Epidemiology of Injuries in National Collegiate Athletic Association Men’s Track and Field: 2014–2015 Through 2018–2019

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Context: College athletes have been competing in championship track and field events since 1921; the numbers of competing teams and participating athletes have expanded considerably.

Background: Monitoring injuries of men's track and field athletes using surveillance systems is critical in identifying emerging injury-related patterns.

Methods: Exposure and injury data collected in the National Collegiate Athletic Association Injury Surveillance Program during the 2014–2015 through 2018–2019 academic years were analyzed. Injury counts, rates, and proportions were used to describe injury characteristics; injury rate ratios were used to examine differential injury rates.

Results: Overall, men's track and field athletes were injured at a rate of 2.37 per 1000 athlete-exposures; injuries occurred at a higher rate during competition compared with practice. Most injuries were to the thigh (26.2%), lower leg (17.3%), or knee (10.7%) and were caused by noncontact (37.2%) or overuse (31.5%) mechanisms. The most reported injury was hamstring tear (14.9%).

Summary: The etiologies of thigh and lower-leg injuries warrant further attention in this population. Future researchers should also separately examine injury incidence during indoor and outdoor track and field seasons.

Key Words: collegiate, sport-related, surveillance

Key Points
- Overall, and across five years, the competition injury rate was higher than the practice injury rate.
- The overall preseason injury rate was not different than the regular season injury rate.
- Nearly half of all competition-related injuries were diagnosed as strains and were ankle-related.

Though not considered a contact or collision sport, track and field combines running, throwing, and jumping field events, making athletes susceptible to both acute and chronic injuries. Running events include long-distance, sprinting, and hurdle events, and field events include throwing as well as horizontal and vertical jumping. Each of these requires rigorous and event-specific training, leading to a wide spectrum of possible injuries. Importantly, the popularity of men's track and field events has steadily grown at the collegiate level. Over the past 3 decades in particular, participation in men’s track and field within the National Collegiate Athletic Association (NCAA) has increased from 422 to 734 teams in indoor track and field and from 577 to 834 teams in outdoor track and field. Given the observed popularity of and participation in men’s track and field, it is important to continue surveying injury incidence in this complex and growing sport.

Sports injury surveillance allows for the continuous monitoring of injury-related patterns and has been integrated into the NCAA since 1982 via the NCAA Injury Surveillance Program (ISP). Using the ISP, previous researchers have been able to describe injury incidence and outcomes in men’s track and field, yet there exists a paucity of epidemiologic evidence in this population. In the extant literature, it has been previously noted that overuse injuries impose a particular burden among NCAA men’s track and field athletes. It has also been noted that the lower extremity is most affected in this population, with hamstring strains accounting for the majority of both injury and outdoor injuries. As men’s track and field continues to grow, it is important to update these findings in order to identify injury incidence patterns and better inform injury prevention practices. Accordingly, the purpose of this study is to describe the epidemiology of track and field–related injuries captured among NCAA men’s track and field athletes between 2014–2015 and 2018–2019.

