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Return to Play, Performance, and Economic-Analysis Following Lisfranc Injuries in the National Football League

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Disclosures:

All authors declare that there are no conflicts of interest to disclose.

Background

- Athletes in the National Football League (NFL) are subject to a great deal of strain to their bodies, placing them at an increased risk for injury.
- Foot injuries account for over 15% of all athletic injuries.
- A Lisfranc injury can occur to either the ligament or bone, which causes instability when attempting to perform strength and balance maneuvers.
- In the general population, this injury has a low incidence of 1 per 55,000 people.
- There is limited literature of the cost associated with recovery. With the complex nature of NFL salaries, they generally get paid weekly during the season, with one major component of their contract being that their salaries are guaranteed for injuries.

- **Purpose:** To analyze the return to play (RTP) and performance level of players following Lisfranc injury in the NFL. We hypothesized there would be a low return to play following Lisfranc injury in the NFL. Secondarily, the economic and financial impact of Lisfranc injuries in the NFL will be determined.

Methods

- NFL players with Lisfranc injury were identified by cross-referencing multiple online resources and articles including official injury reports, press releases, game summaries, and online publications.
- Inclusion criteria included those who experienced their injury between the years 2009 and 2020.
- Return to play was defined as any player who played at least 1 snap in at least 1 regular season NFL game after their injury.
- Players were grouped accordingly for analysis: quarterback, running back, receiver (wide receiver, tight end), offensive linemen (offensive guard, center, offensive tackle), defensive linemen (defensive end, defensive tackle), linebacker, and cornerback.

Player Characteristics	Return to Play (n = 27)	Did not Return to Play (n = 6)	P-Value
Age (y)*	26.0 (23.5 - 28.5)	31.0 (29.0 - 33.0)	0.007
Body Mass Index (kg/m^2)*	30.6 (28.6 - 34.0)	34.5 (29.2 - 37.4)	0.624
Time in NFL Before Injury (y)*	3.0 (2.0 - 6.0)	8.5 (5.5 - 12.2)	0.008
Injury Characteristics			
Pre-Season/Off-Season	3 (11.1%)	0	
In-Season	24 (88.9%)	6 (100.0%)	1.000
Surgery Performed	23 (85.2%)	3 (50.0%)	
Player Draft Status			
Draft Position*	45.0 (20 to 78)	35.5 (6 to 100)	0.811
Drafted in Rounds 1-3	18 (66.7%)	3 (50.0%)	
Drafted in Rounds 4-	9 (33.3%)	3 (50.0%)	
Undrafted			0.643
Player Positions			
Quarterback	4 (14.8%)	0	
Running Back	5 (18.5%)	2 (33.3%)	
Receiver (WR, TE)	3 (11.1%)	0	
Offensive Linemen (G, C, OT)	5 (18.5%)	3 (50.0%)	0.533
Defensive Linemen (DE, DT)	5 (18.5%)	0	
Linebacker	3 (11.1%)	0	
Cornerback	2 (7.4%)	1 (16.7%)	

*Median (IQR); p-value from Wilcoxon rank-sum test

Bolded P-values indicate statistically significant difference between groups (P < .05).

C, center; DE, Defensive end; DT, Defensive tackle; G, guard; NFL, National Football League; OT = offensive tackle; TE, tight end; WR, wide receiver

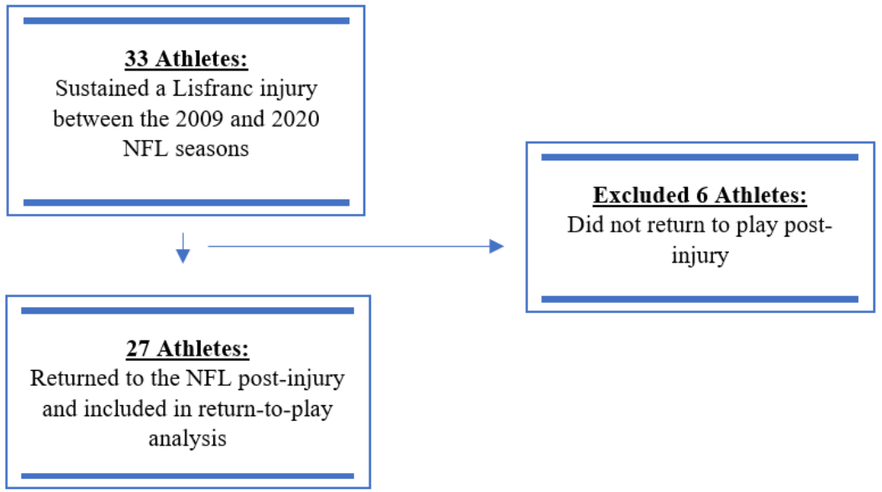
Methods (Continued)

- Time missed was defined as the number of NFL regular season games missed from the date of a player's Lisfranc injury to when they returned to a game and played in at least 1 snap.
- Pre-season and playoff games missed were not calculated as they are highly variable in participation.
- Pro Football Reference database was used to collect data points into a customized Excel spreadsheet which included: body mass index (BMI), draft position, snap counts, games played, games started, and approximate value (AV).
- Performance data was collected for 3 years before and after a player's return from Lisfranc injury. Players who were injured in their rookie year were excluded from performance analysis as they did not have pre-injury data.
- Players served as their own internal control in this study.
- Return to play time was collected by calculating the number of days between their injury date and return to play date.
- Economic loss was calculated using a player's earnings during the NFL season from Spotrac.

