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Epidemiology of Secondary School Boys' and Girls' Basketball Injuries: National Athletic Treatment, Injury and Outcomes Network

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Context: Little is known about non–time-loss (NTL) injury patterns in basketball athletes. Knowledge of these patterns may aid in the development of prevention and management strategies for patients with these injuries.

Objective: To describe the epidemiology of time-loss (TL) and NTL injuries sustained by secondary school boys' and girls' basketball athletes.

Design: Descriptive epidemiology study.

Setting: Eighty-six unique schools provided data, with 84 and 83 contributing to boys' and girls' basketball, respectively.

Patients or Other Participants: Athletes participating in secondary school-sponsored boys' and girls' basketball.

Main Outcome Measure(s): Boys' and girls' basketball data from the National Athletic Treatment, Injury and Outcomes Network (NATION) injury-surveillance program (2011–2012 through 2013–2014 years) were analyzed. Injury counts, rates, and rate ratios (IRRs) were reported with 95% confidence intervals (CIs).

Results: The NATION captured 2653 injuries over 364 355 athlete-exposures (AEs) for boys' basketball and 2394 injuries over 288 286 AE for girls' basketball, producing rates of 7.28/1000 AEs (95% CI = 7.00, 7.56) for boys and 8.30/1000 AEs (95% CI = 7.97, 8.64) for girls. The overall injury rates were slightly lower for boys (IRR = 0.88; 95% CI = 0.83, 0.93). For boys, 559 (21.1%) injuries were TL and 2094 (78.9%) were NTL, producing a TL injury rate of 1.53/1000 AEs (95% CI = 1.40, 1.66) and an NTL injury rate of 5.75/1000 AEs (95% CI = 5.50, 5.99). For girls, 499 (20.8%) injuries were TL and 1895 (79.2%) were NTL, producing a TL injury rate of 1.73/1000 AEs (95% CI = 1.58, 1.88) and an NTL injury rate of 6.57/1000 AEs (95% CI = 6.28, 6.87). Rates of TL injuries were similar between boys' and girls' basketball (IRR = 0.89; 95% CI = 0.79, 1.00); NTL injury rates were lower for boys (IRR = 0.87; 95% CI = 0.82, 0.93).

Conclusions: When NTL injuries were included, the rates of injury in boys' and girls' secondary school basketball were higher than previously reported.

Key Words: adolescents, injury incidence, youth sports

Key Points

- When non–time-loss injuries were taken into consideration, boys' and girls' secondary school basketball injury rates were higher than previously reported.
- The rate of injury for girls' secondary school basketball was higher than for boys, consistent with earlier reports.
- Compared with time-loss injuries, non–time-loss injuries accounted for a larger proportion and higher rate of injuries overall.

Nearly 975 000 US student-athletes participated in secondary school basketball during the 2015–2016 academic year, ranking it as 1 of the most popular secondary school sports nationwide.[1] Similar to other sports, basketball carries an inherent risk of injury.[2–5] Research[5] suggested that injuries from secondary school basketball resulting in time loss (TL) were limited, with rates reported as 1.83 and 2.08 per 1000 athlete-exposures (AEs) among boys and girls, respectively. Although practices accounted for nearly 70% of total AEs, competition injury rates consistently exceeded those of practice.[5–8] The most recent comprehensive epidemiology report on secondary school basketball injury rates was completed during the 2005–2007 academic years, with an emphasis on *TL injuries*, which were defined as injuries that restricted participation from practices or competitions for at least 24 hours beyond the day of injury.[5,9]

Time-loss injury data are valuable because injuries resulting in removal from participation can significantly affect an athlete's daily living and productivity. A report[9]

indicated that non–time-loss (NTL) injuries constituted more than 75% of secondary school basketball injuries among boys and girls. Little is known about injuries that do not result in lost time in any setting, including the secondary school. A better understanding of NTL injuries is essential to managing the various injuries encountered in the day-to-day care of basketball athletes. Proper knowledge about the breadth of injuries that basketball athletes sustain will assist us in identifying prevention strategies to lessen the injury risk in this important athlete population and close a knowledge gap for those who treat and manage these injuries. Athletic trainers (ATs) play an integral role in player safety. Thus, understanding the health care demands of athletes and the responsibilities of the AT is essential to ensuring that appropriate care is delivered.

One way to better understand the health care needs of athletes, and subsequently sports programs, is through injury surveillance. The growing number of basketball players, combined with the associated risk of injury, makes surveillance efforts aimed at capturing NTL injuries essential so that we can learn more about the types and mechanisms of these injuries. Therefore, the purpose of our study was to describe the TL and NTL injuries experienced by secondary school basketball athletes by analyzing data from the National Athletic Treatment, Injury and Outcomes Network (NATION) surveillance system.

METHODS

We used a descriptive epidemiologic design to examine injury patterns in secondary school boys' and girls' basketball athletes.[9] Deidentified injury data from the 2011–2012 through 2013–2014 academic years were obtained from the Datalys Center, Inc (Indianapolis, IN), and reflect data collected through NATION.[9] A detailed description of the NATION injury-surveillance methods has been published.[9] In brief, ATs who are part of the NATION injury-surveillance effort collect and enter injury and exposure data into a certified electronic medical record that allows exporting of data to NATION.[9] Deidentified exposure and injury data are extracted from these records and checked for errors by trained, experienced NATION data quality-control staff.[9] Data are collected in a single, aggregated database that includes 147 high schools across the country.[9] The NATION project was granted approval by the Western Institutional Review Board (Puyallup, WA), and the study was reviewed and approved by the local institutional review board before review of any data.

Definitions

An *injury* was defined as any injury that occurred as a result of participation in a secondary school-sanctioned basketball competition or practice and was evaluated or treated by an AT, physician, or other health care professional.[9] Injuries were further defined in terms of injury-restriction time (eg, lost playing time versus no loss in playing time). A *TL injury* was defined as any injury that withheld the athlete from sport participation for at least 1 day postinjury.[9] An *NTL injury* was defined as any injury that did not require the athlete to be withheld from participation beyond the day of injury (<24 hours).[9]

An *athlete-exposure* (AE) was defined as a single athlete participating in 1 secondary school-sanctioned practice or competition, regardless of duration, in which the athlete was exposed to the risk of injury.[9] A competition exposure required that the student-athlete actually participate in the competition event to be considered exposed.[9]

Diagnoses were listed as abrasion, concussion, contusion (hematoma), dislocation, fracture, general medical, inflammation, laceration, nervous system, sprain, strain, tendinitis, or other. Body parts injured were described as head or face, neck, shoulder, arm or elbow, hand or wrist, trunk, hip or groin, thigh, knee, lower leg, ankle, foot, or other. Mechanisms of injury were categorized as player contact, surface contact, ball contact, contact with other equipment, out-of-bounds contact, noncontact, overuse, illness or infection, other, or unknown.

