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The Relationship Between Injury Rates and Winning in the National Football League

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ABSTRACT

An expert strength and conditioning coach can be an important component of a sports performance and medicine staff that will train their athletes to help them become more resilient to injury. Previous research in a variety of sports has shown that teams with players that have fewer games missed due to injury have achieved greater success. The purpose of this study was to determine if a relationship exists between games missed due to injury by offensive and defensive starters on National Football League (NFL) rosters and a NFL team's ability to win during the 2010-19 NFL seasons. A Spearman rank-order correlation analysis set at ($p \leq 0.01$) level of significance indicated that fewer games missed by starters in the NFL is correlated with multiple variables associated with winning such as games won per season and playoff appearances. These results were obtained after analyzing all 32 NFL teams from the 2010-19 seasons. Descriptive statistics were also used to further analyze the data set and found that teams ranked in the top-five in terms of fewest injuries outperformed the remainder of the teams in the NFL according to multiple variables associated with winning. The data in this study supports that NFL organizations that have fewer games missed due to injury of their athletes may have a better opportunity of achieving success.

Keywords: strength and conditioning; injury prevention; sports medicine; physical therapy; winning in sports; performance coach

INTRODUCTION

One of the most essential skills of an expert strength and conditioning coach is they train athletes with the primary goal of helping them to excel in their specific sport (20). A key aspect is that the athlete must be resilient to injury so that they are able to compete at a high level, and must have a certain level of strength and conditioning based on the sport they compete in (25, 30, 34). Due to this, one of the primary goals of an expert strength and conditioning coach, or a strength and conditioning coach looking to develop into an expert, is to train their athletes to become as resilient to injury as possible. This is no easy task, especially in the sport of American football where previous research has found that up to 68 percent of athletes in the National Football League (NFL) may be injured during a season (17).

Strength and conditioning coaches instruct their athletes through specific exercises with the intention of helping reduce the chance of injury during competition (14). In a team setting, multiple staff members play a role in helping an athlete perform at their best. For example, in the NFL, teams will have athletic trainers, physical therapists, and team physicians, in addition to the strength and conditioning professionals, such as strength and conditioning coaches and directors of performance. Directors of performance, such as directors of high performance and directors of sports performance, are relatively new positions that oversee all aspects of player performance such as strength and conditioning and nutrition (23). Although athletic trainers, physical therapists, and team physicians play important roles related to the well-being of

each athlete, it is the responsibility of the strength and conditioning professionals to proactively train an athlete through proper movement patterns in an effort to reduce the likelihood of an injury, where an athlete would seek medical treatment from the athletic trainer, physical therapist, or team physician (14). If a NFL team is fortunate enough to have a sports nutritionist on staff providing the athletes with nutritional guidance, this can also play an important role, along with recovery methods such as sleep, in supporting the proactive training that the athletes perform to remain injury-free (13, 21, 26).

Research has been conducted to study injuries in the NFL ranging from concussions to acromioclavicular joint injuries to anterior cruciate ligament injuries (4, 18, 22). Injuries such as these can cause players to sit out of games. However, research has yet to be conducted on how these injuries to players impact a NFL team's success. In-depth research has been conducted in other sports where significant correlations have been found between injuries and the team's ability to win (1, 7, 10, 16, 33). Only one study has been conducted to this point in the sport of American football and that was at the college level where Memphis State University's football team was studied between the years 1975-79. However, due to the limited data available from this study it was not clear if a significant relationship existed between injuries and the team's win-loss record (5).

Determining if a significant relationship exists between the number of games missed due to injury and a NFL team's ability to win may potentially serve as valuable information for a NFL organization. This research may help a NFL organization determine how they will utilize their time and resources in order to provide their team with a better chance of winning. Thus, the purpose of this current study is to evaluate how games missed due to injury by offensive and defensive starters on NFL rosters affects each NFL team's ability to win.

