

Drawing Pass Interference Calls: Luck or Skill?

After a heartbreaking 34 - 31 loss against the Miami Dolphins in week 9 of 2020, Deandre Hopkins of the Arizona Cardinals was frustrated - and rightfully so. You see, Hopkins had caught just 3 passes for 30 yards, a rare unproductive game from one of the NFL's most talented wide receivers. However, his stat line fails to tell the whole story. In addition to his 30 yards receiving, Hopkins also drew a whopping 4 defensive pass interference (DPI) penalties against the Dolphins' cornerback Byron Jones, good for an additional 61 yards.

Following the game, Hopkins told reporters, "As long as the ball moves, that's all I care about. But I do think the rules should change and receivers should get the counted yards for penalties."

This sparked a lot of reactions around the football world. To many, it seemed pretty clear that Hopkins was the target of a defensive unit that was happy to commit penalties in order to minimize opportunities for yards after the catch. Because a 50-yard gain from a defensive pass interference call is just as valuable as a 50-yard catch, it only seemed fair that the receiver is credited for both.

However, there was also significant backlash, with those against this potential change raising questions like: would yards lost for offensive pass interference penalties be subtracted from a receiver's stat lines? How should we account for bad calls? Should quarterbacks be awarded the passing yards from drawn DPI penalties?

There seemed to be a lot of questions - none with obvious answers - but I was interested in a different question: is drawing DPI penalties even a skill?

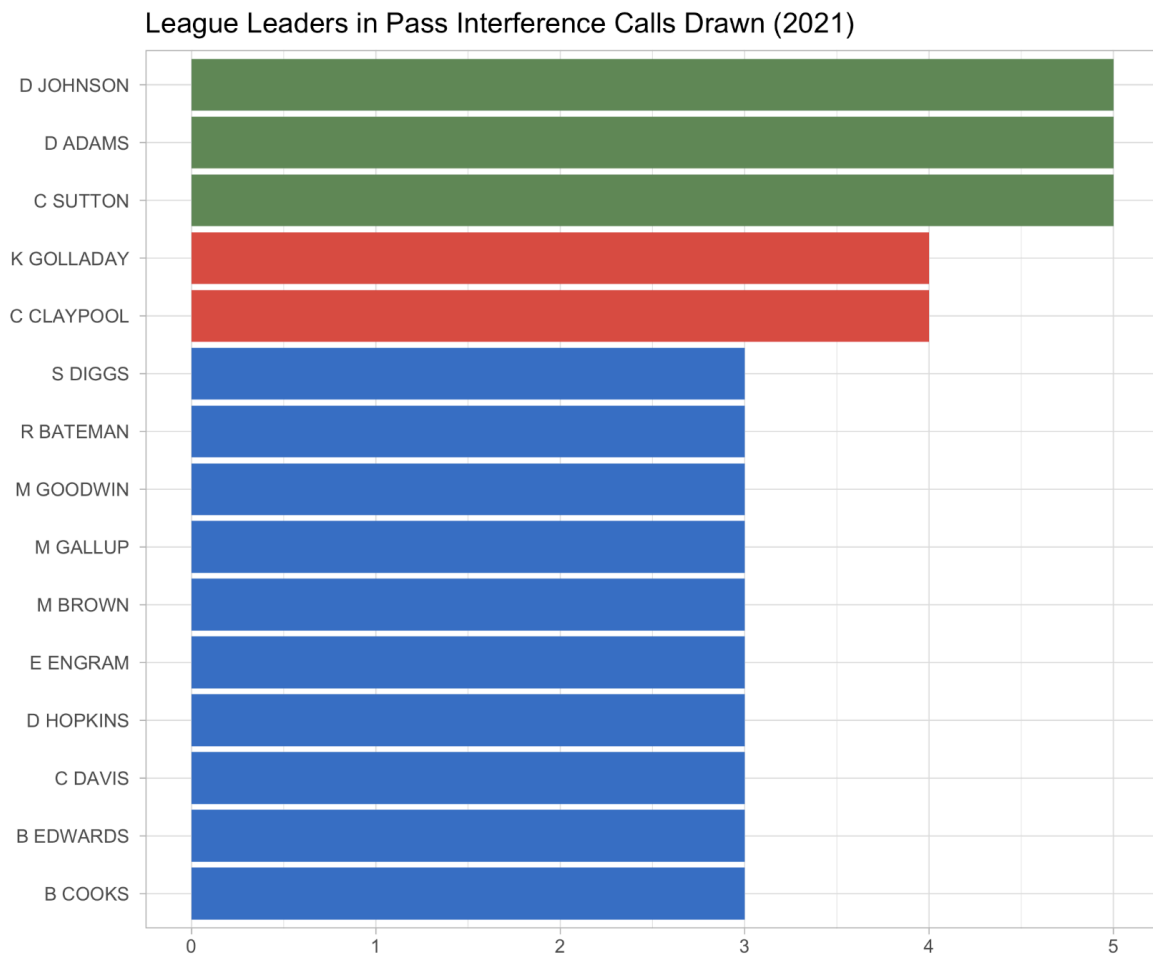
Common sense would say it is. If an NFL cornerback were to cover you or me 1-on-1, we probably wouldn't catch a single ball in however many attempts. However, going up against the sport's best playmakers is an entirely different story. They are faster, stronger, taller, and significantly more talented than the average individual. Common sense would say that being harder to cover would induce more mistakes by the defender, including DPI penalties.

