



Musculoskeletal injuries in elite athletes at the Chilean High-Performance Center: prevalence and characteristics

Lesiones musculoesqueléticas en atletas de élite del Centro de Alto Rendimiento de Chile: prevalencia y características

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Abstract

Introduction: There is a need to characterize musculoskeletal injuries (MSK-I) in elite athletes in order to understand the factors associated with their occurrence and their impact on athletic performance.

Objective: To characterize MSK-I in elite athletes treated at the Chilean High-Performance Center.

Methodology: Observational, analytical, cross-sectional study. A total of 286 athletes and 372 clinical records were entered into the physiotherapy service during 2023. Demographic variables, type and location of injury, period and mechanism were considered. Descriptive statistics, chi-square and logistic regression were applied to identify risk factors, using Jamovi with statistical significance of $p < 0.05$.

Results: Approximately 1 in 4 athletes presented at least one MSK-I, with recurrence in some cases. Injuries were more prevalent in male, due to overuse and in the lower extremities, mainly muscular ($p < 0.01$). Combat sports showed a higher risk of traumatic injuries, while ball sports and strength-endurance sports showed a predominance of overuse injuries, with variations according to gender ($p < 0.01$).

Discussion: The findings coincide with previous studies regarding MSK-I characteristics, although, unlike other studies, traumatic injuries did not predominate during competitions. The findings of this study provide relevant information for optimizing clinical decision-making by the medical team in their recommendations to athletes and their environment.

Conclusions: The prevalence of MSK-I exceeded one injury per athlete on average, being more frequent in men, associated with overuse during training and mainly affecting the lower extremities and muscle tissue, with variations in risk depending on the sport category.

Keywords

Athletic injuries; clinical epidemiology; musculo-skeletal system; sports.

Resumen

Introducción: Existe la necesidad de caracterizar las lesiones musculoesqueléticas (MSK-I) en deportistas de élite para comprender los factores asociados a su aparición y su impacto en el desempeño deportivo.

Objetivo: Caracterizar las MSK-I en los deportistas de élite atendidos en el Centro de Alto Rendimiento de Chile.

Metodología: Estudio observacional, analítico y transversal. Se ingresaron 286 deportistas y 372 registros clínicos en el servicio de kinesiología durante 2023. Se consideraron variables demográficas, tipo y ubicación de la lesión, período y mecanismo. Se aplicaron estadísticas descriptivas, chi-cuadrado y regresión logística para identificar factores de riesgo, utilizando Jamovi, con significancia estadística de $p < 0.05$.

Resultados: Aproximadamente 1 de cada 4 deportistas presentó al menos una MSK-I, con recurrencia en algunos casos. Predominaron lesiones en hombres, por sobreuso y en extremidades inferiores, principalmente musculares ($p < 0.01$). Los deportes de combate mostraron mayor riesgo de lesiones traumáticas, mientras que deportes con balón y de fuerza resistencia evidenciaron predominio de lesiones por sobreuso, con variaciones según sexo ($p < 0.01$).

Discusión: Los hallazgos coinciden con estudios previos en cuanto a características de MSK-I, aunque, a diferencia de otras investigaciones, las lesiones traumáticas no predominaron durante las competencias. Los hallazgos del presente estudio aportan información relevante para optimizar la toma de decisiones clínicas por parte del equipo médico, en las recomendaciones al deportista y a su entorno.

Conclusiones: La prevalencia de MSK-I superó, en promedio, una lesión por deportista, siendo más frecuente en hombres, asociada a sobreuso durante los entrenamientos y afectando principalmente la extremidad inferior y el tejido muscular, con variaciones de riesgo según la categoría deportiva.

Palabras clave

Lesiones deportivas; epidemiología clínica; sistema musculoesquelético; deportes.

Introduction

Elite sport assumes a challenging training load at the physical, technical, and mental levels to allow optimal human performance; however, it can pose greater injury risks due to elevated physiological stress (Meeusen et al., 2013). Elite athletes occupy an area of competitive sportspeople who display high performance, compete at the international level, and build a career thanks to sport (Sanz de la Garza & Adami, 2020). These athletes compete in a high-risk environment where the potential to sustain an injury that can compromise performance is greater (Saragiotto et al., 2014; Verhagen & Gabbett, 2019). A sports injury is defined as an injury caused by sports that ultimately leads to tissue damage or other disturbances of normal physical function, whether it occurred due to the sudden or repetitive transfer of kinetic energy (Bahr et al., 2020; Colonna et al., 2022). The epidemiology of sports injuries has been studied according to the sport practiced and its characteristics, being able to relate their severity and frequency with intrinsic and extrinsic factors of the athlete (Bere et al., 2015; Cruz-Ferreira et al., 2017; Lambert et al., 2022; Romero-Morales et al., 2024). These injuries impact the athlete, mainly by days of lack of training, and have a great economic impact on the athletes and the organizations involved (Lutter et al., 2022; Marconcin et al., 2023).

