

# Profile and occupational impact of ankle sprains in a Portuguese police unit

## Abstract

**Introduction:** Ankle sprains are among the most frequent musculoskeletal injuries in tactical populations, particularly during structured physical training. Although their epidemiology is well established in military cohorts, data integrating imaging patterns and occupational impact in active-duty law enforcement personnel remain limited. This study aimed to characterize the epidemiology, structural injury patterns, and work incapacity associated with ankle sprains in a specialized police unit.

**Methods:** A retrospective observational study was conducted using clinical and occupational health records from the Special Police Unit Intervention Corps of the Portuguese Public Security Police between January 1, 2018, and December 31, 2025. Cases with a clinical diagnosis of ankle sprain were included. Demographic characteristics, professional rank, injury context, imaging findings, and duration of medically certified work incapacity were collected. Imaging findings were categorized using a hierarchical structural classification (fracture, combined ligament injury, isolated ligament injury, tendon pathology and no imaging). Descriptive statistics and non-parametric inferential tests were applied.

**Results:** A total of twenty-eight ankle sprains were identified, all in male officers (mean age 37.0 years). Most injuries occurred during physical training (85.7%), with 14.3% sustained during operational duty. Imaging was performed in 53.6% of cases. The anterior talofibular ligament was involved in 32.1% of cases. Isolated ligament injuries accounted for 21.4%, combined ligament injuries for 14.3%, tendon pathology for 7.1%, and fractures for 10.7%. Work incapacity ranged from 0 to 251 days, with a median of

22.5 days (IQR 0–65.7) and mean of 44.3 days. Incapacity duration differed significantly across structural categories ( $H = 13.80$ ,  $p = 0.009$ ), with combined ligament injuries (median 119.5 days) and fractures (median 90 days) demonstrating the longest absence. Cases undergoing imaging showed significantly longer incapacity than non-imaged cases ( $p = 0.004$ ).

**Conclusion:** In this specialized police unit, ankle sprains were predominantly training-related and frequently involved the lateral ligament complex. Greater structural complexity was significantly associated with prolonged work incapacity. These findings highlight the occupational impact of ankle sprains in law enforcement and support the implementation of targeted prevention strategies and structured rehabilitation pathways to optimize return-to-duty timelines.

**Keywords:** ankle sprain, occupational injury, police officers, ligament injury, return to duty, work disability

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**Abbreviations:** ATFL, anterior talofibular ligament; MRI, magnetic resonance imaging; IQR, interquartile range

## Introduction

Musculoskeletal injuries represent a substantial occupational burden in tactical professions, including law enforcement and military personnel. In police populations, injury surveillance studies consistently report high musculoskeletal injury incidence during structured physical training, with rates ranging from 1.67 to 4.24 per 1000 training days and prevalence up to 24.5% during academy training.<sup>1,2</sup> Injury profiling studies in police cadets further demonstrate that lower-limb injuries account for approximately 25–41% of reported cases and represent a major source of training interruption.<sup>3,4</sup> More recent analyses confirm that both mounted and non-mounted police officers sustain significant lower- extremity injury burden during operational duties and training exposure.<sup>5</sup> Specialist policing units demonstrate comparable injury patterns, with structured conditioning identified as a major exposure context.<sup>6</sup> Comparable epidemiological patterns are observed in military

populations. Injury profiling of law enforcement recruits during academy training shows parallels with military recruit cohorts.<sup>7</sup> In the U.S. military, ankle sprain is among the most frequently diagnosed musculoskeletal injuries.<sup>8</sup> Systematic reviews of foot and ankle injuries during military training confirm high incidence rates across multinational cohorts.<sup>9</sup> Overuse and acute traumatic mechanisms coexist in combat training environments, contributing substantially to medical attrition.<sup>10–13</sup>

Ankle sprain represents a particularly relevant injury phenotype in tactical populations. Large- scale military epidemiological analyses demonstrate high incidence rates, substantial healthcare utilization, and significant operational impact.<sup>14</sup> Recurrent injury and fracture are commonly associated with ankle sprains, further amplifying functional limitation and duty restriction.<sup>15</sup> Macro traumatic fractures of the ankle-foot complex in military tactical athletes have been shown to produce measurable operational burden and prolonged duty limitation.<sup>16</sup> Systematic analyses in military Special Operations Forces reinforce the high musculoskeletal injury burden in high-readiness units.<sup>17</sup>

