

Effect of a Condensed NBA Season on Injury Risk

An Analysis of the 2020 Season and Player Safety

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Background: Health and safety concerns surrounding the coronavirus 2019 (COVID-19) pandemic led the National Basketball Association (NBA) to condense and accelerate the 2020 season. Although prior literature has suggested that inadequate rest may lead to an increased injury risk, the unique circumstances surrounding this season offer a unique opportunity to evaluate player safety in the setting of reduced interval rest.

Hypothesis: We hypothesized that the condensed 2020 NBA season resulted in an increased overall injury risk as compared with the 2015 to 2018 seasons.

Study Design: Descriptive epidemiology study.

Methods: A publicly available database, Pro Sports Transactions, was queried for injuries that forced players to miss ≥ 1 game between the 2015 and 2020 seasons. Data from the 2019 season were omitted given the abrupt suspension of the league year. All injury incidences were calculated per 1000 game-exposures (GEs). The primary outcome was the overall injury proportion ratio (IPR) between the 2020 season and previous seasons. Secondary measures included injury incidences stratified by type, severity, age, position, and minutes per game.

Results: A total of 4346 injuries occurred over a 5-season span among 2572 unique player-seasons. The overall incidence of injury during the 2020 season was 48.20 per 1000 GEs but decreased to 39.97 per 1000 GEs when excluding COVID-19. Despite this exclusion, the overall injury rate in 2020 remained significantly greater (IPR, 1.42 [95% CI, 1.32-1.52]) than that of the 2015 to 2018 seasons (28.20 per 1000 GEs). On closer evaluation, the most notable increases seen in the 2020 season occurred within minor injuries requiring only a 1-game absence (IPR, 1.53 [95% CI, 1.37-1.70]) and in players who were aged 25 to 29 years (IPR, 1.57 [95% CI, 1.40-2.63]), averaging ≥ 30.0 minutes per game (IPR, 1.67 [95% CI, 1.47-1.90]), and playing the point guard position (IPR, 1.67 [95% 1.44-1.95]).

Conclusion: Players in the condensed 2020 NBA season had a significantly higher incidence of injuries when compared with the prior 4 seasons, even when excluding COVID-19-related absences. This rise is consistent with the other congested NBA seasons of 1998 and 2011. These findings suggest that condensing the NBA schedule is associated with an increased risk to player health and safety.

Keywords: NBA; National Basketball Association; basketball; COVID-19; injury; player health

In a typical season, each National Basketball Association (NBA) team participates in 82 regular season games between October and April, with up to an additional 30 playoff games running through June. In comparing this with the collegiate rank, no National Collegiate Athletic Association men's basketball team has ever played >41 total games in a single season.⁴² This disparity may explain why the incidence of injury is nearly twice as high

in professional versus collegiate athletes.^{11,24} In addition to the physical and mental demands associated with the number of competitions, NBA athletes are uniquely stressed by recovery work, training regimens, frequent travel, and inconsistent sleep patterns.^{5,9,20,22,29} There is a growing interest in an informed approach to game scheduling to alleviate some of these issues and optimize player health.

Given the implications of the novel coronavirus 2019 (COVID-19) pandemic, the 2020 NBA season was shortened to 72 regular season games per team. Additionally, it began after an abbreviated offseason. This resulted in a condensed schedule with teams averaging 15.2 back-to-back games

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(21%) in which they played games 2 nights in a row. By comparison, teams averaged 13.3 back-to-back games (16%) during the normal 2018 season.³⁵ Despite league efforts to limit the increased rigor of the season by reducing total travel time, players and trainers have cited the congested schedule as a concern for player health.^{17,34}

It has been demonstrated that the 2020 NBA season had an increased frequency of athletes being held from participation. Specifically, the number of players being sidelined owing to injury, illness, or rest in 2020 was 5% higher than in the next-highest season.¹⁵ Furthermore, All-Star players missed 19% of regular season games during the 2020 season, the highest percentage in NBA history.¹⁵ League officials have suggested that overall injury rates remained in range of the prior 5 seasons and that the incidence of severe injuries decreased from the 2019 season to the 2020 season.^{15,34,40}

Currently, no literature to our knowledge has analyzed the injury-related ramifications of the condensed 2020 NBA schedule. Exploring the consequences of these unique circumstances may aid trainers and league officials if future seasons are modified. The purpose of this study was to evaluate injury rates and characteristics in the condensed 2020 NBA season as compared with prior regular seasons to more closely understand player safety in the setting of reduced interval rest between competitions. It is hypothesized that the condensed 2020 NBA season resulted in an increased overall injury risk as compared with the 2015 to 2018 seasons.

