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# Sports infrastructure as a training environment: Participation patterns and adherence challenges in rural municipalities

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**Abstract**

**Background:** Rural areas face persistent challenges in promoting regular sports participation due to demographic ageing, limited infrastructure, and uneven access to organized programs. These constraints may affect not only population-level physical activity but also the training environments available to athletes and coaches in small rural municipalities.

**Aims:** This study analyzes sports habits, motivations, barriers, and the availability of sports facilities in three rural municipalities in southern Spain, examining how local infrastructural and organizational conditions shape participation patterns and adherence to sport.

**Methods:** A cross-sectional descriptive design was employed involving 289 residents from Cumbres Mayores, Cumbres de San Bartolomé, and Cumbres de Enmedio, selected through a non-probabilistic snowball sampling technique. Data were collected using an adapted questionnaire based on the Spanish Survey of Sports Habits, consisting of items on sports participation frequency, motivations, perceived barriers, and assessment of local sports facilities. The questionnaire demonstrated adequate content validity through expert judgment and high internal reliability (Cronbach's $\alpha = 0.86$). Data were analyzed using descriptive and comparative statistical procedures, including frequencies and percentages, to identify inter-municipal patterns.

**Result:** The findings reveal apparent inter-municipal differences in sustained sports participation and perceived facility adequacy. More than one-third of respondents reported not engaging in regular physical activity, while insufficient or poorly maintained facilities were identified as a key barrier by over 30% of inactive participants. Approximately 40% indicated having practiced sport in the past but no longer do so, particularly in the smallest municipality, suggesting adherence challenges rather than a lack of initial interest. Gender-related disparities were also observed, mainly associated with time constraints and limited program availability among women. Notably, over 70% of participants expressed willingness to resume or increase participation if access to facilities and guided programs improved.

**Conclusion**: Sports participation in small rural contexts depends not only on individual motivation but also on the availability, accessibility, and activation of local sports infrastructure. For athletes and coaches, these conditions directly affect training continuity, program viability, and development opportunities. The results support the need for context-sensitive sports planning that integrates infrastructure improvement, supervised training, and community engagement to promote sustainable training environments in rural areas.

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## INTRODUCTION

The progressive ageing of the population and the persistent inequalities in access to physical activity currently represent significant public health challenges worldwide. The World Health Organization (WHO, 2019) warns that more than 25% of adults do not meet the minimum recommended levels of physical activity. This situation is further exacerbated in rural settings and among older adults. In Spain, these patterns are similarly reflected, combining increased longevity

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with a decline in active lifestyles, which negatively affects health, functional autonomy, and the social cohesion of rural communities.

In Spain, population ageing poses significant challenges for rural territories, where low population density, the outmigration of young people, and the limited availability of social and sports resources intensify the effects of demographic imbalance and reduce opportunities for active living (Beard et al. 2016; Fructuoso et al., 2025). Beyond the well-established health benefits, regular exercise habits play a central role in the long-term development of athletes and in consolidating positive training behaviors. Sustained engagement in physical activity has been associated with greater acquisition of sport-specific skills, improved physical conditioning, and higher adherence to structured training programs—factors that are essential for sustained athlete performance (Telama et al., 2014). In this process, coaches act as key social and educational agents, shaping training routines, reinforcing discipline, and fostering motivational climates that support both performance outcomes and long-term engagement in sport (Ntoumanis et al., 2021).

However, the formation and maintenance of these exercise habits do not depend solely on individual motivation or on the quality of coaching. The availability, accessibility, and adequacy of training environments and sports infrastructure strongly condition them. In rural contexts, limited facilities, reduced program diversity, and scarce professional support can restrict regular practice, disrupt training continuity, and hinder athlete development pathways. As a result, the relationship between exercise habits, athlete development, and sporting achievement becomes particularly fragile in small rural municipalities, where structural constraints directly affect both athletes and coaches. In this context, regular physical activity has become established as one of the most influential factors in maintaining functional capacity, preventing chronic diseases, and promoting psychosocial well-being at all stages of life (Behr et al., 2023; Chalise, 2023). The conceptual frameworks of healthy ageing and active municipalities, promoted over the last decade by international organizations, emphasize that it is not enough to prolong life expectancy; it is also essential to ensure that people live healthy, autonomous, and socially active lives (Davern et al., 2020; Menassa et al., 2023).

Recent evidence indicates that environmental and social conditions – such as the availability of suitable spaces, the presence of family support, and opportunities for informal practice - play a decisive role in shaping sports habits (Timurtaş et al., 2022). Research consistently shows that characteristics of the built environment – such as accessible pathways, the presence of nearby facilities, and the perceived quality and safety of public spaces - strongly influence physical activity levels among older adults (Useche et al., 2023). In addition, studies on bio-healthy parks and community-based programs highlight that well-designed outdoor spaces can promote sustained participation in adapted physical activities (Marcos-Pardo et al., 2023).

From a theoretical standpoint, these elements converge in a single underlying phenomenon: the interaction between demographic ageing and the physical-social environment as key determinants of sports participation in rural settings. The WHO frameworks on healthy environments and active ageing emphasize that physical activity is shaped not only by individual motivation but also by structural factors such as accessibility, resource availability, and community support. In rural areas – where the population is older, and sports infrastructure is often scarce or unevenly distributed - these dimensions become even more influential and help explain differences in participation levels. Understanding this integrated relationship clarifies the study's core research problem: how the demographic and environmental characteristics of small rural municipalities condition sports habits and the opportunities to adopt active lifestyles.

At the national level, recent surveys indicate a gradual increase in sports participation in Spain, with more than half of the population engaging in physical activity at least occasionally (Castellanos-García, 2020). However, these positive trends coexist with persistent barriers, including a lack of time, limited interest, and insufficient public facilities, that continue to restrict regular participation among a significant proportion of adults. Persistent inequalities between urban and rural areas continue to shape levels of sports participation in Spain. In rural contexts, limited infrastructure, fewer organized opportunities, and fewer qualified professionals hinder the development of active habits (Marcen et al., 2022; Rúa-Alonso et al., 2023). These challenges are reinforced by socio-cultural factors that favour more passive forms of leisure, resulting in lower participation rates than in urban settings.

