium effect size ($\Phi = .71$). In relation

to the duration of the visit, there was a predominance of one-day visits to the Pedraforca summit (79.7%), establishing a medium effect size ($\Phi = .43$). With regard to the frequency of visit to the summit, higher percentages of first climb were observed on the summits of Monte Perdido (69.8%), Pedraforca (64.6%) and Aneto (57.1%), with a small effect size ($\Phi = .23$). Finally, the mountaineers on the summit of Mulhacén and Monte Perdido were the ones who stayed the longest on the summit once the climb was completed, with an average time of 33.9 (24.0) and 28.7 (12.9) minutes, respectively. Regarding the importance of COVID-19 for the choice of destination, the results were very similar between the different summits.

Finally, in relation to the logistical preparation of the activity, it was the visitors to Aneto who reported a higher percentage of preparation (75.9%) compared to the rest of the summits. On the other hand, the Pica d'Estats mountaineers were positioned as the best equipped with 44.2% of the needs for summit climbing, resulting in a small-medium effect size ($\Phi = .34$).

Table 5

Characteristics of visit by mountaineering practitioners.

Variables	Mulhacén (n = 119)	Monte Perdido (n = 116)	Aneto (n = 112)	Pica d'Estats (n = 113)	Pedraforca (n = 118)	Total (n = 578)
Frequency of visits to the Park (≤ 2 years)						
$\chi^2 = 18.38, p < .001, \Phi = .18$						
First visit (%)	27.7	52.6	46.4	39.8	34.7	40.1
Two or more visits (%)	72.3 MP A	47.4 M	53.6 M	60.2	65.3	59.9
Access to the Park						
$\chi^2 = 288.03, p < .001, \Phi = .71$						
Private transport (%)	80.7	20.7	22.3	94.7	95.8	63.1
Public transport or walking (%)	19.3 MP A PE P	79.3 M PE P	77.7 M PE P	5.3 M MP A	4.2 M MP A	36.9
Visiting group						
$\chi^2 = 3.94, p = .414, \Phi = .08$						
Equal to or less than 2 people (%)	47.9	44.0	43.8	38.9	36.4	42.2
More than 2 people (%)	52.1	56.0	56.3	61.1	63.6	57.8
Visitors (people). Average (SD) ¹	3.9 (3.6)	3.6 (2.5)	3.2 (1.7)	4.3 (7.7)	3.9 (2.7)	3.8 (4.2)
Duration of the visit						
$\chi^2 = 104.41, p < .001, \Phi = .43$						
One day (%)	39.5	23.3	27.7	28.3	79.7	40.0
More than one day (%)	60.5 P	76.7 P	72.3 P	71.7 P	20.3 M MP A PE	60.0
Duration of visit (days). Average (SD)	1.8 (1.4)	2.1 (1.0)	2.6 (3.2)	2.3 (2.4)	1.2 (0.5)	2.0 (2.0)

Note: SD = standard deviation; χ^2 = chi-square; Φ = effect size; H = Kruskal-Wallis. M = Bonferroni *post hoc* is statistically significant with Mulhacén. MP = Bonferroni *post hoc* is statistically significant with Monte Perdido. A = Bonferroni *post hoc* is statistically significant with Aneto. PE = Bonferroni *post hoc* is statistically significant with Pica d'Estats. P = Bonferroni *post hoc* is statistically significant with Pedraforca. ⁽¹⁾ The Pedraforca data were calculated for a $n = 116$ ⁽²⁾ These data were calculated for an $n = 558$.

Table 5 (Continued)
Characteristics of the visit of mountaineering practitioners.