To offer information to the medical team, athletes, and their staff (coaches, physical trainers), the International Olympic Committee (IOC) has established programs of sports injury monitoring (Junge et al., 2008; Lambert et al., 2024). These programs concentrate on systematic data collection, risk factor analyses, and determination of the incidence with the aim to allocate resources effectively, draw attention to special problems in subgroups or teams, and to design and evaluate the effects of interventions (Post et al., 2024). Therefore, the sports injury surveillance methodology yields important epidemiological data to sports science units and is helpful for making recommendations and developing interventions for prevention of injuries (Costello et al., 2024).

Musculoskeletal injuries (MSK-I) are one of the leading concerns within sports-related injuries, as they lead to discontinuations in training and competition, thereby influencing the athlete's performance (Lisman et al., 2017; Romero-Morales et al., 2024). The IOC defines MSK-I as new or recurrent musculoskeletal injury which occurred during competition or training whose medical attention is needed irrespective of absence from being able to compete or train (Bahr et al., 2012). MSK-I can affect different types of tissue, either individually or in combination, and usually affects older athletes, with a higher incidence in women (Patel et al., 2017; Zelle & Fu, 2013). These types of injuries, depending on severity, can be surgically managed thus leading to even greater time off the sports field and contributing not only toward the athlete's physical capacity but also emotional state (Lin et al., 2020). Nevertheless, at present, such paucity and heterogeneity in the reporting of data on MSK-I prevents specific analysis of MSK-I as records are frequently put altogether with other sports injury (Gimigliano et al., 2021).

In Chile, there is limited epidemiological data on sport injuries, and those that are available correspond to non-elite athletes or sports (Danes Daetz et al., 2020; Yáñez-Sepúlveda et al., 2024). At the national level, high-performance athletes are those meeting the technical criteria established by National Sports Institute in consultation with the Olympic or Paralympic Committee and the respective Chilean federation, in particular if they are a member of a national team (Republica de Chile, 2001). The High-Performance Center located in Santiago, Chile, is home to the UCAD (Unidad de Ciencias Aplicadas al Deporte), which offers care and monitoring services for injuries of elite athletes, among other functions (Muñoz et al., 2022). The UCAD physiotherapy department records is a reliable data source regarding injuries occurring to this population, and it can be used for clinical and institutional program planning. Currently, to be able to understand the risk factors of onset of MSK-I and its implications on athletic achievement, it is necessary first to delineate the condition in elite athletes presenting for rehabilitation. Understanding the presentation of MSK-I in high-level athletes, relevant epidemiological, clinical, preventative, and management-related information is needed to inform the development and implementation of specific surveillance programs (Wang et al., 2024; Zang et al., 2023). In this context, the present study seeks to answer the question: What characteristics do MSK-I present in elite athletes treated at the UCAD physiotherapy service?



Method

This is an observational, analytical, cross-sectional study. No intervention was performed; inferential data were analyzed to describe the relationship between the variables, and the data and the data were identified at a limited period of time (Schober & Vetter, 2018). This work was conducted according to the STROBE statement for observational studies (Cuschieri, 2019).

Participants

The clinical admission records of athletes who arrived with MSK-Is at the UCAD Kinesiology Service between January and December 2023 were chosen. The athletes were contacted either via email or in person at their training location, during which they were informed about the objectives and details of the study and were asked to freely provide written informed consent, solely to authorise the use of their clinical data for research purposes, previously approved by a local ethics committee (SSMO 261124-3).. Records without informed consent from the athlete were removed.

To guarantee that the estimated participants in the study were statistically representative compared to all of the athletes treated during the period, a finite population ($n = 462$ athletes) sample size was calculated under a 95% confidence level, with an error range of 5%, and consideration for an expected proportion of 0.5. This analysis allowed us to estimate a minimum sample size of 210 athletes. Finally, 286 players completed and submitted the written consent form, which ensures the statistical validity of those athletes being included in relation to the reference universe.