In recent years, informal and outdoor sports have gained prominence, particularly activities such as hiking, cycling, and other forms of autonomous exercise, which are especially accessible in rural environments (Nugraha et al., 2024). This trend reflects a growing preference for flexible, nature-based activities that complement the limited availability of structured programs in many rural areas.

International research indicates that rural areas across Europe face challenges comparable to those observed in Spain, including reliance on public infrastructure, limited sports provision, and budgetary constraints. At the same time, studies highlight that the effectiveness of local physical activity policies depends on strong institutional leadership and effective intersectoral cooperation, both of which are essential for developing sustainable models adapted to the specific resources and needs of each rural territory (Till et al., 2025; Messing et al., 2025). Recent reviews confirm that the characteristics of the built and natural environment remain key determinants of physical activity in rural populations, particularly regarding accessibility, perceived quality, and the availability of essential facilities (Müller et al., 2024; Chen et al., 2025). These findings reinforce the importance of creating supportive environments that reduce structural barriers and promote sustained participation among older adults.

Although research on physical activity has expanded in recent years, studies focused explicitly on rural environments remain scarce and fragmented, as most evidence comes from urban areas or large rural regions (Rúa-Alonso et al., 2023; Guo et al., 2025). This lack of research is even more pronounced in small rural municipalities – characterized by low population density and high ageing levels - where integrated analyses of sports habits, motivations, barriers, and perceived facility adequacy are still limited (Muller et al., 2024; Messing et al., 2025). This gap impedes the development of effective policies to reduce territorial inequalities. In this context, the present study provides novelty by comparing three adjacent municipalities in the Huelva Mountains, linking residents' perceptions with the actual infrastructure network and offering practical implications for local sports management.

The present study addresses this need and focuses on three rural municipalities in the Sierra de Huelva – Cumbres Mayores, Cumbres de San Bartolomé, and Cumbres de Enmedio – characterized by low population density, a high ageing index, and limitations in their network of sports facilities (Sánchez-Martín et al., 2025). In addition to its social and community relevance, understanding sports habits and the availability of sports infrastructure in rural environments also provides valuable insights for the field of training, talent development, and sports science. For instance, the availability and quality of sports facilities in sparsely populated areas have been linked to higher physical participation rates and greater opportunities for athlete development, which may, in turn, indirectly influence access to structured training and overall performance (Marcen et al., 2022). Likewise, recent research has shown that perceptions of infrastructure, along with mobility and commuting environments, shape the sporting trajectories of young people in rural contexts, affecting their training environments, motivation, and access to technical resources (Carlman & Högman, 2024). Consequently, the findings of this study can inform federative planning strategies, facility management, and the design of more inclusive, context-sensitive training environments, thereby enhancing talent identification and optimizing local resources.

In this context, the municipalities of Cumbres Mayores, Cumbres de San Bartolomé, and Cumbres de Enmedio represent a particularly relevant case for analyzing sports participation in the Spanish rural environment. These territories share key features typical of small inland municipalities, low population density, high ageing indices, residential dispersion, and a limited network of facilities and services. Yet, they also differ in their sports provision and community dynamics, allowing for a comparative understanding of how local variations shape physical activity habits. The selection of these three municipalities, in addition to their geographical proximity and sociodemographic similarity, offers an opportunity to examine territorial inequalities at a micro-scale and to understand how available resources influence the adoption and maintenance of active lifestyles.

In summary, the existing literature reveals a lack of studies focused on very small rural municipalities, where demographic dynamics, infrastructural limitations, and territorial inequalities are especially pronounced. There is also a shortage of research that integrates, within a single design, sports habits, motivations, barriers, and citizens' perceptions of facility adequacy. These gaps hinder

our understanding of how individual attitudes and the actual availability of resources interact in shaping active lifestyles in rural contexts. In this context, the present study directly addresses these shortcomings by providing a comparative analysis of three neighboring municipalities in the Huelva Mountains and offering empirical evidence that contributes to understanding local inequalities and informing sports planning strategies better adapted to territorial needs. Consequently, this study aims to analyze sports habits, motivations, barriers, and the availability of sports facilities in three rural municipalities located in the Sierra de Huelva. Through a descriptive and comparative approach, the research seeks to identify differential patterns of practice and accessibility, thereby contributing to a broader understanding of territorial equity in the promotion of physical activity and to the development of evidence-based local policies.

## METHOD

*Research Design*

This study employed a cross-sectional descriptive design, which is appropriate for characterizing sports habits, motivations, barriers, and perceived facility adequacy at a specific point in time(Lee et al., 2020). This type of design is particularly suitable for analyzing small, geographically bounded populations, such as the three rural municipalities included in this research, as it allows for comparing patterns across territories with similar sociodemographic characteristics. The research was carried out in the northern region of the province of Huelva (Spain), in the municipalities of Cumbres Mayores, Cumbres de San Bartolomé, and Cumbres de Enmedio. These localities, grouped administratively as "Las Cumbres, share similar demographic and geographical characteristics. Cumbres Mayores has a population of approximately 1,731 inhabitants, while Cumbres de San Bartolomé and Cumbres de Enmedio have 366 and 63 inhabitants, respectively. Together, they cover an area of 280 $km^2$, characterized by low population density and an ageing population pyramid.

The choice of these municipalities responds to an intentional criterion of representativeness, as they are characteristic examples of rural Huelva: communities with an ageing population, territorial dispersion, and limited sports facilities. Furthermore, the fact that they belong to the same administrative region facilitates comparison between localities with different population sizes but similar sociodemographic conditions. This approach allows for a contextualized analysis of sporting habits, motivations, and barriers in rural environments with limited resources (Marcen et al., 2022; Rúa-Alonso et al., 2023).