In the age of limitless data, though, common sense is no longer enough. We are interested in cold, hard, facts. So, I got to digging, downloading NFL play-by-play data for every season from 2013 to 2021.

The first decision I made was to remove the 2019 season from the sample, as it was the only season in which a team could challenge pass interference calls (and non-calls). Not only would this have added a new factor not present in the rest of our data, it would punish players who

may succeed in drawing DPIs because they are, for lack of a better word, good "actors" - drawing DPIs even when the defender doesn't deserve to be flagged for one.

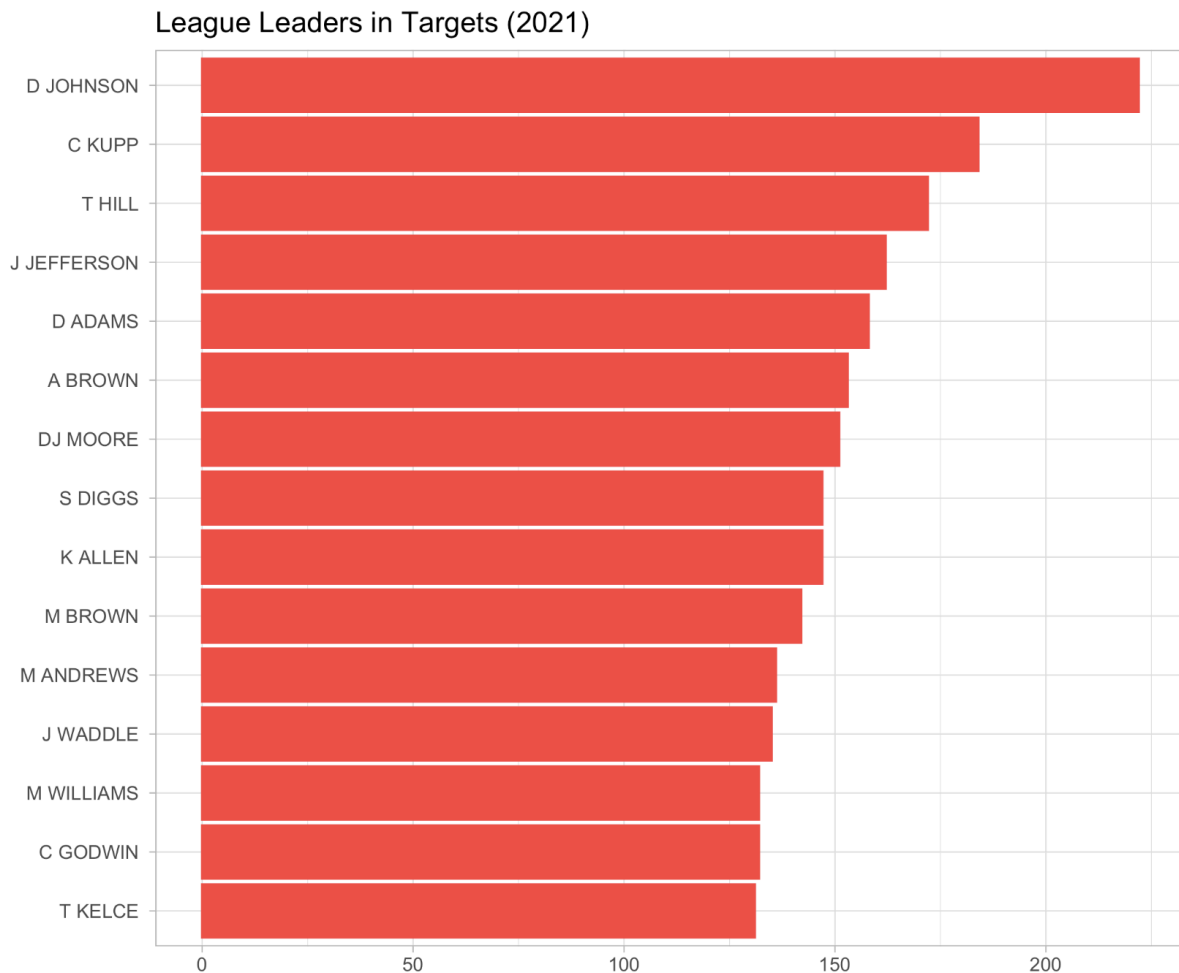
After removing the 2019 data, I filtered out the plays without a DPI penalty, extracted the intended receiver's name from the description of the play, and noted the yards it netted. From there, I could begin to visualize the preliminary data, looking at 2021's league leaders in DPI calls drawn:



Your immediate reaction might be to think wow, that sure is a lot of top-tier receivers - and you would be right. The players listed in the above graphic have a combined 16 Pro Bowls and 6 All-Pro selections (per pro-football-reference.com). So, I guess our common sense was right after all. The league leaders in drawing DPI penalties are some of the league's best receivers, so it's clear that drawing DPIs takes skill.

Well.... that's not exactly true. These are all good receivers and they did lead the league in DPIs drawn, but this is one of those times where correlation does not necessarily equal causation. Because these receivers are so good, they also get the ball thrown their way a lot. It remains a possibility that drawing DPIs is a function of luck, not skill, and these players just had more

chances to get lucky. To help put this into context, I decided to take a look at the league leaders in targets from that same 2021 season:



Before analyzing this data, it's important to note that my definition of a target is a bit different than what is typically used by the NFL. The NFL does not include plays waived off by penalties, including DPIs. For the purpose of this project, we wanted to analyze a player's ability to draw DPIs relative to the number of opportunities they had to draw one, so I included plays in which penalties occurred.

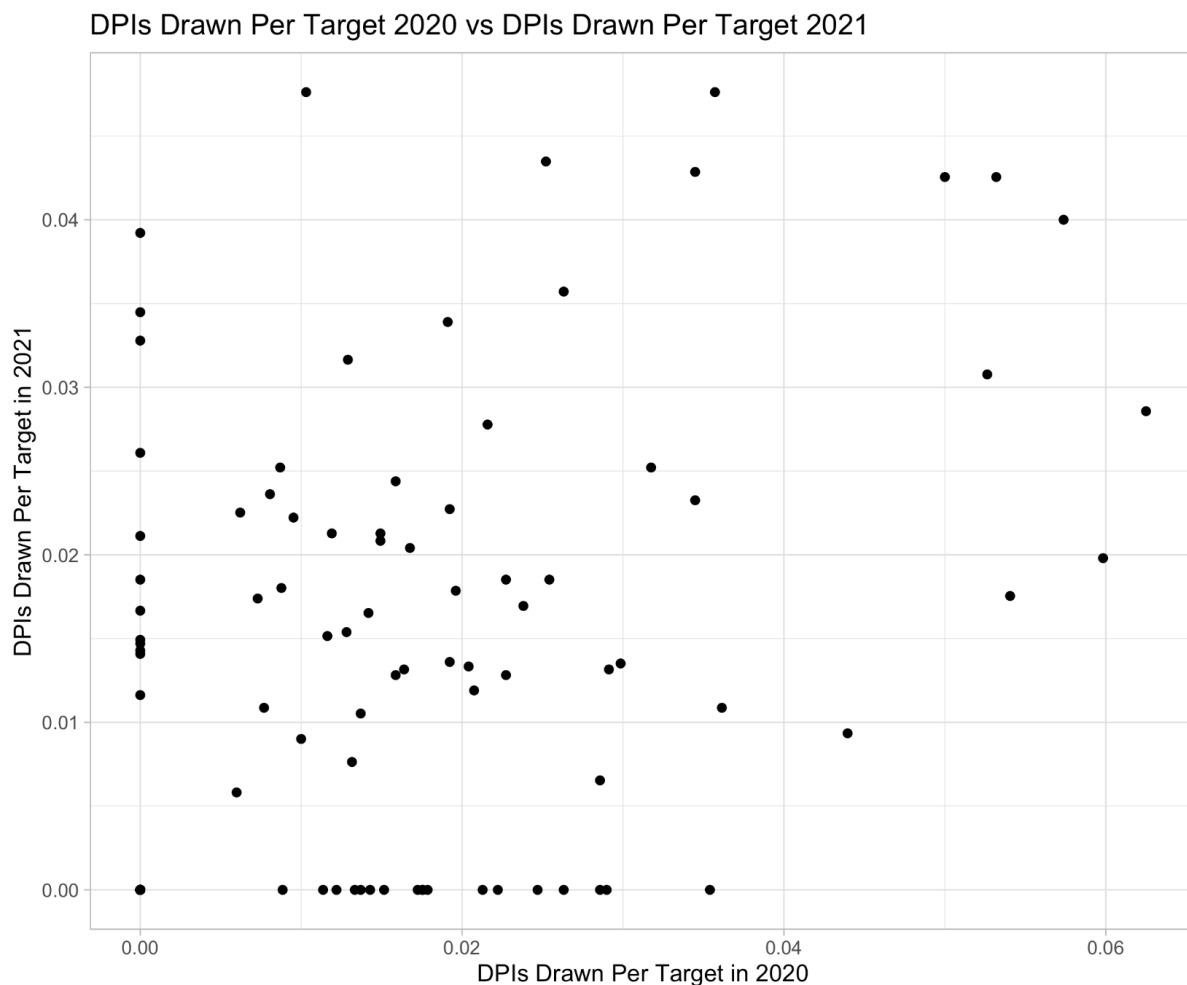
Now that that's out of the way, we can immediately see that Diontae Johnson, who was tied for the league lead in DPIs drawn, also led the league in targets. The target leaders list also includes Davante Adams, Stefon Diggs, and Marquise Brown. all of whom were seen in the previous graph depicting the league leaders in DPIs drawn. We can already see a potential connection between the number of times a player is targeted and how many times the player manages to draw a DPI.

