Injury Risk in Professional Basketball Players

A Comparison of Women's National Basketball Association and National Basketball Association Athletes

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Background: Gender-based differences in injury rates have been reported in scholastic and collegiate basketball. The purpose of this study was to retrospectively compare injury rates in women's and men's professional basketball.

Hypothesis: Female professional basketball players are injured at a higher rate than are men.

Study Design: Cohort study (prevalence); Level of evidence, 2.

Methods: Women's National Basketball Association and National Basketball Association injury data were retrospectively reviewed for 6 full seasons. The frequency of all injuries and the rate of game-related injuries were calculated.

Results: Complete player profiles were obtained on 702 National Basketball Association athletes and 443 Women's National Basketball Association athletes who competed in their respective leagues during the data collection period. Total game exposures totaled 70 420 (National Basketball Association) and 22 980 (Women's National Basketball Association). Women's National Basketball Association athletes had a higher overall game-related injury rate (24.9 per 1000 athlete exposures; 95% confidence interval, 22.9-26.9; $P < .05$) when compared with National Basketball Association athletes (19.3 per 1000 athlete exposures; 95% confidence interval, 18.3-20.4) and sustained a higher rate of lower extremity injuries (14.6 per 1000 athlete exposures; 95% confidence interval, 13.1-16.2; $P < .05$) than seen in the National Basketball Association (11.6 per 1000 athlete exposures; 95% confidence interval, 10.8-12.4). The lower extremity was the most commonly injured body area (65%), and lateral ankle sprain (13.7%) was the most common diagnosis in both leagues. The incidence of game-related knee injury was higher in Women's National Basketball Association players. The incidence of anterior cruciate ligament injury in the National Basketball Association (n = 22, 0.8%) and Women's National Basketball Association (n = 14, 0.9%) accounted for 0.8% of the 4446 injuries reported.

Conclusion: The lower extremity is the most frequently injured body area in both leagues, and Women's National Basketball Association athletes are more susceptible than are National Basketball Association athletes. There were, however, few statistical differences in the actual injuries occurring between the 2 leagues.

Keywords: Women's National Basketball Association (WNBA); National Basketball Association (NBA); gender; epidemiology; basketball

Women's professional basketball has gained increasing national attention since the inception of the Women's National Basketball Association (WNBA) in 1997. Limited data exist as to a WNBA athlete's susceptibility to injury. The incidence of injuries incurred by male athletes in the National Basketball Association (NBA) has been well documented.[4,6,11,13] On entering the professional ranks, NBA athletes participate in a longer season and compete in longer games than do their collegiate counterparts. As a result, NBA players experience a rate of game-related injuries that is twice that of college players.[11]

Only 1 previous study has compared men and women basketball players competing at the professional level.

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Women were found to sustain 60% more injuries than did the men.[14] At lower levels of competition, several authors have concluded significant differences exist in injury incidence, rate, and risk between genders.[1-3,5,7-9] Women have been noted to have a higher risk of injuries to the knee and ankle at both the scholastic and collegiate levels of play.[1-3,5,7-9]

To date, no comparative study has been conducted to determine whether differences exist in the injury patterns of male and female athletes participating in the NBA and WNBA. Our hypothesis was female professional basketball players sustain injuries at a higher rate than do male professional basketball players. The purpose of our study was to retrospectively compare injury incidence, rate, and frequency occurring in the WNBA and NBA.

METHODS

We used a retrospective cohort design to compare the frequency and rate of injury between the 2 leagues. The National Basketball Athletic Trainers' Association maintains a database of all injuries and illnesses occurring to NBA players that (1) required physician referral and/or prescription medication, (2) resulted in a practice or game being missed, or (3) caused emergency care to be rendered to the athlete. These records are based on standardized league-wide injury-reporting instruments that are completed by the team's athletic trainer and then cosigned by the team physician. We obtained the official injury records from the WNBA league office. These reporting instruments are identical to those used in the NBA.