Statistical Analysis

Descriptive data, including frequencies, were reported for sex, body part, exposure type, diagnosis, and mechanism of injury. Injury data were grouped according to TL or NTL status for all variables except mechanisms, which were reported only for TL injuries. Exposures were calculated for practices, competitions, and total events (practices and competitions). Injury rates (IRs) were reported per 1000 AEs. Injury rate ratios (IRRs) were calculated with 95% confidence intervals (CIs) and P values where appropriate. Those CIs that did not include 1.00 and P values $< .05$ were considered statistically significant.[5] All analyses were performed with SPSS (version 23; IBM Corp, Armonk, NY). The following is an example of an IRR comparing NTL injuries with TL injuries: IRR = (No. of NTL Injuries / No. of NTL AEs) / (No. of TL Injuries / No. of TL AEs).

RESULTS

Overall Incidences and Rates

Boys' Basketball. The NATION captured a total of 2653 injuries over 364 355 AEs during 146 team-seasons in 84 unique schools over 3 years. These injuries resulted in an IR of 7.28/1000 AEs (95% CI = 7.00, 7.56; Table 1). A total of 1794 (67.6%) injuries were sustained during practices and 859 (32.4%) during competitions. In total, 559 (21.1%) injuries were TL and 2094 (78.9%) were NTL, producing a TL IR of 1.53/1000 AEs (95% CI = 1.40, 1.66) and an NTL IR of 5.75/1000 AEs (95% CI = 5.50, 5.99). Competition rates exceeded practice rates for all injuries (IRR = 1.43; 95% CI = 1.32, 1.55), including TL (IRR = 1.90; 95% CI = 1.60, 2.25) and NTL (IRR = 1.32; 95% CI = 1.20, 1.45) injuries. Most injuries (70.0%, n = 1858) occurred during the regular season, with 26.4% (n = 701) and 3.5% (n = 94) occurring in the preseason and postseason, respectively.

Girls' Basketball. The NATION captured a total of 2394 injuries over 288 286 AEs during 143 team-seasons in 83 unique schools over 3 years. These injuries resulted in an IR of 8.30/1000 AEs (95% CI = 7.97, 8.64; Table 2). A total of 1483 (62.0%) injuries were sustained during practices and 911 (38.0%) during competitions. In total, 499 (20.8%) injuries were TL and 1895 (79.2%) were NTL, producing a TL IR of 1.73/1000 AEs (95% CI = 1.58, 1.88) and an NTL IR of 6.57/1000 AEs (95% CI = 6.28, 6.87). Competition rates exceeded practice rates for all injuries (IRR = 1.69; 95% CI = 1.55, 1.83), including TL (IRR =

Table 1. Injury Rates (IRs) by Time of Season and Event Type for Non–Time-Loss (NTL) and Time-Loss (TL) Injuries in Secondary School Boys' Basketball[a]

	TL Injuries		NTL Injuries		Overall Injuries		
Outcome Variable	n (%)	IR (95% CI)/1000 AEs	n (%)	IR (95% CI)/1000 AEs	n (%)	IR (95% CI)/1000 AEs	AEs
Time of season							
Preseason	105 (18.8)	1.45 (1.18, 1.73)	596 (28.5)	8.25 (7.59, 8.91)	701 (26.4)	9.70 (8.98, 10.42)	72 264
Regular season	443 (79.2)	1.58 (1.43, 1.72)	1415 (67.6)	5.03 (4.77, 5.30)	1858 (70.0)	6.61 (6.31, 6.91)	281 035
Postseason	11 (2.0)	0.99 (0.41, 1.58)	83 (4.0)	7.51 (5.89, 9.12)	94 (3.5)	8.50 (6.78, 10.22)	11 057
Total	559 (100)	1.53 (1.40, 1.66)	2094 (100)	5.75 (5.50, 5.99)	2653 (100)	7.28 (7.00, 7.56)	364 355
Event type							
Practice	342 (61.2)	1.25 (1.12, 1.39)	1452 (69.3)	5.32 (5.05, 5.59)	1794 (67.6)	6.57 (6.27, 6.88)	272 998
Competition	217 (38.8)	2.38 (2.06, 2.69)	642 (30.7)	7.03 (6.48, 7.57)	859 (32.4)	9.40 (8.77, 10.03)	91 357
Total	559 (100)	1.53 (1.41, 1.66)	2094 (100)	5.75 (5.50, 5.99)	2653 (100)	7.28 (7.00, 7.56)	364 355

Abbreviations: AE, athlete-exposure; CI, confidence interval.

[a] The TL injuries resulted in participation-restriction time ≥24 h; NTL injuries resulted in participation-restriction time <24 h.

2.57; 95% CI = 2.15, 3.06) and NTL (IRR = 1.50; 95% CI = 1.37, 1.65) injuries. Most injuries occurred during the regular season (64.9%, n = 1553), with 32.5% (n = 778) and 2.6% (n = 63) occurring in the preseason and postseason, respectively.

Sex Differences. The overall IRs, regardless of exposure or time-loss category (TL or NTL), were slightly lower in boys than in girls (IRR = 0.88; 95% CI = 0.83, 0.93). The IR was similar between boys and girls for practice injuries (IRR = 0.94; 95% CI = 0.87, 1.00) but lower for competition injuries (IRR = 0.79; 95% CI = 0.72, 0.87). Regardless of competition or practice, NTL IRs were lower in boys compared with girls (IRR = 0.87; 95% CI = 0.82, 0.93), but TL IRs were similar (IRR = 0.89; 95% CI = 0.79, 1.00). When considering exposure type, TL IRs were similar for boys and girls during practices (IRR = 1.03; 95% CI = 0.87, 1.21) but lower for boys during competitions (IRR = 0.76; 95% CI = 0.63, 0.91).

Body Part. The most commonly injured body parts for boys and girls, regardless of exposure or time-loss category, were the ankle (boys = 566, 21.3%; girls = 462, 19.3%), hand or wrist (boys = 430, 16.2%; girls = 416, 17.3%), and knee (boys = 382, 14.4%; girls = 389, 16.2%; Table 3). The majority of these injuries were classified as NTL (boys: ankle = 394, 69.6%; hand or wrist = 392, 91.2%; knee = 328, 85.9%; girls: ankle = 352, 76.2%; hand or wrist = 386, 92.8%; knee = 316, 81.2%).

