

# EPIDEMIOLOGY OF TRACK & FIELD INJURIES: A ONE YEAR EXPERIENCE IN ATHLETIC SCHOOLS

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**ABSTRACT:** The purpose of this study was to record injuries in track & field events that were sustained by students who attended the athletic schools during a one-year period. From September 2009 to May 2010, the researchers observed 2045 students (883 males and 1163 females), who were participating in track and field events at the mentioned schools. During the study period 150 injuries were recorded, which accounted for 13.3% of all injuries sustained by students. Most of the injuries (34%) according to the diagnosis were sprains and strains and occurred during the months of February, December and January. A large percentage of the injuries (45.4%) were sustained by students who attended the Athletic Schools, which operated in the urban region. Students who attended the second class sustained more injuries than the other classes (first and third). Students who were practising or competing on a tartan playing surface were more likely to sustain an injury. Knee and ankle were the most frequent anatomical sites in which injuries (43.9%) occurred. Additionally, 80.0% of injuries occurred in students who were practising or competing in running events. No statistical differences were observed in all above mentioned parameters amongst male and female students. Physical education (P.E.) teachers should place more emphasis on prevention measures. These measures should include proper supervision of students during training, warming up and cooling down sessions with stretching techniques. By following these suggestions students will compete in a safe and healthy environment.

**KEY WORDS:** track & field, athletic schools, injuries, sprains, strains

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## INTRODUCTION

Athletics or field events that are practised in athletic schools include the throwing events (shot put, discus throw and javelin throw), jumping events (high jump, long jump, pole vault and triple jump), running events (80, 150, 300, 600, 1000, 3000, 5000 m, race walking, 4 X 80 and 4 X 300 m relays, 100 and 300 m hurdles) and combined events (sixethlon) [1].

During the practice or competition of athletics, the musculoskeletal system is required to absorb large amounts of energy, that are produced by long periods of repetitive stress when the feet strike the ground. Often, the soft tissues have to absorb the produced energy that is equal to 15 times the body weight and can cause overuse injuries [1,9].

During field events there is generation of maximum force by maximal muscle contractions in a short period of time and this results in high stress that can injure the soft tissues that are implicated in this process [8,23].

In the current literature although there are a lot of investigations studying the epidemiology of school sport-related injuries [2,4,6, 12,19,20,21,22] no epidemiological study has investigated the

details of track and field in identical schools. Therefore, the purpose of this research was to record: (a) the incidence and type of track and field injuries in the athletic schools, (b) the incidence of injuries in relation to anatomical site, month, place of residence, class and training surface, (c) the incidence of injuries in relation to specific events, (d) the differences in all above mentioned parameters amongst male and female students.

## MATERIALS AND METHODS

*Subjects.* This study was carried out by the Laboratory of Health, Fitness & Disability Management, Faculty of Human Movement and Quality of Life, University of Peloponnese; it started on September 2009 and finished at the end of May 2010. The school in Greece starts at the begging of September and ends at the end of June, consisting of two semesters: the autumn (September–January) and the spring semester (February–June). In order to undertake the study, the authors gained permission from the Central Committee of the athletic schools. Then, they sent correspondence to the Director of Physical Education at the Central Committee, which included

a cover letter, a questionnaire and the injury report form. In the cover letter the authors described in detail the study procedures. The director of the Department of Physical Education sent an e-mail to all Physical Education teachers of athletic schools and informed them about the research project and their duty to record and send weekly injury reports to the Department of Physical Education at the Central Committee. The present prospective investigation involved all student athletes (883 males and 1163 females) who attended the track and field events at all athletic schools at a national level during the 2009-10 school year. Physical education teachers of the athletic schools participated in the research as data reporters.

An 'injury' was defined as an injury to the musculoskeletal system that occurred during practising or competing requiring further medical attention at some level (e.g., coach, school nurse, trainer, and physician), and limits student athletes from normal full participation for one or more days following the injury [1].

Physical education teachers were asked to report daily all injuries newly incurred during the school year on a standardized injury report form [2,10]. In this report form the researchers included: (a) information about injuries, (b) the kind of treatment, and (c), anthropometric characteristics of male and female students of athletic schools (region of residence, class, sex, age, height, body mass, body mass index).