Procedure

This secondary data analysis relied exclusively on admission data obtained from the clinical records of the UCAD Physiotherapy Department. These data were gathered in a database of detailed information on athletes suffering from MSK-I. The head of UCAD had previously approved the use of this database.

The clinical records of elite athletes who received treatment at the UCAD Physiotherapy Department during 2023, who sustained at least one MSK-I during that period, and who provided consent for the use of their clinical data for research purposes, were included. In contrast, records with incomplete data on key variables for the study were excluded.

Study variables

The variables were defined and analysed in accordance with international recommendations (Bahr et al., 2020). The following were included: age, gender, period in which the injury occurred (training or competition), origin of the injury (injury mechanism), affected body region, type of damaged tissue, sport category, and injured body segment.

Data/measurement sources

Two researchers (FP, PA) manually extracted demographic and clinical data from clinical records reported by the professionals in charge at the UCAD Physiotherapy Department. The database was previously pre-coded and reviewed to ensure data integrity and completeness, thereby minimising missing or inconsistent data. Data extraction was performed independently by both researchers, who subsequently compared and reconciled their records to minimise errors and discrepancies. The information corresponding to clinical records obtained during 2023 was collected between November 2024 and March 2025.

Bias

Attempts were made to reduce possible sources of bias. The data in the database were pre-coded and there were no missing data for the variables used in the analysis. We used standard definitions relying on international recommendations in order to minimize classification bias. A sub-analysis stratified by gender was also performed to explore possible differences between groups, which allowed specific associations to be detected.

Study size

The unit of analysis for this study was the admission record because an individual athlete could generate more than one record during the investigation period. A sample size was estimated assuming a universe



of 574 admission records for a finite population with the same parameters as above (95% confidence, 5% error, and expected proportion of 0.5); resulted in a minimum record estimate of 230. Finally, 372 clinical admission notes were analyzed for the included athletes, accounting for 64.81% of all available admissions.

Quantitative variables

Age was only considered as numerical in this study. It was reported as mean \pm standard deviation.

Data analysis

The age variable was subjected to the Shapiro-Wilk Test in order to verify its distribution normality. For categorical variables, both absolute frequencies and percentages are provided. Prevalence rate estimates were based on aggregated and anonymised institutional chart data. These included the overall athlete population at the high-performance center eligible for care from UCAD and the number of injuries registered in the physiotherapy department during 2023. No personal identifiable information was available; therefore, individual consent was not needed.

Afterwards, the prevalence of injury observed was estimated with the records of those athletes who followed all phases of this research (athletes that agreed to be part of this study) and associations between variables were analyzed. For analysis of the associations between variables, the Pearson chi-square test (χ^2) was used. A binary logistic regression analysis was also conducted to find out risk factors according to sports category, with odds ratios (OR) being stratified for sex. No formal adjustment for multiple confounding variables was performed using extensive multivariable models. However, stratification by sex allowed partial control of this factor to detect potential variations according to gender. Statistical analyses were performed using open-source software Jamovi, and differences with p-value < 0.05 were considered statistically significant (The Jamovi project, 2022).

Results

Prevalence of MSK-I

The prevalence rate of athletes injured with MSK-I in 2023 was 278 per 1000 athletes (total number of athletes = 1664; number of injured athletes = 462), which means that approximately 1 in 4 athletes had at least one MSK-I. In addition, the total number of injuries exceeded the number of injured athletes (total number of admission records = 574), with an average of 1.24 injuries per injured person, indicating the recurrence of MSK-I in some athletes.

The sample analyzed included 286 elite athletes with an average age of 22.81 ± 5.13 years, who had an observed injury rate of 130.10 MSK-I per 100 athletes.

Characteristics of admission records by MSK-I

Most cases corresponded to injuries in male athletes, with a significant difference compared to women ($p < 0.01$). Regarding the origin of the injury, MSK-I due to overuse predominated over traumatic injuries ($p < 0.01$). The period of occurrence showed a clear majority of MSK-I during training, with this difference being highly notable in relation to competition periods ($p < .01$). In relation to the affected body region, injuries to the lower extremities were considerably more frequent than those to the upper extremities ($p < 0.01$). Regarding the type of injured tissue, muscle involvement was the most prevalent, followed by ligament, tendon, and bone injuries ($p < 0.01$). The values of these proportion analyses are shown in Table 1.

