Papers on Anthropology XXXII/2, 2023, pp. 68–81

PREVALENCE OF SELF-REPORTED LOWER LIMB OVERUSE PROBLEMS IN HIGHLY TRAINED TRACK AND FIELD ATHLETES DURING 12 WEEKS OF PRE-SEASON TRAINING

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ABSTRACT

The aim of the study was to record the extent of lower limb overuse problems in highly trained track and field athletes during the 12 weeks of their preparation for national and international athletics championships. 21 highly trained track and field athletes (10 males: height 188.4 ± 6.8 cm; weight 79.9 ± 5.4 kg; BMI 22.5 ± 0.9; training hours per week 7.78 ± 2.37; 11 females: height 174.1 ± 7.9 cm; weight 61.7 ± 5.8 kg; BMI 20.4 ± 1.4; training hours per week 6.28 ± 2.76) from the national team volunteered to participate. The study was a prospective cohort study during which the Oslo Sports Trauma Research Center Overuse Injury Questionnaire was distributed weekly to all athletes for 12 weeks from May 2015 to August 2015. The two most prevalent overuse problems reported in our study group were hamstring and lower back area problems. On average, 64% of athletes in the present study group suffered from an overuse problem to ankle, hamstring, groin, knee or low back at any given time. The results of the study show that lower limb overuse injuries are too frequent in track and field athletes, and many athletes still train and compete through these injuries. Therefore, it is very important for athletes' long-term health to regularly monitor their health problems in order to start preventing them.

Keywords: *questionnaire; epidemiology; injury; prevention; surveillance*

https://doi.org/10.12697/poa.2023.32.2.05

INTRODUCTION

By definition, overuse injuries are the result of cumulative processes where there is insufficient recovery time and tissue adaptation between physical loadings [22]. Previously, overuse injuries were more often associated with endurance sports that require monotonous and repetitive activities [25, 28]. Yet, according to the work of D'Souza et al. [14] and Bennell et al. [7] in track and field, up to 76% of all injuries were classified as overuse injuries which most often involved the lower extremity (64–87%). To further show the extent of overuse problems in athletics, over two thirds of Swedish track and field athletes have been found to suffer a performance-limiting overuse injury to the lower limb [24]. During elite athletics championships, the most prevalent injury diagnosis has been thigh strains (especially hamstring strain with 16%), and 46% of them have led to time loss from training [2, 3]. Hopkins et al. found that, in the seasons 2010–2014, track and field athletes of the National Collegiate Athletic Association had injury prevalence of 3.99 injuries per 1000 athletic exposures [20].

Previous research on elite youth track and field athletes has shown that junior athletes often do not transit into elite senior athletes [8], and the main reasons for dropping out of sports in England have been inappropriate training and competition loads with repeated injury and inability to recover to previous levels at a young age [8, 23, 9, 15]. The analysis by Ristolainen et al. [30] has also revealed a significant relationship between forced retirement and having sustained an overuse injury. Therefore, overuse injuries seem to be a growing problem in track and field athletes, and, in order to prevent injuries in the sport of athletics, injury patterns need to be established [24].

Previous researchers have pointed out that athletes often continue to train and compete despite health problems from overuse, and that elite athletes' threshold for ceasing participation in sports may be higher [12, 5, 4]. Therefore, the onset of overuse-related problems is gradual, and the point at which they can be called an injury is blurred. Traditionally used injury surveillance systems [18] might not be best suited for studying overuse injuries since they only rely on the clearly identifiable onset of a trauma and use the duration of time-loss from sport as the sole means of measuring severity [12, 5, 4]. To improve our knowledge of overuse problems in sport, Clarsen et al. [12] have developed a new approach to recording the extent of overuse injuries – the Oslo Sports Trauma Research Center (OSTRC) Overuse Injury Questionnaire – which is distributed to athletes at regular intervals (e.g. weekly) with primary outcome measures based on the prevalence of subjectively reported overuse problems

compared to injury incidences as used in traditional systems. Additionally, the change score of the OSTRC severity score can be used to monitor changes and measurement errors at different athletic group levels [17]

The purpose of this study was to record the extent of overuse problems in highly trained track and field athletes during the 12 weeks of their preparation for the Estonian National Championship and the European Athletics Championship competitions.