METHODS

Study Data

Men’s track and field–related (indoor and outdoor) exposure and injury data collected in the NCAA-ISP
Methods manuscript. In analyses. Qualification criteria are detailed in the surveillance program are detailed separately within this special issue. Briefly, certified athletic trainers (ATs) at participating institutions contributed relevant injury and exposure data using their clinical electronic medical record systems. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition, and required medical attention by a team Certified Athletic Trainer or physician (regardless of time loss).8 Scheduled team practices and competitions were retained in this analysis. Data presented in the order of reported number, followed by athlete exposures (AEs), estimated injury rates, and associated 95% Confidence Intervals (CIs) for each cross-tabulation of division and event types. Data pooled association-wide are presented overall, and separately for practices and competitions. National estimates were produced using sampling weights estimated on the basis of sport, division, and year. All CIs were constructed using variance estimates calculated on the basis of reported data. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition, and required medical attention by a team Certified Athletic Trainer or physician (regardless of time loss). Only scheduled team practices and competitions were retained in this analysis. Statistical Analysis Injury counts and rates (per 1000 athlete-exposures [AEs]; 1 AE was defined as 1 athlete participating in 1 exposure event) were evaluated by event type (practice, competition), competition level (Division I, Division II, Division III), season segment (preseason, regular season, postseason), and TL (TL, non-time loss [NTL]). Weighted and unweighted rates were estimated, and results are presented in terms of unweighted rates because of low frequencies of injury observations across levels of certain covariates unless otherwise specified. Temporal patterns (changes in injury incidence over time) in injury rates across the study period were evaluated using rate profile plots stratified across the aforementioned variables. Similarly, temporal trends in rates of most commonly reported injuries were also examined across the study period. Injury counts and proportions were examined by TL, body part injured, injury mechanism, injury diagnosis, playing position, and activity. Injury rate ratios (IRRs) were used to examine differential injury rates across event type, competition level, and season segment. Injury rate ratios with associated 95% CIs excluding 1.00 were considered statistically significant. All analyses were conducted using SAS (version 9.4; SAS Institute).

RESULTS

A total of 1081 men’s track and field injuries from 455 609 AEs were reported to the NCAA-ISP between 2014–2015 and 2018–2019 (rate = 2.37 per 1000 AEs). This equated to a national estimate of 57 427 injuries overall (Table 1). A total of 281 injuries were reported from competition events during the study period, and the competition injury rate was significantly higher than the practice injury rate (IRR = 2.02; 95% CI = 1.77, 2.32). Practice injury rates increased from 2014–2015 to 2015–2016; a noteworthy decrease was observed between 2015–2016 and 2016–2017, and a slight increase between 2017–2018 and 2018–2019 (Figure A). Conversely, competition injury rates increased from 2014–2015 to 2015–2016, then continued to decrease until 2018–2019 (Figure A). The overall Division I injury rate (2.92 per 1000 AEs) was higher than the Division II (1.68 per 1000 AEs) and Division III (2.33 per 1000 AEs) injury rates; statistically significant differences were observed between Divisions I and II (IRR = 1.74; 95% CI = 1.49, 2.04), Division I and III (IRR = 1.26; 95% CI = 1.09, 1.44), and Divisions II and III (IRR = 0.72; 95% CI = 0.61, 0.85).

Injuries by Season Segment

Across the study period, 322 preseason injuries (national estimate = 16 600), 715 regular-season injuries (national
estimate = 37,418), and 44 postseason injuries (national estimate = 3,409) were reported in men’s track and field athletes (Table 2). Notably, injury rates among all 3 season segments increased during the final year of the study. The injury rate was significantly higher in the preseason (IRR = 2.59; 95% CI = 1.89, 3.55) and regular season (IRR = 2.88; 95% CI = 2.13, 3.91), as compared with the postseason. Preseason and regular-season injury rates varied comparably across the study period (Figure B). Postseason injury rates were not calculated because of low injury counts across the study period.

**Time Loss**

More than one-third (36.3%) of all reported injuries resulted in TL of 1 day or more (approximately 26% of all injuries were missing TL information). The prevalence of TL injuries was higher among competition (41.3%) than practice-related (34.5%) injuries. Rates of practice-related TL injuries were lower than rates of competition-related TL, and practice-related TL injury rates were markedly more stable across the study period (Figure C).

**Injury Characteristics**

Overall, the most commonly injured body parts were the thigh (26.2%), lower leg (17.3%), and knee (10.7%). During competition, the most prevalently injured body parts were the thigh (36.3%), ankle (12.5%), and knee (10.3%). In practice, the most prevalently injured body parts were the thigh (22.6%), lower leg (20.4%), and knee/trunk (10.9%). Lower leg injuries accounted for a greater proportion of practice (20.4%) than competition (8.5%) injuries (Table 3). Noncontact (37.2%) and overuse (31.5%) injuries were the most frequently reported mechanisms of injury overall. Notably, the prevalence of overuse injuries was higher in practice (35.8%) than in competition (19.2%), whereas a greater proportion of competition (17.4%) as compared with practice injuries (8.1%) was attributed to surface contact.