*Participant*

The sample analyzed consisted of 289 individuals, of whom 239 were from Cumbres Mayores, 36 from Cumbres de San Bartolomé, and 14 from Cumbres de Enmedio. In terms of gender, the distribution was 128 females and 111 males in the first village, 20 females and 16 males in the second, and five females and nine males in the third. The sampling was non-probabilistic, using the snowball technique, which enabled different citizen profiles to be reached through previous contacts. This technique was complemented by the dissemination of surveys through social networks and direct telephone contact with sports and educational organizations and local associations. Although this method may compromise statistical representativeness, it maximized the response rate in environments with low digital connectivity and limited internet access (Useche et al., 2023). Given the substantial disparity in sample size between municipalities –an expected outcome in snowball sampling applied to very small and unevenly populated localities- specific precautions were taken in the analytical phase. Inter-municipal comparisons were limited to descriptive patterns rather than inferential statistics, to avoid overinterpretation of differences that could be influenced by reduced sample sizes, especially in Cumbres de Enmedio. As a result, the findings presented should be interpreted as exploratory indicators of local trends rather than as statistically generalizable differences between municipalities.

*Instruments*

An ad hoc questionnaire was designed based on the Spanish Sports Council's Survey of Sports Habits in Spain. The questionnaire consisted of three sections: [1] interest and frequency of sports practice, [2] use and assessment of facilities, relationship with technology, and perception of needs,

and [3] personal and sociodemographic data. The surveys were administered using online forms (Google Forms), adapted to the digital reality of the territory and to ensure anonymity, confidentiality, and informed consent of the participants at all times. The content validity was verified through expert judgement by three specialists in physical activity, health promotion, and sports management, who evaluated the relevance and clarity of the items (Marcos-Pardo et al., 2023). The internal reliability of the questionnaire, as measured by Cronbach's α, was 0.86, which is considered adequate for descriptive studies (Taber, 2018). As an example, one of the items in the main block was formulated as follows: "How often do you engage in physical activity or sports per week?", with a five-point Likert scale (1 = Never, 5 = More than three times per week).

In addition, the adaptation process included several procedures to ensure the questionnaire's cultural, linguistic, and technological suitability for a rural and ageing population. The content was reviewed by specialists in physical activity and ageing, who assessed item clarity, vocabulary adequacy, and the comprehensibility of instructions for participants with different literacy levels. Given the limited Internet access in the municipalities and the fact that many older residents do not possess mobile devices or digital skills, the researcher administered the questionnaire in person to the oldest participants, thereby ensuring their inclusion and preventing a group of residents with characteristics similar to the target population, to verify item comprehension and identify potential reading or interpretation difficulties. Based on this phase, several statements were simplified to improve the instrument's cognitive accessibility. Regarding validity, in addition to expert judgement, construct coherence was assessed by examining the alignment between the items and the theoretical domains (habits, motivations, barriers, and facilities), thereby strengthening the instrument's robustness for use in rural contexts with technological constraints.

*Procedure*

The information gathering process took place during the first two months of 2024. After the questionnaire was designed, a dissemination campaign was launched on municipal social networks, and those responsible for clubs, educational centers, and health centers were contacted. It was ensured that all participants would accept, through informed consent, the processing of their personal information in accordance with the Personal Data Protection and Digital Rights Guarantee Act 3/2018 and the General Data Protection Regulation (GDPR) 2016/679. Once the collection phase was complete, the data was cleaned to remove duplicate or incomplete responses. To minimize potential response bias associated with an online-only format in municipalities with low digital connectivity, a mixed administration procedure was implemented. Although the questionnaire was available online, the researcher also offered in-person completion to older residents and individuals without Internet access or sufficient digital skills. This approach ensured equitable participation across age groups and literacy levels, preventing the systematic exclusion of non-digital populations. All responses collected in person were entered into the same data system used for the online version, following identical confidentiality and anonymity procedures.

*Data Analysis*

A descriptive statistical analysis of the data was performed, including the calculation of absolute and relative frequencies, along with measures such as the arithmetic mean and standard deviation, to assess the distribution of the variables. Contingency tables were used to explore associations among variables such as age, gender, educational level, sports participation, and satisfaction with the facilities. Illustrative graphs were also used to facilitate the interpretation of the results. This approach has been used in similar research in Andalusia within the framework of the Local Sports Facilities Plans (Bahariniya & Madadizadeh, 2021). Data analysis was based on frequencies and percentages, with descriptive comparisons across municipalities and demographic subgroups. Although inferential statistical tests were initially considered, they were ultimately discarded due to substantial imbalance in sample sizes across municipalities and the exploratory nature of the study, which could have led to unstable estimates or unwarranted interpretations. Instead, a descriptive-comparative approach was adopted to identify patterns and trends without compromising analytical validity. All analyses were performed using IBM SPSS (version 26).

## RESULTS AND DISCUSSION

### Result

The analysis of data from surveys conducted among 289 residents of the municipalities of Cumbres Mayores, Cumbres de San Bartolomé, and Cumbres de Enmedio provides a clear overview of sporting habits and the provision of local infrastructure. Across the three municipalities, marked quantitative differences were observed. In Cumbres Mayores, 64.9% of respondents reported practicing sports regularly, compared to 58.3% in Cumbres de San Bartolomé and 42.9% in Cumbres de Enmedio. The perception of insufficient sports facilities also varied substantially: it reached 35.3% in Cumbres de San Bartolomé, while only 7.1% of participants in Cumbres de Enmedio reported lacking nearby facilities. In addition, half of the residents in Cumbres de Enemdio reported having practiced sports in the past but had stopped (50.0%), highlighting difficulties in maintaining long-term participation.

Regarding sports facilities and spaces, the results in Figure 1 reveal unequal provision across municipalities. Cumbres Mayores has the most resources (an open-air sports center, a municipal gym, marked trails, and a paddle tennis court). In Cumbres de San Bartolomé, availability is more limited, although open spaces are used for informal activities. For its part, Cumbres de Enmedio has a significant lack of consolidated infrastructure, which severely restricts opportunities for organized practice. Across the board, deficiencies related to maintenance, accessibility, and the lack of equipment adapted for older people were identified in all three municipalities.