In competition, boys had a higher IR than girls for all hip or groin injuries overall (IRR = 1.95; 95% CI = 1.14, 3.34) and for NTL injuries (IRR = 1.82; 95% CI = 1.04, 3.19) but not for TL injuries (IRR = 4.21; 95% CI = 0.49, 36.03; Table 3). Boys experienced a lower competition IR for the head or face (IRR = 0.70; 95% CI = 0.55, 0.89), including TL injuries (IRR = 0.51; 95% CI = 0.37, 0.70) but not NTL injuries (IRR = 1.14; 95% CI = 0.77, 1.70), and for the knee (IRR = 0.61; 95% CI = 0.48, 0.77) for both TL (IRR = 0.50; 95% CI = 0.30, 0.85) and NTL (IRR = 0.64; 95% CI = 0.49, 0.84) injuries (Table 3).

During practices, boys also demonstrated a higher IR for the hip or groin (IRR = 1.47; 95% CI = 1.05, 2.07) injuries, including TL (IRR = 1.57; 95% CI = 1.08, 2.27) but not NTL (IRR = 1.03; 95% CI = 0.43, 2.45) injuries (Table 3). Although the IRs for the shoulder were similar in boys and girls when considering all injuries (IRR = 1.48; 95% CI = 0.98, 2.23), the boys' IR was higher for TL injuries (IRR = 2.79; 95% CI = 1.03, 7.51; Table 3). Injury rates for the knee were consistent for boys and girls when considering all (IRR = 0.89; 95% CI = 0.75, 1.06), TL (IRR = 0.69; 95% CI = 0.43, 1.11), and NTL (IRR = 0.93; 95% CI = 0.77, 1.12) injuries (Table 3). When compared with girls, the boys' IR for the lower leg was less for all (IRR = 0.52; 95% CI = 0.41, 0.67) and NTL (IRR = 0.51; 95% CI = 0.38, 0.67) injuries but not for TL injuries (IRR = 0.63; 95% CI = 0.33, 1.19; Table 3).

Table 2. Injury Rates (IRs) by Time of Season and Event Type for Non–Time-Loss (NTL) and Time-Loss (TL) Injuries in Secondary School Girls' Basketball[a]

	TL Injuries		NTL Injuries		Overall Injuries		
Outcome Variable	n (%)	IR (95% CI/1000 AEs)	n (%)	IR (95% CI/1000 AEs)	n (%)	IR (95% CI/1000 AEs)	AEs
Time of season							
Preseason	93 (18.6)	1.35 (1.07, 1.62)	685 (36.1)	9.92 (9.18, 10.66)	778 (32.5)	11.27 (10.48, 12.06)	69 044
Regular season	391 (78.4)	1.84 (1.66, 2.02)	1162 (61.3)	5.46 (5.15, 5.77)	1553 (64.9)	7.30 (6.93, 7.66)	212 810
Postseason	15 (3.0)	2.33 (1.15, 3.51)	48 (2.5)	7.46 (5.35, 9.57)	63 (2.6)	9.79 (7.37, 12.21)	6433
Total	499 (100)	1.73 (1.58, 1.88)	1895 (100)	6.57 (6.28, 6.87)	2394 (100)	8.30 (7.97, 8.64)	288 286
Event Type							
Practice	258 (51.7)	1.22 (1.07, 1.37)	1225 (64.6)	5.80 (5.47, 6.12)	1483 (62.0)	7.02 (6.66, 7.37)	211 368
Competition	241 (48.3)	3.13 (2.74, 3.53)	670 (35.4)	8.71 (8.05, 9.37)	911 (38.0)	11.84 (11.07, 12.61)	76 919
Total	499 (100)	1.73 (1.58, 1.88)	1895 (100)	6.57 (6.28, 6.87)	2394 (100)	8.30 (7.97, 8.64)	288 286

Abbreviations: AE, athlete-exposure; CI, confidence interval.

[a] The TL injuries resulted in participation-restriction time ≥24 h; NTL injuries resulted in participation-restriction time <24 h.

Table 3. Injury Rates (IRs) per Body Part for Non–Time-Loss (NTL) and Time-Loss (TL) Classification: Secondary School Boys' and Girls' Basketball