MATERIALS AND METHODS

We invited all Estonian national track and field team athletes to participate in the study, and 21 of them volunteered to participate. The study was conducted during the 12 weeks of spring training period in 2015 when athletes prepared for the Estonian National Athletics Championships and the European Athletics Championships.

Table 1. Subjects mean (± SD) characteristics.

	Age (y)	Height (cm)	Weight (kg)	BMI	Training h/week
Males n = 10	22.9 ± 1.7	188.4 ± 6.8	79.9 ± 5.4	22.5 ± 0.9	7.78 ± 2.37
Females n = 11	22.1 ± 2.3	174.1 ± 7.9	61.7 ± 5.8	20.4 ± 1.4	6.28 ± 2.76

Before starting the study, the Oslo Sports Trauma Research Center (OSTRC) questionnaire was introduced to the athletes, and they could contact the leading physiotherapist via e-mail in case of questions or requests for information. To minimise the learning effect, the subjects had two weeks of trial during which the participants had the chance to get more acquainted with the questionnaire. These data were excluded from the final analysis. The study was approved by the Research Ethics Committee of the University of Tartu.

This study was a prospective cohort study during which the OSTRC Overuse Injury Questionnaire [12] was distributed weekly to all athletes for 12 weeks from May 2015 to August 2015. The Estonian version of the Oslo Sports Trauma Research Centre Questionnaire on Health Problems [12] was translated from the English version using the forward-backward translation method.

The link with the questionnaire was delivered to participants' emails in an online format using Google Forms software (Mountain View, CA, USA). Nonresponders received a reminder on the next day and, if necessary, also on the third day. If the participant failed to fill out the questionnaire for a longer period, he/she was contacted via telephone and urged to continue the study.

The OSTRC Overuse Injury questionnaire targeted five key areas – low back, groin, knee, hamstring and ankle. There were four questions of interest about each anatomical area, which meant a total of 20 questions. The four questions for each anatomical area had a numerical value from 0 to 25 where the score of 0 represented no problem and 25 represented the maximum problem level in which case the athlete could not participate in his/her sport. The summarized values of the four questions were equal to a severity score ranging from 0 to 100 for each anatomical area's overuse problem.

Statistical analysis

The weekly prevalence of overuse problems was calculated for each anatomical area each week of the study. Also, the prevalence of substantial problems was calculated for each of these measures. Substantial health problems were defined as those leading to moderate or severe reductions in training volume, moderate or severe reductions in athletic performance or complete inability to train and compete [13]. Weekly prevalences were calculated to identify the trends over the course of 12 weeks. Average values and standard deviations were calculated for the severity scores and the duration of cases.

RESULTS

All 21 athletes who volunteered to participate completed the study period. The overall response rate to the questionnaires was 93.7% and the weekly response rate was from 85–100%. 17 athletes (81%) completed all 12 questionnaires. Three athletes stopped due to time-loss injuries after weeks 6, 9 and 11.

The self-reported injuries and illnesses during the study period of 12 weeks are shown in Figure 1.

