

Is Running the Ball Important in the NFL?

By Eric Chu

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Background

For fellow fans of the New York Giants (yes I will eventually and begrudgingly talk about the current season), the biggest topic this offseason was what we were going to do with Barkley. The consensus was he was the MVP for our offense and the team needed him more than he needed us. There was a long standoff between the front office and Barkley, and ultimately the front office won. How did the front office win?

It was because of the word that reporters love: analytics. We frequently heard the adage “analytics say not to pay running backs”, but the actual math behind the analytics is not shared by reporters. While they may seem like a vague justification for GMs and their actions, few deny that analytics are a powerful tool. If every GM ([except for Gettleman](#)) embraces them, shouldn't fans embrace them and “trust the process”? A large part of me wanted to pay Saquon as he's one of my favorite players, but the analytics said not to. I wanted to defy the analytics and conventional wisdom, but I needed to see the actual statistics myself.

The motivation for this paper was to conduct some of my own analytics in order to see if I should trust the process. Using the offensive stats from 2022, I analyzed how successful teams are based on their rushing and passing tendencies. Should I trust the conventional wisdom that running the ball, and by extension running backs, have become less important to team success? Can we still have success running the ball with an “old school” offense, or is it time to fully accept the idea the NFL is now a “passing league”?

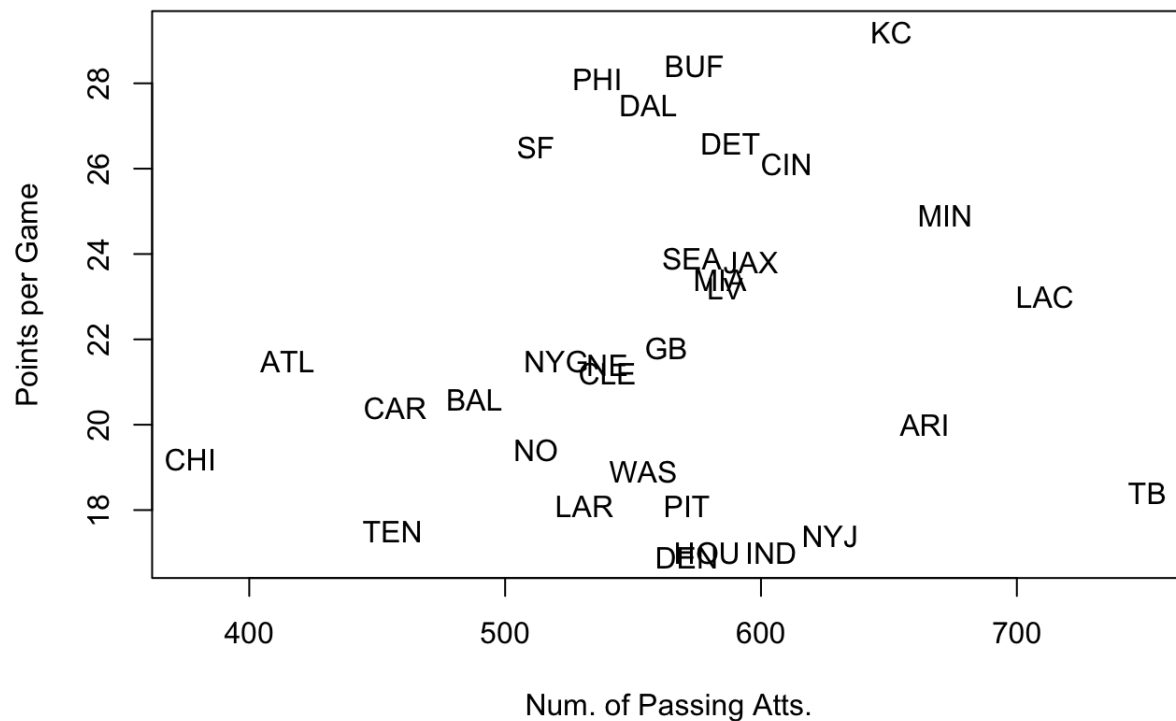
Technical Information

All the statistics were gathered from [profootballreference](#). You can view all my code and the CSVs I used in my GitHub repository ([insert link here](#)). I used R and R Markdown to create all the graphs, correlations, and other calculations. Due to the fact that the Bills and Bengals played