Between 2014–2015 and 2018–2019, the most frequently reported injuries were strains (33.6%), inflammatory conditions (musculoskeletal pathologies with degenerative characteristics in the tissue involved, such as bursitis, capsulitis, etc; 18.6%), and sprains (9.4%). The prevalence of strains was higher in competition (42.4%) than in...
practice (30.5%), whereas the prevalence of inflammatory conditions was higher in practice (22.3%) than in competition (8.2%). The prevalence of spasms was similar in competition (8.9%) and in practice (8.3%). The most commonly reported injuries during the study period were partial or complete hamstring tears (14.9%), partial or complete lateral ligament complex tears (ankle sprains) (5.0%), hamstring spasms (4.1%), and medial tibial stress syndrome (4.1%). The rate of hamstring tears fluctuated across the study period (Figure D). Temporal patterns in rates of lateral ligament complex tears, hamstring spasms, and medial tibial stress syndrome are not reported because of low injury frequencies (n < 5) observed in certain years across the study period.

Injuries by Track and Field–Specific Activities and Positions

Most reported injuries in men’s track and field between 2014–2015 and 2018–2019 occurred during sprinting activities (29.9%) and distance running (21.3%). A higher prevalence of sprinting injuries was observed in competition (36.3%) than in practice (27.6%). Distance-running injuries were more prevalent in practice (24.0%) compared with competition injuries (13.5%). Overall, most injuries were reported among runners (60.9%), jumpers (14.7%), and throwers (11.1%). Comparable proportions of competition and practice injuries were reported among runners (Table 4). Injuries to jumpers accounted for a higher proportion of competition (18.5%) than practice injuries (13.4%).

SUMMARY

We have described the epidemiology of NCAA men’s track and field–related injuries reported to the NCAA-ISP between 2014–2015 and 2018–2019. Overall, the competition injury rate was significantly higher than the practice injury rate, similar to findings observed in other populations of track and field athletes and in other sports.9,10 However, it is important to acknowledge that this may be considered paradoxical in men’s track and field given the inherent mechanics of the sport. For instance, in men’s track and field events, there is typically minimal contact with other competitors or unanticipated events during competition.11 Examining injury rates by year reveals that overall and TL competition (and practice) injury rates increased markedly from 2014–2015 to 2015–2016, and subsequently decreased reflexively and stabilized (Figure C). A possible contributing factor to the observed injury rate inflection may be related to AT nuances in the reporting of injuries (potentially due to insufficient definitional clarity in certain circumstances) having had a greater impact on the observed estimates during years in which participation in the NCAA-ISP among track and field programs was low.12 Moreover, it has been proposed that improvements in shoe technology,13–15 amendments to NCAA track and field rules,16 and advancements in preventative injury practices and rehabilitation techniques17 may have influenced the overall injury rate decline previously described. In examining the temporal patterns (changing injury incidence over time) in injury incidence across the present study period, it may be noted that estimates from the latter years of the study are likely more indicative of injury incidence in this population, given the increased number of participating schools. National Collegiate Athletic Association ISP recruitment strategies have evolved over time, and the improvements in participation reflect the success of recently used recruitment strategies (for instance, support and communication from the NCAA Sport Science Institute). Therefore, it is important to continue monitoring injury incidence in men’s
Injury site