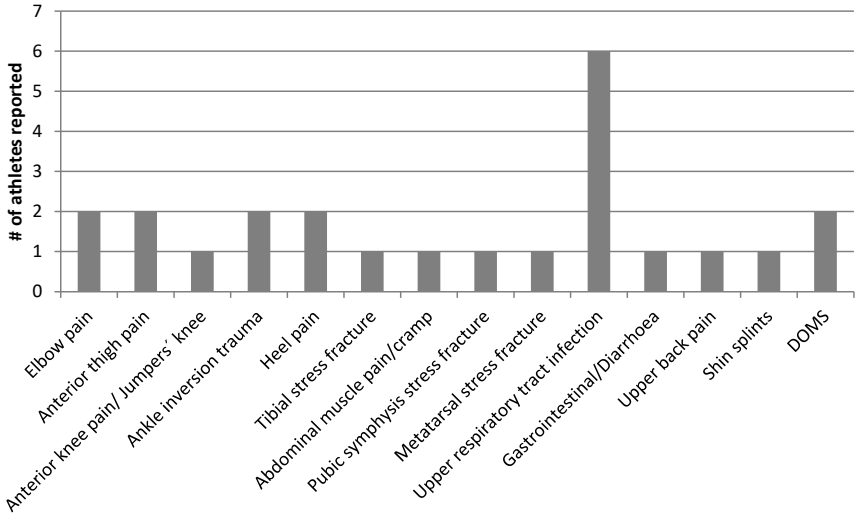

Figure 1. Self-reported injuries and illnesses and the number of cases in 21 track and field athletes during the 12 weeks of the study period. DOMS – delayed onset muscle soreness.

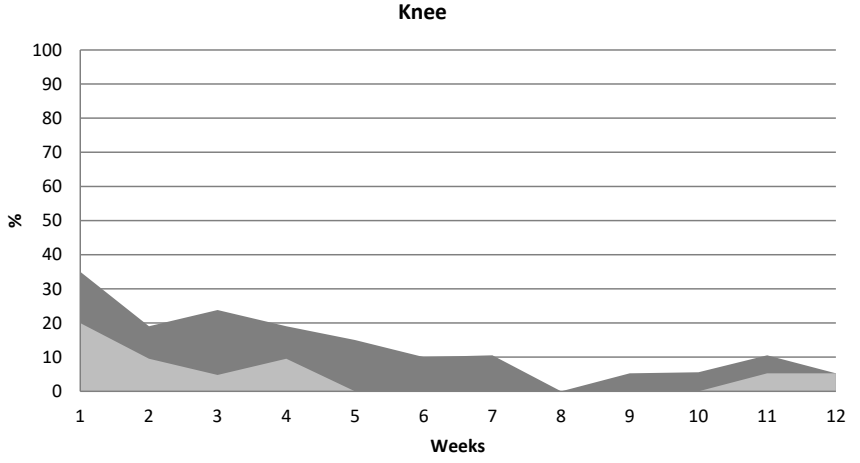

Figure 2. Prevalence of all overuse problems (dark grey area) and substantial overuse problems (light grey area) in the knee area during the 12-week period in track and field athletes (n = 21).

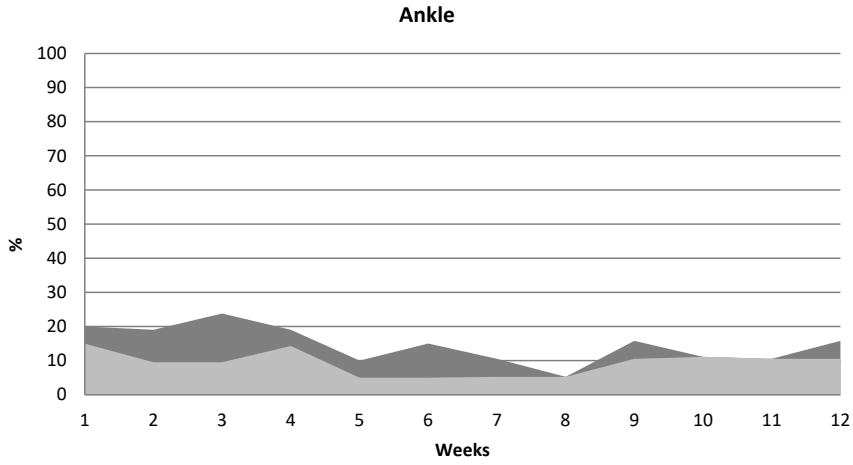

Figure 3. Prevalence of all overuse problems (dark grey area) and substantial overuse problems (light grey area) in the ankle area during the 12-week period in track and field athletes (n = 21).