		Boys' Injuries				Girls' Injuries			
Event	Body Part	TL, n (%)	NTL, n (%)	Overall, n (%)	Overall IR (95% CI/1000 AEs)	TL, n (%)	NTL, n (%)	Overall, n (%)	Overall IR (95% CI/1000 AEs)
Competitions	Head/face	59 (27.2)	57 (8.9)	116 (13.5)	1.27 (1.04, 1.50)	98 (40.7)	42 (6.3)	140 (15.4)	1.82 (1.52, 2.12)
	Neck	5 (2.3)	8 (1.2)	13 (1.5)	0.14 (0.06, 0.22)	2 (0.8)	10 (0.8)	12 (1.3)	0.16 (0.07, 0.24)
	Shoulder	8 (3.7)	24 (3.7)	32 (3.7)	0.35 (0.23, 0.47)	7 (2.9)	25 (3.4)	32 (3.5)	0.42 (0.27, 0.56)
	Arm/elbow	6 (2.8)	33 (5.1)	39 (4.5)	0.43 (0.29, 0.56)	2 (0.8)	30 (4.5)	32 (3.5)	0.42 (0.27, 0.56)
	Hand/wrist	13 (6.0)	126 (19.6)	139 (16.2)	1.52 (1.27, 1.77)	18 (7.5)	138 (20.6)	156 (17.1)	2.03 (1.71, 2.35)
	Trunk	4 (1.8)	45 (7.0)	49 (5.7)	0.54 (0.39, 0.69)	11 (4.6)	32 (4.8)	43 (4.7)	0.56 (0.39, 0.73)
	Hip/groin	5 (2.3)	39 (6.1)	44 (5.1)	0.48 (0.34, 0.62)	1 (0.4)	18 (2.7)	19 (2.1)	0.25 (0.14, 0.36)
	Thigh	5 (2.3)	38 (5.9)	43 (5.0)	0.47 (0.33, 0.61)	4 (1.7)	44 (6.6)	48 (5.3)	0.62 (0.45, 0.80)
	Knee	22 (10.1)	89 (13.9)	111 (12.9)	1.22 (0.99, 1.44)	37 (15.3)	117 (17.5)	154 (16.9)	2.00 (1.69, 2.32)
	Lower leg	16 (7.4)	35 (5.4)	51 (5.9)	0.56 (0.41, 0.71)	7 (2.9)	38 (5.7)	45 (4.9)	0.59 (0.41, 0.76)
	Ankle	66 (30.4)	117 (18.2)	183 (21.3)	2.00 (1.71, 2.29)	47 (19.5)	130 (19.4)	177 (19.4)	2.30 (1.96, 2.64)
	Foot	6 (2.8)	28 (4.4)	34 (4.0)	0.37 (0.25, 0.50)	4 (1.7)	42 (6.3)	46 (5.0)	0.60 (0.43, 0.77)
	Other	2 (0.9)	3 (0.5)	5 (0.6)	0.05 (0.01, 0.10)	3 (1.2)	4 (0.6)	7 (0.8)	0.09 (0.02, 0.16)
	Total	217 (100)	642 (100)	859 (100)	9.40 (8.77, 10.03)	241 (100)	670 (100)	911 (100)	11.84 (11.07, 12.61)
Practices	Head/face	80 (23.3)	92 (6.3)	172 (9.6)	0.63 (0.54, 0.72)	64 (24.8)	44 (3.6)	108 (7.3)	0.51 (0.41, 0.61)
	Neck	2 (0.6)	13 (0.9)	15 (0.8)	0.05 (0.03, 0.08)	0 (0)	16 (1.3)	16 (1.1)	0.08 (0.04, 0.11)
	Shoulder	18 (5.3)	49 (3.4)	67 (3.7)	0.25 (0.19, 0.30)	5 (1.9)	30 (2.4)	35 (2.4)	0.17 (0.11, 0.22)
	Arm/elbow	7 (2.0)	61 (4.2)	68 (3.8)	0.25 (0.19, 0.31)	3 (1.2)	39 (3.8)	42 (2.8)	0.20 (0.14, 0.26)
	Hand/wrist	25 (7.3)	266 (18.3)	291 (16.2)	1.07 (0.94, 1.19)	12 (4.7)	248 (20.2)	260 (17.5)	1.23 (1.08, 1.38)
	Trunk	18 (5.3)	108 (7.4)	126 (7.0)	0.46 (0.38, 0.54)	13 (5.0)	71 (5.8)	84 (5.7)	0.40 (0.31, 0.48)
	Hip/groin	12 (3.5)	85 (5.9)	97 (5.4)	0.36 (0.28, 0.43)	9 (3.5)	42 (3.4)	51 (3.4)	0.24 (0.18, 0.31)
	Thigh	7 (2.0)	77 (5.3)	84 (4.7)	0.31 (0.24, 0.37)	12 (4.7)	70 (5.7)	82 (5.5)	0.39 (0.30, 0.47)
	Knee	32 (9.4)	239 (16.5)	271 (15.1)	0.99 (0.87, 1.11)	36 (14.0)	199 (16.2)	235 (15.9)	1.11 (0.97, 1.25)
	Lower leg	17 (5.0)	83 (5.7)	100 (5.6)	0.37 (0.29, 0.44)	21 (8.1)	127 (10.4)	148 (10.0)	0.70 (0.59, 0.81)
	Ankle	106 (31.0)	277 (19.1)	383 (21.3)	1.40 (1.26, 1.54)	63 (24.4)	222 (18.1)	285 (19.2)	1.35 (1.19, 1.50)
	Foot	12 (3.5)	90 (6.2)	102 (5.7)	0.37 (0.30, 0.45)	14 (5.4)	107 (8.7)	121 (8.2)	0.57 (0.47, 0.67)
	Other	6 (1.8)	12 (0.8)	18 (1.0)	0.07 (0.04, 0.10)	6 (2.3)	10 (0.8)	16 (1.1)	0.08 (0.04, 0.11)
	Total	342 (100)	1452 (100)	1794 (100)	6.57 (6.27, 6.88)	258 (100)	1225 (100)	1483 (100)	7.02 (6.66, 7.37)

Abbreviations: AE, athlete-exposure; CI, confidence interval.

Diagnosis. The majority of injuries in boys and girls were diagnosed as contusions (boys = 796, 30.0%; girls = 607, 25.4%), sprains (boys = 646, 24.3%; girls = 650, 27.2%), and other (boys = 334, 12.6%; girls = 293, 12.2%; Table 4). Most of these injuries were classified as NTL (boys: contusions = 763, 95.9%; sprains = 464, 71.8%; other = 264, 79.0%; girls: contusions = 581, 95.7%; sprains = 509, 78.3%; other = 241, 82.3%).

During competitions, boys and girls had similar IRs for strains when considering all (IRR = 1.12; 95% CI = 0.83, 1.52), TL (IRR = 1.50; 95% CI = 0.78, 2.89), and NTL (IRR = 1.03; 95% CI = 0.73, 1.46) injuries. Boys also experienced a lower concussion injury rate than girls for competitions (IRR = 0.48; 95% CI = 0.33, 0.69) but not for practices (IRR = 0.77; 95% CI = 0.52, 1.16). During practices, boys had a lower injury rate than girls for all (IRR = 0.82; 95% CI = 0.72, 0.94) and NTL (IRR = 0.75; 95% CI = 0.64, 0.88) sprains but not TL sprains (IRR = 1.15; 95% CI = 0.85, 1.55).

Mechanism. The largest proportions of TL injury mechanisms for boys and girls were for player contact, noncontact, and surface contact. A summary is provided in Table 5. In boys' basketball, player-contact injuries were sustained most frequently during competitions, whereas noncontact injuries occurred more frequently during practices. The same number of surface-contact injuries occurred during competitions and practices.

The frequencies of player-contact and surface-contact injuries in girls' basketball were higher during competitions than practices. As with boys' basketball, noncontact injuries in girls' basketball were more frequent during practices compared with competitions.

DISCUSSION

Our injury epidemiology data reflect a total of 5047 injuries and 652 641 AEs in secondary school boys' and girls' basketball. To our knowledge, this is one of a few studies[9–11] of NTL injuries in secondary school athletes, particularly as related to boys' and girls' basketball. Further, our study adds to previous descriptive epidemiology research regarding secondary school TL basketball injuries.[3–5] The addition of NTL injury data to existing epidemiologic reports provides a more complete picture of the health care needs of athletes and the responsibilities of their health care teams.