METHODS

Data Collection

This study was deemed exempt by our institutional review board. Injury data between October 2015 and July 2021 were initially queried from Pro Sports Transactions (prosportstransactions.com), an online database that tracks player movement on and off each NBA team's inactive list, games missed owing to injury, description of injury, and dates of injury. This database has been cited in numerous NBA-related studies.^{3,5,8,21,26,31} Each recorded injury event was verified using historical injury data available on The Sports Network (tsn.ca) and Rotowire (rotowire.com) and using player game logs on Basketball-Reference (basketball-reference.com). Information from Basketball-Reference is sourced by Sportradar US (Sportradar AG), the official statistics partner of the NBA. Furthermore, injury data were compared with those in studies that extracted injury totals from the official database of the National Basketball Athletic

Trainers Association (Appendix Table A1).^{10,12,38} Team schedules, player characteristics, and player statistics were obtained from Basketball-Reference. Injury-related data from the 2019 NBA season was omitted from this study because of an abrupt league-wide suspension of the season because of the onset of the COVID-19 pandemic.

Definition of Terms

Season. An NBA season is identified by the year in which it began. For example, the 2020-2021 season is referred to as the 2020 NBA season.

Player-Seasons. Player-seasons refer to the total number of seasons played by an individual between 2015 and 2020, sans 2019. For example, a player who appeared in games during the 2018 and 2020 seasons would account for 2 player-seasons.

Injury. A reportable injury was determined to be a health-related concern sustained during the NBA season that resulted in a minimum absence of 1 game. Absences were excluded if attributed to personal reasons or injuries experienced during the offseason, as described by the online database. An injury was presumed to be resolved when an individual returned to play; hence, if a player reaggrieved a previous injury, it was counted as a new injury.

Injury Type. Injuries were categorized using keywords within the description of the injury: foot/toe (foot, toe, heel), ankle (ankle), lower leg (leg, calf, shin, fibula, tibia, Achilles tendon), knee (knee), groin/hip/thigh (thigh, quadriceps, hamstring, hip, groin, adductor), trunk/back (torso, back, abdominal, oblique, rib, sternum, spine, pelvis, pectoral), arm/shoulder (arm, shoulder, elbow, biceps), wrist/hand (forearm, hand, wrist, finger, thumb), head/neck (head, neck, face, nose, eye, mouth, concussion, cervical, collarbone, jaw), illness (illness, flu, virus, gastroenteritis, headache, migraine, respiratory, dizziness, bronchitis, mononucleosis), COVID-19 related (COVID-19, health and safety protocols), and other (conditioning, general soreness, cardiac, respiratory, hematologic, renal, genitourinary, undisclosed). COVID-19-related absences encompassed any player who entered the league's health and safety protocols, regardless of a positive screening test. Players were tested daily, and protocols mandated that individuals with a positive test result be restricted from participating in NBA games or team activities for a minimum 10 days. Protocols also restricted any player from game participation if exposed to persons with COVID-19 until cleared by team physicians.⁴

Injury Severity. Severity of an injury was classified by the number of consecutive games missed because of the

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Ethical approval was not sought for the present study.

TABLE 1
Player Characteristics Stratified by Season^a

	2015	2016	2017	2018	2020	2015-2018	2015-2020
Age, y	26.6 ± 4.4	26.4 ± 4.3	26.1 ± 4.2	25.9 ± 4.2	25.6 ± 4.1	26.2 ± 4.3	26.1 ± 4.2
Height, cm	200.5 ± 8.8	200.4 ± 9.0	200.0 ± 8.7	200.0 ± 8.5	199.0 ± 8.6	200.1 ± 8.7	199.9 ± 8.7
BMI	24.9 ± 1.7	24.8 ± 1.6	24.6 ± 1.7	24.6 ± 1.7	24.7 ± 2.1	24.7 ± 1.7	24.7 ± 1.8
Players	476	486	540	530	540	2032	2572
Game-exposures	27,972	27,875	27,830	27,862	24,918	111,539	136,457
Players injured	315	322	346	341	424	1324	1748
Total injuries	735	732	829	849	1201	3145	4346

^aData are reported as mean ± SD or No. BMI, body mass index.

injury: minor (1-game absence), moderate (2-10 games), and severe (≥11 games).