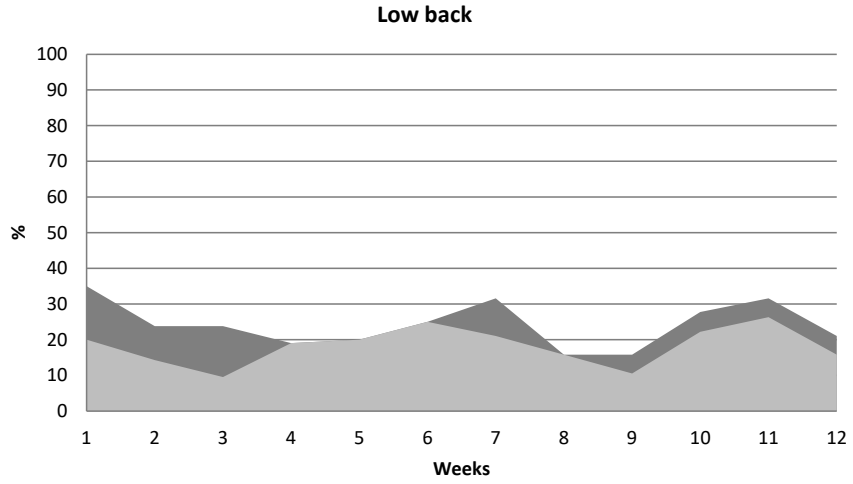

Figure 4. Prevalence of all overuse problems (dark grey area) and substantial overuse problems (light grey area) in the low back area during the 12-week period in track and field athletes (n = 21).

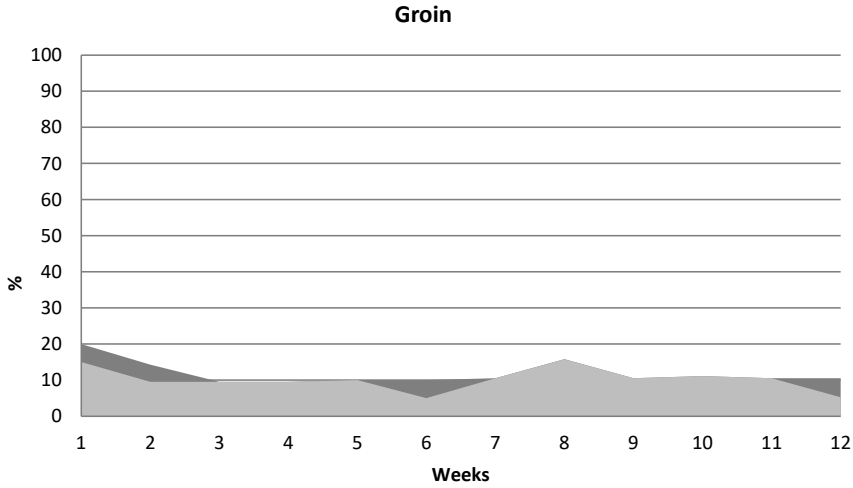

Figure 5. Prevalence of all overuse problems (dark grey area) and substantial overuse problems (light grey area) in the groin area during the 12-week period in track and field athletes (n = 21).

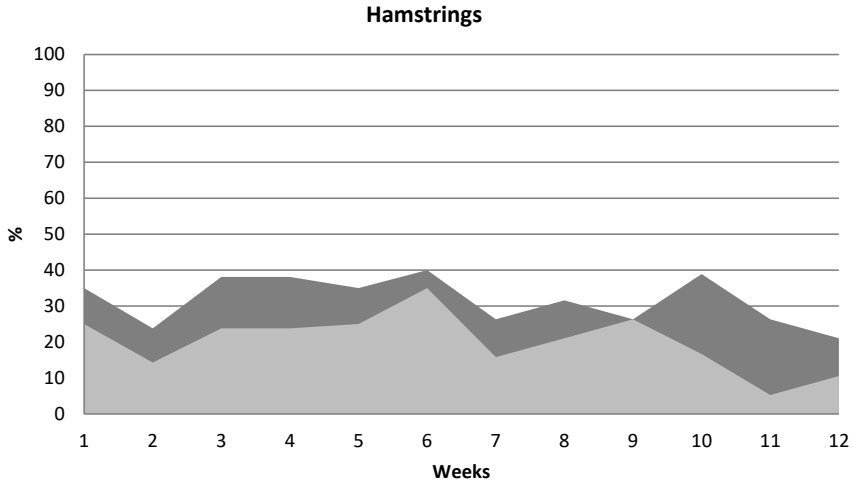

Figure 6. Prevalence of all overuse problems (dark grey area) and substantial overuse problems (light grey area) in the hamstring area during the 12-week period in track and field athletes (n = 21).

