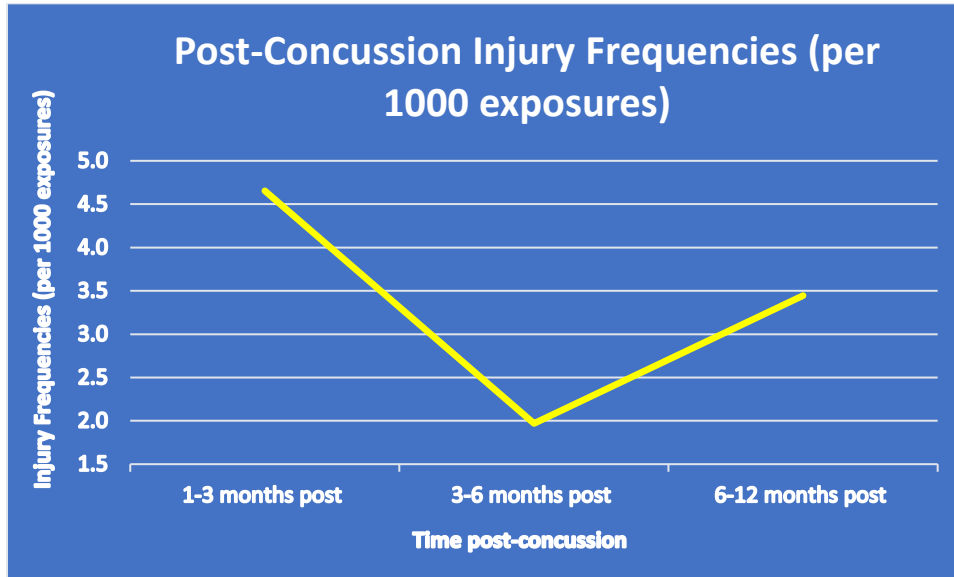




Coaches' Brief

Part 1: Post-concussion Injury Frequency

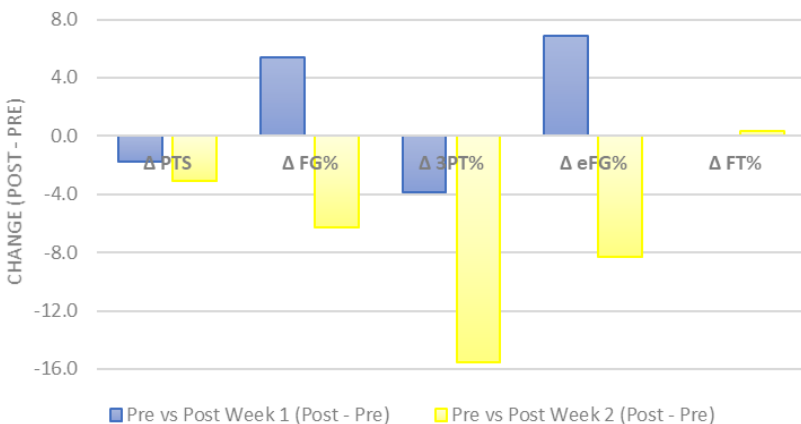
- Players aren't more likely to suffer a lower body soft-tissue injury post-concussion
- Post-concussion injury frequency is highest 1-3 months post, decreases between 3-6 months and increases after 6-12 months



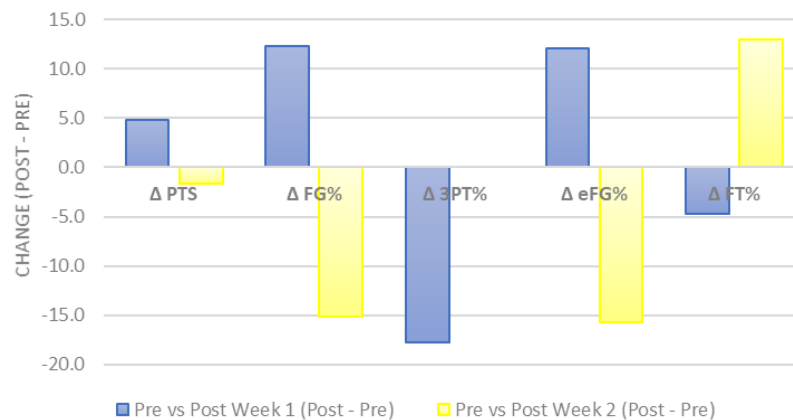
Part 2: Post-concussion Performance Decrease

- On average, players have slight performance changes post-concussion
- 1-week post-concussion
 - $\uparrow 1.5$ PT, 0.2 FG%, 0.4 eFG%
 - $\downarrow -1.2$ 3PT%, -1.9 FT%
- Pacers players have slightly larger variations
 - Graphs for Victor Oladipo, Doug McDermott & Goga Bitazde are below

Malcolm Brogdon Performance \downarrow (2019-2020)



T.J. Warren Performance (2017-2018, 2019-2020)





Methods

My first step was creating a database of NBA concussion histories. I used several open-source sites, including *Spotrac* and *Pro Sports Transactions* to compile a 10-year list.

