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Citation for published version:

Edouard, P, Mosser, C, Chapon, J, Depiesse, F & Palmer, D 2024, 'Understanding the first injury in athletics and its effect on dropout from sport: An online survey on 544 high-level youth and junior athletics (track and field) athletes', *BMJ open sport & exercise medicine*, vol. 10, no. 1, pp. e001767. <https://doi.org/10.1136/bmjsem-2023-001767>

Digital Object Identifier (DOI):

[10.1136/bmjsem-2023-001767](https://doi.org/10.1136/bmjsem-2023-001767)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Publisher's PDF, also known as Version of record

Published In:

BMJ open sport & exercise medicine

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Understanding the first injury in athletics and its effect on dropout from sport: an online survey on 544 high-level youth and junior athletics (track and field) athletes

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To cite: Edouard P, Mosser C, Chapon J, *et al.* Understanding the first injury in athletics and its effect on dropout from sport: an online survey on 544 high-level youth and junior athletics (track and field) athletes. *BMJ Open Sport & Exercise Medicine* 2024;**10**:e001767. doi:10.1136/bmjsem-2023-001767

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/bmjsem-2023-001767>).

Accepted 12 January 2024



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ABSTRACT

Objective To describe the first injury and to investigate whether it plays a role in altering athletics' sustainable practice.

Methods We conducted a cross-sectional study using an exploratory survey on the first injury and its consequences on athletics practice. In 2021, we asked all high-level athletes licensed with the French Federation of Athletics (FFA) under 18 years, under 20 years and under 23 years categories between 2007 and 2021.

Results Out of 6560 emails sent by FFA, 544 athletes responded, and 93.6% (n=510) reported experiencing at least one injury during their career. The first injury occurred at a mean age of 17.5±3.3 years after 6.1±4.1 years of athletics practice. The main locations of the first injury were the posterior thigh (28.9%), the ankle (16.5%) and the knee (12.6%), and the principal reported injury types were muscle (37.7%), tendon (17.5%) and ligament (15.5%). More than a third of injured athletes (36.7%) reported experiencing ongoing symptoms or sequelae after their first injury, and about half (48.5%) experienced recurrences. About 20% had stopped athletics at the time of the survey, with injury problems the primary cause of athletes dropping out (46.2%), including the first injury (9.4%).

Conclusions Injuries played an important role in altering sustainable athletics practice, with injury accounting for about 50% of all reported dropouts and the first injury accounting for about 10% of all reported causes. Our results provide evidence to target the prevention of the first injury, which could be considered the origin of the 'vicious circle' of injuries.

INTRODUCTION

Training and competing in athletics leads to a risk of injury,¹ which goes against the beneficial health effects sought by practising sport,² and can also alter athletics performance.³⁻⁶ Developing injury risk reduction strategies is thus needed to allow sustainable and healthy athletic practice and the best performance level. These should be based

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ The injury risk is associated with training and competing in athletics (track and field).
- ⇒ A major reported injury risk factor is a history of previous injuries.
- ⇒ Injuries can cause an interruption of sports, subsequent and/or recurrent injuries and ongoing symptoms or sequelae, which can result in the decision to dropout of sport.
- ⇒ Injuries could play a role in this difficult transition between youth and junior to senior athletes by altering individual progression and/or causing dropout from sports.

WHAT THIS STUDY ADDS

- ⇒ Of French high-level athletes, 94% reported experiencing at least one injury during their career.
- ⇒ Injuries played an important role in altering the sustainable athletics practice, with about 50% of all reported causes for dropout.
- ⇒ The first injury counted for about 10% of all reported causes of athletics dropout.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ The present results provide arguments about the fundamental need to develop, improve and implement injury risk reduction strategies in athletics. The first injury could be considered the origin of the 'vicious circle' of injuries. Our study provide important information to help target the prevention of this first injury. This could include focussing on and targeting specific injury characteristics and athletics disciplines.

on understanding the extent of the problem and the factors leading to injuries.⁷ A major reported injury risk factor is a history of previous injuries.⁸⁻¹² It could be relevant to understand the origin of the problem better: the very first injury. It could indeed be of great interest to help better target injury risk

reduction strategies and to help avoid the ‘vicious circle’ of injuries from a primary prevention perspective.