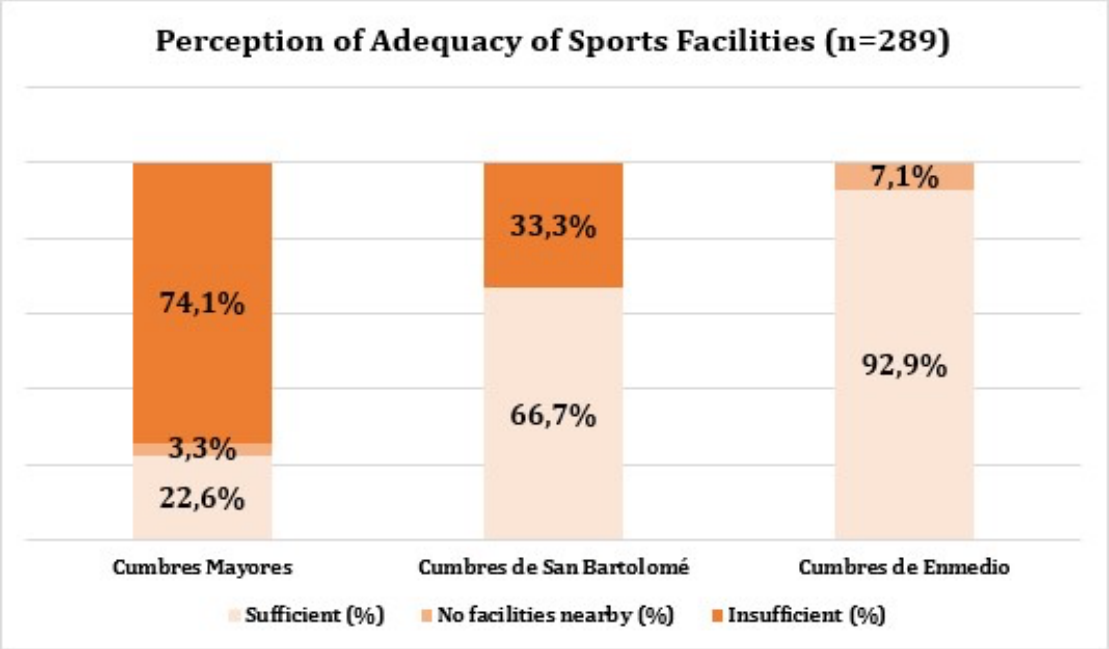


**Figure 1.** Perception of Adequacy of Sports Facilities (n=289)

As can be seen, the highest percentage of "insufficient" ratings is found in Cumbres de San Bartolomé (35.3%). In comparison, Cumbres de Enmedio has the highest percentage of "sufficient" ratings (92.9%), suggesting territorial inequality in availability and accessibility. In terms of user interest and participation in sports, most respondents reported some degree of involvement in physical activity, with differences between municipalities. In Cumbres Mayores, the distribution was more balanced; in Cumbres de San Bartolomé, interest among adults aged 18-50 predominated; and in Cumbres de Enmedio, the group that used to practice but no longer does so increased. These data are shown in Figure 2.

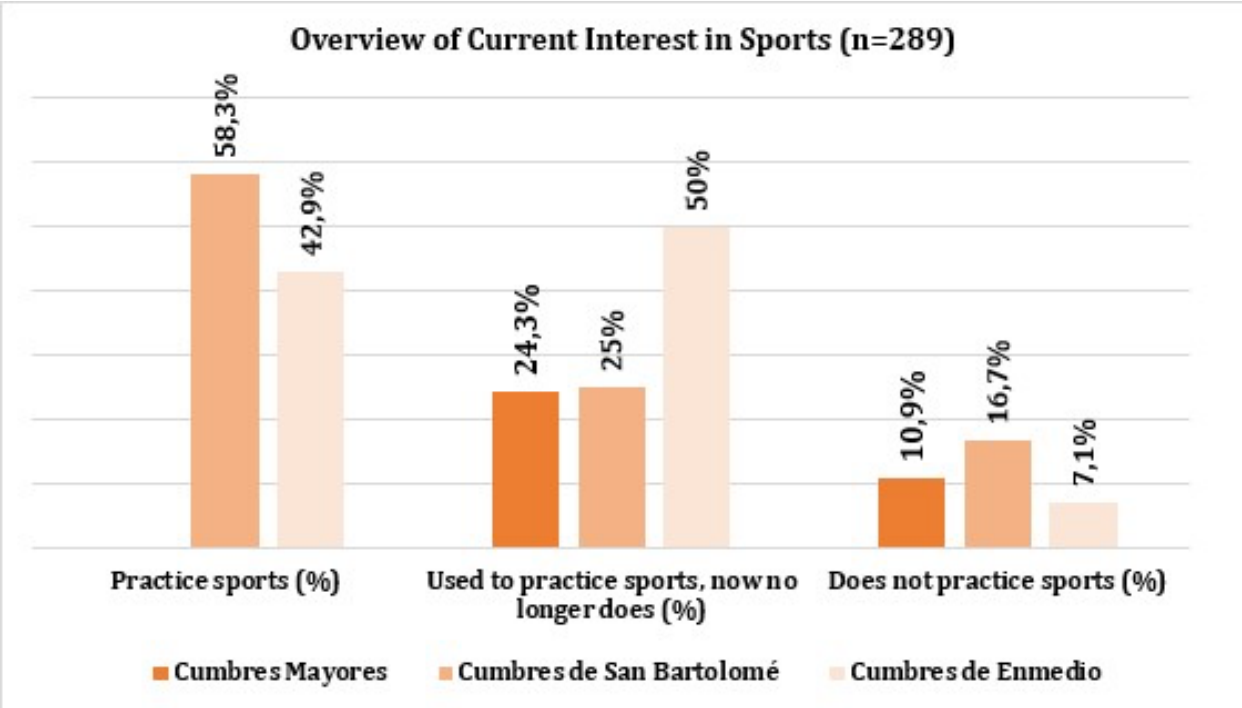


**Figure 2.** Overview of Current Interest in Sports (n=289)

It is noteworthy that in Cumbres de Enmedio, the proportion of people who "used to practice, but no longer do" reaches 50.0%, compared to 24.3% in Cumbres Mayores and 25.0% in Cumbres de San Bartolomé, suggesting barriers to maintaining the practice. Regarding motivations and barriers, the main factors identified were a lack of time, a lack of interest, and insufficient facilities, with local particularities. In Cumbres de Enmedio, health problems had a greater relative weight; in Cumbres de San Bartolomé, the dominant barrier was "insufficient facilities. These data are shown in Figure 3.