|                | Reported (%) | National Estimates (%) |
|----------------|--------------|------------------------|
| Head/face      | 21 (1.94)    | 1001 (1.74)            |
| Neck           | 3 (0.28)     | 77 (0.13)              |
| Shoulder       | 20 (1.85)    | 1056 (1.84)            |
| Arm/elbow      | 17 (1.57)    | 958 (1.67)             |
| Hand/wrist     | 17 (1.57)    | 731 (1.27)             |
| Trunk          | 106 (9.81)   | 6343 (11.05)           |
| Hip/groin      | 92 (8.51)    | 4144 (7.22)            |
| Thigh          | 283 (26.18)  | 16331 (28.44)          |
| Knee           | 116 (10.73)  | 6880 (11.98)           |
| Lower leg      | 187 (17.30)  | 9706 (16.90)           |
| Ankle          | 95 (8.79)    | 4417 (7.69)            |
| Foot           | 111 (10.27)  | 4872 (8.48)            |
| Other          | 13 (1.20)    | 910 (1.58)             |

Mechanism

|                | Overall | Competitions | Practices |
|----------------|---------|--------------|-----------|
| Noncontact     | 402 (37.19) | 27147 (47.27) | 108 (38.43) | 7417 (46.95) | 294 (36.75) | 19730 (47.39) |
| Contact with player | 10 (0.93)    | 621 (1.08)   | 8 (2.85)   | 555 (3.51)   | 2 (0.25)    | 67 (0.16)   |
| Contact with surface | 114 (10.55) | 4770 (8.31)  | 49 (17.44) | 2051 (12.98) | 65 (8.13)   | 2719 (5.93) |
| Contact with apparatus | 45 (4.16)    | 1952 (3.40)  | 14 (4.98)  | 521 (3.30)   | 31 (3.88)   | 1430 (3.44) |
| Contact with out-of-bounds object | 7 (0.65)     | 324 (0.56)   | 1 (0.36)   | 20 (0.13)    | 6 (0.75)    | 303 (0.73)  |
| Overuse        | 340 (31.45) | 15446 (26.90) | 54 (19.22) | 2550 (16.14) | 284 (35.75) | 12896 (30.98) |
| Illness/infection | 11 (1.02)    | 737 (1.28)   | 1 (0.36)   | 79 (0.50)    | 10 (1.25)   | 658 (1.56)  |
| Other/unknown  | 152 (14.06) | 6431 (11.20) | 46 (16.37) | 2605 (16.49) | 106 (13.25) | 3825 (9.19) |

Diagnosis

|                | Overall | Competitions | Practices |
|----------------|---------|--------------|-----------|
| Abrasion/laceration | 10 (0.93)    | 702 (1.22)   | 4 (1.42)   | 162 (1.03)   | 6 (0.75)    | 540 (1.30)  |
| Concussion       | 15 (1.39) | 550 (0.96)   | 8 (2.85)   | 347 (2.20)   | 7 (0.88)    | 204 (0.49)  |
| Contusion        | 48 (4.44) | 2394 (4.17)  | 20 (7.12)  | 1185 (7.50)  | 28 (3.50)   | 1209 (2.90) |
| Dislocation/subluxation | 5 (0.46)   | 317 (0.55)   | 0 (0)      | 0 (0)        | 5 (0.63)    | 317 (0.76)  |
| Entrapment/impingement | 8 (0.74)  | 270 (0.47)   | 2 (0.71)   | 93 (0.59)    | 6 (0.75)    | 177 (0.43)  |
| Fracture         | 28 (2.59) | 1575 (2.74)  | 6 (2.14)   | 333 (2.11)   | 22 (2.75)   | 1242 (2.98) |
| Illness/infection | 2 (0.19)    | 345 (0.60)   | 0 (0)      | 0 (0)        | 2 (0.25)    | 345 (0.83)  |
| Inflammatory condition | 201 (18.59) | 9401 (16.37) | 23 (8.19)  | 1418 (8.98)  | 178 (22.25) | 7982 (19.17) |
| Sprain           | 91 (8.42)  | 4787 (8.34)  | 25 (8.90)  | 1040 (6.58)  | 66 (8.25)   | 3746 (9.00) |
| Sprain           | 102 (9.44) | 5027 (8.75)  | 34 (12.10) | 1868 (11.82) | 68 (8.50)   | 3159 (7.59) |
| Strain           | 363 (33.58) | 21349 (37.18) | 119 (42.35) | 6845 (43.33) | 244 (30.50) | 14503 (34.84) |
| Other            | 208 (19.24) | 10712 (18.65) | 40 (14.23) | 2507 (15.87) | 168 (21.00) | 8205 (19.71) |