METHODS

Experimental Approach to the Problem

In order to find the relationship between NFL injury rates and winning in the NFL, the authors determined that experimental research design would best answer the research question guiding the study. This was a secondary data analysis study where data were already collected by other sources. NFL injury data were collected from 2010-19 so that a decade's worth of data could be included in this study and this was a time period where reliable data were available. Data was also collected from the 2011-20 NFL Drafts where the draft order of each NFL team during this time period was recorded.

Subjects

The subjects in this study included all offensive and defensive starting players (N = 7040) from the 32 NFL teams between the years 2010-19. Offensive and defensive starters were identified based on the offensive and defensive starters for the first game of the regular season for each season from 2010-19. IRB approval was not needed for this study as data was collected from publicly available sources.

Procedures

The researchers collected NFL injury data from *Pro Football Reference* (29), which has been used in previous studies (19, 24). This source was chosen due to the reliability of the data available over a prolonged period of time. Data for all 32 NFL teams for each season between 2010-19 were downloaded in .csv files from *Pro Football Reference*. This data provided the number of times each player was listed on the injury report. Along with injury data, offensive and defensive starting lineups were also collected from *Pro Football Reference*, while names of NFL strength and conditioning professionals were collected primarily from NFL team media guides and staff directories. The *NFL Draft Order* for each season from 2010-19 was available through *FFToday* (27).

Statistical Analysis

All NFL injury data were organized using Microsoft Excel in order to calculate the mean number of games missed due to injury by each offensive and defensive starter. These data were categorized by NFL team and NFL season. Means were calculated by dividing the total number of games missed due to injury by the total number of games the respective NFL team competed in during that particular season. *Injury* Ranking was then determined based on comparing the mean number of games missed by offensive and defensive starters per NFL team per season relative to the other NFL teams in that particular season. The NFL team with the lowest mean number of injuries for that season received a ranking of one while the NFL team with the greatest number of mean injuries received a ranking of 32.

Injury Ranking was then associated with *NFL Draft Order* data through the use of another Microsoft Excel document. The data were organized by season and then by draft position acquired from the results of that particular season. A draft position of 32 indicates that the team won the Super Bowl and thus drafted last in every round of the draft, and a draft position of 1 indicates that the team finished with the worst record in the NFL and thus drafted first in every round of the draft. In this document the mean number of games missed due to injury by each team's offensive and defensive starters was rank-ordered based relative to the rest of the teams in the NFL. For example, in 2019 the team that averaged 0.24 offensive and defensive starters out per game had the lowest average during that season, and thus they were ranked first. The team that averaged 5.19 starters out per game in the 2019-20 season had the highest average, and thus they were ranked thirty-second. Each *Injury Ranking* and *NFL Draft Order* were associated with the respective NFL team.

Wins Per Season was calculated was calculated based on the number of wins that the team accumulated during one season. *Winning Percentage* was calculated based on the number of wins, in addition to half of the amount of ties, divided by the total number of games during a particular season. *Playoff Appearances* were identified based on if a team finished with an *NFL Draft Order* between 21-32. *American Football Conference (AFC)* or *National Football Conference (NFC) Championship Game Appearances* were identified based on if a team finished with an NFL Draft Order between 29-32. *Super Bowl Victories* were identified base don if a team finished with an *NFL Draft Order* of 32.

Analyses were made in order to determine the relationships that exist between *Injury Ranking* and the following variables: *NFL Draft Order, Wins Per Season, Winning Percentage, Playoff Appearances, AFC or NFC Championship Game Appearances,* and *Super Bowl Victories.* This analysis looked at how all 32 NFL teams performed relative to their team's Injury Ranking during the 2010-19 NFL seasons. To conduct this analysis, *Injury Ranking* and one variable at a time were placed into IBM SPSS where a Spearman's rank-order correlation was run in order to determine the significance of the relationship between Injury Ranking and the single variable. This test was determined after running a Kologorov-Smirov test which found that the variables were not normally distributed. The data were sorted in rank order to satisfy the requirement of Spearman's rank-order correlation. This methodology was similar to those performed in previous studies (10, 19). The results from this analysis were then placed into Microsoft Excel documents where all correlations of ($p \leq 0.01$) and ($p \leq 0.05$) significance levels were identified and placed into a table for offensive and defensive position groups. Both ($p \leq 0.01$) and ($p \leq 0.05$) levels of significance were chosen to take into account the large sample size of this study.