When calculating injury frequency, I defined an exposure as a game or practice. To validate this, I compared it to the process used in a 2010 *Sports Health* article¹. They defined an exposure as a player appearing in a game. I assumed players were exposed daily (i.e. practice or a game), so I had roughly double the number of exposures over the same time period. Using the duration of the 2019-2020 season as a benchmark, games were played every ~2.15 days. To validate my method, I divided the *Sport Health* frequency by 2.15 to include practice ($11.1/2.15 \approx 5.16$ injuries per 1000 exposures). This is very close to my calculated pre-concussion injury frequency (5.03 injuries per 1000 exposures) so it appears my method works.

To examine performance decreases, I removed players that didn't meet the minimums to qualify for NBA league leaders in scoring (70% of games) & FG% (300 FG made in a season)². This eliminated players that didn't score much (hard to see decrease if the number of shots made was low initially) or missed many games. I did include current Pacers so I could perform analysis on them. If players didn't shoot many 3's (e.g. Andre Drummond) but happened to hit 1 pre-or post concussion, I omitted them from the 3PT% calculation to avoid skewing the numbers.

Key Findings (0.99 injuries within 1 year)

Part 1: Post-concussion Injury Frequency

Since the 2010-2011 NBA season up until the All-Star break of the 2019-2020, there have been 114 concussion cases and 96 individual players impacted. Kevin Love leads the league in sustained concussions (4) while Aaron Gordon and Ersan Ilyasova have had 3 apiece. Among Pacers players, Victor Oladipo and T.J. Warren both have had 2 concussions. On average, players missed 8.65 days and sustained 0.99 injuries over the following year. With regards to player position and concussion occurrences, power forwards were the most concussed (27) followed by small forwards and centres (25 each). Shooting guards (22) and point guards (15) had the fewest concussions, possibly due to their perimeter-oriented game.

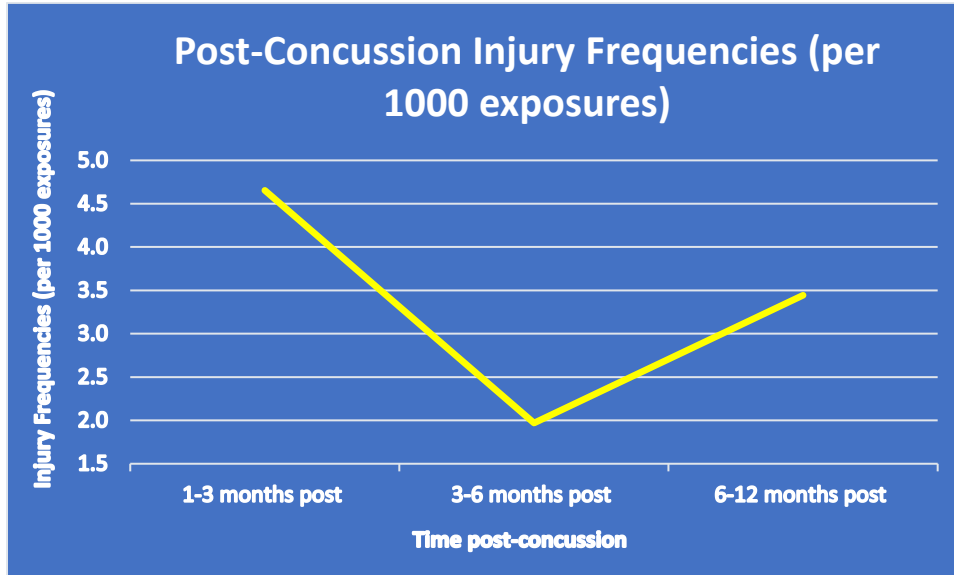
Players aren't more likely to suffer lower body soft-tissue injuries (LBSTI) post-concussion and injury frequency doesn't follow the model seen in other sports (highest risk in the first 3 months, followed by a decrease between 3-6 months and another decrease 6-12 months). While post-concussion LBSTI frequencies are highest in the first 3 months following injuries (4.65 per 1000 exposures), they still don't exceed the pre-concussion frequencies. LBSTI frequencies do decrease 3-6 months post (1.97) but increase 6-12 months post (3.44). This is