The primary information collected included the player's identification number, when and where the injury occurred, specific pathologic findings, and onset, activity, and mechanism of the injury. Data regarding the number of practices and games missed, injured reserve list status, hospitalization, surgery, and medication status were also collected.

Each team's certified/licensed athletic trainer submitted player profiles detailing each player's position, height, weight, age, number of years of playing experience, and permanent identification number. Player exposures (appearances) for games and playing minutes were acquired from the NBA and WNBA league offices.

Both leagues used identical reporting instruments and reporting criteria. The author who maintains the NBA injury and illness database (C.S.) used the same criteria and procedures for entering the WNBA injury report and player profile data as used by the NBA. Reports lacking complete player information or injury documentation were not entered into the database. To create a cohort, only athletes having 0 to 5 years of NBA experience were included in the study. We did not account for professional playing experience in other professional leagues for either the men or women.

Data Analysis

We recalled NBA injury and illness data meeting the reporting criteria submitted during the seasons 1996 through 2002 (omitting the strike-shortened 1998-1999 season) and WNBA injury data from 1997 to 2002, providing us with 6 full seasons of data for each league. Frequencies, means, SDs, and incidence rates were calculated using Microsoft Excel 2003.

Game injury rates were calculated per 1000 athlete exposures (AEs). This method describes the total number of athletes appearing in regular and postseason games, in which 1 athlete appearing in 1 game equals 1 AE (during a single game, the maximum AE would be 24 when all 12 players from each team participate in the contest). Because of the lack of a consistent and reliable method of calculating practice and preseason game exposures, incidence rates for participation in these activities were not calculated. However, overall frequencies and percentage of injuries for both practices and games were calculated. Incidence rates for game-related AE were calculated using the following formula: (number of injuries [group]/total game exposures [group]) $\times$ 1000.

Differences in the number of athletes sustaining injuries in the 2 leagues were identified using a χ^2 analysis performed with SPSS for Windows, version 11.01 (SPSS Science Inc, Chicago, Ill). The .05 α level was used to identify statistical differences. To identify differences in game-related injury rates between the NBA and WNBA, 95% confidence intervals (CIs) were calculated. The stability and reliability of CIs decrease with cell frequency; therefore, we did not calculate CIs for injuries having fewer than 10 game-related occurrences in either league. Rates were considered significantly different from each other at the .05 α level if the CIs did not overlap.

TABLE 1
Demographic Information

	National Basketball Association	Women's National Basketball Association
Height, cm	200.4 ± 11.6	183.2 ± 16.8
Weight, kg	101.5 ± 13.7	75.9 ± 11.5
Age, y	24.3 ± 2.5	26.6 ± 5.4
Professional playing experience, y	2.0 ± 1.7	1.4 ± 1.4
Players in database	702	443
Seasons in database per player	2.7 ± 1.4	2.4 ± 1.5
Players appearing in games	591	369
Total game exposures	70 420	22 980
Reportable injuries	2876	1570
Game-related injuries	1361	572
No. of injured players	556	390
No. of players injured during games	366	359

RESULTS

The study included 1145 individual players, 702 (61%) NBA players and 443 (39%) WNBA players. Within our player database, 591 (84%) NBA and 369 (83%) WNBA athletes

TABLE 2
Injury Frequency by Body Area[a]

	NBA					WNBA							
	All Injuries		Game Related			All Injuries		Game Related			Injured Players χ^2	95% Confidence Interval Rate AE	
Body Area	n	%	n	%	AE	n	%	n	%	AE		NBA	WNBA
Lower extremity	1857	64.6	816	60.0	11.6	1031	65.7	336	58.7	14.6	9.625[b]	10.8-12.4	13.1-16.2[c]
Upper extremity	425	14.8	235	17.3	3.3	237	15.1	110	19.2	4.8	0.090	2.9-3.8	3.9-5.7[c]
Head and cervical	330	11.5	174	12.8	2.5	168	10.7	88	15.4	3.8	1.939	2.1-2.8	3.0-4.6[c]
Torso	250	8.7	132	9.7	1.9	116	7.4	35	6.1	1.5	10.630[b]	1.6-2.2	1.0-2.0
Other[d]	14	0.5	4	0.3	0.1	18	1.1	3	0.5	0.1	3.474	—	—
Total	2876	100.0	1361	100.0	19.3	1570	100.0	572	100.0	24.9	18.585[b]	18.3-20.4	22.9-26.9[c]