The data were recorded on a weekly basis and transmitted via e-mail to the Department of Physical Education at the Central Committee. Moreover, the physical education teachers sent a second report form which included all information that was related to the rehabilitation process of the students and their return to school.

Statistical analyses were carried out using Statistical Package for Social Sciences (version 17, SPSS inc. Chicago) software. Frequencies of injuries were calculated for the aforementioned categorical variables. Statistical significance of differences among the variables was estimated using the non-parametric  $\chi^2$  test (applying Fisher's exact test where appropriate). The level of statistical significance was set at  $p < 0.05$  for all comparisons [10].

## RESULTS

From September 2009 until the end of the school year (May 2010), students/athletes who participated in track and field events sustained 150 injuries, which made an incidence of 13.3%. Females sustained 83 injuries and males 67.

Twenty-four of the recorded injuries in both sexes (16%) were sprains and 28 (18.6%) were strains. Females sustained slightly more strains and sprains than male peers (13 vs 11, and 13 vs 15). However, this difference was not statistically significant (Table 1).

Most of the injuries occurred during the months of February (24%), December (15.3%) and January (14%). No differences were observed between male and female students (Table 2).

45.4% of the injuries ( $n=68$ ) were sustained by subjects who attended the Athletic Schools (A.S.) that operated in the urban regions, Athens/Thessaloniki (21.3%) and the Capital of Prefecture

area (21.3%). Although female students sustained slightly more injuries than males, this difference was not significant (Table 3).

Sixty-five injuries (43.4%) occurred in students who attended the second class. Also, there was a similar distribution in the injuries

**TABLE 1.** FREQUENCIES OF INJURIES SUSTAINED BY STUDENTS OF ATHLETIC SCHOOLS DURING THE STUDY ACCORDING TO THE DIAGNOSES

Injury diagnosis	Males (n=883) Incidence (%)	Females (n=1163) Incidence (%)	Both sexes (n= 2045) Incidence (%)
Lacerations	6 (8.9)	7 (8.4)	13 (8.6)
Sprains	11 (16.4)	13 (15.6)	24 (16.0)
Strains	13 (19.5)	15 (18.2)	28 (18.6)
Fractures	8 (11.9)	10 (12.1)	18 (12.0)
Contusions	3 (4.5)	3 (3.6)	6 (4.0)
Tendonitis	9 (13.4)	8 (9.6)	17 (11.3)
Bleeding	7 (10.5)	15 (18.0)	22 (14.6)
Other lesions	10 (14.9)	12 (14.5)	22 (14.6)
Total	67 (100.0)	83 (100.0)	150 (100.0)

**TABLE 2.** FREQUENCIES OF INJURIES SUSTAINED BY STUDENTS OF ATHLETIC SCHOOLS DURING THE STUDY ACCORDING TO THE RECORDING MONTH

Month	Males (n=883) Incidence (%)	Females (n=1163) Incidence (%)	Both sexes (n= 2045) Incidence (%)
September 2009	1 (1.5)	1 (1.2)	2 (1.3)
October 2009	9 (13.4)	3 (3.6)	12 (8.0)
November 2009	4 (6.0)	9 (10.8)	13 (8.7)
December 2009	8 (11.9)	15 (18.1)	23 (15.3)
January 2010	11 (16.4)	10 (12.0)	21 (14.0)
February 2010	13 (19.4)	23 (27.7)	36 (24.0)
March 2010	7 (10.4)	10 (12.0)	17 (11.3)
April 2010	4 (6.0)	6 (7.2)	10 (6.7)
May 2010	10 (14.9)	6 (7.2)	16 (10.7)
Total	67 (100.0)	83 (100.0)	150 (100.0)

**TABLE 3.** FREQUENCIES OF INJURIES SUSTAINED BY STUDENTS OF ATHLETIC SCHOOLS DURING THE STUDY ACCORDING TO THE PLACE OF RESIDENCE

Place of residence	Males (n=883) Incidence (%)	Females (n=1163) Incidence (%)	Both sexes (n= 2045) Incidence (%)
Rural region	10 (14.9)	8 (9.6)	18 (12.0)
Urban region	30 (44.8)	38 (45.8)	68 (45.4)
Capital of Prefecture	15 (22.4)	17 (20.5)	32 (21.3)
Athens/Thessaloniki	12 (17.9)	20 (24.1)	32 (21.3)
Total	67 (100.0)	83 (100.0)	150 (100.0)

sustained by students of the other classes (first and third). Analysis between females and males revealed no statistical differences (Table 4).