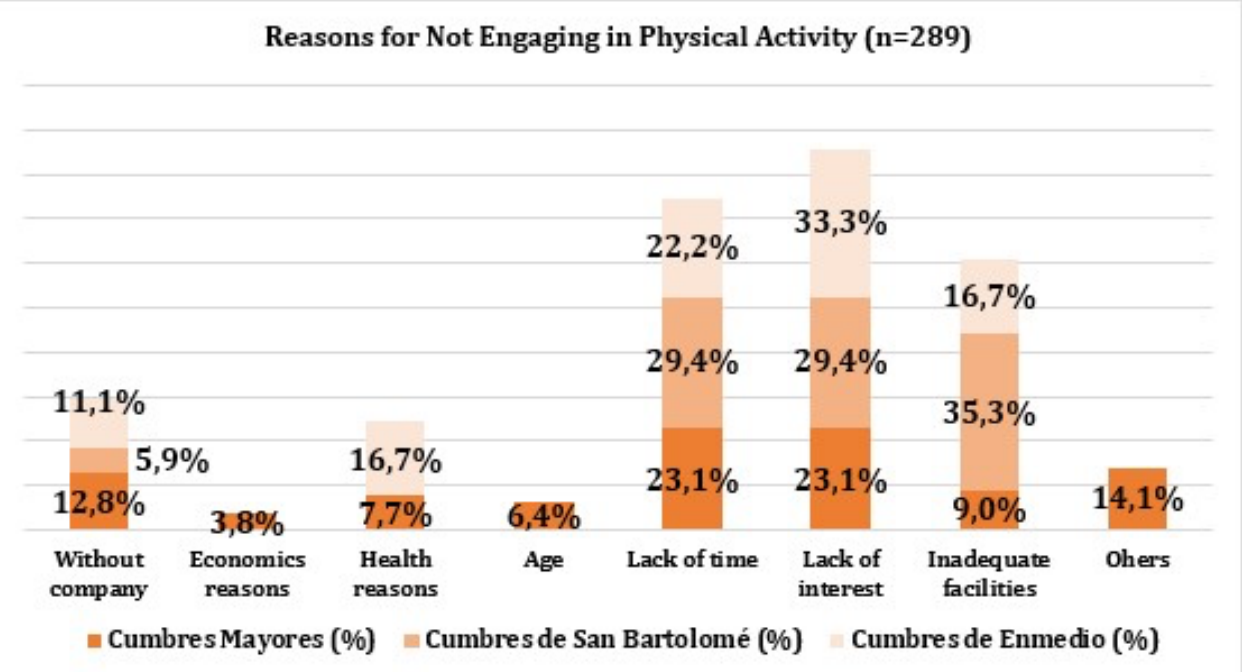


**Figure 3.** Reasons for Not Engaging in Physical Activity (n=289)

As can be seen, the barrier of "insufficient facilities" reaches its highest value in Cumbres de San Bartolomé (35.3%), which reinforces the hypothesis of territorial inequality in the provision of and access to sports resources. Finally, sporting preferences and future intentions reveal that indoor

football and padel tennis are among the most popular sports, along with a sedentary lifestyle, among the adult population. The main reasons given were to keep fit, relax, and have fun, with the latter being particularly important in Cumbres de Enmedio. These patterns are shown in **Figures 4** and **5.**