Additional analyses were performed through the use of descriptive statistics to further determine the relationship between *Injury Ranking* and the variables associated with winning. Specifically, *Injury Ranking* was compared to the mean *NFL Draft Order* for NFL teams from 2010-19. Injury Ranking was also compared to the mean *Wins Per Season* and *Winning Percentage* of teams from 2010-19. The total number of *Playoff Appearances, AFC or NFC Championship Game Appearances,* and *Super Bowl Victories* was compared to *Injury Ranking* as well. These analyses were performed on separate tabs of a Microsoft Excel document and organized onto tables made through Microsoft Word. The results for most variables are organized into four quartiles in order to provide an in-depth breakdown of the top and bottom performers.

RESULTS

This study endeavored to identify the relationship between games missed due to injury of offensive and defensive starters in the NFL and winning, as defined by *NFL Draft Order, Wins per Season, Winning Percentage, Playoff Appearances, AFC or NFC Championship Game Appearances,* and *Super Bowl Victories*. This analysis looked at how all 32 NFL teams performed relative to their *Injury Ranking* during the 2010-19 NFL seasons. The analysis of 10 years of NFL injury data yielded significant correlations and many compelling relationships between games missed due to injury by offensive and defensive starters and winning in the NFL, which can be seen in Table 1.

Table 1. Variables Associated with Winning Correlated to Injury Ranking

Variables	Injury Ranking
NFL Draft Order	-.235*
Wins per Season	-.212*
Winning Percentage	-.226*
Playoff Appearances	-.201*
AFC or NFC Champ Appearances	-.108
Super Bowl Victories	-.008

Notes. *Significant difference ($p \leq 0.01$) (2 tailed). Values are based on a Spearman's rank-order correlation.

NFL Draft Order

When analyzing all 10 years of data from 2010-19, it was found that there was a significant correlation at the ($p \leq 0.01$) level of significance between the variables of *Injury Ranking* and *NFL Draft Order* ($r = -.235$). This result states that when an NFL team had fewer games missed by their offensive and defensive starters over the course of a season the team finished higher in the final NFL standings.

As can be seen in Table 2, the teams that ranked in the top 25 percent in terms of *Injury Ranking* had, on average, a higher *NFL Draft Order* than the remaining 75 percent of the teams that had a worse Injury Rating. The teams with a top-five Injury Ranking averaged an *NFL Draft Order* of 19.96 while the teams with a bottom-five *Injury Ranking* had an average *NFL Draft Order* of 13.38, which is a difference of 6.58. When rounded to the nearest whole number, only five *Injury Rankings* were associated with a mean *NFL Draft Order* of at least 21, which were the *Injury Rankings* of: one, two, seven, 10, and 15. A *NFL Draft Order* of 21 or higher indicates that the team made the playoffs.

Wins per Season and Winning Percentage

Through analyzing the data from 2010-19, it was found that there were significant correlations at the ($p \leq 0.01$) level of significance between the variables of *Injury Ranking* and *Wins per Season* ($r = -.212$), as well as *Injury Ranking* and *Winning Percentage* ($r = -.226$). These results state that when an NFL team had fewer games missed by their offensive and defensive starters over the course of a season the team won more games.

As can be seen in Table 3 and Table 4, from 2010-19 teams that had a top-five *Injury Ranking* in the NFL averaged 9.42 wins per season and had a 0.553 *Winning Percentage* while teams that had a bottom-five *Injury Ranking* averaged 7.28 wins per season with a 0.434 *Winning Percentage*. This is a difference of 2.14 more Wins per Season for the less injured teams and a 0.119 better *Winning Percentage*. To put in perspective, the average *Winning Percentage* per NFL team per season from 2010-19 was 0.491, which is a losing record. The average wins increases for the teams with a top-four *Injury Ranking*, up to 9.55 wins per season with a 0.559 winning percentage. Teams with a top-three *Injury Ranking* averaged 9.90 wins per season with a 0.576 winning percentage, and teams ranked in the top-two averaged 10.35 wins per season with a 0.603 winning percentage. Based on the results from 2010-19, if an NFL team has an *Injury Ranking* in the top-two then they finished with, on average, 3.07 more wins per season than the teams that had an *Injury Ranking* in the bottom-five of the league.