Neuromuscular asymmetry and functional performance deficits have been identified as modifiable risk factors for ankle sprain in military recruits.<sup>18</sup> Furthermore, prophylactic ankle bracing has demonstrated effectiveness in reducing ankle sprain incidence in military settings.<sup>19</sup> Despite this extensive military and recruit-focused literature, there remains limited evidence specifically characterizing ankle sprains in experienced active-duty law enforcement personnel, particularly regarding imaging-defined structural patterns and their association with work incapacity. The primary aim of the present study was therefore to characterize the epidemiology, structural injury patterns, and work incapacity associated with ankle sprains in an active-duty specialized police unit over an eight-year period. A secondary objective was to explore the relationship between hierarchical structural injury classification and duration of occupational absence in this operational context.

### Materials and methods

A retrospective observational study was conducted through analysis of clinical and occupational health records from the Special Police Unit Intervention Corps of the Portuguese Public Security Police between January 1, 2018, and December 31, 2025. All officers who sought medical care during the study period and received a clinical diagnosis of ankle sprain were eligible. Diagnosis was established by a unit physician based on clinical examination, with imaging performed when clinically indicated. Cases with incomplete medical records were excluded. Data were extracted from medical and occupational health records using a standardized form. Collected variables included age, sex, professional rank, injury context, imaging findings, and duration of medically certified work incapacity. Professional rank was categorized as Police Officer, Senior Police Officer, Sergeant, or Senior Sergeant. For statistical analysis, ranks were further grouped into operational ranks (Police Officer and Senior Police Officer) and command ranks (Sergeant and Senior Sergeant). Injury context was classified as operational duty or physical training. Imaging findings were obtained from official radiology reports. To ensure mutually exclusive groups, a hierarchical structural classification was applied prioritizing fracture, combined ligament injury, isolated ligament injury, tendon pathology, and cases without imaging. The primary outcome was temporary work incapacity, defined as total days of medically certified absence from duty. Data were organized in Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and analyzed using IBM Statistical Package for the Social Sciences Statistics version 31 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized using mean and standard deviation or median and interquartile range as appropriate. Categorical variables were presented as frequencies and percentages. Due to non-normal distribution and small sample size, non-parametric tests were used. Mann-Whitney U tests were applied for two-group comparisons and Kruskal-Wallis tests for comparisons across multiple groups. Statistical significance was set at  $p < 0.05$ . The study was authorized by the Training Directorate of the Portuguese Public Security Police. As this was a retrospective analysis of anonymized data, formal ethics committee approval and informed consent were not required.

### Results

A total of twenty-eight ankle sprain cases were identified between January 1, 2018, and December 31, 2025. Demographic, occupational, and annual distribution characteristics are summarized in Table 1. All affected individuals were male, 28 (100%). Age ranged from 28 to 59 years, with a mean of 37.0 years and a median of 35.6 years. Most cases involved Senior Police Officers, 14 (50.0%), followed by Police Officers, 11 (39.3%), Sergeants, 2 (7.1%), and Senior Sergeant,

1 (3.6%). Most injuries occurred during physical training, 24 (85.7%), whereas 4 (14.3%) occurred during operational duty. The number of cases ranged between 2 and 4 per year from 2018 to 2025, with the highest frequency observed in 2025, 7 (25.0%).

**Table 1** Demographic, occupational, and annual distribution characteristics of ankle sprain cases (N = 28)

Variable	Category	N (%)
Sex	Male	28 (100.0)
Rank	Police Officer	11 (39.3)
	Senior Police Officer	14 (50.0)
	Sergeant	2 (7.1)
	Senior Sergeant	1 (3.6)
Context of injury	Physical training/activity	24 (85.7)
	Operational duty	4 (14.3)
Year of injury	2018	4 (14.3)
	2019	3 (10.7)
	2020	4 (14.3)
	2021	2 (7.1)
	2022	3 (10.7)
	2023	3 (10.7)
	2024	2 (7.1)
	2025	7 (25.0)

N, number of cases; %, percentage of total cohort

Imaging examinations were performed in 15 (53.6%) cases, while 13 (46.4%) cases were managed clinically without imaging. Detailed imaging findings are summarized in Table 2. Anterior talofibular ligament (ATFL) involvement was identified in 9 (32.1% of the total cohort; 60.0% of imaged cases). Based on imaging-defined structural classification, isolated ligament injuries were documented in 6 (21.4%) cases, combined ligament injuries in 4 (14.3%) cases, tendon pathology in 6 (21.4%) cases, and fractures in 3 cases (10.7%). As multiple structural abnormalities were observed in some individuals, category totals may exceed the number of imaged cases.