Variables	Mulhacén (n = 119)	Monte Perdido (n = 116)	Aneto (n = 112)	Pica d'Estats (n = 113)	Pedraforca (n = 118)	Total (n = 578)
Summit frequency						
	$\chi^2 = 30.53, p < .001, \Phi = .23$					
First climb (%)	41.2	69.8	57.1	64.6	43.2	55.0
Two or more climbs (%)	58.8 MP PE	30.2 M P	42.9	35.4 M P	56.8 MP PE	45.0
Climbs to the summit (no.). Average (SD)	7.0 (13.8)	2.4 (6.4)	3.8 (11.2)	2.9 (9.4)	4.1 (5.4)	4.1 (9.9)
Time at the summit						
	$H(4) = 43.23, p < .001$					
Time at the summit (minutes). Average (SD)	33.9 (24.0) A PE P	28.7 (12.9) A PE P	21.4 (14.4) M MP	23.0 (10.6) M MP	21.3 (13.4) M MP	25.7 (16.4)
Photography/filming at the summit						
	$\chi^2 = 7.75, p = .101, \Phi = .12$					
No (%)	5.0	4.3	0.9	0.9	5.9	3.5
Yes (%)	95.0	95.7	99.1	99.1	94.1	96.5
Share on social media²						
	$\chi^2 = 7.55, p = .109, \Phi = .12$					
No (%)	31.9	36.0	41.4	25.9	28.8	32.8
Yes (%)	68.1	64.0	58.6	74.1	71.2	67.2
Importance of COVID-19 in visiting the summit						
	$H(4) = 5.50, p = .239$					
COVID-19 (Likert scale 1-5). Average (SD)	2.31 (1.66)	2.00 (1.54)	1.87 (1.42)	2.01 (1.37)	1.92 (1.26)	2.02 (1.46)
Logistical preparation of the activity						
	$\chi^2 = 7.56, p = .109, \Phi = .11$					
Inadequate (%)	29.4	27.6	24.1	30.1	39.8	30.3
Adequate (%)	70.6	72.4	75.9	69.9	60.2	69.7
Equipment						
	$\chi^2 = 65.75, p < .001, \Phi = .34$					
Incomplete (%)	60.5	73.3	85.7	55.8	94.9	74.0
Complete (%)	39.5 A P	26.7 P	14.3 M PE P	44.2 A P	5.1 M MP A PE	26.0

Note: SD = standard deviation; χ^2 = chi-square; Φ = effect size; H = Kruskal-Wallis. M = Bonferroni *post hoc* is statistically significant with Mulhacén. MP = Bonferroni *post hoc* is statistically significant with Monte Perdido. A = Bonferroni *post hoc* is statistically significant with Aneto. PE = Bonferroni *post hoc* is statistically significant with Pica d'Estats. P = Bonferroni *post hoc* is statistically significant with Pedraforca. ⁽¹⁾ The Pedraforca data were calculated for a n = 116 ⁽²⁾ These data were calculated for an n = 558.

Reasons for visiting

The most valued reasons of the total sample were: firstly, enjoying the landscape, with an average of 4.7 (0.6), followed by observing the scenic beauty of the surroundings, with 4.6 (0.7) (Table 6).

Fourteen of the eighteen variables analysed showed marked differences of varying significance. Significance .001: skills ($p < .001$), physical exercise ($p < .001$), releasing tension ($p < .001$), being away from crowds

of people ($p < .001$), improving health ($p < .001$) and releasing anxiety ($p < .001$). Significance .01: learning more about oneself ($p < .01$), thinking about personal values ($p < .01$), showing others that I could do it ($p < .01$). Significance .05: increasing self-esteem ($p < .05$), developing skills, doing something impressive ($p < .05$), proving to myself that I could do it ($p < .05$), experiencing the outdoors ($p < .05$), and observing the beauty of the environment ($p < .05$).

As shown in Table 6, the most valued reasons among the different summits coincide in the first two motivations: enjoying the landscape and observing the scenic beauty of the surroundings. In this respect, it is worth noting the presence of also high scores in the case of Mulhacén for the reasons to experience the outdoors 4.5 (0.8) and to do physical exercise 4.5 (0.9); Monte Perdido, to experience the outdoors 4.2

(1.0) and to live a stimulating and exciting experience 4.2 (1.1); Aneto, to live a stimulating and exciting experience 4.3 (1.1) and do physical exercise 4.2 (1.0); Pica d'Estats, to live a stimulating and exciting experience 4.5 (0.8), do physical exercise 4.4 (0.9) and experience the outdoors 4.4 (0.9) and in Pedraforca, to do physical exercise 4.4 (0.8) and experience the outdoors 4.4 (0.8).