Age. The age of a player was determined using date of birth, as provided by Basketball-Reference, and the date of injury. If a player did not sustain an injury, the start date of the corresponding season was used.

Position. Player position was provided by the Basketball-Reference and included point guard, shooting guard, small forward, power forward, and center.

Minutes per Game. Minutes per game (MPG) for each player were provided by Basketball-Reference. MPG represents the mean minutes that a player logged in all regular season and playoff games of the corresponding season.

Game-Exposure. A game-exposure (GE) was characterized by a single game appearance, regardless of minutes played in the contest. This did not include any exposures related to practice or training periods.

Statistical Analysis

The incidence of injury events for each season was calculated per 1000 GEs. Injury proportion ratios (IPRs) and corresponding 95% CIs were computed to compare the injury rates between the 2020 season and previous years. An IPR >1 indicated a greater rate of injuries during the 2020 season. A given IPR was determined to be significant if the 95% CIs did not contain 1.0. Further exploration was conducted after stratifying injury rates by severity, age, MPG, and position. All comparisons excluded COVID-19 as an injury type.

Cumulative injury curves were created to visualize the differences in injured player rates by season. All analyses were conducted using R Version 3.6 (R Core Team) and Excel 2021 (Microsoft).

RESULTS

Player Characteristics

There were 4346 total injuries sustained by NBA players between the 2015 and 2020 NBA seasons, excluding the suspended 2019 season. Over this period, there were 2572 unique player-seasons and 136,457 total GEs. Mean age,

height, and body mass index remained similar between the seasons (Table 1).

Injury Totals and Incidences: 2020 Season

The overall incidence of injury during the 2020 season was 48.20 per 1000 GEs (Table 2). COVID-19-related was the most common injury type (8.23 per 1000 GEs), followed by groin/hip/thigh (7.75 per 1000 GEs) and knee (7.46 per 1000 GEs). Severe injuries, or those requiring players to miss >10 games, were most frequently sustained in the groin/hip/thigh (0.92 per 1000 GEs). Of the 540 players during the 2020 season, 176 (33%) suffered COVID-19-related injuries, with absences ranging from 1 to 15 games. With COVID-19-related injuries excluded, the overall injury incidence decreased to 39.97 per 1000 GEs.

Injury by Type

In comparison with the 2015 to 2018 seasons, the overall incidence of injury was significantly greater in the 2020 season (IPR, 1.42 [95% CI, 1.32-1.52]) (Table 3). Every type of lower extremity injury occurred at a significantly greater rate during the 2020 season (IPRs: foot/toe, 1.43 [95% CI, 1.10-1.87]; ankle, 1.34 [95% CI, 1.12-1.60]; lower leg, 2.07 [95% CI, 1.61-2.65]; knee, 1.50 [95% CI, 1.27-1.77]; and groin/hip/thigh, 1.95 [95% CI, 1.64-2.30]). Notably, lower leg injuries were over twice as likely. Only arm/shoulder injury (IPR, 0.93 [95% CI, 0.65-1.34]) and illness (IPR, 0.85, [95% CI, 0.66-1.10]) rates decreased, although not to a significant degree.

Injury by Severity

The largest increase in injury rate occurred for minor injuries, in which players missed only 1 game (IPR, 1.53 [95% CI, 1.37-1.70]) (Table 4). There were also significant increases in incidences of moderate (IPR, 1.33 [95% CI, 1.19-1.48]) and severe (IPR, 1.38 [95% CI, 1.12-1.68]) injuries.

Injury by Age

In comparison with previous years, there was a significant rise in injuries in players aged 20 to 24 years (IPR, 1.26 [95% CI, 1.12-1.43]) and 25 to 29 years (IPR, 1.57 [95%