**Table 2** Detailed imaging findings in ankle sprain cases

Imaging finding category	Specific imaging finding	N (%)
No imaging performed	—	13 (46.4)
Isolated ligament injuries	ATFL (complete rupture)	2 (7.1)
	ATFL (partial rupture)	3 (10.7)
	Anterior tibiofibular ligament rupture	1 (3.6)
	Deltoid ligament (partial rupture)	1 (3.6)
Combined ligament injuries	ATFL + deltoid ligament (partial ruptures)	2 (7.1)
	ATFL + calcaneofibular ligament (partial ruptures)	1 (3.6)
	ATFL + anterior tibiofibular ligament (partial ruptures)	1 (3.6)
Tendon pathology	Peroneal tendons (longus and brevis) tenosynovitis	2 (7.1)
	Posterior tibial tendon tenosynovitis	1 (3.6)
	Flexor hallucis longus tenosynovitis	1 (3.6)
	Posterior tibial tendon (partial rupture)	1 (3.6)
	Achilles tendon tendinopathy	1 (3.6)
Fractures	Malleolar fracture	2 (7.1)
	Calcaneal fracture	1 (3.6)

ATFL, anterior talofibular ligament; N, number of cases; %, percentage of total cohort.

Note: Percentages refer to the total cohort (N = 28). Multiple structural abnormalities may be present in individual cases; therefore, percentages may exceed 100%.

The duration of medically certified work incapacity ranged from 0 to 251 days. The overall median duration was 22.5 days (IQR: 0-65.7), with a mean of 44.3 days. Of the 28 cases, 13 (46.4%) resulted in no work absence, whereas 15 (53.6%) required at least one day of leave. Work incapacity according to hierarchical structural classification is

presented in Table 3. A statistically significant difference in incapacity duration was observed across structural categories ( $H = 13.80, p = 0.009$ ), with combined ligament injuries and fractures demonstrating the longest median absence durations.

**Table 3** Work incapacity by hierarchical structural category

Category	N (%)	Median (IQR)	Range (min-max)	H value	p-value
No imaging	13 (46.4)	0 (0-20)	0-90	13.80	0.009
Isolated ligament injury	6 (21.4)	22.5 (0-45)	0-60		
Combined ligament injury	4 (14.3)	119.5 (94-136.5)	83-139		
Isolated tendon pathology	2 (7.1)	26 (7-45)	7-45		
Fracture	3 (10.7)	90 (60-251)	60-251		

N, number of cases; %, percentage of total cohort; IQR, interquartile range in days. Kruskal-Wallis test was used to compare incapacity duration across structural categories.

Comparisons according to occupational and clinical factors are presented in Table 4. No statistically significant difference in work incapacity duration was observed between operational and command ranks (Mann-Whitney  $U = 23.5, p = 0.290$ ). Similarly, no significant difference was identified between injuries sustained during operational

duty and those occurring during physical training ( $U = 27.0, p = 0.151$ ). However, incapacity duration was significantly higher in cases in which imaging was performed compared with those managed without imaging ( $U = 159.5, p = 0.004$ ).

**Table 4** Work incapacity duration according to occupational and clinical factors

Variable	Group	N (%)	Median (IQR)	U value	p-value
Rank category	Operational ranks	25 (89.3%)	22 (0-83)	23.5	0.29
	Command ranks	3 (10.7%)	22 (0-22)		
Injury context	Physical training	24 (85.7%)	22 (0-83)	27	0.151
	Operational duty	4 (14.3%)	42 (12-139)		
Imaging status	Imaging performed	15 (53.6%)	45 (23-105)	159.5	0.004
	No imaging	13 (46.4%)	0 (0-12)		

N, number of cases; %, percentage of total cohort; IQR, interquartile range in days. The Mann-Whitney U test was used for comparisons between groups.