Table 1. Characteristics of admission records by MSK-I.

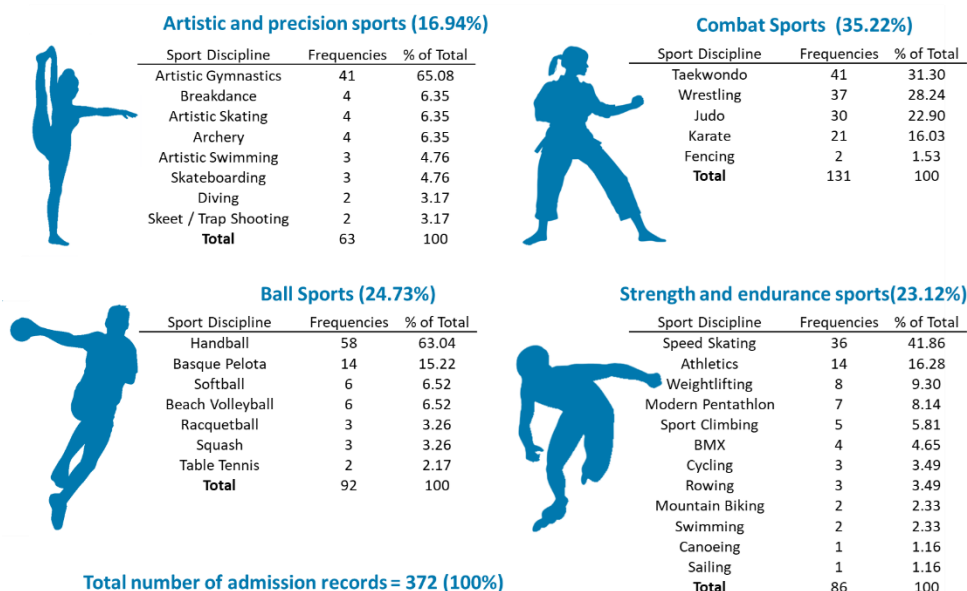
		Frecuencias	% del Total	χ^2	p
Gender	Male	218	58.60	5.69	< 0.01
	Female	154	41.40		
	Total	372	100.00		
Origin of injury	Overuse	209	56.18	11.01	< 0.01
	Traumatic	163	43.82		
	Total	372	100.00		
Period of injury	Training	301	80.91	142.20	< 0.01
	Competition	71	19.09		
	Total	372	100.00		
Body region	Lower body	265	71.24	67.11	< 0.01
	Upper body	107	28.76		
	Total	372	100.00		
Type of tissue injury	Muscular	135	36.29	33.44	< 0.01
	Ligamentous	94	25.27		
	Tendon	86	23.12		
	Bone	57	15.32		
	Total	372	100.00		

χ^2 = Pearson's chi-square test

Sport category and sport

Of the total number of admission records included in the study ($n = 372$), the sports category 'Combat Sports' accounted for 35.22% of admission records with MSK-I ($n = 131$), followed by 'Ball Sports' with 24.73% ($n = 92$), 'Strength and endurance sports' with 23.12% ($n = 86$) and 'Artistic and precision sports' with 16.94% ($n = 63$). The sports with the highest frequency of MSK-I were handball ($n=58$), artistic gymnastics ($n = 41$), taekwondo ($n = 41$), wrestling ($n = 37$) and speed skating ($n = 36$). The frequency of MSK-I in the disciplines reported in the admission records, as well as the percentage of MSK-I according to the category to which the athletes belonged, is shown in Figure 1.