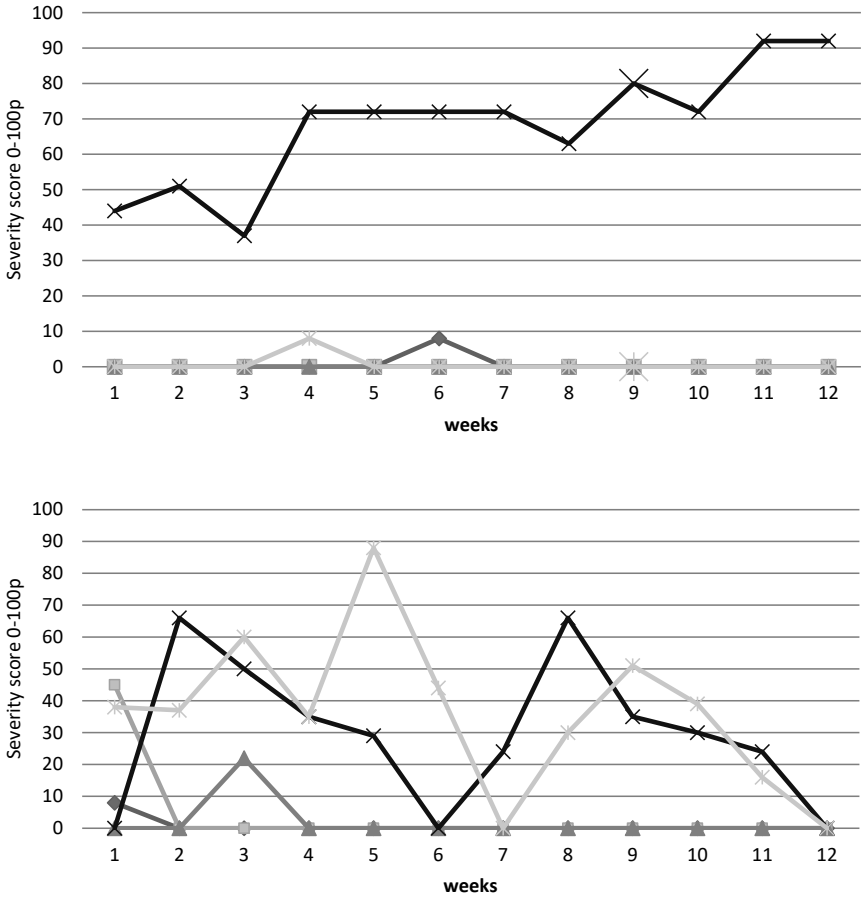

Figure 7. Example of two athletes with the highest injury severity score during the 12-week study period. Squares: ankle severity score; triangle: low-back severity score; cone: knee severity score; cross: groin severity score; * hamstring severity score.

DISCUSSION

The purpose of this study was to measure the extent of lower extremity and low back problems in highly trained track and field athletes during the 12 weeks of their preparation for national and international championships. The main findings were that at any given time an average of 64% of athletes in this group had an overuse problem with ankle, hamstring, groin, knee or low back. The most prevalent musculoskeletal overuse and health problems reported in our study group were hamstring and lower back problems and upper respiratory tract problems. Three serious injuries were registered in this group of track and field athletes, and they all involved stress fractures to the lower limb.

Previous research has pointed out that bone stress injuries may be common in track and field athletes, and the annual incidences may be higher than 20% [31]. In our study group, we registered three bone stress injuries with the time-loss from trainings of more than 6 weeks. Two of the injured athletes were males (one long jump and one multi-event athlete) and one a female sprinter. Previous studies have shown more bone stress fracture injuries in females and in long distance runners compared to sprinters and jumpers [29]. A number of risk factors, including low bone mineral density, menstrual irregularities, dietary factors and prior history of stress fractures, have been associated with an increased risk of stress fractures in female athletes, but few studies have focused on risk factors in male athletes. Nattiv [29] showed that lower body fat percentage was a significant risk factor in females, while lower body weight and lower hip eccentric strength were additional risk factors in male track and field athletes. Therefore, to prevent bone stress injuries, even sprinters, jumpers and multi-event track and field athletes need to pay more attention to their bone mineral density and dietary factors while in high-intensity and heavy-load training which involves repeated jumping and sprinting activities.