In addition, when they occur, injuries can cause an interruption of sports, subsequent and/or recurrent injuries and ongoing symptoms or sequelae, which can result in the decision to dropout from sport^{13–16} with health-related consequences due to the cessation of physical activities and sports. From the performance point of view, it has been reported that the best athletics youth and junior athletes do not always transfer to become the best at a senior level; conversely, the best-performing senior athletes were rarely the best youth and junior athletes.^{17 18} This is also true in other sports.¹⁹ Injuries could play a role in this difficult transition between youth and junior to senior athletes by altering individual progression and/or causing dropout from sports.^{6 14 16} There is, however, little data reporting the magnitude of sports dropout of high-performing youth athletes,¹⁹ and specifically in athletics, as well as the role of injuries as a cause of athletics dropout,¹³ and thus altering the sustainable practice of athletics. So, there is a need for objective data to help us understand whether injuries play a role in the failure of athletics sustainable practice.

In this context, we aimed to describe the first injury and investigate whether it plays a role in altering the sustainable practice of athletics.

METHODS

Study design and overall procedure

We conducted a cross-sectional study using an exploratory survey on the first injury and the consequences on athletics practice. The study included high-level athletes in the categories of under 18 years (U18), under 20 years (U20) and under 23 years (U23) between 2007 and 2021, licensed with the French Federation of Athletics (FFA, <http://www.athle.fr>). The study was reviewed and approved by the Saint-Etienne University Hospital Ethical Committee (Institutional Review Board: IORG0007394; IRBN672021/CHUSTE). All participants, or their parents when under 18 years old, were informed about the study aim and modalities by an information letter. No signed informed consent was required by the Ethical Committee.

Population

The study used a total population design in which eligible participants were all athletes licensed at the FFA and listed by the French Ministry of Sports for being high-level athletes (eg, corresponding to national or international levels and/or selection in the French national team) in the categories of U18, U20 or U23 from 2007 to 30 April 2021.

Patient and public involvement

The public was involved in the study development as two sports medicine physicians specialised in athletics (PE and FD) and one former high-level U18 and U20 athlete

(JC) were investigators and developed the study procedure.

Equity, diversity and inclusion statement

All athletes licenced at the FFA in categories under 18 years, under 20 years and under 23 years within the 10 previous years were eligible for this study without any restriction based on sex, race/ethnicity/culture, socioeconomic level or representation from marginalised groups. Apart from sex and age, no other sociodemographics were collected from the participants and considered in the analysis and interpretation of results.

The research team included two women and three men, two junior researchers, two senior researchers and one senior physician, from various disciplines (sports medicine, sports science, physical medicine and rehabilitation) and two European countries (France and the UK).

Definitions and data collection

All data were collected by an online survey developed in Google Forms (Google) (online supplemental data). Two sports medicine physicians specialised in athletics (PE and FD), one medical student (CM) and one former high-level U18 and U20 athlete (JC) developed the survey.

The survey included questions on the athlete’s personal information (sex, date of birth, body mass and height), the current athletics practice (date of athletics practice start, current practice and cause of dropout if they stopped athletics) and the first injury (date, athletics practice at the time of the first injury, injury location, injury type, injury mode of onset, consequence of the first injury). An injury was defined as any physical pain or lesion of the musculoskeletal system, traumatic or overuse, suffered by an athlete during athletic training or competition, regardless of the consequences with regard to the absence of the athlete from competitions or training or whether they receive medical care or not²⁰; the definition was presented in the survey. A recurrent injury was defined as an injury of the same location and type.²⁰ Ongoing symptoms or sequelae were defined as any symptoms or negative physical or psychological occurring after the first injury. To describe the first injury, we used the classifications for location, type, mode of onset and severity described in the consensus statement for epidemiological studies in athletics.²⁰ Location was grouped into head/trunk upper extremities and was detailed for the lower extremities.²¹ The type was grouped according to the type of tissue: fracture, bone stress injuries, joint, ligament, muscle tendon growth related and other.²¹ The survey is available in online supplemental material.