Results

- A total of 33 NFL athletes sustained a Lisfranc injury during the 2009 and 2020 seasons, with 26 undergoing surgery.
- Of these 33 players, 27 returned to the NFL post-injury and were included in for return to play analysis.

Figure I. CONSORT (Consolidated Standards of Reporting Trials) flow diagram demonstrating final patient selection.



NFL, National Football League

Results (Continued)

- Characteristics of Return-To-Play Following Lisfranc Injury

Player Characteristics	Return to Play (n = 27)	Did not Return to Play (n = 6)	P-Value
Age (y)*	26.0 (23.5 - 28.5)	31.0 (29.0 - 33.0)	0.007
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*Median (IQR); p-value from Wilcoxon rank-sum test

Bolded P-values indicate statistically significant difference between groups ($P < .05$)

C, center; DE, Defensive end; DT, Defensive tackle; G, guard; NFL, National Football League; OT = offensive tackle; TE, tight end; WR, wide receiver

Results (Continued)

Games Played and Started

Athletes played in a median of 13.0 (IQR: 11.5 – 15.5) games preinjury and 12.3 (10.0 – 14.7) games postinjury averaged across 3 seasons (p=0.198). When comparing the number of games played in the season 1-year before and after their injury, players played in 15 (13 – 16) and 15 (11 – 16) games respectfully (p=0.195). Injured athletes started in 9.5 (4.5 – 14.2) games preinjury and 8.0 (5.0 – 11.5) games postinjury averaged across 3 seasons (p=0.429).

Snap Count

In terms of snap count, athletes played a median of 687 (IQR: 446 – 857) snaps/year preinjury and 517 (312 – 726) snaps/year averaged across 3 seasons (p=0.145). When comparing the number of snaps played in the season 1-year before and after their injury, players participated in 643 (502 – 885) and 589 (387 – 876) snaps/year respectfully (p=0.244).

Approximate Value

In terms of player performance, there was a statistically significant decrease in 1-year following injury [median 6.0 (IQR: 4.0 – 10.0) vs. 5.0 (2.5 – 7.5); p=0.022]. When comparing over the course of 3-years postinjury, differences were not significant [median 5.0 (IQR: 3.3 – 7.8) vs. 4.0 (2.5 – 5.7); p=0.080).

Results (Continued)

- On average, quarterbacks who sustain a Lisfranc injury cause the greatest economic loss for an NFL team at $8.159 million per player, while cornerbacks cost the least at $0.672 million per player. In total, between 2009 and 2020, the COR was $104.716 million.

Table VI. Economic Loss by Position of NFL Player and Year (Accounting for Inflation in Millions)

Position	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Quarterback	2.022	5.357*	4.734*	4.327*	0.796	-	-	-	-	-	15.399	-	32.635
Receiver	-	-	-	7.288	-	-	-	-	-	-	2.986	6.196*	16.470
Running Back	-	0.252	7.811	3.416	0.391	-	-	0.634	-	-	-	-	12.504
Offensive Linemen	-	-	-	1.461	15.713	0.221	1.277	0.742*	-	-	-	-	19.414
Defensive Linemen	-	-	-	-	-	-	-	-	6.084	-	10.097	3.192*	19.373
Linebacker	-	-	-	-	2.009	0.073	-	-	0.894	-	-	-	2.976
Cornerback	-	-	-	-	-	0.820	0.393	0.131*	-	-	-	-	1.344
Total	2.022	5.609	12.545	16.492	18.909	1.114	1.670	1.507	6.978	0	28.482	9.388	$104.716

* Includes a player from a previous season injury that missed games the recorded year

Table VII. Economic Loss and Return to NFL By Player Position (In Millions)

Position	Total Cost Corrected for Inflation	Average Cost Per Player Corrected for Inflation	Return to NFL After Injury
Quarterback	$32.635	$8.159	4
Receiver	$16.470	$5.490	3
Running Back	$12.504	$2.501	5
Offensive Linemen	$19.414	$3.883	5
Defensive Linemen	$19.373	$3.875	5
Linebacker	$2.976	$0.992	3
Cornerback	$1.344	$0.672	2

Conclusion

- **Our results do not support the hypothesis, as it was found that 81.8% of NFL athletes sustaining Lisfranc injuries return to play.**
- **This injury was associated with a significant decrease in Approximate Value (AV) one-year post-injury.**
- **In terms of economic impact, quarterbacks accounted for almost 1/3 of expenses while only constituting 14.8% of injuries due to their higher average salary.**

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