Table 6
Reasons for visit.

Variables	Mulhacén (n = 119)	Monte Perdido (n = 116)	Aneto (n = 112)	Pica d'Estats (n = 113)	Pedraforca (n = 118)	Total (n = 578)	Kruskal-Wallis
	Average (SD)	Average (SD)	Average (SD)	Average (SD)	Average (SD)	Average (SD)	
To increase the feeling of self-esteem	3.5 (1.3) A P	3.0 (1.4)	2.9 (1.4) M	3.3 (1.4)	2.9 (1.4) M	3.1 (1.4)	H(4)=17.17, p < .05
To develop skills and abilities	3.7 (1.2) MP A	3.2 (1.3) M PE P	3.2 (1.3) M PE P	3.8 (1.1) MP A	3.7 (1.1) MP A	3.5 (1.2)	H(4)=28.53, p < .001
To learn more about myself	3.5 (1.4) MP A	3.0 (1.4) M PE	2.9 (1.4) M PE	3.5 (1.4) MP A	3.3 (1.3)	3.2 (1.4)	H(4)=18.53, p < .01
To challenge/push me	3.8 (1.3)	3.6 (1.4)	3.5 (1.4)	3.9 (1.2)	3.6 (1.3)	3.7 (1.3)	H(4)=4.44, p = .350
For physical exercise	4.5 (0.9) MP	3.9 (1.1) M PE P	4.2 (1.0)	4.4 (0.9) MP	4.4 (0.8) MP	4.3 (1.0)	H(4)=27.17, p < .001
For an exhilarating and exciting experience	4.4 (0.9)	4.2 (1.1)	4.3 (1.1)	4.5 (0.8)	4.2 (1.0)	4.3 (1.0)	H(4)=8.98, p = .062
To release or reduce tension	3.7 (1.4) MP A	2.9 (1.4) M PE P	3.1 (1.5) M P	3.5 (1.3) MP	3.8 (1.1) MP A	3.4 (1.4)	H(4)=31.64, p < .001
To do something impressive	3.3 (1.4)	2.9 (1.4)	3.1 (1.3)	3.3 (1.3)	3.0 (1.3)	3.1 (1.4)	H(4)=10.71, p < .05
To be away from the crowds	3.8 (1.3) MP	2.9 (1.5) M P	3.3 (1.5)	3.3 (1.4)	3.5 (1.4) MP	3.4 (1.5)	H(4)=21.62, p < .001
To enjoy the scenery	4.7 (0.6)	4.7 (0.6)	4.6 (0.8)	4.7 (0.6)	4.6 (0.7)	4.7 (0.6)	H(4)=2.28, p = .684
To think about my personal values	3.6 (1.2) MP A	3.0 (1.5) M	3.0 (1.4) M PE	3.5 (1.3) MP A	3.4 (1.3)	3.3 (1.4)	H(4)=19.43, p < .01
To experience emotion	3.9 (1.1)	3.6 (1.2)	3.8 (1.2)	4.0 (1.0)	3.8 (1.1)	3.8 (1.1)	H(4)=7.24, p = .124
To prove to myself that I could do it	3.6 (1.4)	3.2 (1.4)	3.1 (1.5)	3.5 (1.5)	3.4 (1.4)	3.4 (1.4)	H(4)=10.52, p < .05
To experience the outdoors	4.5 (0.8) MP	4.2 (1.0) M	4.2 (1.1)	4.4 (0.9)	4.4 (0.8)	4.3 (0.9)	H(4)=12.36, p < .05
To prove to others that I could do it	1.7 (1.2) PE	1.6 (1.0) PE	1.7 (1.1) PE	2.2 (1.4) M MP A	1.9 (1.2)	1.8 (1.2)	H(4)=16.12, p < .01
To observe the scenic beauty of the surroundings	4.7 (0.5) A	4.6 (0.6)	4.4 (0.8) M	4.6 (0.8)	4.6 (0.7)	4.6 (0.7)	H(4)=10.32, p < .05
To maintain/improve overall health	4.2 (1.0) MP A	3.6 (1.1) M PE P	3.7 (1.3) M P	4.2 (1.0) MP	4.3 (0.9) MP A	4.0 (1.1)	H(4)=41.32, p < .001
To help me get rid of anxiety	3.3 (1.5) MP	2.6 (1.4) M P	2.8 (1.5)	2.8 (1.4)	3.2 (1.4) MP	2.9 (1.5)	H(4)=21.09, p < .001