¹ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3445097/>

² <https://stats.nba.com/help/statminimums/>

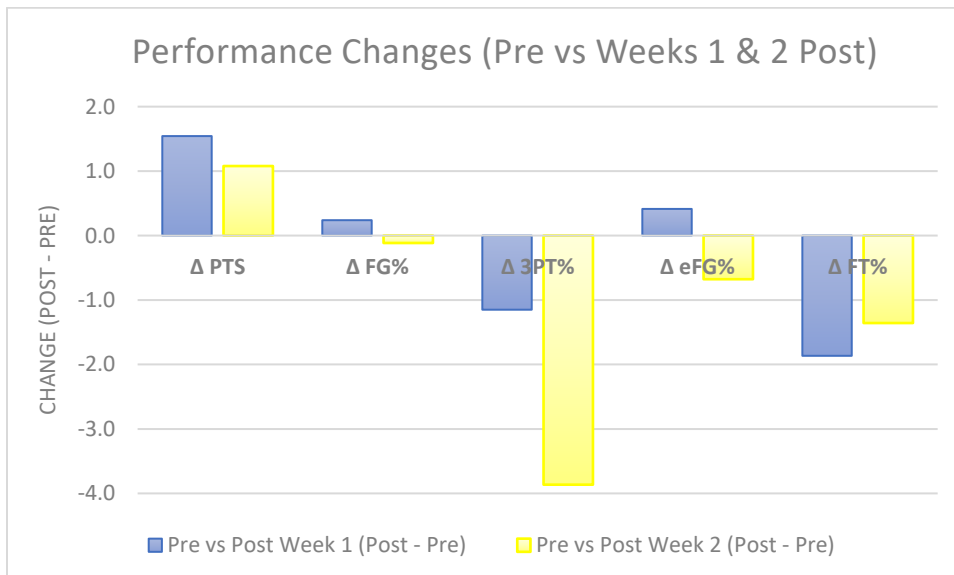


likely due to the average timing of concussions in the NBA. Analysis showed the average concussion date is around mid-January (e.g. Jan 17th). 3-6 months after this date would be mid-April to mid-July. At least half of the league wouldn't be playing around this time (playoffs) and over the summer there is less injury reporting. The 6-12 months post-concussion increase can likely be explained by the NBA season resuming ~ 9 months after the average concussion date.