Compared with researchers in secondary school basketball who reported IRs for boys (4.8/1000 AEs[2]; 1.83/1000 AEs[5]) and girls (4.4/1000 AEs[2]; 2.08/1000 AEs[5]), our overall injury rates were higher (boys = 7.28/1000 AEs, girls = 8.30/1000 AEs). The difference in rates may be attributed to the inclusion of NTL injury data in our sample. When we separated our data into TL and NTL injuries, the TL IRs for boys (1.53/1000 AEs) and girls (1.73/1000 AEs) were lower than those reported in previous investigations.[2,5] Our lower TL IRs may be attributed to the recognition and reporting of NTL injuries.[6,12] Differences in injury-surveillance methods, such as injury and TL and NTL definitions and reporting

Table 4. Injury Rates (IRs) per Diagnosis According to Non–Time-Loss (NTL) and Time-Loss (TL) Classification: Secondary School Boys' and Girls' Basketball

		Boys' Injuries				Girls' Injuries			
Event	Diagnosis	TL, n (%)	NTL, n (%)	Overall, n (%)	Overall IR (95% CI/1000 AEs)	TL, n (%)	NTL, n (%)	Overall, n (%)	Overall IR (95% CI/1000 AEs)
Competition	Abrasion	0 (0)	48 (7.5)	48 (5.6)	0.53 (0.38, 0.67)	0 (0)	70 (10.4)	70 (7.7)	0.91 (0.70, 1.12)
	Concussion	44 (20.3)	1 (0.2)	45 (5.2)	0.49 (0.35, 0.64)	78 (32.4)	1 (0.1)	79 (8.7)	1.03 (0.80, 1.25)
	Contusion	13 (6.0)	267 (41.6)	280 (32.6)	3.06 (2.71, 3.42)	17 (7.0)	242 (36.1)	259 (28.4)	3.37 (2.96, 3.78)
	Dislocation	5 (2.3)	2 (0.3)	7 (0.8)	0.08 (0.02, 0.13)	11 (4.6)	4 (0.6)	15 (1.7)	0.20 (0.10, 0.29)
	Fracture	13 (6.0)	3 (0.5)	16 (1.9)	0.18 (0.09, 0.26)	12 (5.0)	3 (0.4)	15 (1.7)	0.20 (0.10, 0.29)
	General medical	2 (0.9)	4 (0.6)	6 (0.7)	0.07 (0.01, 0.12)	3 (1.2)	3(0.4)	6 (0.7)	0.08 (0.02, 0.14)
	Inflammation	2 (0.9)	4 (0.6)	6 (0.7)	0.07 (0.01, 0.12)	1 (0.4)	0 (0)	1 (0.1)	0.01 (0.00, 0.04)
	Laceration	7 (3.2)	28 (4.4)	35 (4.1)	0.38 (0.26, 0.51)	5 (2.1)	31 (4.6)	36 (4.0)	0.47 (0.32, 0.62)
	Nervous system	4 (1.8)	1 (0.2)	5 (0.6)	0.05 (0.01, 0.10)	7 (2.9)	2 (0.3)	9 (1.0)	0.12 (0.04, 0.19)
	Sprain	75 (34.6)	140 (21.8)	215 (25.0)	2.35 (2.04, 2.67)	69 (28.6)	175 (26.1)	244 (26.8)	3.17 (2.77, 3.57)
	Strain	25 (11.5)	71 (11.1)	96 (11.2)	1.05 (0.84, 1.26)	14 (5.8)	58 (8.7)	72 (7.9)	0.94 (0.72, 1.15)
	Tendinitis	2 (0.9)	0 (0)	2 (0.2)	0.02 (0.00, 0.05)	1 (0.4)	1 (0.1)	2 (0.2)	0.03 (0.00, 0.06)
	Other	25 (11.5)	73 (11.4)	98 (11.4)	1.07 (0.86, 1.29)	23 (9.5)	80 (11.9)	103 (11.3)	1.34 (1.08, 1.60)
	Total	217 (100)	642 (100)	859 (100)	9.40 (8.77, 10.03)	241 (100)	670 (100)	911 (100)	11.84 (11.07, 12.61)
Practice	Abrasion	0 (0)	153 (10.5)	153 (8.5)	0.56 (0.47, 0.65)	1 (0.4)	167 (13.6)	168 (11.3)	0.79 (0.67, 0.92)
	Concussion	47 (13.7)	0 (0)	47 (2.6)	0.17 (0.12, 0.22)	47 (18.2)	0 (0)	47 (3.2)	0.22 (0.16, 0.29)
	Contusion	20 (5.9)	496 (34.2)	516 (28.8)	1.89 (1.73, 2.05)	9 (3.5)	339 (27.7)	348 (23.5)	1.65 (1.47, 1.82)
	Dislocation	8 (2.3)	4 (0.3)	12 (0.7)	0.04 (0.02, 0.07)	7 (2.7)	5 (0.4)	12 (0.8)	0.06 (0.02, 0.09)
	Fracture	33 (9.7)	5 (0.3)	38 (2.1)	0.14 (0.09, 0.18)	19 (7.4)	5(0.4)	24 (1.6)	0.11 (0.07, 0.16)
	General medical	6 (1.8)	14 (1.0)	20 (1.1)	0.07 (0.04, 0.11)	5 (1.9)	10 (0.8)	15 (1.0)	0.07 (0.04, 0.11)
	Inflammation	12 (3.5)	9 (0.6)	21 (1.2)	0.08 (0.04, 0.11)	15 (5.8)	12 (1.0)	27 (1.8)	0.13 (0.08, 0.18)
	Laceration	5 (1.5)	60 (4.1)	65 (3.6)	0.24 (0.18, 0.30)	4 (1.6)	56 (4.6)	60 (4.0)	0.28 (0.21, 0.36)
	Nervous system	14 (4.1)	3 (0.2)	17 (1.0)	0.06 (0.03, 0.09)	7 (2.7)	4 (0.3)	11 (0.7)	0.05 (0.02, 0.08)
	Sprain	107 (31.3)	324 (22.3)	431 (24.0)	1.58 (1.43, 1.73)	72 (27.9)	334 (27.3)	406 (27.4)	1.92 (1.73, 2.11)
	Strain	45 (13.2)	180 (12.4)	225 (12.5)	0.82 (0.72, 0.93)	33 (12.8)	126 (10.3)	159 (10.7)	0.75 (0.64, 0.87)
	Tendinitis	0 (0)	13 (0.9)	13 (0.7)	0.05 (0.02, 0.07)	10 (3.9)	6 (0.5)	16 (1.1)	0.08 (0.04, 0.11)
	Other	45 (13.2)	191 (13.1)	236 (13.2)	0.86 (0.75, 0.97)	29 (11.2)	161 (13.1)	190 (12.8)	0.90 (0.77, 1.03)
	Total	342 (100)	1452 (100)	1794 (100)	6.57 (6.27, 6.88)	258 (100)	1225 (100)	1483 (100)	7.02 (6.66, 7.37)

Abbreviations: AE, athlete-exposure; CI, confidence interval.