[a]Data are rank ordered by total frequency. NBA, National Basketball Association; WNBA, Women's National Basketball Association; AE, per 1000 athlete exposures. The m-dashes (—) indicate that the confidence intervals were not calculated because of low n.
[b]χ^2, $P < .01$.
[c]Confidence interval, $P < .05$.
[d]Genitals, systemic.

appeared in at least 1 regulation (regular season or postseason) game. There were 70 420 game exposures in the NBA and 22 980 in the WNBA. On average, WNBA athletes were slightly older and had slightly less professional playing experience than did NBA athletes (Table 1).

Across the 6 years of this study, 4446 complete injury reports were received, 2876 (65%) from the NBA and 1570 (35%) from the WNBA. The NBA athletes suffered 1361 (47%) game-related injuries, compared with 572 (36%) injured during WNBA games. The WNBA players were more frequently injured in practices and games and experienced a statistically significantly higher game-related injury rate (24.9 per 1000 AE) than did NBA players (19.3 per 1000 AE) (WNBA 95% CI, 22.9-26.9; NBA 95% CI, 18.3-20.4) (Table 2).

Tables 2 through 5 describe the frequency of injury by body area, structure, type, and specific pathologic findings, respectively. In total, the lower extremity was the most frequently injured body area, accounting for 2888 (65%) of all cases, 1857 (65%) in the NBA and 1031 (66%) in the WNBA (Table 2). The knee was the most frequently injured structure, totaling 904 (20%) reports—representing 550 (19%) cases in the NBA and 354 (22.5%) in the WNBA. The ankle was the most common structure injured in game competition, occurring in 398 instances; 284 of these cases occurred in the NBA, accounting for 21% of all game-related injuries. The WNBA athletes suffered 114 game-related ankle injuries (20%) (Table 3). Sprains were the most frequently occurring injury type, representing 1337 (30%) of the reports: 860 (30%) in the NBA and 477 (30%) in the WNBA (Table 4). A lateral ankle sprain was the most common diagnosis reported in both leagues, totaling 611 (13.7%) cases, 412 (14.3%) in the NBA and 199 (12.7%) in the WNBA (Table 5). There were 36 ACL sprains reported, accounting for 0.8% of all injuries. There were 22 ACL sprains in NBA athletes (0.8%), whereas 14 (0.9%) occurred in WNBA players (Table 5).

Injury Frequency

More WNBA athletes suffered lower extremity injuries ($\chi^2_3 = 9.625$, $P < .01$) than did NBA players (Table 2). Finger trauma ($\chi^2_3 = 4.354$, $P < .01$), head and skull injuries ($\chi^2_3 = 6.910$, $P < .01$), and systemic-related injuries ($\chi^2_3 = 7.182$, $P < .01$) also occurred more frequently in WNBA players than in NBA players. The NBA players had a higher frequency of injury to the lumbosacral region ($\chi^2_3 = 8.335$, $P < .01$), hip ($\chi^2_3 = 7.430$, $P < .01$), thorax and thoracic spine ($\chi^2_3 = 5.602$, $P < .01$), and wrist and hand ($\chi^2_3 = 5.602$, $P < .01$) than did WNBA players (Table 3).