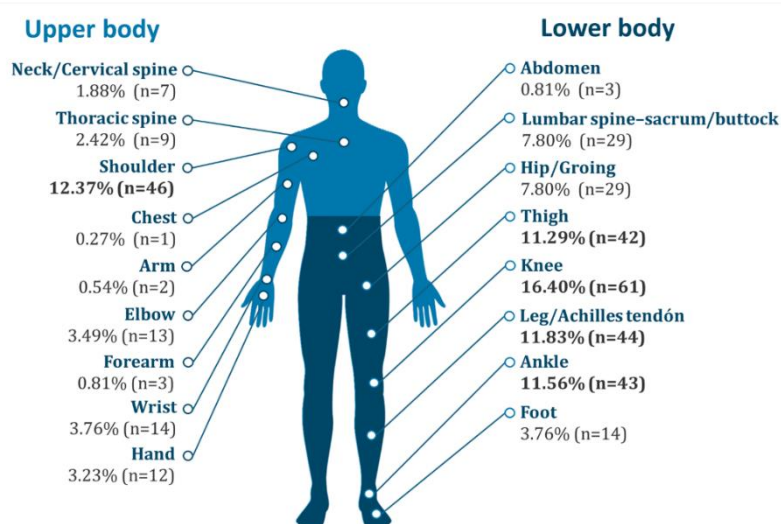
Figure 1. MSK-I frequencies according to category and sports discipline.



Injured body segment

In relation to the injured body segment, admission records with MSK-I were most frequently reported for the knee ($n = 61$), followed by the shoulder ($n = 46$), leg/Achilles tendon ($n = 44$), ankle ($n = 43$) and thigh ($n = 42$). The percentages and frequencies of MSK-I according to the body segment reported in the admission records are shown in Figure 2

Figure 2. MSK-I frequencies and percentages by body segment



The body segment demonstrating the highest frequency is indicated in bold.

MSK-I risk analysis in artistic and precision sports

In the risk analysis, during the period of occurrence of MSK-I, it was observed a trend of these injuries in art and precision disciplines occurred during training, with a significantly higher proportion compared to the competition period, but the magnitude of the effect remains uncertain. This difference was not significant when analyzed by gender.

Regarding the origin of the injury, no statistically significant differences were found between overuse and traumatic mechanisms when analysing arts and precision sports by gender or overall.

In the affected body region, no significant differences were identified between injuries in upper and lower regions, when comparing the arts and precision disciplines with the other disciplines. This absence of difference remained consistent in the analysis by gender.

All relevant data are provided in Table 2.

MSK-I risk analysis in combat sports

In combat disciplines versus other categories, MSK-I occurred during training compared to those occurring in competition, was not statistically significant. When disaggregated by gender, no significant differences were observed either.

Traumatic injuries were significantly more frequent when associated with overuse injuries within combat disciplines versus other categories. This pattern was observed in both males and females.

No significant differences were observed between MSK-I in the lower or upper regions. This pattern remained consistent when analyzed by gender, with no significant differences.

Statistical results are summarized in Table 2.

MSK-I risk analysis in ball sports

In the analysis of the period of occurrence of MSK-I, it was observed that in female athletes who practice ball sports, the proportion of injuries during competition was significantly higher in association with training. In contrast, this difference was not significant in male or in the overall analysis.

Regarding the origin of MSK-I, it was found that men who played ball sports had a significantly higher risk of overuse injuries compared to other categories. In female athletes, although a higher proportion of overuse injuries was observed in ball sports, this difference did not reach statistical significance.

Considering both genders together, the risk of overuse injuries was also significantly higher in ball sports.

In terms of the affected body region, no significant differences were observed between ball sports and other categories, either in males or in the total sample.

Detailed data are presented in Table 2.

MSK-I risk analysis in strength and endurance sports

No statistically significant differences were found between competition and training in any of the comparisons. In male, the proportion was similar, as it was in females and in the total.

In strength and endurance sports, overuse injuries were significantly more frequent than traumatic injuries, indicating a higher risk of overuse compared to other disciplines. This condition was also observed in females, while in male there were no significant differences between the two types of injury.

Regarding the affected body region, the difference was not statistically significant. In males, injuries in the upper region were significantly more frequent in strength and endurance sports compared to other categories. In females, no significant differences were observed.

Statistical results are summarized in Table 2.