TABLE 2
Injury Totals and Incidences: 2020 Season^a

Injury Type	No. of Injuries	Injury Incidence per 1000 GEs	No. of Games Missed ^b	Injury Severity Incidence per 1000 GEs		
				Mild	Moderate	Severe
Foot/toe	73	2.93	2.5 (1-6)	1.04	1.40	0.48
Ankle	159	6.38	2 (1-5.5)	2.25	3.37	0.76
Lower leg	90	3.61	2 (1-6)	1.44	1.65	0.52
Knee	186	7.46	2 (1-5)	3.41	3.25	0.80
Groin/hip/thigh	193	7.75	1 (1-4)	3.89	2.93	0.92
Trunk/back	73	2.93	1 (1-3)	1.81	0.80	0.32
Arm/shoulder	35	1.40	2 (1-4)	0.56	0.68	0.16
Wrist/hand	51	2.05	3 (2-12)	0.44	0.92	0.68
Head/neck	47	1.89	2 (1-4)	0.64	1.12	0.12
Illness	73	2.93	1 (1-2)	2.05	0.88	0.00
COVID-19 related	205	8.23	3 (1-5)	2.57	5.22	0.44
Other	16	0.64	1.5 (1-3.8)	0.32	0.20	0.12
Total	1201	48.20	2 (1-5)	20.43	22.43	5.34
Total without COVID-19	996	39.97	2 (1-5)	17.86	17.22	4.90

^aCOVID-19, coronavirus 2019; GE, game-exposure.

^bMedian (interquartile range).

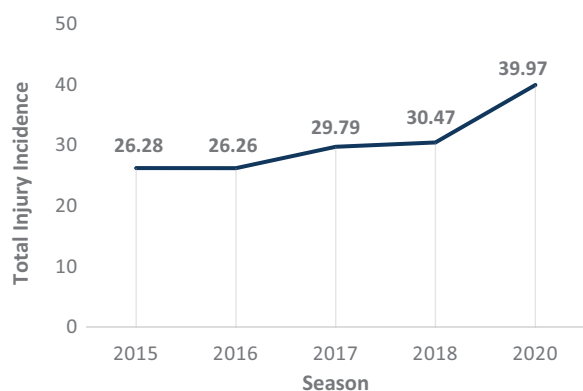


Figure 1. Overall injury incidence by season: 2015 to 2020. Each value is calculated per 1000 game-exposures.

CI, 1.40-2.63]) (Table 4). Players aged <20 and ≥ 30 years were 1.18 and 1.50 times more likely to sustain an injury during the 2020 season, respectively.

Injury by MPG

During the 2020 season, players averaging <10.0 MPG (IPR, 1.23 [95% CI, 0.93-1.62]) and between 10.0 and 19.9 MPG (IPR, 1.05 [95% CI, 0.90-1.22]) experienced injuries at slightly higher rates when compared with normal seasons (Table 4). However, only those averaging 20.0 to 29.9 MPG (IPR, 1.56 [95% CI, 1.12-2.17]) and ≥ 30.0 MPG (IPR, 1.67 [95% CI, 1.47-1.90]) demonstrated significantly greater incidences of injury.

Injury by Position

The rate of injuries rose substantially for all positions (IPRs: point guard, 1.67 [95% CI, 1.44-1.95]; shooting

guard, 1.34 [95% CI, 1.15-1.56]; small forward, 1.56 [95% CI, 1.32-1.85]; power forward, 1.21 [95% CI, 1.03-1.42]; center, 1.36 [95% CI, 1.15-1.62]) (Table 4).

Injury by Cumulative Workload

There was a similar accumulation of injuries over each season between 2015 and 2018 when stratified by games (Figure 2A) or minutes played (Figure 2B). During the 2020 season, there appeared to be a more rapid accumulation of injuries after game number 20 and 500 minutes played.

DISCUSSION

The overall incidence of injury during the 2020 NBA season was 48.20 per 1000 GEs, with COVID-19–related absences identified as the most common injury type (8.23 per 1000 GEs). Although this study did not specify which COVID-19–related absences were due to a positive diagnosis or contact tracing purposes, these results indicate that nearly 30% of players missed games for health and safety protocols, with some missing up to 15 games at a time. By excluding COVID-19–related absences as an injury type, the overall incidence of injury during the 2020 NBA season decreased to 39.97 per 1000 GEs. Injuries most frequently occurred in the groin/hip/thigh (7.75 per 1000 GEs), knee (7.46 per 1000 GEs), and ankle (6.38 per 1000 GEs). These areas of the body have commonly been identified as the 3 most injury-prone sites in basketball players.^{5,10} The unique repetition of jumping, landing, and rapid change of direction seen in basketball movements places immense stresses on the lower extremities over the course of a game and more so a season. Lower extremity injuries (foot, ankle, lower leg, knee, groin/hip/thigh) represented 70.4% of all injuries not related to COVID-19. This is consistent with