Table 5. Mechanism of Injury for Boys' and Girls' Secondary School Basketball Time-Loss Injuries

		Injuries, n (%)	
Event	Mechanism	Boys	Girls
Competition	Player contact	63 (29.0)	107 (44.4)
	Surface contact	59 (27.2)	47 (19.5)
	Ball contact	5 (2.3)	16 (6.6)
	Other equipment contact	4 (1.8)	2 (0.8)
	Out-of-bounds contact	8 (3.7)	1 (0.4)
	Noncontact	66 (30.1)	56 (23.2)
	Overuse	3 (1.4)	0 (0)
	Illness/infection	0 (0)	0 (0)
	Other	4 (1.8)	4 (1.7)
	Unknown	5 (2.3)	8 (3.3)
	Total	217 (100)	241 (100)
Practice	Player contact	20 (35.1)	74 (28.7)
	Surface contact	59 (17.2)	45 (17.4)
	Ball contact	16 (4.7)	13 (5.0)
	Other equipment contact	4 (1.2)	2 (0.8)
	Out-of-bounds contact	4 (1.2)	2 (0.8)
	Noncontact	100 (29.2)	75 (29.1)
	Overuse	17 (5.0)	25 (9.7)
	Illness/infection	3 (0.9)	2 (0.8)
	Other	10 (2.9)	3 (1.2)
	Unknown	9 (2.6)	17 (6.6)
	Total	242 (100)	258 (100)

requirements (eg, electronic versus paper format) and factors such as the AT's employment status[13] may account for inconsistencies among studies. Until now, many authors of secondary school sport-specific descriptive epidemiologic studies[2–5,8,13–17] have focused largely on TL IRs. Time-loss injury data are valuable because they provide insight into the types of injuries that affect athletes' lives but not necessarily their ability to compete. Although extensive monitoring of TL injury data has shaped much of our current understanding of injury trends, a large portion of the picture has not been taken into account. Further, in past surveillance studies, ATs may have reported injuries as TL because only TL injuries were captured and they felt the injury was important to report even though it did not fully meet the TL definition. With the availability of an NTL option, some of those TL injuries may now be classified as NTL. This change in reporting may have the greatest effect on injuries that required the athlete's removal from play for the rest of the day but permitted return to play less than 24 hours later. We found that NTL injuries represented the majority of injuries sustained by boys' (78.9%) and girls' (79.2%) basketball athletes. These results aligned with a report[6] based on the National Collegiate Athletic Association (NCAA)-Injury Surveillance Program (ISP), which demonstrated that 57.7% of men's and 52.3% of women's basketball-related injuries were classified as NTL. Although NTL injury proportions may be lower in the collegiate versus the secondary school setting, the large

number of NTL injuries in both settings highlights their significance when injury trends across settings are interpreted. Given the omission of NTL injury data in the body of the epidemiology literature, we are missing information on nearly 80% of all secondary school injuries and 70% of all secondary school athletes' visits to the athletic training room.[11] Therefore, to date, our picture of the effects of injuries on basketball athletes has been incomplete.

We observed that boys had lower TL IRs than girls during competitions and overall, which supports the findings of other studies of secondary school basketball injuries.[5,8,9,18] However, the collegiate setting has revealed conflicting evidence.[6,13,19,20] Compared with women, men may have higher TL IRs as a result of increased physicality,[6,9] more player-to-player contact,[20] uncontrolled game situations,[20] and longer playing times.[6] Additionally, secondary schools typically have only 1 AT available for all sports, whereas the collegiate setting may have multiple ATs dedicated to fewer sports.[9] The overall number of injuries occurring in the secondary school setting may be underreported due to an increased ratio of athletes to ATs.[9] Furthermore, we noted that boys had lower NTL injury rates than girls for competitions, practices, and overall. This is consistent with the hypothesis that girls are injured more frequently than boys in secondary school basketball; however, additional factors may be influencing this rate. For instance, girls may be more likely to seek health care compared with boys.[21,22] Differences in IRs between boys and girls warrant further exploration so that targeted injury-prevention strategies can be created.

The ankle was the most commonly injured body site for both boys and girls, regardless of time-loss category (TL or NTL) or exposure, which is similar to the results of other secondary school basketball injury studies.[2–5,8,9,14,16,18,23] Most ankle injuries resulted in no time lost from participation. Previous researchers[2,5,16] demonstrated that among secondary school athletes, between 39.3% and 43.2% of boys' and 35.9% and 36.5% of girls' reportable injuries were to the ankle. In our investigation, 21.3% of boys' and 19.3% of girls' reportable injuries, regardless of time-loss category (TL or NTL) or exposure, were to the ankle. The reduction in the percentage of injuries to the ankle may be due in part to more injury-prevention strategies, including the use of ankle braces, being employed in the secondary school setting.[23] Additionally, the definition of *injury* differed between surveillance systems. For the 1995–1997 seasons,[2] the definition stated that an injury did not allow for same-day return to play.[8] Our definition differentiated between TL and NTL injuries and required that a player receive medical attention for the injury to be considered reportable. Therefore, IRs may have differed due to variations in injury definitions, which allowed us to categorize minor injuries in more detail. Further detail regarding common injury definitions may provide a fuller representation of IRs and injury types, thereby enhancing our knowledge across all sports and settings.

Boys were less likely to sustain concussions than girls during both competitions and practices. This trend supported the results of other secondary school studies.[8,15] The most notable difference in concussion rates between boys and girls was during competitions, when the rate in boys was 52% less than in girls. This finding was consistent with the literature,[5,8,15] although our overall concussion rates for boys (IR = 0.25/1000 AEs; 95% CI = 0.20, 0.30) and girls (IR = 0.44/1000 AEs; 95% CI = 0.36, 0.51), regardless of time-loss category (TL or NTL) or exposure, were higher than those demonstrated in 2005–2006 (boys IR = 0.07/1000 AEs; 95% CI = 0.04, 0.11; girls IR = 0.22/1000 AEs; 95% CI = 0.16, 0.30)[15] and 2011–2012 (boys IR = 0.24/1000 AEs; 95% CI = 0.18, 0.31; girls IR = 0.37/1000 AEs; 95% CI = 0.28, 0.47).[15] Suggested reasons for our IRs include greater concussion awareness, improved documentation and recording of concussion injuries, and perhaps an actual increase in concussions.[8,15] Between the 2008–2009 and 2011–2012 academic years, Gibson et al[24] found a 92% increase in health care utilization in states with concussion legislation for secondary school-aged children.[24] Therefore, increased reporting and documenting of concussions may be positively affected by the efforts of ATs to follow state laws.