The survey was anonymous. This questionnaire was sent by FFA to the eligible population on 30 April 2021, and opened for 2 months until 30 June 2021.

Table 1 Characteristics of athletes participating in the present study and causes of athletics dropout

| | Total | Athletes who dropped out of athletics | Athletes still participating in athletics | P value |
|---|-------------------------------|---------------------------------------|---|---------|
| n (%) | 544 (100.0) | 106 (19.5) | 438 (80.5) | |
| Athletes' characteristics | | | | |
| W/M/O (n (%)) | 314 (57.7)/229 (42.1)/1 (0.2) | 69 (65.1)/37 (34.9)/0 (0.0) | 245 (56.0)/192 (43.8)/1 (0.2) | 0.091 |
| Age (years) (mean SD) | 23.6±4.7 | 26.2±4.5 | 23.0±4.6 | 0.000 |
| Height (cm) (mean SD) | 172.9±18.5 | 170.2±24.8 | 173.5±16.5 | 0.396 |
| Body mass (kg) (mean SD) | 65.7±11.3 | 66.5±10.6 | 65.5±11.5 | 0.103 |
| Age of athletics start (years) (mean SD) | 11.3±3.9 | 12.0±4.1 | 11.2±3.8 | 0.054 |
| Reported experiencing at least one injury | 509 (93.4) | 101 (95.3) | 408 (93.2) | 0.884 |
| Cause of athletics dropout | | | | |
| Injuries | | 49 (46.2) | | |
| including the first injury | | 10 (9.4) | | |
| including injuries in athletics | | 37 (34.9) | | |
| including injuries outside of athletics | | 2 (1.9) | | |
| Other health problems | | 6 (5.7) | | |
| Lack of time | | 33 (31.1) | | |
| including studies or work | | 25 (23.6) | | |
| including family | | 5 (4.7) | | |
| including other | | 3 (2.8) | | |
| Lack of motivation | | 7 (6.6) | | |
| Change living location | | 5 (4.7) | | |
| Stop sporting career | | 4 (3.8) | | |
| Others | | 2 (1.9) | | |

M, men; O, other gender; W, women.

Statistical analyses

We performed a descriptive analysis using frequency with percentages for categorical variables and mean with SDs (\pm SD) for continuous variables. We then compared categorical variables using the χ^2 test and continuous variables using the Student's t-test between athletes who dropped out of athletics and those still practising athletics. Analyses were performed using Excel (Office, Microsoft, 2021). Significance was accepted at $p < 0.05$.

RESULTS

Population

The total population of eligible participants were 8238 athletes. Among them, 1708 athletes (20.7%) were no longer licensed at the FFA for more than 3 years, meaning they did not continue practising athletics. As requested by the French law, their email addresses were deleted from the FFA system. Thus, the FFA sent 6530 emails to the eligible population on 30 April 2021. A total of 544 (8.3%) answers were received and analysed. The characteristics of the participating athletes are presented in [table 1](#).

The first injury

Among the 544 athletes participating in this study, 509 (93.6%) reported experiencing at least one injury during their career. The first injury reported by these high-level athletes occurred at a mean age of 17.5 ± 3.3 years after 6.1 ± 4.1 years of athletics practice ([table 2](#)). Athletes reporting their first injury mainly practised jumps (20.8%), middle and long distances (20.4%) and sprints (19.8%). On average, athletes undertook 8.1 ± 3.7 hours of training per week. About a third (32.0%) also practised another sport besides athletics.