Note: SD = standard deviation; H = Kruskal-Wallis. M = Bonferroni *post hoc* is statistically significant with Mulhacén. MP = Bonferroni *post hoc* is statistically significant with Monte Perdido. A = Bonferroni *post hoc* is statistically significant with Aneto. PE = Bonferroni *post hoc* is statistically significant with Pica d'Estats. P = Bonferroni *post hoc* is statistically significant with Pedraforca.

Perceptual carrying capacity of visitors

The results showed that the number of people come across during the summit climb was more than 50 visitors (31%), and 33% of the respondents described the number of people observed during their visit as excessive, with a high degree of satisfaction with the visit, with an average score of 4.78 (0.51), on a scale of 1 to 5 (Table 7).

The results showed significant differences between the study summits in relation to the number of people come across ($p < .001$) and in the perception of overcrowding ($p < .01$).

In the analysis by summit, it was observed that the mountaineers on the summit of Mulhacén mostly came across groups of up to 25 people (81.6). On the other hand, 47.5% of the visitors to the summit of Monte Perdido claimed to have met more than 50 people, which meant a small effect size ($\Phi = .23$). With regard to the perception of overcrowding, Pedraforca mountaineers stood out with 40.7% for having declared the number of people observed to be excessive, followed by Monte Perdido and Aneto mountaineers, with 38.8% and 35.7%, respectively. On the other hand, on Mulhacén they recorded the lowest levels of perception of overcrowding, with 18.5%. In terms of satisfaction with the visit, the results were very similar between the different summits.

Discussion

This study is a first approximation of the characterisation of mountaineering practitioners at a national level. The objectives of this study were i) to characterise the generic profile of mountaineers on Spain's emblematic summits, and ii) to identify patterns of behaviour according to the different summits. The results obtained are discussed below.

Generic profile of mountaineers

The article helps to identify characteristics of mountaineering practitioners in a global way thanks to the consideration of five substantially different summits ranging from very accessible peaks, close to large population centres such as Mulhacén (Sierra Nevada National Park) and Pedraforca (Cadí-Moixeró Natural Park) to the peaks of Pica d'Estats, Monte Perdido and Aneto, with different physical-technical requirements.

Among the main results obtained at the socio-demographic level, in line with previous studies such as those carried out by Babí et al. (2018); Habelt et al. (2022); Montaña Segura (2022); Martín and Mediavilla (2020), which characterise the practitioners of this or other similar sports modalities, there was a clear predominance of males over females and, in our case, a higher degree of environmental sensitivity.

Table 7
Perceptual Carrying Capacity.

Indicators	Mulhacén (n = 119)	Monte Perdido (n = 116)	Aneto (n = 112)	Pica d'Estats (n = 113)	Pedraforca (n = 118)	Total (n = 578)
Number of people come across $\chi^2 = 93.28, p < .001, \Phi = .23$						
Less than 10 people (%)	42.9	7.8	17.0	12.4	24.6	21.1
Between 10 and 25 people (%)	38.7	19.8	29.5	32.7	20.3	28.2
Between 26 and 50 people (%)	6.7	25.0	23.2	25.7	18.6	19.7
More than 50 people (%)	11.8 MP A PE P	47.4 M P	30.4 M	29.2 M	36.4 M MP	31.0
Perception of overcrowding $\chi^2 = 22.74, p < .01, \Phi = .14$						
Scarce (%)	7.6	1.7	2.7	1.8	4.2	3.6
Acceptable (%)	73.9	59.5	61.6	66.4	55.1	63.3
Excessive (%)	18.5 MP A P	38.8 M	35.7 M	31.9	40.7 M	33.0
Satisfaction of visit to the summit $H(4)=4.57, p = .334$						
Satisfaction (Likert scale 1-5). Average (SD)	4.75 (0.59)	4.84 (0.39)	4.76 (0.52)	4.84 (0.41)	4.71 (0.59)	4.78 (0.51)