When examining the type of injury, we found that fractures occurred more frequently in the NBA than in the WNBA ($\chi^2_3 = 3.938$, $P < .05$), and more WNBA players sustained heat-related illness than did NBA players ($\chi^2_3 = 4.042$, $P < .05$) (Table 4). Regarding the specific injury, more NBA players experienced lumbar erector spinae strains ($\chi^2_3 = 10.739$, $P < .01$), adductor strains ($\chi^2_3 = 8.038$, $P < .01$), hip contusions ($\chi^2_3 = 7.565$, $P < .01$), and lower leg contusions ($\chi^2_3 = 6.654$, $P < .01$) than did WNBA players. More WNBA players experienced a cerebral concussion than did NBA players ($\chi^2_3 = 4.876$, $P < .05$) (Table 5).

Game Incidence Rates

The WNBA players had higher game-related incidence rates of injury to the lower extremity (WNBA, 14.6 per 1000 AE [95% CI, 13.1-16.2]; NBA, 11.6 per 1000 AE [95% CI, 10.8-12.4]) and head and cervical spine (WNBA, 3.8 per 1000 AE [95% CI, 3.0-4.6]; NBA, 2.5 per 1000 AE [95% CI, 2.1-2.8]) than did the NBA players (Table 2). The rate of injury to the knee (WNBA, 4.4 per 1000 AE [95% CI, 3.6-5.3]; NBA, 2.5 per 1000 AE [95% CI, 2.1-2.9]) and to the fingers (WNBA, 1.3 per 1000 AE [95% CI, 0.8-1.8]; NBA, 0.5 per 1000 AE [95% CI, 0.4-0.7]) was statistically higher in the WNBA than in the NBA (Table 3).

TABLE 3
Injuries by Structure[a]

	NBA					WNBA							
	All Injuries		Game Related			All Injuries		Game Related			Injured Players χ^2	95% Confidence Interval Rate AE	
Structure	n	%	n	%	AE	n	%	n	%	AE		NBA	WNBA
Knee	550	19.1	177	13.0	2.5	354	22.5	102	17.8	4.4	2.348	2.1-2.9	3.6-5.3[b]
Ankle	486	16.9	284	20.9	4.0	235	15.0	114	19.9	5.0	1.875	3.6-4.5	4.1-5.9
Lumbosacral	258	9.0	98	7.2	1.4	94	6.0	25	4.4	1.1	8.335[c]	1.1-1.7	0.7-1.5
Foot and toes	227	7.9	68	5.0	1.0	117	7.5	29	5.1	1.3	1.162	0.7-1.2	0.8-1.7
Lower leg	218	7.6	101	7.4	1.4	118	7.5	33	5.8	1.4	0.067	1.2-1.7	0.9-1.9
Hip	215	7.5	108	7.9	1.5	83	5.3	24	4.2	1.0	7.430[c]	1.2-1.8	0.6-1.5
Femur	161	5.6	78	5.7	1.1	126	8.0	35	6.1	1.5	3.162	0.9-1.4	1.0-2.0
Face	123	4.3	87	6.4	1.2	80	5.1	42	7.3	1.8	1.214	1.0-1.5	1.3-2.4
Wrist and hand	113	3.9	67	4.9	1.0	38	2.4	18	3.1	0.8	5.652[d]	0.7-1.2	0.4-1.1
Shoulder	98	3.4	47	3.5	0.7	61	3.9	24	4.2	1.0	0.320	0.5-0.9	0.6-1.5
Thumb	70	2.4	44	3.2	0.6	32	2.0	19	3.3	0.8	1.028	0.4-0.8	0.5-1.2
Eye	66	2.3	43	3.2	0.6	36	2.3	20	3.5	0.9	0.299	0.4-0.8	0.5-1.3
Fingers	63	2.2	37	2.7	0.5	66	4.2	30	5.2	1.3	4.354[d]	0.4-0.7	0.8-1.8[b]
Elbow	55	1.9	30	2.2	0.4	28	1.8	14	2.4	0.6	0.214	0.3-0.6	0.3-0.9
Thorax and T-spine	51	1.8	27	2.0	0.4	14	0.9	5	0.9	0.2	5.602[d]	—	—
Cervical spine	33	1.1	22	1.6	0.3	17	1.1	7	1.2	0.3	0.662	—	—
Skull	28	1.0	22	1.6	0.3	34	2.2	18	3.1	0.8	6.910[c]	0.2-0.4	0.4-1.1
Arm	26	0.9	10	0.7	0.1	11	0.7	5	0.9	0.2	0.528	—	—
Abdomen	21	0.7	7	0.5	0.1	8	0.5	5	0.9	0.2	0.884	—	—
Systemic[e]	10	0.3	1	0.1	0.0	18	1.1	3	0.5	0.1	7.182[c]	—	—
Genitals	4	0.1	3	0.2	0.0	0	0.0	0	0.0	0.0	—	—	—