The main locations of the first injury were the posterior thigh (28.9%), followed by the ankle (16.5%) and the knee (12.6%) ([tables 2 and 3](#), and online supplemental tables 4 and 5). The most frequently reported injury types were muscle (37.7%), followed by tendon (17.5%) and ligament (15.5%). Growth-related pathologies (apophysis or physis) counted only for 3.1% of the first injuries. The most frequently reported injury diagnoses were posterior thigh (hamstring) muscle injuries (25.9%), followed by ankle sprain (10.8%), Achilles tendon (4.5%) and knee tendon (4.3%) injuries (online supplemental tables 4 and 5). The most



Table 2 Characteristics of the first injury reported by the 509 athletes with at least one injury, and according to the fact that athletes are continuing or not practicing athletics

| | Total | Athletes who dropped out of athletics | Athletes still participating in athletics | P value |
|---|-------------|---------------------------------------|---|---------|
| n (%) | 509 (100.0) | 101 (19.8) | 408 (80.2) | |
| Sex (n (%)) | | | | 0.123 |
| Women | 295 (58.0) | 66 (65.3) | 229 (56.1) | |
| Men | 213 (41.8) | 35 (34.7) | 178 (43.6) | |
| Other | 1 (0.2) | 0 (0.0) | 1 (0.2) | |
| Age of athletics start (years) (mean SD) | 13.4±3.9 | 12.0±4.0 | 11.2±3.8 | 0.042 |
| Age of the first injury (years) (mean SD) | 17.5±3.3 | 18.0±2.9 | 7.4±3.4 | 0.114 |
| Duration of athletics before the first injury (years) (mean SD) | 6.1±4.1 | 5.9±3.7 | 6.2±4.2 | 0.533 |
| Discipline practised at the time of the first injury (n (%)) | | | | 0.242 |
| Sprints | 101 (19.8) | 19 (18.8) | 82 (20.1) | |
| Hurdles | 75 (14.7) | 17 (16.8) | 58 (14.2) | |
| Jumps | 106 (20.8) | 23 (22.8) | 83 (20.3) | |
| Throws | 38 (7.5) | 11 (10.9) | 27 (6.6) | |
| Combined events | 51 (10.0) | 14 (13.9) | 37 (9.1) | |
| Middle and long distances | 104 (20.4) | 12 (11.9) | 92 (22.5) | |
| Race walking | 13 (2.6) | 1 (1.0) | 12 (2.9) | |
| Road running/trail | 4 (0.8) | 1 (1.0) | 3 (0.7) | |
| No specific discipline | 17 (3.3) | 3 (3.0) | 14 (3.4) | |
| Number of hours of training at the time of the first injury (hours) (mean SD) | 8.1±3.7 | 8.6±3.6 | 8.0±3.7 | 0.104 |
| Practised another sport (n (%)) | 163 (32.0) | 29 (28.7) | 134 (32.8) | 0.498 |
| Location of the first injury (n (%)) | | | | 0.093 |
| Upper limb | 25 (4.9) | 4 (4.0) | 21 (5.1) | |
| Trunk | 24 (4.7) | 2 (2.0) | 22 (5.4) | |
| Pelvic/hip/groin/sacrum/buttock | 32 (6.3) | 9 (8.9) | 23 (5.6) | |
| Posterior thigh | 147 (28.9) | 29 (28.7) | 118 (28.9) | |
| Anterior thigh | 18 (3.5) | 5 (5.0) | 13 (3.2) | |
| Thigh other | 11 (2.2) | 3 (3.0) | 8 (2.0) | |
| Knee | 64 (12.6) | 9 (8.9) | 55 (13.5) | |
| Lower leg | 40 (7.9) | 9 (8.9) | 31 (7.6) | |
| Achilles tendon | 27 (5.3) | 3 (3.0) | 24 (5.9) | |
| Ankle | 84 (16.5) | 14 (13.9) | 70 (17.2) | |
| Foot | 36 (7.1) | 14 (13.9) | 22 (5.4) | |
| Type of the first injury (n (%)) | | | | 0.321 |
| Fracture | 16 (3.1) | 3 (3.0) | 13 (3.2) | |
| Bone stress injuries | 46 (9.0) | 10 (9.9) | 36 (8.8) | |
| Joint | 24 (4.7) | 9 (8.9) | 15 (3.7) | |
| Ligament | 79 (15.5) | 13 (12.9) | 66 (16.2) | |
| Muscle | 192 (37.7) | 40 (39.6) | 152 (37.3) | |
| Tendon | 89 (17.5) | 12 (11.9) | 77 (18.9) | |
| Growth-related injuries | 16 (3.1) | 4 (4.0) | 12 (2.9) | |
| Other | 47 (9.2) | 10 (9.9) | 37 (9.0) | |
| Mode of onset (n (%)) | | | | 0.265 |