Students who were practising or competing on tartan playing surfaces were more likely to sustain an injury (n=104, 69.3%). Female students sustained 57 injuries, males 47. No statistical differences were observed between sexes (Table 5).

Overall, 37 (24.6%) injuries occurred in the knee, 29 (19.3%) in the ankle and 28 (18.6%) in the hand. Although female students

sustained slightly more injuries than males, this difference was not significant (Table 6).

Additionally, 120 injuries (80.0%) occurred in students who were practising or competing in running events. Analysis of injury frequency between females and males revealed no significant differences (Table 7).

**TABLE 4.** FREQUENCIES OF INJURIES SUSTAINED BY STUDENTS/ATHLETES OF ATHLETIC SCHOOLS DURING THE STUDY ACCORDING TO THE CLASS

Classes	Males (n=883) Incidence (%)	Females (n=1163) Incidence (%)	Both sexes (n= 2045) Incidence (%)
First	17 (25.4)	24 (28.9)	41 (27.3)
Second	30 (44.8)	35 (42.2)	65 (43.4)
Third	20 (29.8)	24 (28.9)	44 (29.3)
Total	67 (100.0)	83 (100.0)	150 (100.0)

**TABLE 5.** FREQUENCIES OF INJURIES SUSTAINED BY STUDENTS OF ATHLETIC SCHOOLS DURING THE STUDY IN RELATION TO PLAYING SURFACE

Playing surface	Males (n=883) Incidence (%)	Females (n=1163) Incidence (%)	Both sexes (n= 2045) Incidence (%)
Tartan	47(70.1)	57 (68.6)	104 (69.3)
Synthetic floor	19 (28.4)	24 (28.9)	43 (28.7)
Parquet	1 (1.5)	2 (2.5)	3 (2.0)
Total	67 (100.0)	83 (100.0)	150 (100.0)

**TABLE 6.** FREQUENCIES OF INJURIES SUSTAINED BY STUDENTS OF ATHLETIC SCHOOLS DURING THE STUDY ACCORDING TO THE LOCATION

Injury location	Males (n=883) Incidence (%)	Females (n=1163) Incidence (%)	Both sexes (n= 2045) Incidence (%)
Upper extremity except hand	9 (13.4)	10 (12.0)	19 (12.7)
Hand	11 (16.4)	17 (20.5)	28 (18.6)
Lower extremity except knee and ankle	12 (17.9)	21 (25.3)	33 (22.1)
Knee	18 (26.9)	19 (22.9)	37 (24.6)
Ankle	15 (22.4)	14 (16.8)	29 (19.3)
Truncus	2 (3.0)	2 (2.5)	4 (2.7)
Total	67 (100.0)	83 (100.0)	150 (100.0)

## DISCUSSION

The purpose of this investigation was to record the track and field injuries that were sustained by 883 male and 1163 female students of the athletic schools in Greece during the 2009-10 school year period.

According to the results we found that: a) no differences were observed between sexes, b) sprains and strains were the most common types of injuries according to diagnoses, c) more injuries were recorded during winter months, d) students of the first class sustained more injuries than peers of the other classes, e) more injuries were recorded in students who were practising or competing on tartan playing surfaces, f) students sustained more injuries in the knee and ankle and, g) most injuries occurred in students who were practising or competing in running events.

It was noted that 2045 students sustained 150 injuries, an incidence of 13.6%, which is the lowest among studies reported in the current literature, where there is observed variation between 17.5% and 76% [13,23]. Perhaps the present study might be an appropriate epidemiological study, since P.E. teachers recorded the new injuries observed in the defined period of time of the risk population in a prospective manner.

According to our results, we found no significant differences between sexes. These results can be compared with already published studies. While Watson and DiMartino [23] found a higher incidence of injuries in males (68%) than in the females (33%), Bennell & Crossley [3], in their study, did not find significant differences between males and females. Similarly, D' Souza [5] rejected the hypothesis of an increased incidence in the number of female injuries. Also, Nattiv [14] argues that many studies do not appear to be differentiated by gender. The results of our study are in line with the above studies.