[a]NBA, National Basketball Association; WNBA, Women's National Basketball Association; AE, per 1000 athlete exposures. The m-dashes (—) indicate that the confidence intervals were not calculated because of low n. Confidence intervals for fields that have a game-related n of fewer than 15 are potentially unstable and/or unreliable.
[b]Confidence interval, $P < .05$.
[c]χ^2, $P < .01$.
[d]χ^2, $P < .05$.
[e]Systemic abnormalities include heat exhaustion, dehydration, and general fatigue.

The WNBA players were more likely to suffer a sprain (10.1 per 1000 AE [95% CI, 8.8-11.3]) during game competition than were NBA players (7.2 per 1000 AE [95% CI, 6.5-7.8]) (Table 4). When specific diagnoses were analyzed, only finger sprains occurred more frequently during game competition in the WNBA, with WNBA athletes having a higher rate (1.0 per 1000 AE [95% CI, 0.6-1.4]) than that occurring during NBA games (0.3 per 1000 AE [95% CI, 0.2-0.4]) (Table 5).

DISCUSSION

The goal of our study was to provide a normative comparison of the rate and frequency of injuries occurring in women's and men's professional basketball. Although the overall frequency and rate were higher in the WNBA than in the NBA, we found that the overall distribution of injuries was remarkably consistent between the leagues. Gender difference did not markedly alter the nature, distribution, and rates of most game-related injuries.

Although the overall rate and frequency of injuries between the 2 leagues were statistically different, when we examined the actual diagnoses, there were few actual differences between the 2 leagues. For example, lower extremity injuries were more frequent in the WNBA, but only hip contusions and lower leg contusions showed a statistically significant difference. This discrepancy could be related to the low frequencies of the specific diagnoses.

Zelisko et al[14] published the only previous study comparing men's and women's professional basketball injuries. Two professional teams, 1 men's and 1 women's, were followed for 2 seasons. The women's injury frequency was 1.6 times that of men. Our findings were consistent with the overall gender-based injury rates cited for lower levels of competitive basketball.[7-10] Multiple authors have reported on the gender

TABLE 4
Injury Frequency and Rate by Injury Type[a]

	NBA					WNBA							
	All Injuries		Game Related			All Injuries		Game Related			Injured Players χ^2	95% Confidence Interval Rate AE	
Injury Type	n	%	n	%	AE	n	%	n	%	AE		NBA	WNBA
Sprain	860	29.9	504	37.0	7.2	477	30.4	231	40.4	10.1	0.002	6.5-7.8	8.8-11.3[b]
Inflammatory	623	21.7	129	9.5	1.8	417	26.6	56	9.8	2.4	3.200	1.5-2.1	1.8-3.1
Strain/spasm	567	19.7	223	16.4	3.2	280	17.8	87	15.2	3.8	2.252	2.8-3.6	3.0-4.6
Contusion	423	14.7	278	20.4	3.9	187	11.9	114	19.9	5.0	0.835	3.5-4.4	4.1-5.9
Fracture	135	4.7	78	5.7	1.1	51	3.2	18	3.1	0.8	3.938[c]	0.9-1.9	0.4-1.1
Skin wounds	130	4.5	79	5.8	1.1	48	3.1	26	4.5	1.1	2.532	0.9-1.9	0.7-1.6
Other	43	1.5	23	1.7	0.3	31	2.0	11	1.9	0.5	1.057	0.2-0.5	0.2-0.8
Neurologic	55	1.9	30	2.2	0.4	39	2.5	15	2.6	0.7	0.259	0.3-0.6	0.3-1.0
Meniscal tear	19	0.7	7	0.5	0.1	18	1.1	5	0.9	0.2	2.144	—	—
Eye injury	15	0.5	9	0.7	0.1	13	0.8	6	1.0	0.3	0.798	—	—
Heat illness	6	0.2	1	0.1	0.0	9	0.6	3	0.5	0.1	4.042[c]	—	—