Continued

Table 2 Continued

| | Total | Athletes who dropped out of athletics | Athletes still participating in athletics | P value |
|---|------------|---------------------------------------|---|---------|
| Sudden | 288 (56.6) | 55 (54.5) | 233 (57.1) | |
| Progressive | 204 (40.1) | 40 (39.6) | 164 (40.2) | |
| Did not remember | 17 (3.3) | 6 (5.9) | 11 (2.7) | |
| Athletes think that this first injury could have been avoided (n (%)) | 345 (67.8) | 64 (63.4) | 281 (68.9) | 0.347 |
| Athletes consulted a health professional (n (%)) | 469 (92.1) | 91 (90.1) | 378 (92.6) | 0.519 |
| Time loss of sport after the first injury (n (%)) | | | | 0.994 |
| No time loss | 13 (2.6) | 3 (3.0) | 10 (2.5) | |
| No time loss but training adaptation | 70 (13.8) | 13 (12.9) | 57 (14.0) | |
| Time loss less than 7 days | 45 (8.8) | 10 (9.9) | 35 (8.6) | |
| Time loss from 7 to 28 days | 183 (36.0) | 31 (30.7) | 152 (37.3) | |
| Time loss more than 28 days | 198 (38.9) | 44 (43.6) | 154 (37.7) | |
| Athletes reported sequelae after the first injury (n (%)) | 187 (36.7) | 46 (45.5) | 141 (34.6) | 0.045 |
| Athletes reported recurrences after the first injury (n (%)) | 247 (48.5) | 59 (58.4) | 188 (46.1) | 0.037 |

Table 3 Characteristics of the first injury by injury location and by injury type according to the disciplines