Table 2. MSK-I risk analysis in sports category

Outcome	Sex	Artistic and precision sports vs Others			Combat sports vs Others			Ball sports vs Others			Strength and endurance sports vs Others		
		χ^2	p	Odds Ratio (CI 95%)	χ^2	p	Odds Ratio (CI 95%)	χ^2	p	Odds Ratio (CI 95%)	χ^2	p	Odds Ratio (CI 95%)
Period of injury (Training vs Competition)	Male	2.2	0.13	2.51 (0.73-8.69)	1.97	0.16	0.62 (0.32-1.21)	0.12	0.73	1.14 (0.54-2.38)	<0.01	0.97	1.01 (0.43-2.39)
	Female	2.1	0.15	2.47 (0.70-8.79)	2.22	0.14	2.17 (0.77-6.15)	5.05	0.02	.35 (0.14-0.90)	0.80	0.37	0.67 (0.28-1.61)
	Total	4.5	0.03	2.53 (0.45-6.13)	0.08	0.78	0.93 (0.54-1.59)	1.11	0.29	0.74 (0.41-1.31)	0.24	0.62	0.86 (0.47-1.56)
Origin of injury (Overuse vs Traumatic)	Male	2.2	0.14	1.80 (0.81-3.99)	19.27	< 0.01	0.28 (0.16-0.50)	11.53	< 0.01	2.86 (1.54-5.30)	0.05	0.82	1.08 (0.54-2.15)
	Female	0.17	0.68	1.18 (0.53-2.67)	18.77	< 0.01	0.21 (0.10-0.44)	1.91	0.17	1.91 (0.76-4.83)	8.00	< 0.01	3.17 (1.39-7.21)
	Total	2.4	0.12	1.56 (0.89-2.75)	39.15	< 0.01	0.25 (0.16-0.39)	10.40	< 0.01	2.27 (1.37-3.77)	5.76	< 0.01	1.85 (1.12-3.08)
Body region (Lower body vs Upper body)	Male	0.99	0.32	1.49 (0.68-3.30)	0.09	0.76	1.10 (0.61-1.96)	0.61	0.44	1.28 (0.69-2.36)	4.80	0.03	0.39 (0.16-0.93)
	Female	0.24	0.62	1.25 (0.52-2.99)	0.28	0.60	0.80 (0.35-1.83)	0.13	0.72	0.84 (0.31-2.25)	0.15	0.70	1.17 (0.53-2.60)
	Total	0.77	0.38	1.30 (0.73-2.32)	< 0.01	0.94	1.02 (0.64-1.63)	0.45	0.50	1.19 (0.71-1.99)	2.43	0.12	0.64 (0.36-1.13)

χ^2 = Pearson's chi-square test

Discussion

The aim of this study was to characterize MSK-I in elite athletes treated at the UCAD physiotherapy service of the Chilean High-Performance Center. It was found that the approximate rate of MSK-I reflects a significant frequency of injury events in the population studied during 2023. Similarly, the medical records reviewed demonstrated greater than one injury per athlete during this period. The prevalence of injuries in various sports modalities among young Chilean university students had been described previously (Danes Daetz et al., 2020). To our knowledge, this is the first study to characterize injuries in elite Chilean athletes.

Characteristics of MSK-I

The present study also observed a higher frequency of injuries in men, mainly associated with overuse mechanisms during training, affecting mainly the lower extremities and with a predominance of muscle involvement. This coincides with what has been described in high-performance athletes, in whom a higher frequency of injuries has been identified in men, with a predominance of muscle tissue involvement (Gimigliano et al., 2021; Katagiri et al., 2023). Although the findings of this study coincide with reports on overuse injuries, which are more frequent during training and represent a significant proportion of total injuries, there are also studies that indicate that traumatic injuries are more common during competition, both in terms of frequency and severity, which was not observed in the present study (Geßlein et al., 2020; Jacobsson et al., 2013; Lambert et al., 2024; Lystad et al., 2020). These differences may be due to different training protocols and physical loads, as well as the methods used to collect injury data. In addition, cultural and communication factors may play an important role in injury reporting, contributing to underreporting of mild or subclinical cases.

Sports Category

When analyzing the athletes' sports category, a higher frequency of MSK-I was observed in combat sports, with taekwondo and wrestling having the highest percentage of admissions. Combat sports involve striking, grappling or a combination of both, making them particularly susceptible to a higher number of injuries that keep athletes away from competition and training (Lystad et al., 2021). In addition, a higher risk of injury has been described in association with the sudden weight loss experienced by these athletes in the stages leading up to competition (Turnagöl et al., 2021). However, the correct use of protective equipment, together with compliance with regulations aimed at safeguarding health, has been shown to significantly reduce the incidence of injuries in combat sports (Štyriak et al., 2023).

Ball sports had the second highest frequency of MSK-I, with handball recording the highest proportion of admissions. Biomechanical factors such as jumping, landing and contact with opponents, combined with inappropriate movements, overuse or insufficient preparation, have been described as playing a key role in the incidence of injuries in these disciplines (Milić et al., 2025).