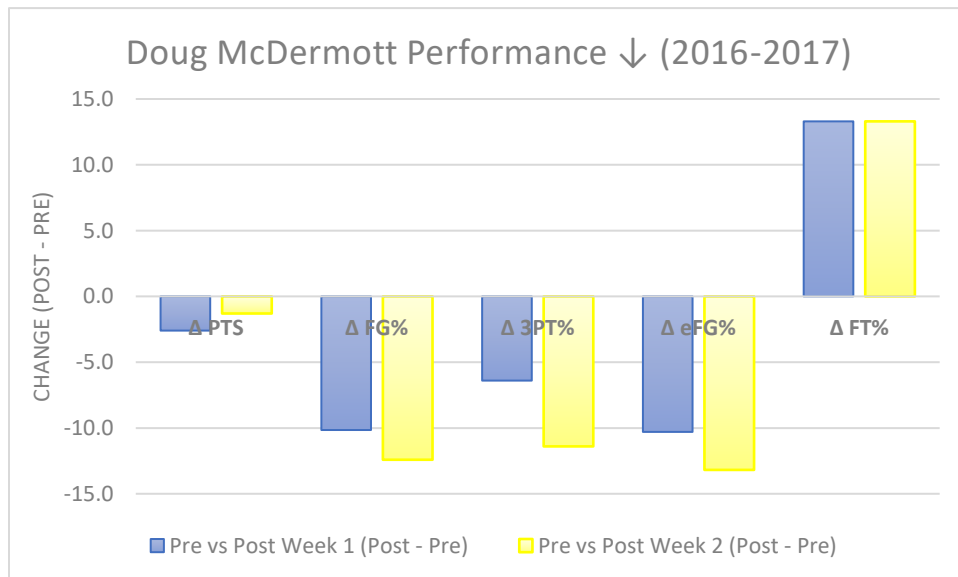
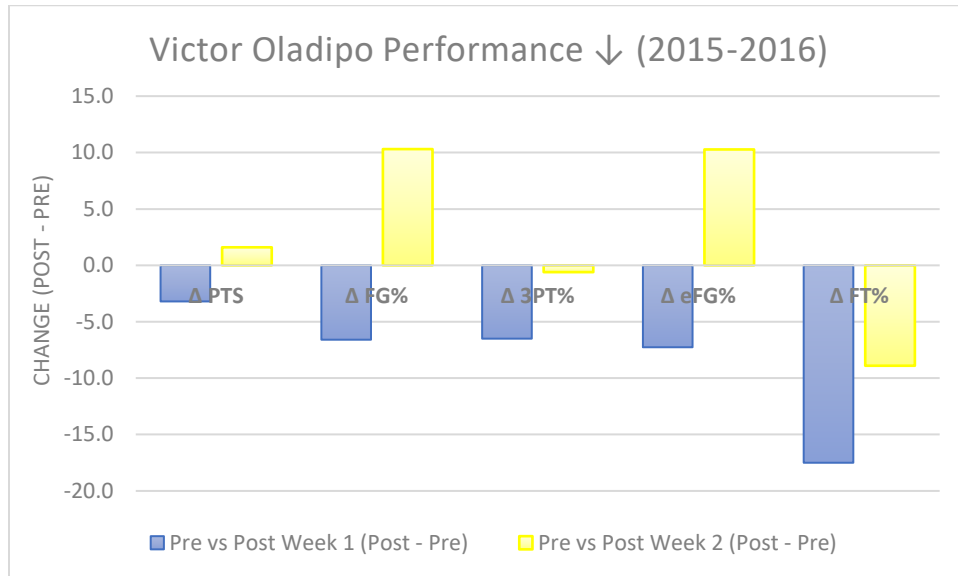
Part 2: Post-concussion Performance Decrease