| | Sprints | Hurdles | Jumps | Throws | Combined events | Middle and long distances | Race walking | Road running/trail | No specific discipline | Total |
|---------------------------------|-------------|------------|-------------|------------|-----------------|---------------------------|--------------|--------------------|------------------------|-------------|
| Location | | | | | | | | | | |
| Upper limb | 1 (1.0) | 3 (4.0) | 3 (2.8) | 12 (31.6) | 2 (3.9) | 2 (1.9) | 2 (15.4) | 0 (0.0) | 1 (5.9) | 26 (5.1) |
| Trunk | 4 (4.0) | 1 (1.3) | 6 (5.7) | 4 (10.5) | 2 (3.9) | 5 (4.8) | 2 (15.4) | 0 (0.0) | 0 (0.0) | 24 (4.7) |
| Pelvic/hip/groin/sacrum/buttock | 6 (5.9) | 6 (8.0) | 4 (3.8) | 3 (7.9) | 4 (7.8) | 6 (5.8) | 2 (15.4) | 0 (0.0) | 1 (5.9) | 32 (6.3) |
| Posterior thigh | 65 (64.4) | 25 (33.3) | 28 (26.4) | 2 (5.3) | 10 (19.6) | 10 (9.6) | 2 (15.4) | 1 (25.0) | 4 (23.5) | 147 (28.9) |
| Anterior thigh | 7 (6.9) | 3 (4.0) | 4 (3.8) | 0 (0.0) | 2 (3.9) | 2 (1.9) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 18 (3.5) |
| Thigh other | 2 (2.0) | 4 (5.3) | 1 (0.9) | 0 (0.0) | 2 (3.9) | 1 (1.0) | 0 (0.0) | 0 (0.0) | 1 (5.9) | 11 (2.2) |
| Knee | 5 (5.0) | 12 (16.0) | 15 (14.2) | 6 (15.8) | 4 (7.8) | 19 (18.3) | 1 (7.7) | 1 (25.0) | 1 (5.9) | 64 (12.6) |
| Lower leg | 3 (3.0) | 1 (1.3) | 8 (7.5) | 0 (0.0) | 4 (7.8) | 21 (20.2) | 0 (0.0) | 0 (0.0) | 3 (17.6) | 40 (7.9) |
| Achilles tendon | 2 (2.0) | 0 (0.0) | 5 (4.7) | 1 (2.6) | 1 (2.0) | 14 (13.5) | 3 (23.1) | 1 (25.0) | 0 (0.0) | 27 (5.3) |
| Ankle | 6 (5.9) | 15 (20.0) | 24 (22.6) | 6 (15.8) | 15 (29.4) | 11 (10.6) | 1 (7.7) | 0 (0.0) | 6 (35.3) | 84 (16.5) |
| Foot | 0 (0.0) | 5 (6.7) | 8 (7.5) | 4 (10.5) | 5 (9.8) | 13 (12.5) | 0 (0.0) | 1 (25.0) | 0 (0.0) | 36 (7.1) |
| Type | | | | | | | | | | |
| Fracture | 3 (3.0) | 3 (4.0) | 7 (6.6) | (0.0) | 1 (2.0) | 1 (1.0) | (0.0) | (0.0) | 1 (5.9) | 16 (3.1) |
| Bone stress injuries | (0.0) | 3 (4.0) | 6 (5.7) | 2 (5.3) | 8 (15.7) | 23 (22.1) | (0.0) | 1 (25.0) | 3 (17.6) | 46 (9.0) |
| Joint | 1 (1.0) | 5 (6.7) | 5 (4.7) | 3 (7.9) | 4 (7.8) | 3 (2.9) | 2 (15.4) | 1 (25.0) | (0.0) | 24 (4.7) |
| Ligament | 6 (5.9) | 11 (14.7) | 24 (22.6) | 10 (26.3) | 13 (25.5) | 11 (10.6) | 1 (7.7) | (0.0) | 3 (17.6) | 79 (15.5) |
| Muscle | 73 (72.3) | 32 (42.7) | 35 (33.0) | 7 (18.4) | 17 (33.3) | 20 (19.2) | 2 (15.4) | 1 (25.0) | 5 (29.4) | 192 (37.7) |
| Tendon | 11 (10.9) | 7 (9.3) | 17 (16.0) | 9 (23.7) | 4 (7.8) | 34 (32.7) | 5 (38.5) | 1 (25.0) | 1 (5.9) | 89 (17.5) |
| Growth-related injuries | 1 (1.0) | 6 (8.0) | 2 (1.9) | 1 (2.6) | 1 (2.0) | 2 (1.9) | 1 (7.7) | (0.0) | 2 (11.8) | 16 (3.1) |
| Concussion | 1 (1.0) | (0.0) | (0.0) | (0.0) | (0.0) | (0.0) | (0.0) | (0.0) | (0.0) | 1 (0.2) |
| Other | 5 (5.0) | 8 (10.7) | 10 (9.4) | 6 (15.8) | 3 (5.9) | 10 (9.6) | 2 (15.4) | (0.0) | 2 (11.8) | 46 (9.0) |
| Total | 101 (100.0) | 75 (100.0) | 106 (100.0) | 38 (100.0) | 51 (100.0) | 104 (100.0) | 13 (100.0) | 4 (100.0) | 17 (100.0) | 509 (100.0) |

frequent injury diagnoses varied according to the main disciplines (online supplemental tables 4 and 5). The first injuries mostly occurred suddenly (56.6%) compared with progressively (40.1%) (table 2). The first injuries were reported as severe, with more than three-quarters (83.7%) leading to time loss from sports, including 38.9% with more than 28 days of time loss. About two-thirds of injured athletes (67.8%) reported that they could have avoided this first injury. Almost all athletes (92.1%) consulted a health professional. More than a third of injured athletes (36.7%) reported experiencing ongoing symptoms or sequelae after their first injury, and about half (48.5%) experienced recurrences.