*Data presented in the order of reported number, followed by the proportion of all injuries attributable to a given category. Data pooled across event types are presented overall, and separately for practices and competitions. National estimates were produced using sampling weights estimated on the basis of sport, division, and year. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition, and required medical attention by a team Certified Athletic Trainer or physician (regardless of time loss). Only scheduled team practices and competitions were retained in this analysis.

**Discussion**

Track and field athletes have a higher risk of overuse injuries. It is important to mention that this study did not examine potential differences in injury rates between indoor and outdoor track seasons, as these data are not separated in ISP data collection. This is an inherent limitation of the ISP in its current form, and differential injury rates between the 2 seasons should be investigated in future studies. Subsequent authors should also examine the percentage of athletes that compete in both seasons and explore off-season season training characteristics. This will facilitate a comprehensive and accurate explanation of injury rates and trends among these athletes.

Describing the distribution of injuries via body parts, mechanisms, and activities offers greater insight into the injury characteristics of this biomechanically diverse, demanding sport. Not surprisingly, the body parts most often reported injured were in the lower extremities in both practice and competition, particularly muscular thigh injuries. Competition-related thigh injuries are likely the result of high-intensity workload coupled with high-risk maneuvers that result in changes to an athlete’s running technique in an effort to increase speed. These changes, although minor, can lead to greater than optimal muscle...
lengthening that subsequently increases intramuscular strain. Given the relationships between performance, stride length, and stride frequency, the musculature of the thigh is under exceptional stress during competition. This, combined with bouts of high-intensity and -workload movements often associated with competition, may provide additional context as to why thigh injuries constitute a high proportion of competition-related injuries. The complex relationship between workload accumulation and injury risk is vital in elucidating NCAA men’s track and field injury trends. Surveillance-based systems can identify developing patterns that subsequent smaller sampled studies can be informed by. This can be subsequently used to inform prophylactic and preventative injury objectives that reduce the burden of injury in this population. Surveillance-based systems can identify developing patterns that subsequent smaller sampled studies can be informed by. This can be subsequently used to inform prophylactic and preventative injury objectives that reduce the burden of injury in this population.

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Steeplechase 4 (0.37) 134 (0.23) 4 (1.42) 134 (0.85) 0 (0) 0 (0)

Running 644 (59.57) 33268 (57.93) 171 (60.85) 1352 (8.45) 182 (23.22) 7552 (16.30)

Jumping 194 (17.95) 10995 (19.15) 25 (8.90) 1542 (9.76) 95 (11.88) 5665 (13.61)

Practice may be the result of greater volumes of repetitive movements that subsequently increases intramuscular strain. Given the relationships between performance, stride length, and stride frequency, the musculature of the thigh is under exceptional stress during competition. This, combined with bouts of high-intensity and -workload movements often associated with competition, may provide additional context as to why thigh injuries constitute a high proportion of competition-related injuries. The complex relationship between workload accumulation and injury risk is vital in elucidating NCAA men’s track and field injury trends. Surveillance-based systems can identify developing patterns that subsequent smaller sampled studies can be informed by. This can be subsequently used to inform prophylactic and preventative injury objectives that reduce the burden of injury in this population.