Table 2. Injury Ranking Relative to Mean NFL Draft Order

Injury Ranking	Mean NFL Draft Order M (SD)	Top 25% Injury Ranking 1-8 M (SD)	51-75% Injury Ranking 9-16 M (SD)	26-50% Injury Ranking 17-24 M (SD)	Bottom 25% Injury Ranking 25-32 M (SD)
1	20.6 (7.68)	18.9 (3.07)			
2	21.9 (8.44)				
3	20.1 (8.28)				
4	18.4 (8.54)				
5	18.8 (7.34)				
6	14.1 (7.41)				
7	22.3 (9.37)				
8	14.7 (9.57)				
9	16.8 (9.74)		17.8 (3.98)		
10	21.8 (6.75)				
11	19.9 (9.40)				
12	16.6 (10.13)				
13	17.2 (8.50)				
14	16.2 (7.30)				
15	23.3 (10.27)				
16	10.4 (10.17)				
17	12.2 (9.30)				
18	20.0 (6.58)				
19	15.8 (10.30)				
20	19.4 (8.81)			15.8 (3.37)	
21	16.9 (10.70)				
22	11.8 (8.00)				
23	18.0 (9.02)				
24	12.1 (7.28)				
25	14.6 (9.28)				
26	16.5 (10.45)				
27	10.7 (8.83)				
28	11.8 (8.05)				13.6 (2.32)
29	12.1 (8.54)				
30	17.2 (9.27)				
31	12.4 (8.45)				
32	13.4 (11.84)				

Notes. Mean NFL Draft Orders were calculated based on the sum of *NFL Draft Orders* associated with each *Injury Ranking* from the 2010-19 NFL seasons divided by the total number of seasons (N = 10). Means for each quartile were calculated based on averaging the eight *Mean NFL Draft Order* values in the quartile.

Table 3. Injury Ranking Relative to Mean Wins per Season

Injury Ranking	Mean Wins per Season M	Top 25% Injury Ranking 1-8 M	51-75% Injury Ranking 9-16 M	26-50% Injury Ranking 17-24 M	Bottom 25% Injury Ranking 25-32 M
1	9.9 (2.92)	9.1 (1.25)			
2	10.8 (3.36)				
3	9.0 (2.94)				
4	8.5 (3.06)				
5	8.9 (3.00)				
6	7.2 (3.01)				
7	10.6 (3.57)				
8	8.0 (3.46)				
9	8.8 (4.39)				
10	9.6 (2.59)				
11	9.1 (3.75)				
12	8.2 (4.26)		8.7 (1.33)		
13	8.5 (2.95)				
14	8.4 (3.34)				
15	10.9 (3.57)				
16	6.2 (4.18)				
17	6.8 (3.26)				
18	9.6 (2.80)				
19	8.8 (3.61)				
20	9.1 (3.41)			8.2 (1.26)	
21	8.7 (4.40)				
22	6.7 (2.62)				
23	9.0 (2.26)				
24	6.5 (2.17)				
25	6.9 (3.87)				
26	8.8 (3.97)				
27	6.1 (3.57)				
28	6.9 (2.81)				7.3 (1.01)
29	6.5 (3.06)				
30	8.6 (3.53)				
31	6.6 (3.34)				
32	7.8 (4.61)				

Notes. Mean Wins per Season were calculated based on the total number wins accumulated from the 2010-19 NFL seasons divided by the total number of seasons (N = 10). Means for each quartile were calculated based on averaging the eight *Mean Wins per Season* values in the quartile.