Cause of athletics dropouts

Among the 544 participating athletes, about 1 in 5 athletes (19.5%; n=106) had stopped their practice of athletics at the time of the survey (table 1). Compared with athletes still participating in athletics, these athletes were significantly older (26.2±4.5 vs 23.0±4.6, p<0.001), they started later (12.0±4.1 vs 11.2±3.8, p=0.054), and included slightly more women (65.1% vs 56.0%, p=0.091). Injury problems were reported as the primary cause of athletic dropout (46.2%), followed by lack of time (31.1%). The first injury represented 9.4% of all reported causes of athletics dropout. The 10 athletes (5 women, 5 men; mean age of 25.2±5.1 years) who declared that their first injury was their cause of athletics dropout started athletics at 13.2±3.9 years old, their disciplines were throws (n=3), endurance running (n=3), jumps (n=2), sprints (n=1) and combined events (n=1). They sustained their first injury at 19.7±4.9 years old.

Of the 509 athletes who reported experiencing at least one injury, 101 (19.8%) reported dropping out of athletics. They were significantly older (p=0.042), had a significantly higher proportion of ongoing symptoms or sequelae (p=0.045) and had a significantly higher proportion of recurrences after the first injury (p=0.037) than those who continued practising athletics (table 2).

DISCUSSION

The main findings of the present study were that (1) in French high-level athletes, 94% reported experiencing at least one injury during their career, with their very first injury mainly involving the posterior thigh (29%) and the muscle (38%), and in one case out of two leading to recurrences, and (2) injuries played an important role in altering the sustainable athletics practice with about 50% of all reported causes for dropout, and the very first injury counted for about 10% of all reported causes.

The first injury

The present study describes the first injury reported by former and current French high-level athletes in U18, U20 or U23. The characteristics of the first injury, as reported in tables 2 and 3, are similar to injuries reported in previous studies in athletics athletes.^{9,21–26} The posterior

thigh (hamstring) was the most frequent injury location, and the muscle was the most frequent injury type.^{21–26} Differences in the distribution of injury location and/or type were reported across disciplines, which agrees with the different physical, mechanical, technical and psychological demands of the different athletics disciplines.²¹ Surprisingly, this young cohort's first reported injury was not growth related. It could have been consistent that the first injury reported by athletes would have been an injury that occurred early in the growing phases because of more fragile areas of the musculoskeletal system.^{25–27} Our result could be explained because (1) athletes forget their growth-related injuries occurring a long time ago, (2) athletes reported as their first injury an injury that had the greatest impact on them and/or (3) the self-reported injury type reported by athletes may be incorrect.

The first injury and subsequent injuries are prevalent factors in athletics dropout

To our knowledge, this is the first study reporting data on athlete dropout within athletics and the main causes. About 20% of participating athletes had stopped their athletic practice during the survey, and injury problems represented almost 50% of the reported cause. Among athletes experiencing at least one injury during their career, 20% declared having dropped out from athletics. This is similar to the 17% of youth Australian athletics athletes¹³ and the 20% Great British Olympians¹⁴ who retired due to injury. Although there were differences in the population and injury definition used, these rates highlight the important impact of injuries in an athlete's career. Thus, for both sustainable and healthy athletics practice and the best performance level, it seems relevant to improve injury risk reduction strategies and focus them on the very first injury, which could help avoid the 'vicious circle' of injuries. Reducing the risk of injury appears relevant for both direct (musculoskeletal damage) and indirect (sports interruption and cessation) consequences.

Strengths and limitations

As a strength, the population is unique and comprises current and former high-level athletes. The recruitment was performed using the official list of high-level athletes.

Given the study design and data collection, we must acknowledge the recall bias as one of the study's limitations. Indeed, although the first injury in the career could be an important event for the athlete, we limited the inclusion of athletes to high-level athletes within the last 10 years, so the first injury could have been long ago. In addition, the sample size (n=544) could be considered small and have a low response rate (8.3%), which presents a limitation of the present study regarding the sample's representativeness. Hence, the study findings relate only to the present sample. There was a possible selection bias. It is possible that athletes who dropped out of athletics were not motivated to reply. So, the percentage of dropouts in athletics may be underestimated. On the contrary,

