

Comparison of the Rate of Concussions in the NFL From 2012-2014 and 2018-2019

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Number of Concussions in the NFL, Bailey LaRea, December 2019

Motivation and Background

Players in the National Football League are consistently getting injured, but one of the most frequent injuries is the concussion. A concussion is a type of traumatic brain injury caused by a blow to the head that causes the brain to move rapidly back in forth inside the skull. Being that I have myself suffered from four concussions, I felt as though this is a topic that I would be interested in, and that I could learn a lot from. I decided to look for data that shows the players that received the concussion, what team they played for, what position they played, and what year they suffered the injury. Since I found data that included all of these levels I wanted to see if there was any relationship between getting a concussion, and what side of the ball the player was on. Meaning, were they offense or defense. I chose the years 2012-2014 because it was before the implementation of the “Use of the Helmet Rule” in the National Football League in 2018. This rule says the standards of the rule are:

1. Lowering the head (not to include brace for contact)
2. Initiating contact with the helmet to any part of an opponent
3. Making contact on an opponent (offense or defense)

Players can be ejected for this type of hit, and ejections are reviews by senior officials in New York. I will also use data from the 2018 season, and through Week 13 on the 2019 season to see if there has been any significant change in the amount of concussions in the league since the rule has been implemented.

Aims

1. Compare number of players who received concussions in the years of 2012-2014 that were on offense versus defense.
2. Compare overall number of concussions from 2012-2014 and 2018-2019.

Data Sources

Aim 1:

A google search on Monday, November 4, 2019 for “raw data concussions in the nfl 2012” turned up 231,000 results. On the third page I found a dataset from GitHub.
<https://github.com/ali-ce/datasets/blob/master/NFL/Concussion%20Injuries%202012-2014.csv>

This data set has players names listed, what team they played for, what season the concussion took place, did the team win or lose the game, who they were playing etc.

Data was extracted manually on the following variables:

- Year
- Position

Aim 2:

In a second google search on Thursday, November 7, 2019 for “how many concussions in the nfl 2018” turned up 6,140,000 results. On the first page I found an article from the NFL stating the number of recorded concussions from the regular season.

<http://www.nfl.com/news/story/0ap3000001013041/article/nfl-sees-significant-drop-in-concussions-during-2018-season>

In a third google search on Thursday, November 7, 2019 for “nfl injury reports 2019 week 1” turned up 233,000,000 results, and on the first page I found the NFL website with weekly injury reports for every team for the 2019 season. I will have to manually go in and count total number of concussions for the season thus far, making sure not to double count a player.

<http://www.nfl.com/injuries>

Data was entered from this website manually into a spreadsheet for the 2019 season through week 13 and added together with the number from the last point to get the total number of concussions in the regular season for 2018-2019.

In a fourth google search on Thursday, November 7, 2019 for “nfl concussions 2012 regular season” turned up 478,000 results. On the first page I found an article from the NFL stating the number of recorded concussions for the 2012-2014 regular seasons.

<http://www.nfl.com/news/story/0ap3000000465310/article/nfl-announces-concussions-fell-25-percent-this-season-from-2013>

Data Analysis

The data is observational, so for the first comparison there is no way to randomly assign treatments of “offense” and “defense”. The data for each year is submitted by the National Football League, not from a random sample. For the second comparison I actually have the total population. 3 graphs will be made.

The data of the sample of concussions from the total population of concussions was read into R:

```
> defense1<-  
read.table("/Users/baileylarea/Desktop/DEFENSE4211.txt")  
> offense1<-  
read.table("/Users/baileylarea/Desktop/OFFENSE4211.txt")
```

The data is a series of binomial data. For “defense1” 1 equals a defensive player. For “offense1” 1 equals an offensive player.

I created a vector for “defense1” and ran a t-test comparing the mean of defensive concussions to the alternative hypothesis of $\mu=.5$ to see if there was any significant difference between the

mean of defensive player concussions and mean if there was no difference between offensive and defensive concussions (which is $\mu=0.5$).