TABLE 3
Injury Incidence by Injury Type^a

	2015-2018		2020		IPR (95% CI) ^b
	No. of Injuries (n = 3145)	Incidence per 1000 GEs	No. of Injuries (n = 996)	Incidence per 1000 GEs	
Foot/toe	228	2.04	73	2.93	1.43 (1.10-1.87)
Ankle	530	4.75	159	6.38	1.34 (1.12-1.60)
Lower leg	195	1.75	90	3.61	2.07 (1.61-2.65)
Knee	554	4.97	186	7.46	1.50 (1.27-1.77)
Groin/hip/thigh	444	3.98	193	7.75	1.95 (1.64-2.30)
Trunk/back	293	2.63	73	2.93	1.12 (0.86-1.44)
Arm/shoulder	168	1.51	35	1.40	0.93 (0.65-1.34)
Wrist/hand	163	1.46	51	2.05	1.40 (1.02-1.92)
Head/neck	164	1.47	47	1.89	1.28 (0.93-1.77)
Illness	383	3.43	73	2.93	0.85 (0.66-1.10)
Other	23	0.21	16	0.64	3.11 (1.65-5.89)
Total	3145	28.20	996	39.97	1.42 (1.32-1.52)

^aData do not include coronavirus 2019 as an injury type. GE, game-exposure; IPR, injury proportion ratio.

^bRatio presented as 2020/2015-2018.

TABLE 4
Injury Incidence by Severity, Age, Minutes per Game, and Position^a

	2015-2018		2020		IPR (95% CI) ^b
	No. of Injuries (n = 3145)	Incidence per 1000 GEs	No. of Injuries (n = 996)	Incidence per 1000 GEs	
Severity					
Minor	1303	11.68	445	17.86	1.53 (1.37-1.70)
Moderate	1445	12.96	429	17.22	1.33 (1.19-1.48)
Severe	397	3.56	122	4.90	1.38 (1.12-1.68)
Age, y					
<20	50	26.71	19	31.46	1.18 (0.69-2.00)
20-24	1020	26.33	331	33.25	1.26 (1.12-1.43)
25-29	1196	27.15	388	42.61	1.57 (1.40-2.63)
≥30	879	32.71	258	49.11	1.50 (0.90-2.50)
Minutes per game					
<10.0	180	24.38	70	30.04	1.23 (0.93-1.62)
10.0-19.9	884	24.86	203	26.13	1.05 (0.90-1.22)
20.0-29.9	1242	29.65	399	46.18	1.56 (1.12-2.17)
≥30.0	839	31.41	324	52.45	1.67 (1.47-1.90)
Position					
Point guard	641	28.97	231	48.50	1.67 (1.44-1.95)
Shooting guard	693	27.46	226	36.74	1.34 (1.15-1.56)
Small forward	541	27.70	181	43.31	1.56 (1.32-1.85)
Power forward	651	29.34	187	35.42	1.21 (1.03-1.42)
Center	619	27.57	171	37.62	1.36 (1.15-1.62)

^aData do not include coronavirus 2019 as an injury type. GE, game-exposure; IPR, injury proportion ratio.

^bRatio presented as 2020/2015-2018.

prior studies that have shown the lower extremities to account for 72.3% of all injuries in NBA players.^{10,12}

The overall incidence of injury not related to COVID-19 during the 2020 season (39.97 per 1000 GEs) was significantly greater than the rate of injury across the previous 4 seasons from 2015 to 2018 (28.20 per 1000 GEs). When injury rates were compared among individual seasons, the nearest injury incidence occurred in the 2018 season (30.47 per 1000 GEs) (Figure 1). These findings suggest a

significant increase in player injury and injury risk during the 2020 season. The omission of COVID-19–related absences from these comparisons suggest that factors such as preseason deconditioning, reduced interval rest time, and increased player burden may have been responsible for the increased injury rate during the 2020 season.

Players and team trainers have cited concerns over a compressed schedule and its effects on player health. The 2020 NBA regular season (3.6 games per week) was 1 of 3