athletes who suffered an important injury that changed their career may have been more inclined to participate in this study, which may have overestimated the results. Given the recall bias and the self-reported nature of injuries, the injury location and types reported may not be accurate. The survey may have been considered too long or lacked sufficient detail on other reasons for dropping out. Hence, it is possible that other factors not presented in this study played a role in athletics dropout. Finally, the results indicate a population of French high-level youth and junior athletics athletes in the study period. We chose to focus this study on high-level athletes, because their project and/or motivation to continue sports could have been higher than non-high-level athletes due to their levels. However, further studies should be conducted for application to other points in time, competitive levels (including not only high-level athletes) or countries. The difficult transition and frequency of injuries during this time as youth and junior athletes transition into senior athletes is not well documented in other sports.¹⁹ Hence, conducting such a study in other sports may also be of interest.

Practical implications

As discussed, the study design and data collection procedures may be limited due to bias. Therefore, confirming and strengthening these results by conducting a prospective cohort study following athletes from the start of athletics until the end of their careers would be interesting. Such a study design could allow a better understanding of the reasons for dropout from athletics and the potential role of injuries in altering the sustainable practice of athletics. This might enable a more timely analysis of the first injury and its consequences (eg, whether it has a lasting effect on the athlete—psychological or physical) and, in case of recurrent injuries, a better understanding of the final injury before dropping out.

The present results provide arguments about the fundamental need to develop, improve and implement injury risk reduction strategies in athletics. We provide important information to help target the prevention of the first injury, which could be considered the origin of the ‘vicious circle’ of injuries. This could include focusing on and targeting specific injury characteristics and athletics disciplines. In addition, such injury risk reduction strategies should be included in youth talent promotion programmes. An example of such a healthy approach has been proposed for youth basketball.²⁸ Injury risk reduction strategies should be developed by taking into account the multifactorial nature of the injuries and the challenges of implementation by involving all the stakeholders.²⁹ This first injury may be very difficult to avoid, and it would be of interest to implement a global rehabilitation approach to reduce sequelae and recurrent injuries for the rest of the athlete’s career. Therefore, these results could support a call to improve the management of the very first injuries, based on the available evidence, for example, muscle injuries,³⁰ ankle

sprains,³¹ tendinopathies,³² or bone stress injuries.³³ Better education for the athlete and their team (eg, coach, family) about their injuries could also help limit career cessation due to an injury.^{34–36}

CONCLUSIONS

Our results reported the high prevalence of injuries among high-level athletes, with 94% of French high-level athletes reporting experienced at least one injury during their career. Injuries played an important role in altering the sustainable athletics practice, accounting for almost 50% of all reported causes of dropout, with the first injury accounting for about 10% of reported causes. The description of their first injury could help inform injury risk reduction strategies from a primary prevention perspective. Secondary prevention could include better athlete education about their injuries to help limit the impact of these injuries on the rest of their career.

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Acknowledgements The authors warmly thank the French Federation of Athletics (<https://www.athle.fr>) for sharing the questionnaire through their email lists, the athletes who participated in the study, Bernard Rabiers du Villars for initiating the idea of analysing the first injury in athletics and Christine Hanon for her participation in this study.

Contributors PE and FD elaborated the idea of the study. PE and CM conceived the study. CM and PE collected the data. PE performed the data analyses. PE drafted the manuscript. All coauthors contributed substantially to interpreting the results and revision of the manuscript and approved the final manuscript. All authors understand that they are accountable for all aspects of the work and ensure the accuracy or integrity of this manuscript. PE acts as guarantor of the study.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests PE and DP are associate editors for the *British Journal of Sports Medicine*, and PE is an associate editor for the *BMJ Open Sports and Exercise Medicine*.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable.

Ethics approval This present study and analysis were reviewed and approved by the Saint-Etienne University Hospital Ethical Committee (Institutional Review Board: IORG0007394; IRBN672021/CHUSTE). All participants, or their parents when under 18 years old, were informed about the study aim and modalities by an information letter. No signed informed consent was required by the ethical committee.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. Requests for data sharing from appropriate researchers and entities will be considered case by case. Interested parties should contact the corresponding author (pascal.edouard@univ-st-etienne.fr).

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