## Discussion

This retrospective study provides a structured characterization of ankle sprains in an active-duty police unit, integrating injury context, imaging patterns, and work incapacity over an eight-year period. The predominance of injuries during physical training (85.7%) is consistent with findings in police and tactical populations.<sup>1-7</sup> Specialist policing units and recruit cohorts consistently report structured physical conditioning as a primary context for musculoskeletal injury exposure. Military literature mirrors this pattern. Large epidemiological datasets identify ankle sprains among the most prevalent musculoskeletal injuries in service members.<sup>8</sup> Systematic reviews confirm the high frequency of ankle injuries during military training environments.<sup>9,14</sup> Musculoskeletal injuries are major contributors to lost-duty days in military and specialist tactical populations.<sup>11,16-18</sup> These findings underscore the broader operational burden associated with lower-limb trauma in tactical professions. Structural severity was significantly associated with differences in incapacity duration ( $H = 13.80, p = 0.009$ ), supporting the functional relevance of imaging-defined injury complexity. In addition, cases undergoing imaging demonstrated significantly longer incapacity duration compared with those managed without imaging ( $U = 159.5, p = 0.004$ ). A progressive increase in median work incapacity duration was observed across hierarchical injury categories. Isolated ligament injuries were associated with shorter absence periods, whereas combined ligament injuries and fractures were associated with substantially prolonged work incapacity.

No significant differences in incapacity duration were observed between operational and command ranks or between injuries sustained during operational duty and those occurring during physical training. These findings suggest that, within this cohort, occupational role and injury context were not independently associated with prolonged absence. However, the small number of command-rank officers and operational-duty injuries may have limited statistical power to detect subtle differences. The observed gradient between structural severity and incapacity duration should be interpreted cautiously. Imaging was not performed in all cases, and milder injuries with rapid clinical resolution may have been less likely to undergo radiological evaluation. This may have influenced structural classification and contributed to the association observed. Population-level military data demonstrate that fractures frequently coexist with ankle sprains and are associated with increased healthcare utilization, recurrence risk, and prolonged duty restriction.<sup>16,17</sup> Although fracture cases were limited in the present cohort, the incapacity burden observed appears consistent with these reports. Rehabilitation timing and structure are relevant considerations. In military populations, ankle sprains are associated with recurrent injury and increased healthcare utilization.<sup>16,21</sup> Structured and progressive rehabilitation protocols have demonstrated improved functional recovery and return-to-duty outcomes in active-duty personnel.<sup>19</sup> Therapeutic exercise interventions reduce recurrence and improve neuromuscular control following ankle sprain.<sup>20</sup> Although rehabilitation pathways were not assessed in this cohort, early structured rehabilitation may contribute to minimizing prolonged occupational absence.

ATFL involvement in this cohort aligns with the well-established epidemiology of inversion-related ankle trauma in tactical settings.<sup>8</sup> Systematic review data specific to military ankle sprain further support the predominance of lateral ligament complex injuries in these populations.<sup>14</sup> Preventive strategies also warrant consideration. Neuromuscular training programs have been shown to reduce ankle sprain risk in high-exposure populations.<sup>15</sup> Prophylactic ankle bracing has demonstrated effectiveness in reducing ankle sprain incidence in military personnel.<sup>22</sup> In addition, equipment-related factors may merit evaluation. Operational footwear, particularly high-cut tactical boots, may influence ankle mechanics and proprioceptive input, although current evidence remains inconclusive. The prolonged absence observed in combined ligament injuries may not be solely attributable to structural severity. In occupational settings, return-to-duty timelines can be influenced by administrative procedures and the criteria used for medical clearance, in addition to clinical recovery. This study is limited by its retrospective design, small sample size, and lack of standardized imaging protocols. Imaging was not performed in all cases, potentially influencing structural categorization. Recurrence and long-term functional outcomes were not assessed. In addition, important individual risk factors-including body mass index, previous ankle sprain history, baseline physical conditioning, and training load-were not available. These factors limit risk stratification and preclude causal inference.

## Conclusion

In this study of active-duty police officers, ankle sprains were predominantly training-related and most frequently involved the lateral ligament complex. Structural severity was associated with progressively longer work incapacity, particularly in cases involving combined ligament injuries and fractures. Although many injuries resulted in no absence from duty, a relevant subset led to prolonged work restriction, highlighting the occupational impact of more complex structural patterns. These findings underscore the importance of early identification of injury severity, structured rehabilitation pathways, and targeted preventive strategies within police units. Implementing evidence-informed return-to-duty criteria and injury prevention programs may help reduce lost workdays and preserve operational readiness in tactical law enforcement settings.

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## Conflicts of interest

The authors declares that there are no conflicts of interest.