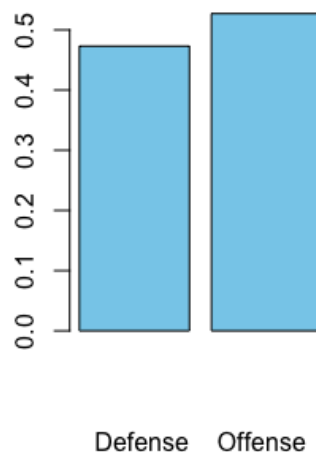
```
> defense1_vec <- defense1[, 1]
> TtestMeans<-
t.test(defense1_vec, alternative="two.sided", mu=0.5, paired=FALSE, c
onf.level = .95)
> TtestMeans
One Sample t-test
data: defense1_vec
t = -1.0622, df = 390, p-value = 0.2888
alternative hypothesis: true mean is not equal to 0.5
95 percent confidence interval:
 0.4234398 0.5228517
sample estimates:
mean of x
0.4731458
```

There was no statistical significance found in the difference between offensive and defensive concussion means. The following graph depicts the marginal difference between the two means.

Graph 1:

- a. Showing the comparison between the means of offense and defense from a sample of concussions in the NFL in the years 2012-2014 and concussions with two bars.

Means Defense vs Offense



I found the total number of concussions from 2012-2014 and the total number of concussions from 2018-2019 through week 13. I took these totals and divided by the number of games played overall in these seasons to find the average number of concussions per game for each time span. I created two vectors of the averages of every season, one for 2012-2014 and the other for 2018-2019.

I then ran a two sample t-test to compare the two sets of means to see if there was a significant difference between the two time frames.

```
> concussions2012_2014_vec<-concussions2012_2014[,1]
> concussions2018_2019_vec<-concussions2018_2019[,1]
> TtestConcussions<-
t.test(concussions2012_2014_vec,concussions2018_2019_vec,alternative="two.sided",paired=FALSE)
> TtestConcussions
```

Welch Two Sample t-test

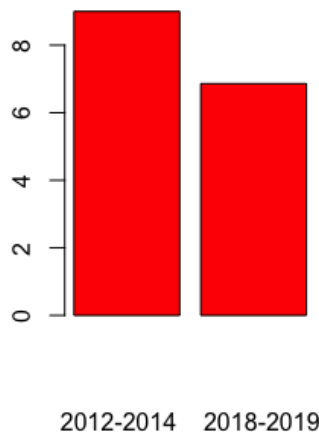
```
data: concussions2012_2014_vec and concussions2018_2019_vec
t = 1.1116, df = 1.8345, p-value = 0.3908
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -7.481886 12.121386
sample estimates:
mean of x mean of y
 9.00000  6.68025
```

No significant difference was found between the average concussions per game for the two time frames. The following graph depicts the difference between the two means.

Graph 2:

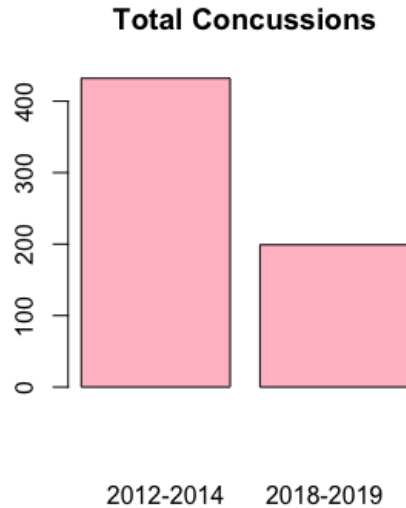
- b. Showing the comparison between the average number of concussions per game between the years 2012-2014 and the years 2018-2019 with two bars. There is a 25.78% decrease in the average concussions per game since the Use of the Helmet Rule was enacted.

Mean Concussions/Game



Graph 3:

- c. Showing the comparison between the total number of concussions from the 2012-2014 seasons and the 2018-2019 seasons. There is a 53.94% decrease since the Use of the Helmet Rule was enacted.



Discussion Points

- Although no significant difference was found between the two time frames there was still a decrease since the Use of the Helmet Rule was implemented in 2018. I believe this is a step in the right direction for the NFL.

References

Corona, Alice. "Concussion Injuries 2012-2014.Csv." *GitHub*, 2014, github.com/alice/datasets/blob/master/NFL/Concussion%20Injuries%202012-2014.csv.

Battista, Judy. "NFL Sees Significant Drop in Concussions during 2018 Season." *NFL.com*, National Football League, 24 Jan. 2019, www.nfl.com/news/story/0ap30000001013041/article/nfl-sees-significant-drop-in-concussions-during-2018-season.

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