Contusions were the most common NTL injury diagnosis for boys (41.6%) and girls (36.1%). Ligamentous sprains were also a frequently reported diagnosis, occurring more often during competitions than practices for boys (IRR = 1.49; 95% CI = 1.27, 1.76) and girls (IRR = 1.65; 95% CI = 1.41, 1.94). For most basketball injuries, competition IRs were consistently greater than practice IRs.[2,3,5,8,9,14,16] This may reflect increased physicality and player contact during competitions versus practices.[5,8] Borowski et al[5] reported that the majority of basketball injuries occurred during rebounding (33.1%), and most ligamentous sprains in secondary school basketball athletes occurred during jumping or landing (29.4%) activities.[5] Prevention strategies may benefit from a multifaceted approach[25] to sport-specific training activities that includes balance training[26] to decrease the likelihood of lower extremity injury.

In our study, during both competitions and practices, TL injuries most commonly occurred as a result of player contact, noncontact, or surface contact. Of the contact injuries, most were typically due to player contact. Girls experienced a higher percentage of player-contact injuries than boys during competitions whereas boys experienced a higher percentage during practices. Among male collegiate athletes, Meeuwisse et al[27] determined that the rate of contact injury, overall, was much higher than that of noncontact injuries (ratio of 4 : 3) and that contact with another player was more frequent than other types of contact (eg, floor, basketball, or rim). Player contact was the second highest mechanism of injury after contact with a ball, as shown by Yde and Nielsen.[28] A possible explanation for the number of player-contact injuries may be the time spent in the key and the aggressive nature of play in that area. However, whether player-contact injuries in boys and girls differ in frequency is unknown.

Noncontact mechanisms made up the largest percentage (29.1%) of practice injuries in girls. A similar but higher percentage (47%) was observed in the collegiate setting.[20] The majority of injuries in our study affected the lower extremity. Therefore, noncontact injuries may have significant effects on body sites such as the knee and ankle.[20,29] In the collegiate setting, Agel et al[20] found that most severe knee injuries were due to noncontact mechanisms and that 64% of all game-related anterior cruciate ligament injuries in females were attributed to noncontact.[20] The high

incidence of lower extremity noncontact injuries emphasizes the need for preventive sport-specific neuromuscular-training programs early in athletes' careers, such as in the secondary school.[16,29] Another consideration is that the definition of *noncontact* may be unclear and ultimately affect clinician reporting. A clearer definition is necessary to decrease observer bias and standardize reporting for more precise calculations of IRs.[20]

Another area of uncertainty involves the definition and documentation of overuse injuries. Currently, no consensus exists regarding the definition of *overuse injuries*, which makes determining the true burden of these injuries difficult.[30] In our study, 3 overuse injuries were documented as occurring during competition. Because these injuries typically develop over time, it is possible that they originated during practice but were exacerbated or affected play more significantly during competition. A clearer definition of *overuse* would assist in proper reporting of these injuries. Collegiate ATs participating in the NCAA-ISP documented that almost half (48.8%) of all injuries they treated were overuse.[31] However, of those, only 62.4% were recorded in the NCAA-ISP.[31] The discrepancy in reporting contributes to the lack of understanding regarding the clinical effects of overuse and potentially NTL injuries. Additionally, *overuse* may reflect a diagnosis, mechanism, or both, further adding to the confusion in reporting these injuries.[30]

We operationalized *overuse* as a mechanism of injury. A higher proportion of practice injuries were designated as overuse compared with competition injuries. Girls had a higher proportion of overuse injuries than boys. These trends support the literature on the secondary school and collegiate settings.[7,21] Compared with males, females in both settings had higher overuse injury rates, which may be due to anatomical and biomechanical differences; disparities in coaching, training, or conditioning programs; and the likelihood that females seek health care earlier than males.[21] Together with the increased number of practices versus competitions and the repetitive nature of practices, it is logical that females experienced higher rates of overuse injuries during practices. Further efforts focused on sex-specific injury-prevention strategies may reduce the risk of overuse injuries in females.

Much like NTL injuries, overuse injuries may alter athletes' current participation status but not completely remove them from competitions or practices.[31] Thus, increased time and resources may be spent to manage athletes with overuse injuries to avoid lost playing time and maintain current participation.[7] Also, NTL injuries may result in decreased playing time, which indicates a modification of playing status due to injury, but we were unable to make that determination based on our data. Kerr et al[11] reported that most secondary school basketball-related visits to the athletic training room (boys = 64.3%, girls = 63.0%) were for NTL injuries.[11] On average, 66.8% and 66.6% of services per visit to the athletic training room were for NTL injuries for secondary school boys' and girls' basketball athletes, respectively.[11] These data suggest that NTL injuries may require substantial athletic training services, which speaks to the large amount of care provided to athletes by ATs when managing players with NTL or overuse injuries. More detailed information regarding point-of-care services and associated injuries would help expand our knowledge of athletic training responsibilities and aid in obtaining appropriate medical coverage.

As do all epidemiologic studies, this study had limitations. The NATION surveillance program uses convenience sampling for sport-specific research. Therefore, generalizations to other levels of play or ages may not be possible. Additionally, schools in the sample had access to an AT who agreed to participate in injury surveillance through NATION, use electronic medical records as the primary form of documentation, and include basketball as a school-sanctioned sport. This may limit our understanding of injury trends in lower-income schools, those in which documentation takes place via pen and paper, and schools without ATs. Future researchers should focus on the effects of NTL injuries in such schools to broaden our knowledge of injury epidemiology in all sports. With more research focused on NTL injury trends in multiple settings and sports, we may gain a more complete understanding of the costs, time, and resources associated with the treatment and management of these injuries. Further, data from a larger sample of schools will increase the representativeness of and confidence in surveillance efforts. However, larger samples require more documentation and participation from ATs across the country. Finally, the analyses related to injury mechanism were limited because a mechanism was reported for too few NTL injuries. Efforts to increase reporting of key variables, such as injury mechanism, in NATION injury-surveillance research are ongoing.

CONCLUSIONS

When we included NTL injuries, the IRs in boys' and girls' secondary school basketball were greater than previously suggested, and boys tended to have a lower IR than girls. Of note were the large percentage of injuries and the high IRs associated with NTL injuries in boys' and girls' basketball players.