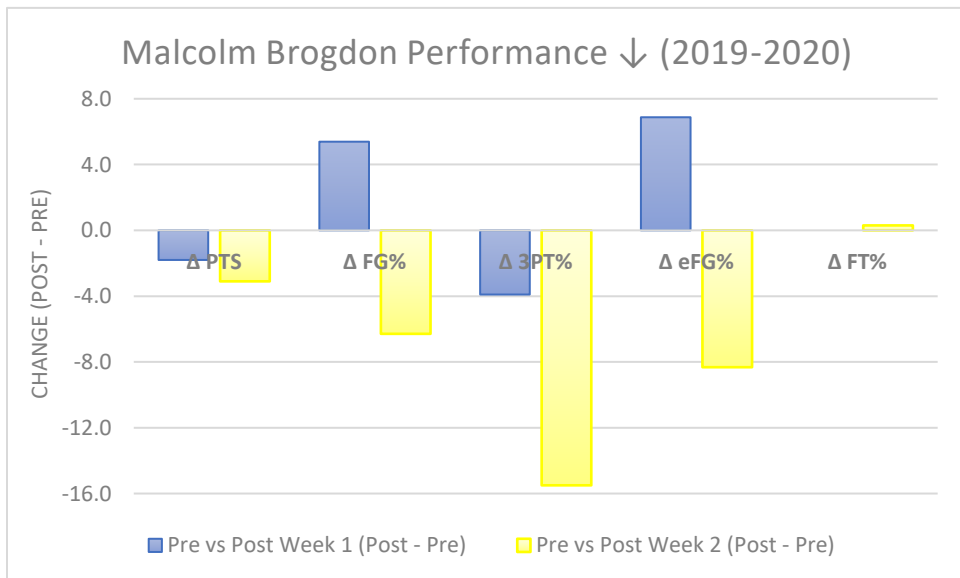
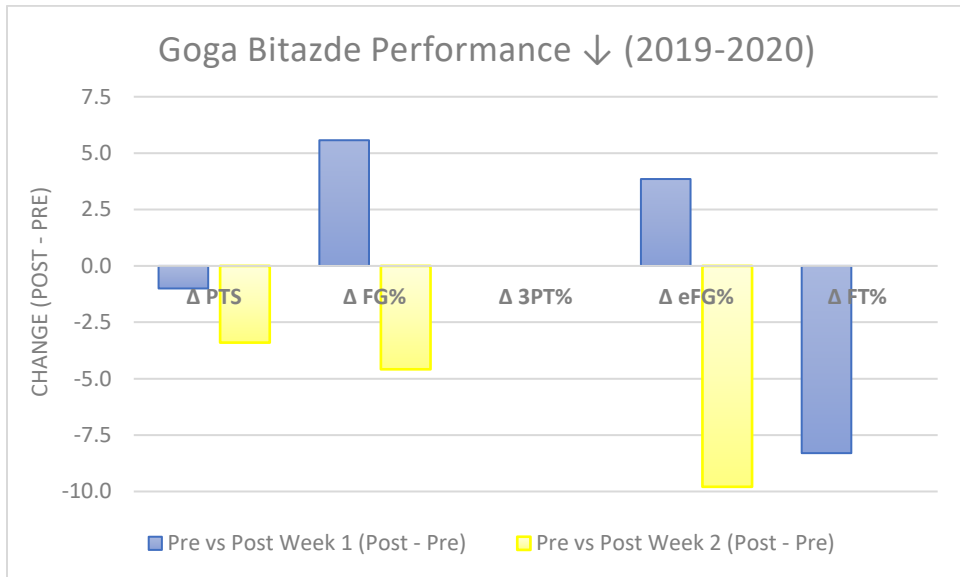
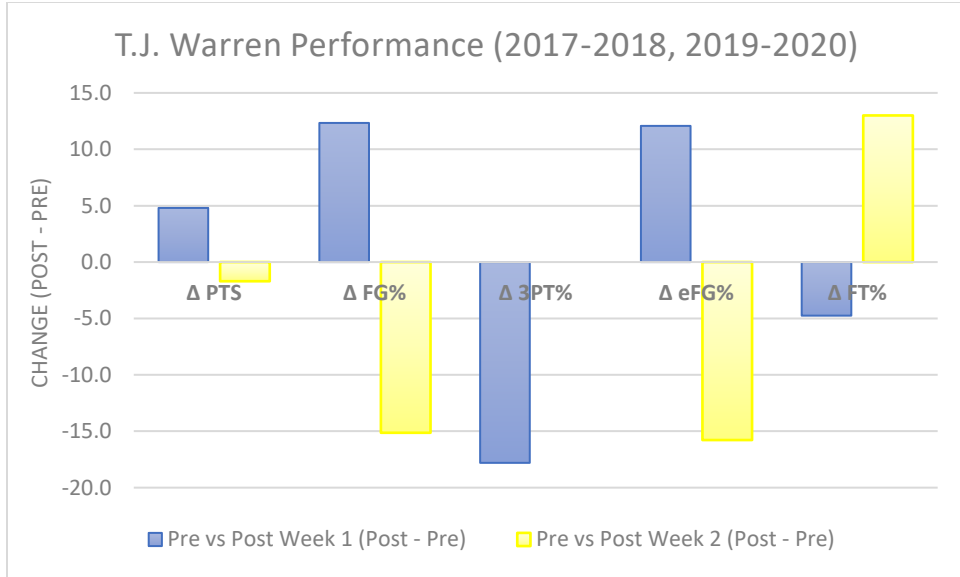
On average, shooting percentages were fairly steady within the 1st week post-concussion. Points increased by 1.5 while FG% and eFG% increased by 0.2% and 0.4%, respectively. 3PT% and FT% decreased (1.2% & 1.9% respectively) but overall these are small changes. Larger changes were exhibited 2-weeks post concussion (all shooting measurements decreased except points).





When examining current Pacers who've had concussion, they had larger performance decreases than the calculated average. That being said, injury duration didn't seem to be a factor (9.67 days for Pacers vs 8.65 days NBA average).







Future Ideas

Part 1: Post-concussion Injury Frequency

- Calculating average # of games a player misses due to concussion
- Examining potential impact of repeat concussions
- Does experience affect concussion duration?

Part 2: Post-concussion Performance Decrease

- Are post-concussion shooting percentages skewed since they return against good or bad defensive teams?
 - Player shooting % vs opposing team allowed % vs NBA team average %

Resources

- <https://www.spotrac.com/nba/injured-reserve/>
- <https://www.foxsports.com/nba/victor-oladipo-player-injuries>
- <https://sportsdata.usatoday.com/basketball/nba/players>
- <https://www.kaggle.com/ghopkins/nba-injuries-2010-2018>
- <https://www.basketball-reference.com/players/w/warretj01.html>
- <https://stats.nba.com/help/statminimums/>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3445097/>