Original Research

The Problem of Recurrent Injuries in Collegiate Track and Field

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Background

As with most sports, participating in Track and Field (T&F) has inherent injury risks and a previous injury often predisposes athletes to a greater future injury risk. However, the frequency and burden of recurrent injuries in collegiate T&F have not been closely examined.

Purpose

The purpose of this study was to describe the frequency and burden of recurrent injuries in collegiate T&F and compare differences in the time loss associated with initial and recurrent injuries by sex and T&F discipline.

Study Design

Descriptive Epidemiology Study

Methods

Data from the NCAA Injury Surveillance Program were analyzed to describe the frequency and burden of recurrent injuries in collegiate T&F between 2009 and 2014. Comparisons of recurrent injury proportions by T&F discipline were made using Injury Proportion Ratios (IPR) and injury-associated time loss comparisons by injury type and sex were made using Negative Binomial Regression.

Results

Four hundred and seventy-four injuries were reported, 13.1% of which were classified as recurrent injuries. T&F athletes who competed in jumps experienced a lower proportion of recurrent injuries (6.1%) than runners (14.6%) and throwers (19.2%) (Recurrent IPR 0.40, 95% CI 0.18-0.88, $p<0.05$). When controlling for sex and injury diagnosis, T&F athletes experienced 50% greater time loss from sport following a recurrent injury than an initial injury (95% CI 17%-107%, $p<0.01$).

Conclusions

Recurrent injuries in T&F athletes account for greater time loss than initial injuries, despite sex or injury diagnosis. The current study indicates a need for further research to assess factors contributing to time loss.

Level of Evidence

Level 3

INTRODUCTION

Collegiate track and field (T&F) athletes engage in demanding aerobic and muscular-strengthening activities that can improve health and well-being.[1,2] However, as with most sports, T&F has inherent injury risks and the highly repetitive and intense nature of its activities may increase previously injured athletes' risk of sustaining a recurrent in-

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jury.[3–5] Recurrent injuries occur when an athlete experiences the same injury they have previously recovered from, either in the same season or a previous one.[6] Recurrent injuries differ from initial injuries because they involve previously injured tissues that may have lingering deficits in strength, proprioception, or range of motion.[6] These recurrent injuries may be associated with longer recovery times, more time away from sport, and potentially retirement from sport.[6,7] While epidemiological research has evaluated injury risk in collegiate T&F, the burden of recurrent injuries has received less attention in this population.[3,4] The purpose of this study was to describe the frequency and burden of recurrent injuries in collegiate T&F and compare differences in the time loss associated with initial and recurrent injuries by sex and T&F discipline.

METHODS

DATA COLLECTION

This study retrieved data from the NCAA Injury Surveillance Program (ISP) to analyze injuries from Men's and Women's Indoor and Outdoor T&F seasons from academic year 2009-2010 through academic year 2013-2014. The ISP collects data from a convenience sample of NCAA Division I, II, and III varsity sports teams. Athletic trainers (AT) at each institution report injury and exposure data in real-time throughout the academic year. All data undergo a verification process in which data may be flagged for invalid values and then reviewed by the reporting AT and data quality assurance staff before becoming available to researchers. The methods of the ISP data collection have been previously described.[8,9]

When injuries were detected by or reported to an AT, the AT completed a detailed report on the athlete (eg. Sport, position, class year), their injury (eg. body region, diagnosis), and the circumstances of their injury (eg. mechanism of injury, practice or competition setting, new or recurrent).

OPERATIONAL DEFINITIONS

Reportable injuries defined by the NCAA ISP are events that occurred as a result of participation in organized intercollegiate practice/competition and required examination from an AT or physician, regardless of whether the athlete missed time away from sport. However, this study only analyzes injuries that required athletes to miss at least one day from sport. This definition may not capture the entire burden of injuries in T&F; however, it reduces bias by using a more objective definition of injury and captures injuries severe enough to warrant time away from sport participation. Similarly, this study defines recurrent injuries as injuries that require athletes to miss at least one day of sport and are of the same type and site as an initial injury after an athlete has returned to full participation following their initial injury. Recurrent injuries may occur during the same season as the initial injury or in subsequent seasons.