[a]NBA, National Basketball Association; WNBA, Women's National Basketball Association; AE, per 1000 athlete exposures. The m-dashes (—) indicate that the confidence intervals were not calculated because of low n. Confidence intervals for fields that have a game-related n of fewer than 15 are potentially unstable and/or unreliable.
[b]Confidence interval, $P < .05$.
[c]χ^2, $P < .05$.

issue as it pertains to injury patterns in college and high school basketball.[6] McKay et al[7] studied gender differences in basketball injuries. Severity of injury was not found to be related to competition level, gender, age, height, or number of exposures per week.

The overall frequency of knee ligament injuries was low. Although the rate of ligamentous knee injury between the 2 leagues was not statistically significant, the disparity between these rates, specifically ACL injuries, remains a concern. The WNBA athletes experienced a game-related ACL injury rate that was 4 times that of the NBA and, overall, experienced a rate 1.6 times that of their NBA counterparts. The relatively low frequency of these injuries during the study period in both leagues may have prevented the difference from reaching statistical significance. Although ACL injuries tend to be the focus of study and media attention, the rate of occurrence across the 6 years of this study serves as evidence of the rarity of this event, representing 36 (0.8%) of the 4446 reports submitted between the 2 leagues.

The effect of prior attrition cannot be discounted when examining the differences in ACL injury between NBA and WNBA players. The higher rate of ACL injury in female high school and college athletes could result in the premature termination of careers that would otherwise include the professional ranks. The low occurrence of ACL sprains could also be reflective of the strength, conditioning, and training programs used to prevent this injury.

The ankle is the body part most susceptible to injury during basketball game competition. Ankle sprains have been shown to be the most common injury associated with basketball at all levels of play.[11,14] In our study, lateral ankle sprains alone accounted for approximately 14% of all injuries and 18% of all game-related injuries in both leagues. Increased emphasis on preventive techniques and investigating the efficacy of various prophylactic taping and bracing techniques could assist in reducing the overall frequency of ankle sprains.

Overuse and inflammatory conditions including tendinitis, bursitis, and synovitis accounted for 22% of NBA injuries and 27% of all WNBA injury reports. Although not a part of our formal study, inflammatory conditions did account for the greatest amount of time lost from practice and games in both leagues. To date, 2 studies have characterized the high rate of inflammatory conditions in the NBA and WNBA. Starkey[11] performed a 10-year study that provided an overview of medical conditions experienced by NBA athletes. He found the greatest number of games missed was owing to patellofemoral inflammation. Inflammatory conditions in general accounted for 15.3% of all NBA injuries and illnesses. He also noted the number of inflammatory conditions per athlete was significantly correlated with the athlete's age. Walters et al[12] reviewed WNBA injury and illness patterns and observed that overuse and chronic injuries accounted for the highest percentage of injuries (20.2%). The high frequency of inflammatory conditions may reflect the additive effects of physical demands of competition and travel in both leagues.