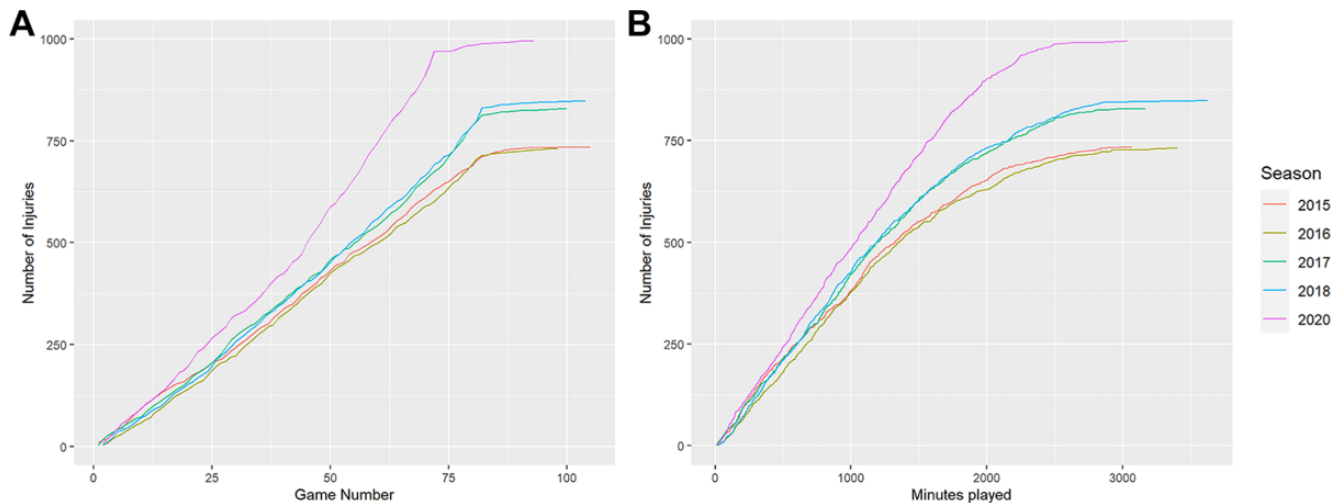


Figure 2. Cumulative sum of injuries by (A) game and (B) minutes played: 2015 to 2020 seasons.

seasons since 1972 in which teams averaged >3.4 games per week.³⁰ The 2 other seasons, 1998 and 2011, averaged 4.2 and 3.9 games per week, respectively (Appendix Table A2). As prior literature has suggested that optimal physical recovery in athletes occurs after roughly 72 hours of rest, the increased congestion of games during this season may have played a role in increased injury risk.^{20,32,39} When the typical 1997 season was compared with the 1998 season with increased games per week, total games missed because of injury rose from 6092 to 6134, despite each team playing 39% fewer regular season games attributed to the 1998 NBA lockout.³³ A similar trend was noted in the 2011 lockout season, when the rate of minor and severe injuries nearly doubled from the preceding year.⁵ In the current study, the risk of sustaining a minor, moderate, or severe injury during the 2020 season increased by 53%, 33%, and 38%, respectively, when compared with previous seasons (Table 4). Although the circumstances surrounding the lockout years of 1998 and 2011 were unlike those of the COVID-19 pandemic, it should be recognized that condensing an NBA team's schedule beyond the normal 3.4 games per week has historically been associated with a negative effect on player health.

Notably, the NBA had made attempts to decongest the schedule in normal seasons before the onset of the pandemic to benefit player safety. This included progressively reducing the number of back-to-back games, eliminating 4 games in 5 days, and adding an extra week to the schedule beginning in the 2017 season.³⁷ These changes decreased average games per week for each team from 3.4 to 3.3. According to the results of the current study, the overall injury incidence rose from 26.26 per 1000 GEs to 29.79 per 1000 GEs between the 2016 and 2017 seasons and continued to rise through the 2018 season (30.47 per 1000 GEs). Therefore, steps to decongest the schedule in recent normal seasons have not necessarily translated to an improvement in injury prevention, although this could also be due to more accurate diagnoses and improved reporting with closer attention to player health. As with many other sports, optimizing schedule

congestion to ensure player safety remains a challenging and controversial topic in the NBA.^{6,19,27}

The COVID-19 health and safety protocols of the 2020 season posed new challenges to NBA players and organizations. To participate in a given game, players were required to produce (1) a negative polymerase chain reaction test result 1 day before the game and (2) a negative rapid test result the day of the game.^{2,4} Players frequently expressed that these daily testing protocols worsened sleep patterns, which were already disrupted from extensive traveling through different time zones.^{15,22,28,34} Sleep deprivation has been associated with prolonged physical recovery, decreased reaction time, and elevated injury risk in professional athletes.^{7,14,16,18,20,36} Though correlations between COVID-19 health and safety protocols and injury risk were not explored in the current study, there is reason to believe that these protocols may be a modifiable risk factor for non-COVID-19 injuries if they are continued in future NBA seasons.