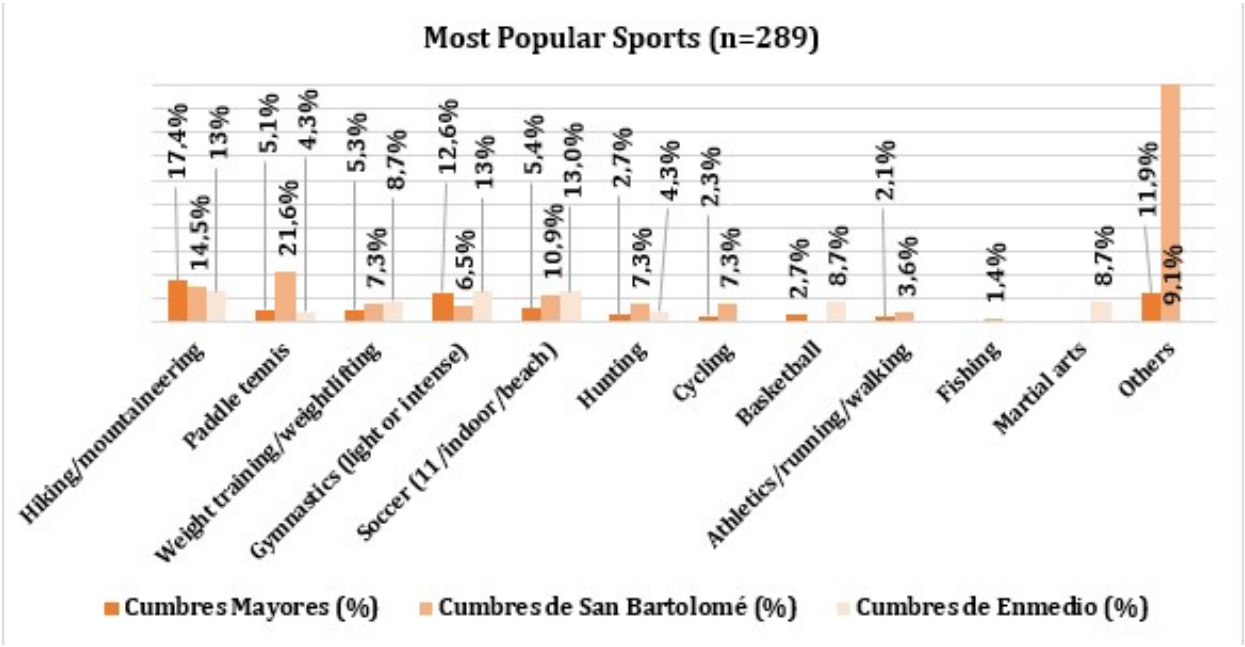


**Figure 4.** Most Popular Sports (n=289)

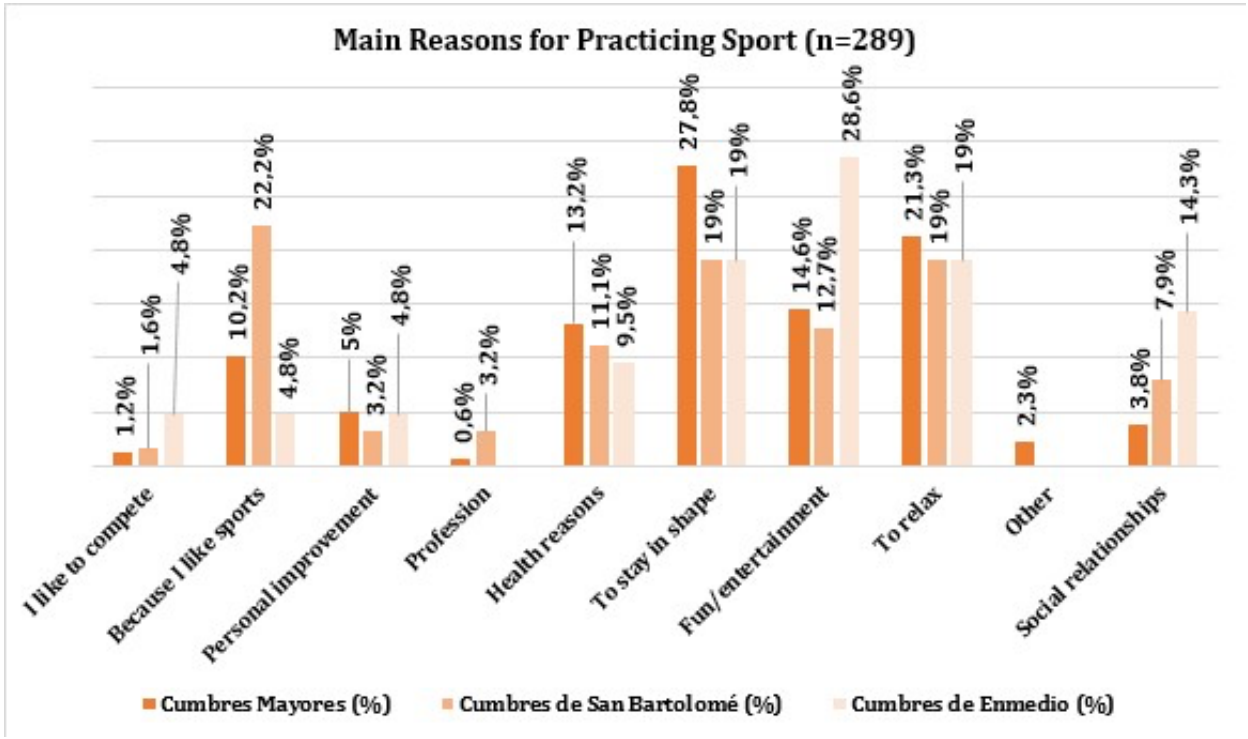


**Figure 5.** Main Reasons for Practicing Sport (n=289)

Overall, the results point to differential patterns across municipalities in both the availability of facilities and the profiles of practice and motivation, underscoring the need for localized interventions and resource planning more closely aligned with local demands. From an applied sport science and coaching perspective, these infrastructural differences are relevant because they shape opportunities for structured practice in each municipality. Perceived limitations in facility availability, accessibility, and maintenance were accompanied by higher reports of inactivity and a greater proportion of former participants, suggesting that local conditions may constrain training

continuity. In small rural settings, such constraints can reduce the feasibility of regular coached sessions and limit athletes' access to consistent development opportunities. These findings provide applied evidence for rural coaching and sport development, showing how local infrastructure and program activation shape training continuity and participation.

**Discussion**

The results of this study provide food for thought on the current state of physical activity and sporting habits in three rural municipalities in northern Huelva. The information gathered reveals inequalities in access to, maintenance, and use of sports facilities, as well as differences in participation based on age, gender, environment, and available options. In Cumbres de San Bartolomé, the barrier of "insufficient facilities" is particularly significant, while in Cumbres de Enmedio, health problems among those who do not participate and a high percentage of people who used to participate but no longer do are more prominent, suggesting difficulties with adherence rather than initiation. Importantly, the observed facility-related constraints should be interpreted not only as a community-level access issue but also as a training-environment limitation for athletes and coaches in small rural municipalities. When facilities are scarce, poorly maintained, or unevenly distributed, the regularity of coached sessions becomes harder to sustain, program schedules become less stable, and opportunities for progressive training exposure are reduced. This may help explain why a substantial share of residents reported having practiced sport in the past but no longer do so, as discontinuities in access and program availability can undermine adherence even among initially motivated participants. For coaches, these contextual barriers can limit group formation, reduce the viability of age- or level-specific programs, and constrain long-term athlete development pathways. Therefore, improving infrastructure must be paired with activation strategies, such as supervised sessions, consistent weekly programming, and targeted initiatives for women and older adults. Thus, facilities translate into sustained participation and more stable training opportunities.

These inter-municipal differences can be better understood when considering the structural and demographic characteristics of each locality. Cumbres Mayores, with a larger and more internally diverse population, shows a more stable pattern of participation, consistent with evidence indicating that population size and social heterogeneity often generate more sustained demand for recreational activities. In contrast, the limited population base of Cumbres de Enmedio reduces the critical mass required to maintain regular programs, which may explain the higher proportion of former practitioners and the difficulty sustaining long-term adherence. Moreover, variations in facility accessibility, the presence or absence of guided or supervised activities, and local cultural norms surrounding sport and gender roles also shape participation behavior. This aligns with recent studies showing that demographic ageing, perceived accessibility, and the degree of municipal programming interact to produce uneven levels of practice across rural territories.