Note: SD = standard deviation; χ^2 = chi-square; Φ = effect size. M = Bonferroni *post hoc* is statistically significant with Mulhacén. MP = Bonferroni *post hoc* is statistically significant with Monte Perdido. A = Bonferroni *post hoc* is statistically significant with Aneto. PE = Bonferroni *post hoc* is statistically significant with Pica d'Estats. P = Bonferroni *post hoc* is statistically significant with Pedraforca.

In relation to gender, it is worth noting that this gender gap increased on those summits with more technical climbs, such as Aneto. Taking into account Piedra (2019), this could be explained by the fact that, despite the changing trend in Spanish society in terms of equal rights and opportunities for men and women, stereotypes still persist, mainly promoted by family, schools, and the media, which subliminally influence the choice of physical-sports activities historically rooted in the male role. This circumstance is aggravated, as López and Monreal (2018) point out, by the biased information provided by many media outlets that extol the achievements of male athletes and make some of the female achievements in mountain sports invisible, which does not help in reducing stereotypes.

With regard to the degree of environmental sensitivity, the results showed the presence of a higher level of environmental sensitivity when compared with those obtained in the characterisation of participants in other sports. In this case, 11.6% above mountain runners and 30.8% above mountain bikers (Dorado et al., 2022a; Farías-Torbidoni, 2015). These results support Eterović's (2019) hypothesis that, due to the idiosyncrasies of mountaineering, it is a philosophy of life between sport and bioethics.

With regard to the characteristics of visits, and focusing on those most relevant to the management of public use of this type of space, the following stand out: the identification in the set of data analysed of an occasional visitor profile visiting the summit for the first time, little influenced by the context of the pandemic, who prioritises sharing their experience on social networks and does not adequately prepare the climb to the summit in terms of equipment and planning. All this data is clearly interconnected if we base ourselves on works such as those carried out by Bhatt and Pickering (2022) and Kim and Stepchenkova (2015), which point to popularity as one of the main factors that contribute to the selection of destinations to visit, and with these, the frivolisation of some key aspects in the same, such as safety, environmental consequences, or social repercussions.

In this regard, it is worth noting that the following are key aspects for a safe visit to these environments: i) checking weather conditions, ii) verifying the route, distance and approximate time of the activity, iii) having sufficient provisions, and iv) having informed a third person of the location and approximate duration of the activity. Aspects which, if they had not been foreseen and added to the lack of the necessary equipment, according to García et al. (2019), are the main precursors of increased accident rates in the mountains.

Patterns of behaviour

On a specific level, the results obtained in relation to the characterisation of the visitors allowed us to observe common trends in the profiles of the mountaineers among the different summits analysed, especially those related to the characteristics and reason for the visit.

In terms of visit characteristics and reasons, similarities were observed in the pattern of behaviour, on the one hand, between the mountaineers who summit Aneto, Monte Perdido and Pica d'Estats and, on the other, between those who climb Mulhacén and Pedraforca; this grouping is not maintained in the case of socio-demographic characteristics and perceptual carrying capacity: Monte Perdido and Aneto versus Pica d'Estats and Pedraforca in the case of the former (in this Mulhacén is unbalanced) and Mulhacén versus the rest of the summits in the case of the latter (perceptual carrying capacity). In the case of visit satisfaction, the results show no differences between summits.

Among the main behavioural patterns identified in relation to visit characteristics, two clearly differentiated behavioural patterns could be identified. On the one hand, in the case of Monte Perdido, Aneto and Pica d'Estats, the identification of a longer duration and frequency of first-time visits than the rest of the summits. That is, a two-day visit and a first-time visit frequency of more than 57%. On the other hand, in the case of Mulhacén and Pedraforca, the characterisation of a more frequent visit, shorter and with a larger group size. The latter data, which if we compare them with the results obtained in previous studies such as the one carried out in the Pedraforca massif area during 2019 (Farías-Torbidoni & Morera, 2019), show the presence of a certain change in trend both in relation to the frequency of visits to the Park (more recurrent visits, increase of almost 5%) and in the duration of the visit (shorter visit, increase of more than 27% of the one-day visit), which indicate a change towards a more local visitor profile, which may be explained by the situation of deconfinement experienced in Catalonia (Dot et al., 2022).