**TABLE 7.** FREQUENCIES OF INJURIES SUSTAINED BY STUDENTS OF ATHLETIC SCHOOLS DURING THE STUDY ACCORDING TO THE PARTICULAR EVENTS

Particular events	Males (n=883) Incidence (%)	Females (n=1163) Incidence (%)	Both sexes (n= 2045) Incidence (%)
Running events	54 (80.6)	66 (79.5)	120 (80.0)
Throwing events	6 (8.9)	11 (13.2)	17 (11.3)
Jumping events	5 (7.5)	5 (6.1)	10 (6.7)
Combined events	2 (3.0)	1 (1.2)	3 (2.0)
Total	67 (100.0)	83 (100.0)	150 (100.0)

Sprains and strains were the most common types of injuries. These results are in line with other studies. For example, Garrick and Requa [8] found that sprains accounted for 15.5% of all injuries and strains 45.1%, together accounting for nearly two thirds of the injuries. Orava and Saarela [15] found an incidence of 12.7% vs 16.9%, Watson and DiMartino [23] an incidence of 17.4% vs 24.3%, and Knowles et al. [11] an incidence of 20.2% vs 46.8%. It seems that sprains and strains appear to be a predominant type of injury across all the studies.

Winter months, mainly December and February, were the months in which the highest injury rates occurred, while a lower incidence was recorded in April. This incidence was expected, since in these months championships start, where the students participate in more vigorous activities. Also, many students participate in a large number of games, increasing the exposure to injury risk.

Students who attended the athletic schools that operated in the urban regions sustained more injuries. One explanation for the increased injury risk amongst students living in these regions may be the frequent participation in more than one event. However, although the increased participation in more than one event can increase injury rates [11], the mentioned results of our study should be further investigated.

Tartan was the playing surface on which the majority of the injuries occurred both in male and female students. It is obvious that training and competition take place on this surface [8].

Most of the injuries in the present sample occurred in the lower extremities. The results are similar to those studies previously published. For example, Orava and Saarela [15] found an incidence of 78.9%, Zaricznyj et al. [24], 64%, Requa and Garrick [17] 87.4%, Watson and DiMartino [23], 80.3% and Knowles et al. [11], a rate of 77%. Taking into consideration the nature of track and field events, with vigorous use of the legs in jumping, running, and throwing activities, it is not surprising that the great majority of injuries occurred in the lower extremities [25].

According to anatomical distribution, the greatest number of injuries sustained by both sexes occurred in the knee and ankle. These results are in line with other studies. Orava and Saarela [15] found an equal distribution of 11.3% of all injuries that occurred in the knee and ankle joints, Zaricznyj et al. [24] 24% vs 14.0%, Requa and Garrick [17] 12.6 % vs 10.2 %, Watson and DiMartino [23]

12.1% vs 17.1%, and Knowles et al. [11] an incidence of 15.0% vs 11.8%. It is obvious that the joints of the knee and ankle during running or jumping are subjected to excessive repetitive stresses and become injured [14].

One hundred and twenty injuries (80%) were sustained by students who participated in running events. These results are in accordance with previous reports [7,11,14,16,25].

The present prospective trial is characterised by reliability and validity, because the data were collected by physical education teachers of athletic schools who transmitted them via e-mail to the Department of Physical Education on a weekly basis. Since physical education teachers are present with student athletes every day throughout the entire academic year, they gain good knowledge of all participants, and were in a privileged position to record all injuries sustained in the defined period of time in a prospective manner. Therefore, minimising the possibility to forget recordings of students was achieved. Additionally, P.E. teachers with the second supplementary report form sent all the details about the student athletes' rehabilitation process and their return to school.

## CONCLUSIONS

The present study revealed no statistically significant differences in the frequency of injuries between male and female students of athletic schools. Also, sprains and strains were the most common types of injuries according to diagnoses. Winter months were the time when more injuries were recorded, and students who attended athletic schools that operated in the urban regions sustained more injuries. Additionally, more injuries were sustained by students who were practising or competing on tartan playing surfaces. Students sustained more injuries in the lower extremities and mainly in the knee and ankle. Finally, the greatest number of injuries occurred in students who were practising or competing in running events.

Since a large number of students participated in track and field events of athletic schools, physical education teachers should place greater emphasis on prevention measures. These measures should include proper supervision of students during training, warming up and cooling down sessions with stretching techniques. With these suggestions students will compete in a safe and healthy environment.

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