Taken together, the present findings both reinforce and nuance the theoretical perspectives highlighted in previous research. The gender differences identified in the three municipalities, for example, are consistent with studies showing that structural constraints and lower perceived self-efficacy limit women's participation in rural settings; however, our results suggest that these inequalities become more pronounced in very small municipalities where the availability of programs and safe spaces is especially restricted. Similarly, the prevalence of motivational and time-related barriers aligns with WHO frameworks and recent reviews. Yet, the high proportion of former practitioners in Cumbres de Enmedio expands this evidence by pointing to adherence difficulties linked not only to personal factors but also to the absence of guided programming and reduced social support. The role of the environment is also corroborated. While natural and built conditions favour outdoor activities, the uneven distribution of facilities and instructors across municipalities shows that environmental advantages do not automatically translate into sustained practice. By articulating these dynamics, the study extends existing models of rural physical activity by demonstrating how demographic composition, infrastructure quality, and community organization jointly shape participation patterns at a micro-territorial scale.

These findings are consistent with evidence from rural European settings: insufficient facilities, territorial dispersion, and lower density of organized provision limit the regularity of practice (Marcen et al., 2022; Rúa-Alonso et al., 2023). Furthermore, it is not enough to have facilities available; the literature shows that the presence of instructors and public facilitators is a key factor

in activating demand and sustaining participation, especially among older people (Guo et al., 2025). In our case, the apparent paradox between the perception of sufficiency and the low level of sustained practice in Cumbres de Enmedio could be explained by local expectations, the small population size, actual accessibility, and the lack of guided programming, rather than by the physical inventory itself.

In terms of motivations and barriers, the pattern described by the WHO and recent reviews is confirmed: lack of time, disinterest, and health limitations are determinants of inactivity; conversely, self-efficacy, social support, and perceived accessibility facilitate engagement in activity (WHO, 2019; Ma et al., 2024; White et al., 2024). From an applied perspective, these data point towards community-based, group and supervised interventions (e.g., walking groups, outdoor strength circuits and introductory sessions), combined with schedule adjustments and low-cost or free provision. The profile of sporting preferences combines traditional disciplines (indoor football, hunting) with the recent boom in hiking and padel tennis, in line with the post-pandemic shift towards outdoor recreational activities and more autonomous formats (Nugraha et al., 2024). This trend has been corroborated by Muller et al. (2024), who show that the availability of natural environments and the quality of built environments are associated with higher levels of physical activity in rural areas, reinforcing the environment's role as a key determinant of public health.

The gender gap is another relevant issue. Although national data point to an overall reduction in inequalities (Castellanos-García, 2020), structural constraints persist in rural contexts, family responsibilities, incompatible schedules, or perceptions of insecurity that disproportionately affect women. Recent research, such as that by Gomwe et al. (2024), confirms that gender moderates the relationship between perceived physical condition and level of practice, with greater self-efficacy in men, while Greeven et al. (2023) highlight that social norms and differential access to resources also explain differences in motivation and opportunities. These findings underscore the need to incorporate a gender-sensitive approach into municipal policies, with measures for work-life balance, inclusive programming, and safety in sports facilities.

In addition, Brown et al. (2025) highlight that the use of mobile technologies and digital tracking can help reduce geographical barriers in rural populations, encouraging adherence to sports practice through registration systems and social motivation. This approach complements the proposal by Cousins et al. (2023), who note that multi-component programs – quality infrastructure, professional support, and community education – are most effective in increasing participation among older adults living in rural or semi-urban areas. Social and community capital is confirmed as another determining factor: neighborhood networks and local associations can build fundamental organizational support for sustained participation. In fact, Greeven et al. (2023) argue that levels of social cohesion, sense of belonging, and municipal collaboration are directly related to the frequency of sports participation in rural areas. Leveraging this social structure in small municipalities would help consolidate more stable participation and foster a sense of community.

The viability of local policies is reinforced by comparative experiences: municipal leadership, intersectoral cooperation (health, sport, urban planning, and education), and integrated plans maximize impact with limited resources (Messing et al., 2025; Till et al., 2025). In small municipalities, "low-cost, high-reach" actions—such as opening school playgrounds, signposting routes, or creating active micro-spaces—can generate tangible gains if accompanied by awareness-raising campaigns and professional revitalization. This approach is in line with the Guide to Planning Healthy Cities (Capolongo et al., 2018), which proposes integrating physical activity into territorial planning and everyday active mobility. In summary, the results confirm that the development of sporting habits in rural populations depends on both personal willingness and the availability and activation of resources that enable sustained practice over time. Promotion policies should combine improvements in the network of facilities and guided programming with education, awareness-raising,g and outreach strategies tailored to sociodemographic and cultural profiles, with a special focus on women, older people,e and households with less access to resources.

*Implications*

The findings of this study provide strategic and operational guidance for sports planning in rural municipalities with limited resources, where optimizing existing spaces and social revitalization are essential priorities. The results show that the population's willingness to resume

physical activity under improved accessibility and supply conditions reinforces the need to invest in multi-purpose infrastructure, adapted open spaces, and community revitalization programs.

From a practical standpoint, improving sports infrastructure in rural municipalities is a strategic investment in athletes' and coaches' training environments. Accessible, safe, and functional facilities support program continuity, enable more stable training planning, and facilitate progressive sport development processes. For coaches, having adequate spaces expands the capacity to organize groups by age or skill level, maintain regular training schedules, and create more engaging learning environments, which may positively influence both participation adherence and athlete progression. To enhance their practical relevance, these recommendations should be tailored to each municipality's specific circumstances. In Cumbres Mayores, where participation is comparatively higher, strengthening supervised programs and intergenerational activities could consolidate existing engagement. In Cumbres de San Bartolomé, expanding the availability and quality of facilities appears essential to overcome the perception of infrastructural insufficiency. In Cumbres de Enmedio, where adherence difficulties are more pronounced, priority should be given to guided sessions, social support strategies, and low-threshold initiatives to help re-engage former practitioners. Tailoring interventions to these local characteristics may increase their feasibility and impact.