In order to adjust for players not having an equal number of opportunities to draw DPIs, I divided their DPIs drawn by their targets, providing a metric for the number of DPIs drawn per target. I then calculated this metric for every player with at least 40 targets in a given season (or 2.5

targets per game over a full 16-game regular season). This ensured that our findings weren't skewed by players like Keke Coutee, who, in 2021 had only 2 targets, one of which resulted in a DPI.

In order to be certain whether this was a skill or not, I needed to compare players' DPIs drawn per target year over year. If drawing DPIs is truly a skill, we'd expect to see a strong correlation in our graph, as we would expect players who are good at drawing DPIs to have consistently high DPIs drawn per target. Similarly, we'd expect players who are not good at drawing DPIs to have consistently low DPIs drawn per target.

As a jumping-off point, I plotted players' DPIs drawn per target in 2020 against their DPIs drawn per target in 2021, removing players with less than 40 targets both years:



It's pretty clear from the graph alone that there is little correlation between DPIs drawn per target in 2020 and DPIs drawn per target in 2021. It turns out the correlation coefficient is a measly 0.429 - not a good indication that drawing DPIs is a skill.

Luckily, we have more than just two years of data, so I found the correlation coefficient year to year from 2013 to 2021, excluding our data from 2019. The results were even less optimistic than the 2020-2021 seasons indicated:

Years	Correlation Coefficient
2013 - 2014	0.208
2014 - 2015	0.311
2015 - 2016	0.367
2016 - 2017	0.311
2017 - 2018	0.181
2020 - 2021	0.429

The correlation coefficients are consistently low, indicating that drawing defensive pass interference calls isn't a skill. However, it's important to note that, unlike most branches of math, statistics is not black and white (because of this, some people consider statistics to be its own subject). Because of this gray area, we have to note some important things about the data and how we interpret it.

Firstly, it is important to understand that in any given regular season, a player plays 16 games at most (17 in 2021). Because of this, we are working with a pretty small sample size, which means there is greater variability. Because of this, our results are less reliable.

The second thing to note is that the range of the data is incredibly small. Over the 8 years of data I analyzed, the most DPIs a player drew in a single season was 10 (shout out Allen Robinson). Additionally, only 21 of the 1,355 qualified seasons were seasons in which a player drew more than 5 DPIs. Because the range is so small, one bad call can have a disproportionately large impact on our findings.

This means that we have to at least acknowledge the possibility that there is skill in drawing DPIs and we just don't have the data to see it.

So, while my analysis does not definitively prove that drawing DPIs is a skill, it is not all for nothing. What it does indicate is that, if drawing DPIs is a skill, there really aren't enough games for it to make a noticeable impact. This means that, in general, teams should not use the ability to draw DPIs as a tool to evaluate players.

For those interested, I am attaching a link to download the data I used below. Additionally, all of my code will be posted on my GitHub, also linked below.

Data: <http://nflsavant.com/about.php>

GitHub: <https://github.com/Josh-Sapira>