Table 4. Injury Ranking Relative to Mean Winning Percentage

Injury Ranking	Mean Winning Percentage per Season M (SD)	Top 25% Injury Ranking 1-8 M (SD)	51-75% Injury Ranking 9-16 M (SD)	26-50% Injury Ranking 17-24 M (SD)	Bottom 25% Injury Ranking 25-32 M (SD)
1	0.577 (0.15)				
2	0.629 (0.18				
3	0.522 (0.14)				
4	0.505 (0.15)	0.538 (0.06)			
5	0.530 (0.15)				
6	0.448 (0.17)				
7	0.614 (0.17)				
8	0.482 (0.19)				
9	0.526 (0.23)				
10	0.559 (0.12)				
11	0.532 (0.19)				
12	0.480 (0.22)		0.510 (0.07)		
13	0.503 (0.15)				
14	0.505 (0.17)				
15	0.606 (0.17)				
16	0.369 (0.22)				
17	0.412 (0.18)				
18	0.562 (0.13)				
19	0.519 (0.18)				
20	0.531 (0.18)			0.485 (0.07)	
21	0.516 (0.24)				
22	0.406 (0.13)				
23	0.533 (0.12)				
24	0.400 (0.13)				
25	0.413 (0.21)				
26	0.517 (0.20)				
27	0.366 (0.18)				
28	0.426 (0.16)				0.433 (0.05)
29	0.399 (0.18)				
30	0.507 (0.18)				
31	0.397 (0.18)				
32	0.442 (0.24)				

Notes. Mean Winning Percentage per Season was calculated based on the sum of winning percentages from the 2010-19 NFL seasons divided by the total number of seasons (N = 10). Means for each quartile were calculated based on averaging the eight *Mean Winning Percentage per Season* values in the quartile.

Table 5. Injury Ranking Relative to Playoff Appearances

Injury Ranking	Playoff Appearances n	Top 25% Injury Ranking 1-8 n (%)	51-75% Injury Ranking 9-16 n (%)	26-50% Injury Ranking 17-24 n (%)	Bottom 25% Injury Ranking 25-32 n (%)
1	8				
2	7				
3	5				
4	6	40 (33)			
5	3				
6	2				
7	6				
8	3				
9	3				
10	6				
11	5				
12	3				
13	4		33 (28)		
14	2				
15	8				
16	2				
17	2				
18	5				
19	3				
20	6				
21	4			26 (22)	
22	1				
23	4				
24	1				
25	2				
26	4				
27	1				
28	2				
29	2				21 (18)
30	4				
31	2				
32	4				

Notes. Percentages represent the number of teams from that quartile that made *Playoff Appearances* relative to the total number of playoff teams from 2010-19 (N = 120).

Playoff Appearances

From 2010-19, it was found that there was a significant correlation at the ($p \leq 0.01$) level of significance between *Injury Ranking* and if a team made a playoff appearance (r = -.201). This result states that there was a strong association between when an NFL team had fewer games missed by their offensive and defensive starters over the course of a season and the team's ability to make the playoffs.

From 2010-19 the teams that had a top-five *Injury Ranking* during their respective season made the playoffs 29 times out of a possible 50, for a 58 percent success rate. This percentage is even higher when you look at the top-four ranked teams in their respective season who made it 26 times out of a possible 40, for a 65 percent success rate. For the teams ranked in the top-two, they made the playoffs 15 out of a possible 20 times, for a 75 percent success rate. The top-ranked team made it eight out of the 10 years for an 80 percent success rate. The teams that ranked in the bottom-five for having the most number of missed games by offensive and defensive starters made the playoffs 14 times out of a possible 50, for a 28 percent success rate, which is less than half of the success rate of teams ranked in the top-five in the NFL. In four of the 10 years the team with the worst Injury Ranking made the playoffs for a 40 percent success rate, which is half the success rate of the team with the number one ranking. Teams that ranked in the top half of the NFL for having the least number of missed games by offensive and defensive starters made the playoffs 73 times out of a possible 160, for a 46 percent success rate. Teams that ranked in the bottom half of the NFL in regards to *Injury Ranking* made the playoffs 47 times out of a possible 160, for a 29 percent success rate. Data pertaining to *Injury Ranking* relative to playoff appearances can be seen in Table 5.