To further characterize risk factors of player health during the 2020 season, we stratified injuries by age, player position, and MPG. Historically, age has not exhibited a relationship with injury incidence in the NBA athlete. The current study supports this, as rates of injury among age groups (range, 26.33-32.71 per 1000 GEs) remained comparable over the 2015 to 2018 seasons. However, it should be recognized that the rise in injury rate during the 2020 season appeared to correlate with increasing age. Players aged 25 to 29 and ≥ 30 years demonstrated a 57% and 50% increase in injuries, respectively. Conversely, those aged <20 years showed a modest 18% increase. These results suggest that schedule congestion affected older players to a greater extent. It has been noted that between the ages of 25 and 50 years, athletes lose 10% of muscle area, with diminished flexibility and tendon integrity.²⁵ Condensing the schedule may have exacerbated the effects of aging, predisposing older players to a substantially higher risk of injury.

When stratified by player position, injury incidences for the 5 standard positions were nearly identical (range,

27.46-29.34) over the 2015 to 2018 seasons. This is consistent with current literature, as there is little evidence that player position contributes to the risk of injury in the NBA athlete.^{5,12,38} Notably, the greatest rise in injury during the 2020 season was seen in point guards (IPR, 1.67). Although it is unclear why this position was most compromised, prior studies have noted that guards endure higher physiologic stress when compared by position in competition.¹

Currently, there is no consensus as to whether an NBA player's workload, often measured using MPG or cumulative minutes played, correlates with increased risk of injury.^{3,13,20,21,41} Across all seasons in the current study, the incidence of injury appeared to correlate with increasing MPG. With regard to the 2020 season, the only significant increase in injury rates as compared with prior seasons was noted in players averaging 20.0 to 29.9 MPG (IPR, 1.56) and ≥ 30.0 MPG (IPR, 1.67). Therefore, it seems the circumstances surrounding the condensed season were most detrimental to high-workload players. These findings are in accordance with studies reporting that significant increases in NBA injury odds are proportional to increases in cumulative minutes played and decreases in number of rest days.²³ In contrast to previous seasons, the accumulation of injuries during the 2020 season seemed to accelerate after players logged about 500 total minutes (Figure 2B) or after 20 games played (Figure 2A). These findings suggest that during the 2020 season, players were injured earlier in the season and at an overall higher rate. The acceleration of injury rate may have been a product of the shortened off-season for many players coming into the 2020 season. Normally, NBA athletes are afforded at minimum a 14-week offseason, although some players experienced as little as 6 weeks of rest before the start of training camp between the 2019 and 2020 seasons. As a result, players may have had inadequate time to pursue offseason recovery measures and medical procedures in preparation for the next season. However, it should be noted that teams excluded from the 2019 season restart experienced an extended offseason, up to 35 weeks. Further studies are needed to explore the relationship of offseason time and player health in the NBA.

Limitations

This retrospective study had several limitations. First, injury data were extracted from a public database and verified using 2 other public websites. Although this database has been frequently cited in literature, there may be inconsistencies between these data and official team medical records. Second, injuries sustained during the offseason and minor injuries that did not force a player to miss a full game were excluded from this study given the inability to verify these events. It is suspected that these events occur frequently and could supplement this study. Third, data were collected under the presumption that any injured athlete returning to gameplay had recovered. Therefore, if a player missed a subsequent game because of reaggravation or lingering soreness associated with the previous injury, a new injury event was recorded, which may have overrepresented the number of novel injuries and potentially underrepresented the severity of minor injuries.

CONCLUSION

Study findings indicated that the 2020 NBA season produced a significantly higher rate of injuries than the 2015 to 2018 seasons. This sharp rise in overall injury incidence is consistent with the other condensed NBA seasons, such as 1998 and 2011. Although COVID-19 introduced a novel injury type to NBA teams, it was not determined to be solely responsible for the negative effect on player availability. These findings suggest that condensing the NBA schedule is not optimal for player safety and should be avoided in future seasons. Independent risk factors that were prominent during the 2020 season included age ≥ 25 years, ≥ 30.0 MPG, and the point guard position.