STATISTICAL ANALYSIS

The frequency and proportions of recurrent injuries were calculated by athletes' sex and primary T&F discipline (runner, jumper, or thrower) as indicated by ATs on injury reports. Injury proportion ratios (IPR) were used to compare the proportion of recurrent injuries by sex and T&F discipline. This analysis allows the comparison of recurrent injury patterns by T&F discipline to understand if certain T&F athletes experience greater proportions of recurrent injuries than others. Negative binomial regression was used to compare the number of days T&F athletes missed following an injury. This model was selected because the primary outcome of interest, number of days missed following injury, was over dispersed count data with a positive skew. Unadjusted negative binomial regression was used to compare the number of days missed after initial and recurrent injuries among each T&F discipline stratified by sex. Adjusted negative binomial regression controlling for injury diagnosis was used to compare the time loss associated with an injury by sex and injury type (initial or recurrent).

All data analyses were conducted using STATA 14.2 statistical software (StataCorp LP, College Station, Texas, USA).

RESULTS

Between the 2009-10 to 2013-14 academic years, there were a total of 474 injuries reported, 13.1% of which were classified as recurrent injuries. As shown in Table 1, T&F athletes whose primary discipline were jumps experienced a lower proportion of recurrent injuries (6.1%) than runners (14.6%) and throwers (19.2%) (Recurrent IPR 0.40, 95% CI 0.18-0.88, $p<0.05$). Table 1 also presents common examples of recurrent injury diagnoses by T&F discipline. Hamstring strains were the most common recurrent injury diagnosis among runners and jumpers. Runners also experienced recurrent injuries involving the lower leg and feet. In addition to hamstring strains, other common recurrent injury diagnoses experienced by jumpers included patellar tendinitis and lateral ankle sprains. Throwing athletes most commonly experienced recurrent injuries involving the spine and upper extremities. On average, T&F athletes missed 15.6 days following an initial injury and 24.2 days following a recurrent injury. Using unadjusted negative binomial regression to account for overdispersion, T&F athletes missed 55% more time following a recurrent injury than an initial injury (95% CI 17%-107%, $p<0.01$). When stratified by sex, this difference was greater in Women's T&F with recurrent injuries requiring 75% more time loss than initial injuries (95% CI 16%-167%, $p<0.01$) compared to Men's T&F where recurrent injuries only required 34% more time loss, however, this difference in Men's T&F was not statistically significant (95% CI -9%-96%, $p=0.14$). Table 2 provides the average number of days missed from initial and recurrent injuries for each discipline in Women's and Men's T&F.

There was no sex difference in the proportion of injuries classified as recurrent (IPR 0.96, 95% CI: 0.7-1.3), however, Women's T&F athletes experienced 27% more time loss across all injuries than Men's T&F athletes (95% CI 5%-55%, $p=0.02$). With this difference in mind, sex and injury diagnoses were included as covariates in an adjusted negative binomial regression analysis. The results of this model are listed in Table 3, where recurrent injuries account for 50% more time loss (95% CI 13%-98%, $p<0.01$) but no

Table 1. Recurrent Injuries by Track and Field Discipline (n=474)

	Proportion of Injuries Reported as Recurrent	Recurrent Injury Proportion Ratio[a] (95% CI)	Examples of Recurrent Injuries in Sample
Discipline			
Runners	14.6%	1.43 (0.82-2.49)	Hamstring strain, Medial Tibial Stress Syndrome, Plantar Fascia strain
Jumpers	6.1%	0.40 (0.18-0.88)	Hamstring strain, Patellar tendinitis, Lateral ankle sprain
Throwers	19.2%	1.56 (0.79-3.07)	Ulnar collateral ligament strain, Sacroiliac dysfunction, Paralumbar muscle strain

[a] *Injury Proportion Ratio (e.g. Proportion of Recurrent Injury among Runners / Proportion of Recurrent Injury among non-Runners)*

Table 2. Time loss by Injury Type and Track and Field (T & F) Discipline (n=474)

	Time loss from initial injuries	Time loss from recurrent injuries
Women's T&F (n=259)		
Runners	18.4 days (n=151)	32.6 days (n=21)
Throwers	14.3 days (n=21)	25.2 days (n=5)
Jumpers	14.5 days (n=56)	23.2 days (n=5)
Total	17.0 (n=228)	29.9 (n=31)
Men's T&F (n=215)		
Runners	14.7 days (n=112)	20.9 days (n=24)
Throwers	12.9 days (n=21)	14.2 days (n=5)
Jumpers	12.5 days (n=51)	2.00 days (n=2)
Total	13.9 (n=184)	18.6 (n=31)

Table 3. Rate ratio of days missed following injury (n=474)

	Ratio of Time Lost Following Injury^	95% CI	p-value
Injury Type			
New Injury	Referent		-
Recurrent Injury	1.50	1.13-1.98	<0.01
Sex			
Male	Referent		-
Female	1.15	0.94-1.41	0.18

^*Negative Binomial Regression controlling for injury diagnosis, injury type, and sex*

significant difference persisted between sexes (95% CI -6%-41%, p=0.18).