In eight of the 10 seasons, the playoffs teams had a better average *Injury Ranking* than the teams that did not make the playoffs. Over the entire 10-year time period, playoff teams had an average Injury Ranking of 14.10 while non-playoff teams had an average *Injury Ranking* of 17.94. The playoffs teams averaged 2.16 starters out per game due to injury while non-playoff teams averaged 2.63 starters out per game due to injury. This is a 22.35 percent difference, or 0.48 starters out per game due to injury. This translates to an average 7.7 more games missed per regular season by those in the offensive or defensive starting lineup on non-playoff teams.

In seven of the 10 seasons at least two teams ranked in the top-three for *Injury Ranking* made the playoffs. This is more than twice the amount of seasons that at least two teams ranked in the bottom-three for Injury Ranking made the playoffs, which occurred during only three of the 10 years.

AFC or NFC Championship Game Appearances

It was found from 2010-19 that there was not a significant correlation at the ($p \leq 0.01$) level of significance between Injury Ranking and if a team made the AFC or NFC Championship game (r = -.108). This result states that there is an association between when an NFL team had fewer games missed by their offensive and defensive starters over the course of a season and the team's ability to make the AFC or NFC Championship game, however it did not reach a level of significance.

In nine out of the 10 years analyzed in this current study, the teams that made the AFC and NFC Championship games had a better *Injury Ranking*, on average, than the teams that finished in the bottom-four in the NFL in regards to win-loss record. This is displayed in Table 6. Teams that made the AFC and NFC Championship games from 2010-19 had an average injury ranking of 13.88 while those that finished in the bottom four of the league had an average injury ranking of 20.3. The teams that made it to the championship games averaged 2.17 offensive and defensive starters out with an injury per game while teams that finished in the bottom-four in the league in terms of win-loss record averaged 2.96 offensive and defensive starters out with an injury per game. This is a difference of 0.79 players out per game, which translates to an average of 12.65 games missed per regular season. This is a difference of 36.5 percent.

From 2010-19, out of the 40 teams that reached the AFC and NFC Championship games, 27 of them, or 68 percent, were ranked in the top half of the league in terms of fewest missed games by starters due to injury. Of these 27 teams, eight were ranked in the top-five of having the fewest games missed by starters, which is 30 percent. Of the remaining 13 teams that made it to the AFC and NFC Championship game, these teams were ranked in the bottom half of the league in terms of games missed by their starters due to injury, and 3 of these teams were ranked in the bottom five. Over twice as many teams with a top-five *Injury Ranking* made it to the AFC or NFC Championship game from 2010-19 versus bottom-five ranked teams, and over twice as many

teams ranked in the top-half of the league in *Injury Ranking* made it to the AFC or NFC Championship game compared to those teams ranked in the bottom-half of the league.

Super Bowl Victories

When analyzing the Super Bowl champions from 2010-19, there was not a significant correlation at the ($p \leq 0.01$) level of significance between *Injury Ranking* and if a team won the Super Bowl (r = -.008). This result states that there is a very small association between when an NFL team had fewer games missed by their offensive and defensive starters over the course of a season and the team's ability to win the Super Bowl, however it did not reach a level of significance.

From 2010-19, of the 10 Super Bowl champions, eight out of the 10, or 80 percent, were ranked in the top-16 in the NFL in terms of having the fewest injuries to offensive and defensive starters, which can be seen in Table 7. Of the two Super Bowl champions that were ranked in the bottom-16 of the NFL in terms of having the most games missed by their starters due to injury, one of them had an *Injury Ranking* in the bottom-five.

The mean *Injury Ranking* for Super Bowl Champions was 16.1 while the mean *Injury Ranking* for the Super Bowl Runner-Up was 17.3 from 2010-19. The only *Injury Ranking* to have been associated with multiple Super Bowl victories during this time period was an *Injury Ranking* of 15, which is in the third quartile, and was associated with three Super Bowl victories.