The results of this study must be interpreted within the context of its design. There is no question that differences exist in the professional basketball playing experiences of NBA and WNBA athletes. Multiple intrinsic and extrinsic factors play a role in the injury risk patterns identified by our study. Intrinsic factors, such as height, weight, limb alignment, strength, generalized laxity, and hormonal differences, and extrinsic factors, including variations in

TABLE 5
Injury Frequency and Rate for Selected Injuries[a]

	NBA					WNBA							
	All Injuries		Game Related			All Injuries		Game Related				95% Confidence Interval Rate AE	
Specific Injury	n	%	n	%	AE	n	%	n	%	AE	Injured Players χ^2	NBA	WNBA
Lateral ankle sprain	412	14.3	244	17.9	3.5	199	12.7	99	17.3	4.3	1.077	3.0-3.9	3.5-5.2
Patellofemoral inflammation	343	11.9	58	4.3	0.8	207	13.2	27	4.7	1.2	0.128	0.6-1.0	0.7-1.6
Lumbosacral sprain/spasm	168	5.8	55	4.0	0.8	57	3.6	16	2.8	0.7	10.739[b]	0.6-1.0	0.4-1.0
Adductor strain	98	3.4	42	3.1	0.6	29	1.8	4	0.7	0.2	8.038[b]	—	—
Hamstring strain	55	1.9	21	1.5	0.3	42	2.7	15	2.6	0.7	0.635	0.2-0.4	0.3-1.0
Foot/toes inflammation	80	2.8	13	1.0	0.2	59	3.8	11	1.9	0.5	0.993	0.1-0.3	0.2-0.8
Knee/patella contusion	60	2.1	41	3.0	0.6	36	2.3	23	4.0	1.0	0.036	0.4-0.8	0.6-1.4
Quadriceps contusion	74	2.6	48	3.5	0.7	26	1.7	15	2.6	0.7	3.347	0.5-0.9	0.3-1.0
Foot/toe strain	63	2.2	30	2.2	0.4	24	1.5	11	1.9	0.5	2.447	0.3-0.6	0.2-0.8
Triceps surae strain	48	1.7	22	1.6	0.3	28	1.8	16	2.8	0.7	0.111	0.2-0.4	0.4-1.0
Hip contusion	58	2.0	40	2.9	0.6	16	1.0	12	2.1	0.5	7.565[b]	0.4-0.7	0.2-0.8
Thumb sprain	55	1.9	34	2.5	0.5	29	1.8	17	3.0	0.7	0.183	0.3-0.6	0.4-1.1
Lower leg contusion	53	1.8	35	2.6	0.5	12	0.8	10	1.7	0.4	6.654[b]	0.3-0.7	0.2-0.7
Achilles tendon inflammation	48	1.7	16	1.2	0.2	44	2.8	3	0.5	0.1	4.245[c]	—	—
Finger sprain	39	1.4	20	1.5	0.3	48	3.1	23	4.0	1.0	6.789[b]	0.2-0.4	0.6-1.4[d]
Rotator cuff injury	36	1.3	9	0.7	0.1	21	1.3	7	1.2	0.3	0.026	—	—
Medial collateral ligament[e]	48	1.7	31	2.3	0.4	27	1.7	16	2.8	0.7	0.163	0.3-0.6	0.4-1.0
Wrist sprain	38	1.3	21	1.5	0.3	16	1.0	8	1.4	0.3	1.060	—	—
Foot/toe contusion	24	0.8	11	0.8	0.2	16	1.0	4	0.7	0.2	0.000	—	—
Foot/toe fracture	36	1.3	10	0.7	0.1	10	0.6	2	0.3	0.1	2.396	—	—
Cervical sprain/strain	23	0.8	13	1.0	0.2	14	0.9	5	0.9	0.2	0.077	—	—
Quadriceps strain	15	0.5	5	0.4	0.1	42	2.7	4	0.7	0.2	24.832[b]	—	—
Face laceration	83	2.9	54	4.0	0.8	31	2.0	17	3.0	0.7	2.661	0.6-1.0	0.4-1.1
Hip flexor strain	33	1.1	13	1.0	0.2	19	1.2	4	0.7	0.2	0.000	—	—
Concussion	23	0.8	17	1.2	0.2	28	1.8	14	2.4	0.6	4.876[c]	—	—
Acromioclavicular sprain	19	0.7	15	1.1	0.2	11	0.7	7	1.2	0.3	0.155	—	—
Nasal fracture	14	0.5	14	1.0	0.2	11	0.7	6	1.0	0.3	0.349	—	—
Tooth fracture	25	0.9	17	1.2	0.2	12	0.8	8	1.4	0.3	0.009	—	—
Finger fracture	14	0.5	11	0.8	0.2	16	1.0	5	0.9	0.2	3.573	—	—
ACL sprain[e]	22	0.8	10	0.7	0.1	14	0.9	9	1.6	0.4	0.021	—	—
Total	2107	73.3	970	71.3		1144	72.9	418	73.1				