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Table 4. Distribution of Injuries by Injury Activity and Playing Position, Stratified by Event Typea

| Activity   | Overall Reported (%) | National Estimates (%) | Competitions Reported (%) | National Estimates (%) | Practices Reported (%) | National Estimates (%) |
|------------|----------------------|------------------------|---------------------------|------------------------|------------------------|------------------------|
| Jumping    | 194 (17.95)          | 10995 (19.15)          | 72 (25.62)                | 4374 (27.69)           | 122 (15.25)            | 6622 (15.91)           |
| High jump  | 38 (3.52)            | 2651 (4.62)            | 15 (5.34)                 | 1068 (6.76)            | 23 (2.88)              | 1584 (3.80)            |
| Long jump  | 55 (5.09)            | 3062 (5.33)            | 22 (7.83)                 | 1180 (7.47)            | 33 (4.13)              | 1883 (4.52)            |
| Triple jump| 40 (3.70)            | 2586 (4.50)            | 19 (6.76)                 | 1354 (8.57)            | 21 (2.63)              | 1232 (2.96)            |
| Pole vaulting | 61 (5.64)          | 2696 (4.69)            | 16 (5.69)                 | 772 (4.89)             | 45 (5.63)              | 1923 (4.62)            |
| Running    | 644 (59.57)          | 33268 (57.93)          | 171 (60.85)               | 1352 (8.45)            | 182 (23.22)            | 7552 (16.30)           |
| Distance running | 230 (21.28)  | 10766 (18.75)          | 38 (13.52)                | 2102 (13.31)           | 192 (24.00)            | 8665 (20.81)           |
| Hurdles    | 74 (6.85)            | 3916 (6.82)            | 23 (8.19)                 | 1335 (8.45)            | 51 (6.38)              | 2582 (6.20)            |
| Sprints    | 323 (29.88)          | 17866 (31.11)          | 102 (36.30)               | 5016 (31.75)           | 221 (27.63)            | 12850 (28.07)          |
| Relays     | 13 (1.20)            | 586 (1.02)             | 4 (1.42)                  | 141 (0.89)             | 9 (1.13)               | 445 (1.07)             |
| Steeplechase | 4 (0.37)           | 134 (0.23)             | 4 (1.42)                  | 134 (0.85)             | 0 (0)                  | 0 (0)                  |
| Throwing   | 84 (7.77)            | 5591 (9.58)            | 20 (7.12)                 | 1002 (6.45)            | 64 (8.00)              | 3482 (7.96)            |
| Hammer     | 23 (2.13)            | 1561 (2.72)            | 5 (1.78)                  | 620 (3.92)             | 18 (2.25)              | 941 (2.26)             |
| Discus     | 6 (0.56)             | 315 (0.55)             | 0 (0)                     | 0 (0)                  | 6 (0.75)               | 315 (0.76)             |
| Javelin    | 31 (2.87)            | 2033 (3.54)            | 9 (3.20)                  | 1029 (6.51)            | 22 (2.75)              | 1004 (2.41)            |
| Shot put   | 24 (2.22)            | 1591 (2.77)            | 6 (2.14)                  | 370 (2.34)             | 18 (2.25)              | 1222 (2.74)            |
| Other or unknown | 73 (6.75)   | 3234 (5.63)            | 13 (4.63)                 | 573 (3.46)             | 6.3872                 | 60 (7.50)              |
| Conditioning | 72 (6.66)          | 3392 (5.91)            | 1 (0.36)                  | 20 (0.13)              | 71 (8.88)              | 3372 (8.10)            |
| Weight     | 14 (1.30)            | 1037 (1.81)            | 4 (1.42)                  | 82 (0.52)              | 10 (1.25)              | 955 (2.29)             |

a Data presented in the order of reported number, followed by the proportion of all injuries attributable to a given category. Data pooled across event types are presented overall, and separately for practices and competitions. National estimates were produced using sampling weights estimated on the basis of sport, division, and year. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition, and required medical attention by a team Certified Athletic Trainer or physician (regardless of time loss). Only scheduled team practices and competitions were retained in this analysis.
ISP. Their efforts are greatly appreciated and have had a tremendously positive effect on the safety of collegiate student-athletes.

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