Injuries to the hamstrings seem to be the most common in track and field athletes, and most often athletes sustain hamstring injuries during eccentric contraction when the muscles are being stretched and contracted at the same time [2, 21]. In our study group of 21 sprinters, jumpers and multi-event athletes, the prevalence of hamstring problems was the highest when compared to other areas – prevalence of 25–40% was recorded during the 12-week period. Studies have also pointed out that previous hamstring injuries are probably the highest risk factors for the subsequent hamstring injury [16]. Since we did not follow up on our subjects, we did not have the information about their prior injuries. As the injury mechanism involves most often eccentric contraction,

this may indicate the need for higher eccentric strength of the hamstrings in sprinters and jumpers in order to prevent hamstring strain injuries [10].

Low back pain is a common complaint in the general and athletic population, but athletes seem to be at higher risk of developing low back pain, and the prevalence of low back pain has been reported to be up to 30% in athletes [4, 32, 27]. In our study group, the weekly prevalence of low back problems ranged from 20–35%. One of the reasons for high prevalence of low back pain could be improper weightlifting technique, since track and field athletes use heavy loads in weight training to improve maximal strength and power. For example, Cappozzo et al. [11] who measured the compressive loads during half-squat lifting of a weight about 1.6 time of body weight showed that the load at L3–L4 motion segment was about ten times body weight. Therefore, improper spinal mechanics during lifting that is performed hundreds of times in one training session might predispose athletes to low back dysfunction. Although low back pain is usually self-limiting, many athletes complain of long-term back problems. The treatment should be individually designed to target the necessary issues – to increase low back and abdominal muscle strength, flexibility or range of motion [32].

According to Jacobsson et al. [24], the most injured body part in Swedish track and field athletes was the knee with the 1-year prevalence of 15.0% and point prevalences of 13.7%. This is similar to our study findings in 21 highly trained track and field athletes where the weekly point prevalence of the knee problems were 20–35% in the first two weeks of the study but showed a decline towards the end of the 12 week period being 5–10% of point prevalence in weeks 11 and 12, which could indicate an increase in training volume or intensity at the start of the preparatory period of training as a cause of knee problems. Interestingly, the groin and ankle problems were not that prevalent in our group of track and field athletes compared to Jacobsson et al. [24] study on Swedish track and field athletes where 11.7% of injuries were to the Achilles tendon or foot area.

Alonso et al. [2] showed that in 2011 Daegu World Athletics Championships more than a third of the registered illnesses affected the respiratory and ear, nose, throat tract. This is similar to our findings in the present study where almost 30% of our subject group of highly trained track and field athletes suffered from upper respiratory tract problems, which was probably due to the fact that the study started in spring when the weather and temperature are very changeable in Estonia, and athletes train both indoors and outdoors. In order to prevent upper respiratory tract infections research has proposed different

interventions which are easy to implement and use – i.e., good hygiene practise; monitoring of training-induced stress; having proper nutrition; getting proper and regular sleep (7h minimum); preventing dehydration stress. Probiotics may improve the immune function and can prevent respiratory infections, and also supplemental intake of zinc within 24h of the start of symptoms can shorten the duration and symptoms of the cold or flu [19, 26].

CONCLUSION

The results of this study show that lower limb overuse injuries are frequent in track and field athletes and many athletes still train and compete through these injuries. Therefore, it is very important for athletes' long term health to regularly monitor their health problems in order to start preventing them. OSTRC Overuse Injury Questionnaire is a good and easy addition to athletes' weekly online training monitoring systems that may give more insight into training load and intensity planning in track and field athletes.

In summary, it can be concluded that overuse problems are quite frequent in track and field athletes and at any given time too many athletes are influenced by some type of injury, which, if left untreated, may develop into chronic problems and finish the athletes' career. Also, the most prevalent musculoskeletal problem areas were the hamstrings and low back. Therefore, coaches and medical personnel working in athletics need to focus on preventing these injuries.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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