REFERENCES

1. 2015-16 High school athletics participation survey. National Federation of State High School Associations Web site. http://www.nfhs.org/ParticipationStatistics/PDF/2015-16_Sports_Participation_Survey.pdf. Accessed March 8, 2019.
2. Powell JW, Barber-Foss KD. Injury patterns in selected high school sports: a review of the 1995–1997 seasons. *J Athl Train*. 1999;34(3):277–284.
3. Messina DF, Farney WC, DeLee JC. The incidence of injury in Texas high school basketball: a prospective study among male and female athletes. *Am J Sports Med*. 1999;27(3):294–299.
4. Gomez E, DeLee JC, Farney WC. Incidence of injury in Texas girls' high school basketball. *Am J Sports Med*. 1996;24(5):684–687.
5. Borowski LA, Yard EE, Fields SK, Comstock RD. The epidemiology of US high school basketball injuries, 2005–2007. *Am J Sports Med*. 2008;36(12):2328–2335.
6. Zuckerman SL, Wegner AM, Roos KG, Djoko A, Dompier TP, Kerr ZY. Injuries sustained in National Collegiate Athletic Association men's and women's basketball, 2009/2010–2014/2015. *Br J Sports Med*. 2018;52(4):261–268.
7. Schroeder AN, Comstock RD, Collins CL, Everhart J, Flanigan D, Best TM. Epidemiology of overuse injuries among high-school athletes in the United States. *J Pediatr*. 2015;166(3):600–606.
8. Rechel JA, Yard EE, Comstock RD. An epidemiologic comparison of high school sports injuries sustained in practice and competition. *J Athl Train*. 2008;43(2):197–204.

9. Dompier TP, Marshall SW, Kerr ZY, Hayden R. The National Athletic Treatment, Injury and Outcomes Network (NATION): methods of the surveillance program, 2011–2012 through 2013–2014. *J Athl Train*. 2015;50(8):862–869.
10. Lam KC, Valier AR, Anderson BE, McLeod TC. Athletic training services during daily patient encounters: a report from the Athletic Training Practice-Based Research Network. *J Athl Train*. 2016;51(6):435–441.
11. Kerr ZY, Dompier TP, Dalton SL, Miller SJ, Hayden R, Marshall SW. Methods and descriptive epidemiology of services provided by athletic trainers in high schools: the National Athletic Treatment, Injury and Outcomes Network Study. *J Athl Train*. 2015;50(12):1310–1318.
12. Kerr ZY, Lynall RC, Mauntel TC, Dompier TP. High school football injury rates and services by athletic trainer employment status. *J Athl Train*. 2016;51(1):70–73.
13. Powell JW, Dompier TP. Analysis of injury rates and treatment patterns for time-loss and non-time loss injuries among collegiate student athletes. *J Athl Train*. 2004;39(1):56–70.
14. Zillmer DA, Powell JA, Albright JP. Gender-specific injury patterns in high school varsity basketball. *J Womens Health*. 1992;1(1):69–76.
15. Rosenthal JA, Foraker RE, Collins CL, Comstock RD. National high school athlete concussion rates from 2005–2006 to 2011–2012. *Am J Sports Med*. 2014;42(7):1710–1715.
16. Nelson AJ, Collins CL, Yard EE, Fields SK, Comstock RD. Ankle injuries among United States high school sports athletes, 2005–2006. *J Athl Train*. 2007;42(3):381–387.
17. Joseph AM, Collins CL, Henke NM, Yard EE, Fields SK, Comstock RD. A multisport epidemiologic comparison of anterior cruciate ligament injuries in high school athletics. *J Athl Train*. 2013;48(6):810–817.
18. Powell JW, Barber-Foss KD. Sex-related injury patterns among selected high school sports. *Am J Sports Med*. 2000;28(3):385–391.
19. Dick R, Sauers EL, Agel J, et al. Descriptive epidemiology of collegiate men's baseball injuries: National Collegiate Athletic Association Injury Surveillance System, 1988–1989 through 2003–2004. *J Athl Train*. 2007;42(2):183–193.
20. Agel J, Olson DE, Dick R, Arendt EA, Marshall SW, Sikka RS. Descriptive epidemiology of collegiate women's basketball injuries: National Collegiate Athletic Association Injury Surveillance System, 1988–1989 through 2003–2004. *J Athl Train*. 2007;42(2):202–210.
21. Roos KG, Marshall SW, Kerr ZY, et al. Epidemiology of overuse injuries in collegiate and high school athletics in the United States. *Am J Sports Med*. 2015;43(7):1790–1797.
22. Galdas PM, Cheater F, Marshall P. Men and health help-seeking behaviour: literature review. *J Adv Nurs*. 2005;49(6):616–623.
23. McGuine TA, Brooks A, Hetzel S. The effect of lace-up ankle braces on injury rates in high school basketball players. *Am J Sports Med*. 2011;39(9):1840–1848.
24. Gibson TB, Herring SA, Kutcher JS, Broglio SP. Analyzing the effect of state legislation on health care utilization for children with concussion. *JAMA Pediatr*. 2015;169(2):163–168.
25. Olsen OE, Myklebust G, Engebretsen L, Holme I, Bahr R. Exercises to prevent lower limb injuries in youth sports: cluster randomised controlled trial. *BMJ*. 2005;330(7489):449.
26. Emery CA, Rose MS, McAllister JR, Meeuwisse WH. A prevention strategy to reduce the incidence of injury in high school basketball: a cluster randomized controlled trial. *Clin J Sport Med*. 2007;17(1):17–24.
27. Meeuwisse WH, Sellmer R, Hagel BE. Rates and risks of injury during intercollegiate basketball. *Am J Sports Med*. 2003;31(3):379–385.
28. Yde J, Nielsen AB. Sports injuries in adolescents' ball games: soccer, handball and basketball. *Br J Sports Med*. 1990;24(1):51–54.
29. Monfort SM, Comstock RD, Collins CL, Onate JA, Best TM, Chaudhari AM. Association between ball-handling versus defending actions and acute noncontact lower extremity injuries in high school basketball and soccer. *Am J Sports Med*. 2015;43(4):802–807.
30. Roos KG, Marshall SW. Definition and usage of the term "overuse injury" in the US high school and collegiate sport epidemiology literature: a systematic review. *Sports Med*. 2014;44(3):405–421.
31. Roos KG, Marshall SW, Kerr ZY, Dompier TP. Perception of athletic trainers regarding the clinical burden of, and reporting practices for, overuse injuries. *Athl Train Sports Health Care*. 2016;8(3):122–126.

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