[a]NBA, National Basketball Association; WNBA, Women's National Basketball Association; AE, per 1000 athlete exposures. The m-dashes (—) indicate that the confidence intervals were not calculated because of low n. Confidence intervals for fields that have a game-related n of fewer than 15 are potentially unstable and/or unreliable.
[b]χ^2, $P < .01$.
[c]χ^2, $P < .05$.
[d]Confidence interval, $P < .05$.
[e]Includes combined ACL and medial collateral ligament abnormalities.

equipment as well as practice and game facilities, must be considered. We did not have information on these particular variables for each athlete in each league and therefore could not factor their influence into our conclusions.

The length of the season and duration of the games are notably different between the 2 leagues. The NBA players compete in 48-minute games over a 30-week, 82-game regular season. Including the preseason and postseason, the NBA season is more than 7 months long. The WNBA players play thirty-two 40-minute games during a 20-week regular season. The WNBA season is only 4 months long. Whereas NBA players primarily compete in only NBA games, WNBA players often play year-round in other professional basketball leagues worldwide. Many WNBA players play more games in other leagues than they do in the WNBA. Because the women may also play many games in professional leagues

other than the WNBA (European leagues), our study reflects only a small part of their annual injury exposure and almost certainly underrepresents the true annual injury risk for the average WNBA player. We recognize we can only account for injuries occurring during league-sanctioned play, yet we are aware of serious injuries occurring to athletes playing outside of their respective leagues, especially in the WNBA, in which several high-profile players have suffered ACL injuries outside of sanctioned league play.

This study does carry some notable limitations. We attempted to create a comparable cohort group by limiting our NBA player pool to those athletes with 0 to 5 seasons of NBA playing experience. In doing so, some selection bias may have occurred, as the mean age of the NBA athlete was younger than that of the WNBA athlete. In a review of NBA injuries, injury rate per player increased with player experience.[11] Unlike the WNBA, the NBA has early entry into the draft, thereby decreasing the lower end of the age range for NBA players.

Another limitation of our data collection is the assumption that all injury information received was medically valid and accurate. We recognize that both leagues used an "injured list" that allowed for additional players to be added to the active roster in the event that an athlete suffers an injury that will result in a significant amount of time lost. The injured list was sometimes used for other forms of roster adjustments. The scope and magnitude of injuries may be inflated to allow a team to retain the rights to a specific player and thereby increase the number of players protected by the roster. This process could inflate the amount of time lost for certain players and create otherwise invalid or inaccurate reports. Given the scope and duration of this study, and using the assumption that this probably occurs equally in each league, we believe that this did not significantly affect the findings of our study.

CONCLUSION

Our data suggest the overall game-related injury rate in women's professional basketball (WNBA) is higher than the game-related injury rate in the NBA. This descriptive analysis can serve as the foundation for further research directed toward the identification of gender-related injury risk factors. We hope that the ultimate outcome of this study, and any epidemiologic study, is the impetus to develop prevention strategies and lead to other studies that determine the efficacy of various conditioning and injury prevention techniques.

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