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APPENDIX

TABLE A1
Previous Studies Reporting Comprehensive NBA Injury Totals by Season^a

Body Part	No. of Injuries (Injuries per Season)			
	Current Study (2015-2018)	Starkey ³⁸ (1988-1997)	Drakos et al ¹² (1988-2004)	Deitch et al ¹⁰ (1996-2002)
Ankle	530 (132.5)	1062 (106.2)	1850 (108.8)	486 (81.0)
Knee (patella, patellofemoral)	554 (138.5)	1367 (136.7)	2401 (141.2)	550 (91.7)
Foot/toe	228 (57.0)	616 (61.6)	962 (56.6)	227 (37.8)
Lower leg (tibia, fibula)	195 (48.8)	548 (54.8)	954 (56.1)	218 (36.3)
Groin/hip/thigh (femur, sacrum)	444 (111.0)	1055 (105.5)	1686 (99.2)	376 (62.7)
Wrist/hand (fingers, thumb)	163 (40.8)	704 (70.4)	1145 (67.4)	266 (44.3)
Trunk/back (thorax, abdomen, spine, lumbosacral, genitals)	293 (73.3)	880 (88.0)	1600 (94.1)	334 (55.7)
Arm/shoulder (humerus, elbow)	168 (42.0)	446 (44.6)	800 (47.1)	179 (29.8)
Head/neck (face, eye, mouth, jaw, cervical spine, skull)	164 (41.0)	768 (76.8)	1149 (67.6)	250 (41.7)

^aNBA, National Basketball Association.

TABLE A2
Games per Week for NBA Seasons Between 1972 and 2020^a

Season	No. of Games	Start Date ^b	End Date ^b	Duration, wk	Games per Week
2020	72	12/22/20	5/16/21	20.86	3.60
2018	82	10/16/18	4/10/19	25.29	3.28
2017	82	10/17/17	4/11/18	25.29	3.28
2016	82	10/25/16	4/12/17	24.29	3.42
2015	82	10/27/15	4/13/16	24.29	3.42
2014	82	10/28/14	4/15/15	24.29	3.42
2013	82	10/29/13	4/16/14	24.29	3.42
2012	82	10/30/12	4/17/13	24.29	3.42
2011	66	12/25/11	4/26/12	17.71	3.88
2010	82	10/26/10	4/13/11	24.29	3.42
2009	82	10/27/09	4/14/10	24.29	3.42
2008	82	10/28/08	4/16/09	24.43	3.42
2007	82	10/30/07	4/16/08	24.29	3.42
2006	82	10/31/06	4/18/07	24.29	3.42
2005	82	11/1/05	4/19/06	24.29	3.42
2004	82	11/2/04	4/20/05	24.29	3.42
2003	82	10/28/03	4/14/04	24.29	3.42
2002	82	10/29/02	4/16/03	24.29	3.42
2001	82	10/30/01	4/17/02	24.29	3.42
2000	82	10/31/00	4/18/01	24.29	3.42
1999	82	11/2/99	4/19/00	24.29	3.42
1998	50	2/5/99	5/5/99	12.86	4.17
1997	82	10/31/97	4/19/98	24.43	3.42
1996	82	11/1/96	4/20/97	24.43	3.42
1995	82	11/3/95	4/21/96	24.43	3.42
1994	82	11/4/94	4/23/95	24.43	3.42
1993	82	11/5/93	4/24/94	24.43	3.42
1992	82	11/6/92	4/25/93	24.43	3.42
1991	82	11/1/91	4/19/92	24.43	3.42
1990	82	11/2/90	4/21/91	24.43	3.42
1989	82	11/3/89	4/22/90	24.43	3.42
1988	82	11/4/88	4/23/89	24.43	3.42
1987	82	11/6/87	4/24/88	24.43	3.42
1986	82	10/31/86	4/19/87	24.43	3.42
1985	82	10/25/85	4/13/86	24.43	3.42
1984	82	10/26/84	4/14/85	24.43	3.42
1983	82	10/28/83	4/15/84	24.43	3.42
1982	82	10/29/82	4/17/83	24.43	3.42
1981	82	10/30/81	4/18/82	24.43	3.42
1980	82	10/10/80	3/29/81	24.43	3.42
1979	82	10/12/79	3/30/80	24.43	3.42
1978	82	10/13/78	4/8/79	25.43	3.28
1977	82	10/18/77	4/9/78	24.86	3.42
1976	82	10/21/76	4/10/77	24.57	3.42
1975	82	10/23/75	4/11/76	24.57	3.42
1974	82	10/17/74	4/6/75	24.57	3.42
1973	82	10/9/73	3/27/74	24.29	3.42
1972	82	10/10/72	3/28/73	24.29	3.42

^aNBA, National Basketball Association.

^bData are presented as month/day/year.