## References

- Lyons K, Radburn C, Orr R, et al. A profile of injuries sustained by law enforcement officers: a critical review. *Int J Environ Res Public Health*. 2017;14(2):142.
- Murphy MC, George HA, Naqi M, et al. Musculoskeletal injury epidemiology in law enforcement and firefighter recruits during physical training: a systematic review. *BMJ Open Sport Exerc Med*. 2022;8(1):e001289.
- Dhahbi W, Ben Saad H, Dergaa I, et al. Injury profiling in male police cadets during initial training phase: a retrospective cohort study. *Am J Mens Health*. 2024;18(6):15579883241304584.
- Merrick N, Hart NH, Mosler AB, et al. Injury profiles of police recruits undergoing basic physical training: a prospective cohort study. *J Occup Rehabil*. 2023;33(1):170–178.
- Orr R, Canetti EFD, Pope R, et al. Characterization of injuries suffered by mounted and non-mounted police officers. *Int J Environ Res Public Health*. 2023;20(2):1144.
- Larsen B, Aisbett B, Silk A. The injury profile of an Australian specialist policing unit. *Int J Environ Res Public Health*. 2016;13(4):370.
- Maupin DJ, Canetti EFD, Schram B, et al. Profiling the injuries of law enforcement recruits during academy training: a retrospective cohort study. *BMC Sports Sci Med Rehabil*. 2022;14(1):136.
- Waterman BR, Owens BD, Davey S, et al. The epidemiology of ankle sprains in the United States. *J Bone Joint Surg Am*. 2010;92(13):2279–2284.
- Fenn BP, Song J, Casey J, et al. Worldwide epidemiology of foot and ankle injuries during military training: a systematic review. *BMJ Mil Health*. 2021;167(2):131–136.
- Schwartz O, Malka I, Olsen CH, et al. Overuse injuries in the IDF's combat training units: rates, types, and mechanisms of injury. *Mil Med*. 2018;183(3-4):e196–e200.
- Havenetidis K, Kardaris D, Paxinos T. Profiles of musculoskeletal injuries among Greek army officer cadets during basic combat training. *Mil Med*. 2011;176(3):297–303.
- Schwartz O, Kanevsky B, Kutikov S, et al. Medical attrition from commanders training in the Israeli Defense Forces (IDF): a cross-sectional study on 23,841 soldiers. *Mil Med*. 2018;183(9-10):e363–e369.
- Yavnai N, Bar Sela S, Pantanowitz M, et al. Incidence of injuries and factors related to injuries in combat soldiers. *BMJ Mil Health*. 2021;167(6):418–423.
- Goodrich E, Morris BL, Hermanns C, et al. Epidemiology of ankle sprain in the military: a systematic review of literature. *Foot Ankle Orthop*. 2022;7(1):2473011421S00209.
- Shenhar M, Dar G, Finestone AS, et al. Performance asymmetry, the risk for ankle sprain, and the influence of an intervention program in new male infantry recruits. *J Clin Med*. 2025;14(19):6887.
- Rhon DI, Greenlee TA, Cook CE, et al. Fractures and chronic recurrence are commonly associated with ankle sprains: a 5-year population-level cohort of patients seen in the US Military Health System. *Int J Sports Phys Ther*. 2021;16(5):1313–1322.
- Fraser JJ, Ryans CP, MacGregor AJ, et al. Macrotraumatic fractures of the multisegmented ankle-foot complex in military tactical athletes: a cohort study. *J Am Podiatr Med Assoc*. 2023;113(1):22–114.
- Stannard J, Fortington L. Musculoskeletal injury in military special operations forces: a systematic review. *BMJ Mil Health*. 2021;167(4):255–265.
- Seo JH, Lee JS, Seo JH, et al. Functional recovery in active-duty military personnel following a novel, self-applicable, stepwise, target-oriented protocol for lateral ankle sprain: a prospective cohort study. *Clin Orthop Surg*. 2025;17(4):678–687.
- Foster KS, Greenlee TA, Fraser JJ, et al. The influence of therapeutic exercise after ankle sprain on the incidence of subsequent knee, hip, and lumbar spine injury. *Med Sci Sports Exerc*. 2023;55(2):177–185.
- Schwartz O, Bulis S, Olsen CH, et al. The association between history of an ankle sprain and traumatic meniscal injury among infantry combat soldiers in the Israeli Defense Forces: a historical cohort study. *Mil Med*. 2020;185(5-6):e748–e754.
- Newman TM, Gay MR, Buckley WE. Prophylactic ankle bracing in military settings: a review of the literature. *Mil Med*. 2017;182(3):e1610–e1615.