DISCUSSION

This study sought to identify the relationship between games missed due to injury of offensive and defensive starters in the NFL and winning, as defined by *NFL Draft Order, Wins per Season, Winning Percentage, Playoff Appearances, AFC or NFC Championship Game Appearances,* and *Super Bowl Victories*. This analysis looked at how all 32 NFL teams performed relative to their Injury Ranking during the 2010-19 NFL seasons. The results of this study revealed that there is a significant correlation between a NFL team's *Injury Ranking* and their *NFL Draft Order, Wins per Season, Winning Percentage, and Playoff Appearances*. It should be highlighted though that players availability explains less than 5% of the variance in overall team performance. Even though the larger sample size is a strength of this study, it is also a limitation where the authors were able to find weaker significant correlations. To overcome this limitation, the authors ran a statistical analysis at the ($p \leq 0.01$) and ($p \leq 0.05$) levels of significance. Even though correlations were found at the ($p \leq 0.01$) level of significance, these correlations do not necessarily imply a causation between the variables.

Analysis through the use of descriptive statistics indicated that teams ranked in the top 25 percent of the NFL in terms of *Injury Ranking* during the 2010-19 seasons averaged more *Wins per Season*, had a higher average *Winning Percentage,* and had more Playoff Appearances relative to the remaining 75 percent of the NFL that scored a worse *Injury Ranking*. When looking at the top 50 percent of the NFL in terms of *Injury Ranking* during the 2010-19 seasons, these teams averaged more *Wins per Season*, had a higher average *Winning Percentage*, more *Playoff Appearances, AFC and NFC Championship Game Appearances,* and *Super Bowl Victories* than the NFL teams ranked in the bottom 50 percent in terms of *Injury Ranking*. These results support that there is a relationship between games missed by offensive and defensive starters due to injury in the NFL and a team's ability to win.

Research relating injuries to winning in the NFL has never been conducted before, but one study has been conducted that looked at the injury rates associated with a win-loss record of a collegiate American football team over the course of five seasons (5). Results of this single study were inconclusive. This may have been due to the fact that injuries were not classified as games missed, but instead a total accumulation of injuries even when the athlete participated in a game (5).

In-depth research has been conducted in the sports of soccer, basketball, track and field, ice hockey, and rugby related to injuries and team performance (9). Similar to our current study, the majority of these research studies focused primarily on professional sports teams, and these teams were from all over the world, including the continents of North America, Europe, and Australia (9). A systematic review of this research determined that injuries detrimentally affect the final ranking position in team sports, which agrees with the results found in this current study (9).

Table 6. Injury Ranking Relative to AFC or NFC Championship Game Appearances

Injury Ranking	AFC or NFC Championship Appearances n	Top 25% Injury Ranking 1-8 n (%)	51-75% Injury Ranking 9-16 n (%)	26-50% Injury Ranking 17-24 n (%)	Bottom 25% Injury Ranking 25-32 n (%)
1	1				
2	2				
3	3				
4	1	13 (33)			
5	1				
6	0				
7	4				
8	1				
9	1				
10	1				
11	3				
12	2		14 (35)		
13	0				
14	1				
15	5				
16	1				
17	1				
18	0				
19	2				
20	1			6 (15)	
21	1				
22	1				
23	0				
24	0				
25	1				
26	2				
27	1				
28	0				7 (18)
29	0				
30	2				
31	0				
32	1				

Notes. Percentages represent the number of teams from that quartile that made *AFC or NFC Championship Game Appearances* relative to the total number of teams that made *AFC or NFC Championship Game Appearances* from 2010-19 (N = 40).