In strength and endurance disciplines, speed skating was the sport with the most records, while in artistic and precision sports, artistic gymnastics had the highest number of entries. The physical demands of these categories, combined with technical complexity and training frequency, are responsible for the MSK-I that occur in these disciplines, both due to overuse and trauma (Gerbino, 2022; Kara et al., 2023; Milas et al., 2025; Ziegler et al., 2025).

The diversity of MSK-I characteristics observed in this study indicates the need to implement specific preventive strategies tailored to each group.

Body segment

Analysis of admission records showed that the knee was the body segment with the highest frequency of MSK-I, followed by the shoulder, leg/Achilles tendon region, ankle, and thigh. These findings are consistent with those reported by Lambert et al. (2024), who identified a higher prevalence of knee and shoulder injuries in Olympic athletes, which tend to occur during training or in periods close to competition (Lambert et al., 2024). These results reinforce the importance of focusing preventive and therapeutic interventions on the body segments that appear most frequently in clinical records, associated with the specific biomechanical demands of the sports analysed.

Risk of injury

The risk of injury in elite athletes is multifactorial and depends both on the characteristics of the sport itself and on individual factors relating to the athlete and the environment (Esmaeili et al., 2018; Panel, 2016; Prieto-González et al., 2021). The results of this study suggest a trend toward a lower risk of injury during competitions in artistic and precision sports, while in combat sports there is a higher risk of traumatic injuries in both male and female. In ball sports, female have a higher risk of injury during competition, while male have a higher risk of overuse injuries. In strength and endurance sports, the risk of overuse injuries predominates, a pattern that is also observed in general and with a particular concentration in the lower extremities of male. It is important to consider that the experience of injury in elite athletes is individual and dynamic, and may be perceived as a simple pause in their sporting career or, over time, become a more intense experience, with positive or negative connotations (Reussner et al., 2024). Currently, the integration of training protocols and personalised preventive measures is being promoted, highlighting the fundamental role of comprehensive biopsychosocial strategies in promoting the overall well-being of athletes, prioritising quality of life as a key component in injury management (Aldanyowi & AlOraini, 2024). These results confirm the multifactorial nature of injury risk, highlighting the interaction between the demands of each sport category and the individual characteristics of the athlete, according to specific patterns depending on the sport category and gender. This underscores the need to monitor training load and promote personalised protocols and comprehensive preventive strategies from a perspective that optimises the athlete's well-being and performance.

Limitations

This research was not without limitations. First, it should be noted that the records only include admissions to the UCAD physiotherapy service, so it is possible that some data was not considered, given that some athletes may have received rehabilitation at other health centers. Therefore, a longitudinal surveillance system is required to record injuries that receive treatment outside the Center. Also, some injuries may have been underdiagnosed or unreported if athletes concealed their symptoms in order to continue training or competing, so periodic assessments are necessary to detect risks or early signs of injury. Finally, the analysis by sport category reflects only clinical admissions and does not reflect the injury rate per sport. Future studies should aim to detect exposure to training and competition, allowing for a comparison of actual risks between disciplines.

Relevance

The findings of this study provide relevant information for optimizing clinical decision-making by the medical team in their recommendations to athletes and those around them (coaches, physical trainers). It also highlights the need to establish agreements on the methodology of injury surveillance programs in order to generalize recommendations for different sports disciplines.

It would be important for future research to consider conducting longitudinal studies to assess the incidence of injuries over several seasons and provide evidence on the effectiveness of sport- and age-specific prevention protocols. These findings can serve as a basis for sports policies that seek to support structured injury prevention initiatives, ongoing training for coaches, and standardised clinical follow-up protocols within sports clubs and federations.

Conclusions

The prevalence of MSK-I was considerable, exceeding an average of one injury per athlete. Men accounted for a higher proportion of cases, with overuse injuries during training predominating and mainly affecting the lower extremities and muscle tissue. Combat sports recorded the highest number of clinical admissions, with the knee being the most affected segment, and were associated with a higher risk of traumatic injuries. In ball sports, women showed a higher risk of injury in competition, while overuse predominated in men. In strength and endurance sports, the main risk was overuse, especially in the lower limbs of men. These results reinforce the multifactorial nature of injury risk in high performance and underscore the importance of preventive strategies tailored to each discipline, along with

the need for longitudinal surveillance systems that allow for accurate assessment of exposure to training and competition.

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