In relation to the reasons most highly rated by the visitors surveyed, the motivations related to enjoying the landscape (1st), observing the scenic beauty of the surroundings (2nd), practising an outdoor activity (3rd), and doing physical activity (4th) were most highly rated by the visitors who climbed Mulhacén and Pedraforca, unlike the mountaineers who climbed the summits of Monte Perdido, Aneto and Pica d'Estats, relegated the third and

fourth motivations in favour of motivations related to the possibility of having a stimulating and exciting experience (3rd). These results are in line with the data obtained by Farías-Torbidoni et al. (2020) and Luque-Gil et al. (2018) in previous non-summit-specific studies.

At this point, it is worth noting that no pattern was identified in relation to sporting habits and perceptual load capacity, with the results obtained in these dimensions being quite similar between summits. For example, in the case of sporting habits, in all the summits, with the exception of the Pedraforca summit, the group of people surveyed showed the same profile: regular practitioners of this sport, mostly non-federated, with an average seniority of more than 16 years. The latter data, if we compare them with those obtained in studies of the profile of practitioners of other sports modalities such as mountain running and mountain biking, show greater seniority, exceeding by 10 and 6 years, respectively, the average value obtained in these profiles (Dorado et al., 2022a; Farías-Torbidoni et al., 2021; Guiu & Leyton, 2019). These results could undoubtedly be explained by the long tradition of mountaineering in Spain which, after its institutionalisation in 1922 (creation of the Spanish Mountaineering Federation), has become one of the most popular sports in Spanish society (Ministerio de Cultura y Deporte, 2022; Moscoso, 2004).

Finally, in relation to the results obtained with regard to perceptual carrying capacity and satisfaction with the visit, a high degree of satisfaction was observed despite a high perceptual sensation of overcrowding. In this sense, it is worth pointing out that this apparent contradiction is not exceptional, given that the results obtained in previous studies such as those carried out by Berrocal et al. (2013) and Luque-Gil et al. (2018) showed the same result. In the words of Luque-Gil et al. (2018), this could be explained by a high tolerance of visitors to the degree of overcrowding present in this type of environment.

Conclusions

Previous studies have characterised the profile of visitors to mountain sports at national level, but none have focused in depth on mountaineering. This is the main contribution of this study, which focused on identifying the generic profile of mountaineers on emblematic summits.

Firstly, the results obtained in relation to the generic profile constitute a good knowledge base, not only in relation to other mountain sports disciplines but also in decision-

making for a more sustainable management of this practice. Knowing the characteristics of mountaineers can favour the implementation of certain environmental awareness campaigns, safer practices, among others.

Secondly, although the study of these characteristics and the comparison between summits showed somewhat different patterns of behaviour, they do not justify specific and differentiated management in the different environments. This is a much debated topic in different forums, especially in the first post-pandemic months, where different administrations advanced in the implementation of isolated regulations, very disconnected at the regional level and not always coherent with the needs or characteristics of the different environments (Gómez-Varela et al., 2020; González et al., 2021; Medina-Chavarría et al., 2022; Navarrete & Gómez-Limón, 2022). The results obtained in this study support the possibility of a more global approach to the design of joint actions, favouring efficiency in their design and a better understanding of them by the recipients, i.e. mountaineers and visitors in general. The results obtained in this respect support this, as there are no excessive differences between the different summits, despite the idiosyncrasies of each one of them. However, always taking into account the particularities of the different environments.

Limitations and future prospects

Finally, the main limitation of this study in relation to its implementation is that it was carried out during a pandemic, with all the implications that this may have had on the results obtained. In this sense, it would be interesting to replicate the study again in order to be able to contrast the effect that the pandemic may have had on the data obtained.

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