Table 7. Injury Ranking Relative to Super Bowl Victories

Injury Ranking	Super Bowl Victories n	Top 25% Injury Ranking 1-8 n (%)	51-75% Injury Ranking 9-16 n (%)	26-50% Injury Ranking 17-24 n (%)	Bottom 25% Injury Ranking 25-32 n (%)
1	0				
2	0				
3	0				
4	0	1 (10)			
5	0				
6	0				
7	1				
8	0				
9	0				
10	1				
11	0				
12	1		7 (70)		
13	0				
14	1				
15	3				
16	1				
17	0				
18	0				
19	0				
20	0			0 (0)	
21	0				
22	0				
23	0				
24	0				
25	1				
26	0				
27	0				
28	0				2 (20)
29	0				
30	0				
31	0				
32	1				

Notes. Percentages represent the number of teams from that quartile that won the Super Bowl relative to the total number of Super Bowls played from 2010-19 (N = 10).

NFL Draft Order

Previous research exists exploring the relationship to injuries with league standings at the conclusion of a season in the sports of both soccer and rugby (1, 7, 10, 16, 33). Of this prior research, every study agrees with the results of the current study, except for one (1, 7, 10, 16, 33). The previous study that goes against the results of this current study defined injuries as all injuries that occurred, even if the athlete continued to play, whereas in our current study injuries were defined as when an athlete missed a game due to injury (7). Also, it should be noted that one study investigating Australian track and field athletes found that there was a relationship between injuries and finish places at major events (31). Though a different definition, it is a similar concept that supporting the influence injuries can have on a team's success each season.

Wins per Season and Winning Percentage

Multiple previous studies compared a team's number of wins, winning percentage, or total points over the course of a season relative to injuries that occurred (3, 6, 11, 12, 28, 33). All but one of these previous studies agreed with the results of the current study that there is a correlation between the number of injuries a team has and their total wins, as well as winning percentage. The studies that found similar results to our current study were conducted in the sports of rugby, soccer, basketball, and ice hockey. The single study that did not find a significant correlation between injuries and winning explored at a college football team over the course of five seasons. A possible reason that this previous study did not find a significant correlation was that the previous study compared total injuries, regardless of severity, to the team's win-loss record, whereas the current study identified injuries for when an offensive or defensive starter missed a game due to injury (5).

Playoff Appearances

Based on the available literature, it can be said that the current study is the first study to analyze a team's success based playoff appearances relative to rate of injuries. However, the results of this study regarding injuries relative to playoff appearances do support the previous research completed that has found significant relationships between fewer injuries and a higher level of team success (1, 10, 16, 33).

AFC or NFC Championship Game Appearances

One previous study that researched the sport of soccer aimed to find if injuries had an influence on a team's ability to advance in the playoffs (15). The results found when analyzing the women's European Championships that teams that progressed onto the semi-finals has less injuries than those that did not make the semi-finals. However, these results were not duplicated regarding the men's teams (15). The results from the previous study regarding the success of the women's teams do somewhat agree with the results of our current student, since our study did find a relationship between a lesser injury rate and a team's ability to make the AFC or NFC Championship game, although this relationship was not statistically significant. It should be noted that the AFC and NFC Championship games represent the semi-finals of the NFL playoffs.

Super Bowl Victories

One previous study analyzed how soccer teams advanced in the European Championships relative to injuries and failed to find a significant relationship between championships won and injuries (15). However multiple studies researching how injuries were related to the final league standings, did find significant relationships (1, 10, 16, 33). The results of the current study are somewhat similar to the prior research as it was found that there was a relationship between having less injuries and more Super Bowl Victories, although it was not significant.

PRACTICAL APPLICATIONS

The variable of games missed due to injury by offensive and defensive starters is a quantifiable variable that NFL organizations can use to assess how injuries are impacting their team. The data from this research also supports that this statistic may be useful in determining a team's opportunity to win, however future research is needed in order to provide further support. Although correlation does not necessarily imply causation, the data from this research, as well as previous studies in other sports, highlights the potential importance of keeping athletes healthy and its relationship to winning (1, 10, 16, 33). A NFL organization may want to consider how it can help influence the many factors that can contribute to keeping an athlete healthy, such as proper strength training, nutrition, and recovery to name a few (2, 8, 21, 26). Even though more research is needed in this area, one option may involve selecting qualified

sports medicine and performance personnel to join their organization whom can help their athletes remain healthy.

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