DISCUSSION

The aim of this study was to describe the frequency and burden of recurrent injuries on collegiate T&F athletes. The main findings of the study indicate that recurrent injuries are associated with a greater amount of time loss compared to initial injuries and that T&F disciplines experience differing proportions of recurrent injuries with jumpers having a lower proportion than runners and throwers. Regardless of injury diagnosis or sex, athletes who experienced a recurrent injury experienced greater time loss from the sport than those who experienced an injury for the first time. While previous injury is a commonly discussed risk factor for future injury, the elevated burden or increased time loss associated with recurrent injuries has received less attention.[6] There may be physiological and psychosocial factors related to the extended time loss observed after a recurrent injury. The goal of this discussion is to describe these factors.

PHYSIOLOGICAL REASONS FOR EXTENDED TIME LOSS

Athletes who have previously experienced an injury may have neuromuscular deficits such as decreased strength and proprioception that could predispose them to a recurrent injury.[6,10] These deficits can decrease athletes' abilities to appropriately respond to changing stimuli in sport and not only increase their risk of injury, but potentially result in more severe injuries with longer healing duration. It is unclear if anatomical changes following an initial injury contribute to increased injury severity of recurrent injuries. The formation of less functional scar tissue following a muscle injury may generate more strain on adjacent muscle fibers and result in a greater risk of recurrent injury.[11] This continued development of scar tissue following a recurrent injury may make it more difficult for athletes to regain appropriate strength, delaying their return to sport. It is unclear whether previously injured tissues experience delayed healing if injured again. In the first study of its kind, Sevick et al. compared the mechanical properties of injured and re-injured rabbit ligaments and found little difference in the structural and material properties of single- and re-injured ligaments of similar severity, however, more severely re-injured ligaments were inferior in ligament failure stress and creep strain.[12] Future research should compare the structural properties of initial and recurrent injuries to better understand physiological factors that may delay healing or prolong an injured athlete's return to sport.

PSYCHOSOCIAL REASONS FOR EXTENDED TIME LOSS

Athletes who have previously recovered from an injury may delay their return to sport following a recurrent injury be-

cause of psychosocial reasons. Athletes recovering from injury might display fear avoidance behaviors which can delay their recovery and require extended time loss from sport.[13,14] However, athletes with recurrent injuries may be more vulnerable to these fear avoidance beliefs than athletes with a single injury.[15] Conversely, athletes with high athletic identity may exhibit poor psychosocial outcomes following an injury and be more prone to not report injury symptoms to coaches or trainers in the hopes of uninterrupted sport participation.[16] Since they have already recovered from an initial injury, these athletes may feel more knowledgeable about injury management practices and seek to self-manage a recurrent injury rather than report it to coaches or athletic trainers. They may only choose to report the recurrent injury if their symptoms worsen beyond their initial injury. This delay in injury reporting could result in a more severe injury that requires greater time to fully recover. Lastly, the athlete's medical team may take a more conservative approach following a recurrent injury if they feel the athlete's previous recovery timeline was inadequate and thus contributed to their recurrent injury. Future research should evaluate these psychosocial correlates of time loss following recurrent and initial injuries.

LIMITATIONS

The findings from the current study may not be generalizable to other competition levels such as high school, professional, or recreational track and field athletes. Additionally, the NCAA ISP uses a convenience sampling method, so participating schools may not be representative of the entire NCAA. This surveillance study also did not account for the many individual- or institutional-related factors that may have contributed to injury risk and time loss. Examples of these factors may include athletes' specific training loads or different injury-prevention or management practices implemented by coaching and training staff at each college. Lastly, the "Runner" position category did not differentiate between sprinters and distance runners, so differences in their injury patterns and recovery times could not be accounted for in this study.

CONCLUSION

This study provides an assessment of the frequency and burden of recurrent injuries in collegiate track and field using data from a large injury surveillance program. The results of this study indicate that regardless of injury diagnosis or sex, recurrent injuries required greater time loss from sport participation than initial injuries. Both physiologic and psychosocial factors may contribute to the extended time loss associated with recurrent injuries, however, further research is necessary to assess their contributions to time loss and better prepare student-athletes for a safe return to sport.

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