In this context, it is proposed to link local sports planning with sustainable community development strategies, articulated through projects such as Cumbres Activa, conceived as a direct response to the main empirical findings. This project focuses its actions on promoting sports and active ageing, and on improving social well-being through the creation and adaptation of infrastructure (indoor sports halls, bio-healthy parks, active mobility circuits, and improvements to inter-municipal trails), facilitating accessibility for older people, and reducing territorial inequalities. It also includes a program to promote healthy habits through intergenerational activities, educational campaigns, and digital tools for monitoring and citizen participation, thereby strengthening social capital and a sense of community belonging.

Based on the conceptual frameworks of Active Ageing (WHO, 2021) and Healthy Municipalities/Healthy Cities (Capolongo et al., 2018), this model is interpreted from a comprehensive perspective, which includes physical and human resources (infrastructure and revitalization), accessible opportunities (safe routes, inclusive schedules), psychosocial support (networks and self-efficacy) and living conditions (time, transport and care). Incremental improvements in accessibility and programming can translate into measurable increases in participation and adherence, provided they are accompanied by intersectoral governance, monitoring indicators – such as the percentage of weekly practice, the gender gap, or the use of facilities – and periodic impact assessment. Taken together, this ecological and multisectoral approach offers a realistic and replicable roadmap for rural municipalities, aligned with the objectives of territorial equity, social cohesion, and sustainable promotion of community health.

*Research contribution*

This study provides an integrated analysis of sporting habits and facility availability in three small rural municipalities, an area that has been little explored in the scientific literature. Unlike national or regional studies, this local approach enables the detection of specific inequalities and concrete needs, providing a contextualized view of physical and sporting behavior in ageing and dispersed populations. Furthermore, by linking citizens' perceptions to the actual inventory of sports resources, the study offers a valuable framework for guiding health promotion and active ageing policies grounded in empirical evidence. These results reinforce the importance of applied research in rural settings as a basis for designing strategies for territorial equity and sustainability (Marcen et al., 2022; Rúa-Alonso et al., 2023; Muller et al., 2024).

*Limitations*

This study presents several limitations that should be considered when interpreting its findings. First, its exploratory and descriptive nature, combined with the use of a non-probabilistic snowball sampling technique, restricts the generalizability of the results. Furthermore, the use of self-administered surveys, although it facilitated data collection in a context of low population density and limited digital connectivity, may have introduced interpretation or social desirability

biases. In addition, the analysis focused solely on quantitative variables, so including qualitative or mixed-method approaches in future research would allow for a deeper exploration of perceptions, motivations, and barriers related to sports participation in rural contexts (Useche et al., 2023). In addition, the marked imbalance in sample size across the three municipalities should be considered when interpreting inter-municipal differences. The smaller subsample from Cumbres de Enmedio limits the stability of comparative estimates, meaning that the results should be understood as exploratory rather than statistically generalizable. Despite this constraint, the descriptive patterns identified provide valuable insights into local dynamics in sparsely populated rural areas.

*Suggestions*

From an applied research perspective, future studies should examine more specifically how the availability, quality, and activation of sports infrastructure influence athlete development processes and coaches' work in rural contexts. Longitudinal designs and mixed-method approaches would allow researchers to explore how sustained access to adequate facilities and structured programs shapes training adherence, technical progression, and the stability of sport groups over time. In addition, incorporating coaches' perceptions of infrastructural and organizational constraints would help to better understand how these factors affect training planning, participant recruitment, and long-term athlete development pathways in small rural municipalities. Future studies should aim to replicate this research in other rural municipalities with similar demographic and infrastructural characteristics to confirm and extend the findings' validity. It would also be valuable to implement pilot interventions that evaluate the impact of improved sports facilities and programs on adherence, functionality, and quality of life among residents.

Furthermore, incorporating indicators of mental health and chronic diseases, as well as establishing intersectoral partnerships between institutions, could help ensure the sustainability of projects promoting physical activity in rural areas (Chen et al., 2025; Guo et al., 2025; Till et al., 2025). Future studies would benefit from adopting more robust methodological approaches, such as mixed-methods designs that integrate qualitative interviews or focus groups to deepen the understanding of motivations, barriers, and local meanings attached to sport. Longitudinal designs could also help examine how changes in facilities, programs, or demographic composition influence adherence over time. In addition, the use of probabilistic or stratified sampling strategies would strengthen the representativeness of findings across municipalities and reduce the impact of sample imbalance.

## CONCLUSION

This study shows that sports participation in small rural municipalities is shaped by the interaction between individual factors and local structural conditions, particularly the availability, accessibility, and activation of sports infrastructure. The findings reveal apparent differences between municipalities in participation patterns and adherence, with facility limitations and insufficient programming constraining regular practice, especially in smaller communities. Gender-related disparities and a high proportion of former practitioners highlight that barriers are not limited to initial access but also affect training continuity over time. From a coaching and sport science perspective, these results indicate that inadequate infrastructure and unstable program provision can limit athletes' development opportunities and challenge coaches' ability to sustain structured training environments. Overall, the study meets its objective by demonstrating that improving sports participation in rural contexts requires not only individual motivation but also context-sensitive sports planning that integrates functional infrastructure, guided programs, and institutional support to promote sustainable training and active lifestyles.

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## AUTHOR CONTRIBUTION STATEMENT

DC was responsible for the design and conceptualization of the research, as well as the initial drafting of the manuscript. JG was responsible for data analysis and discussion of the findings. MG participated in the methodological review of the study, providing technical guidance on the design of the data collection instrument and the interpretation of the results. All authors critically reviewed the content, made substantial contributions to the development of the text, and approved the final version of the manuscript.

## AI DISCLOSURE STATEMENT

The author used digital language assistance tools during the preparation of this manuscript to improve clarity and readability. All content was carefully reviewed and edited by the author, who takes full responsibility for the accuracy and integrity of the work.

## CONFLICTS OF INTERES

The authors confirm the absence of any potential conflicts of interest—financial, institutional, or personal—that could influence the conduct of this study, the analysis of data, the preparation of the manuscript, or its publication.

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