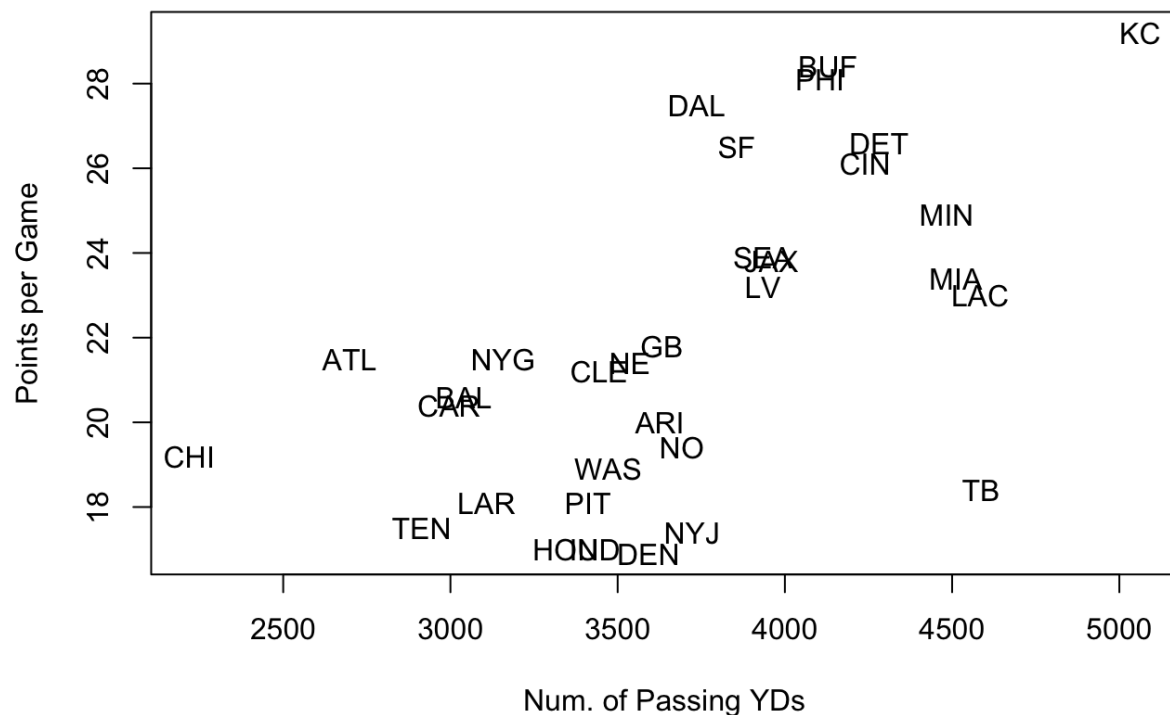
one less game than every other team in the league, I've decided to use points per game and win/loss percentage instead of total points scored and total wins respectively. This more accurately describes their offensive efficiency better than the raw counting stats.

Passing Success and Offensive Success

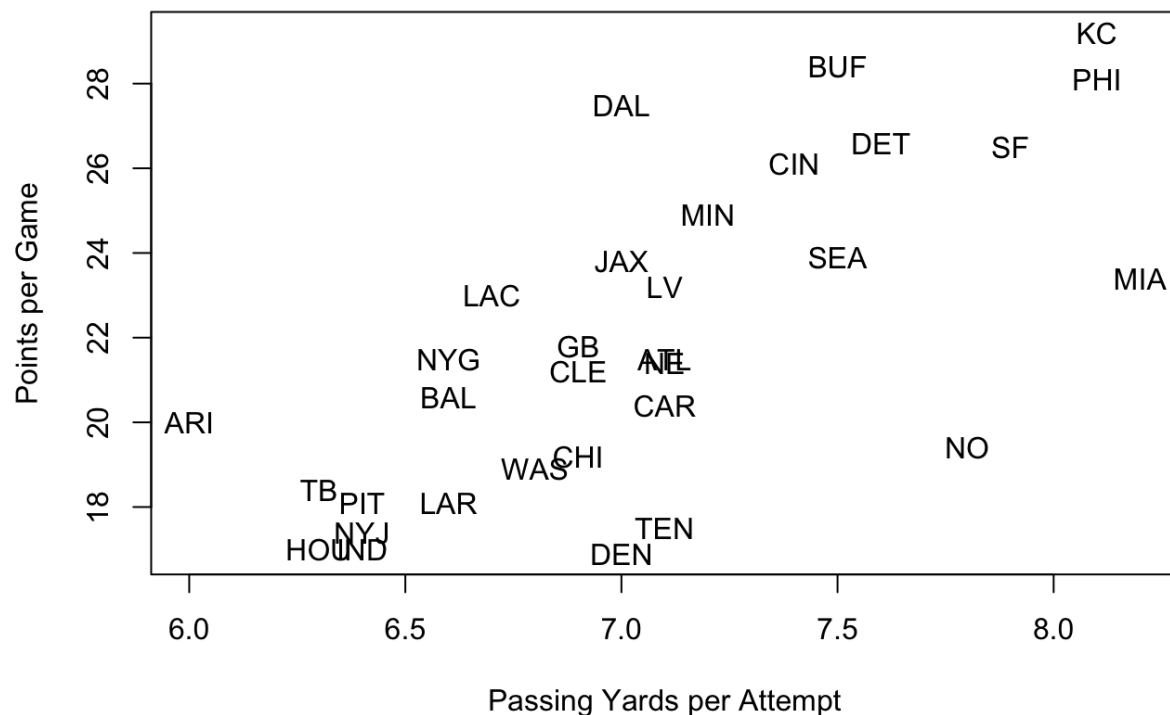
First, I needed to see how vital passing the ball was to a team's offensive success. Unsurprisingly, it was very significant. In general, the greater your passing volume and efficiency metrics are, the better your team is. Here is the data:



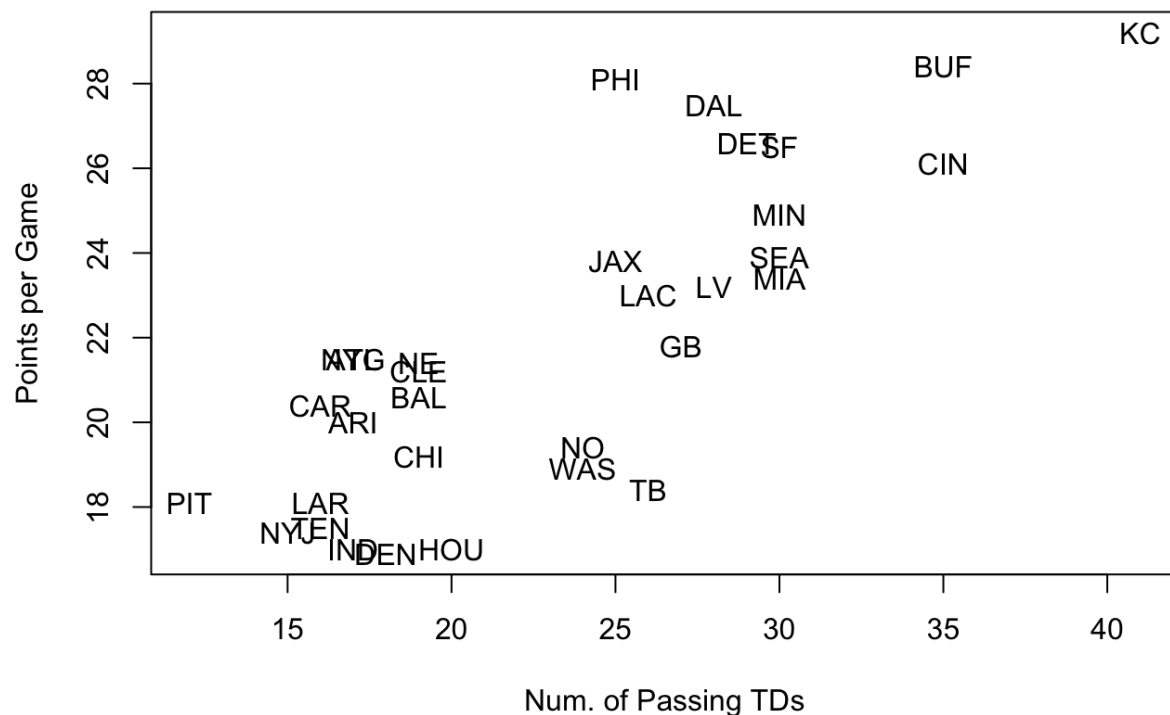
I initially wanted to see how successful a team can be based on the raw number of passing attempts, that is to say "is your offense better the more you pass"? As you can see, it's not really the case. Tampa Bay has by far the most passing attempts at a whopping 751 (the average number of attempts is 571) and are well below average in points per game. The correlation of number of passing attempts and offensive success is an underwhelming 0.147, effectively little to no correlation. The subsequent stats are far more intriguing, however.



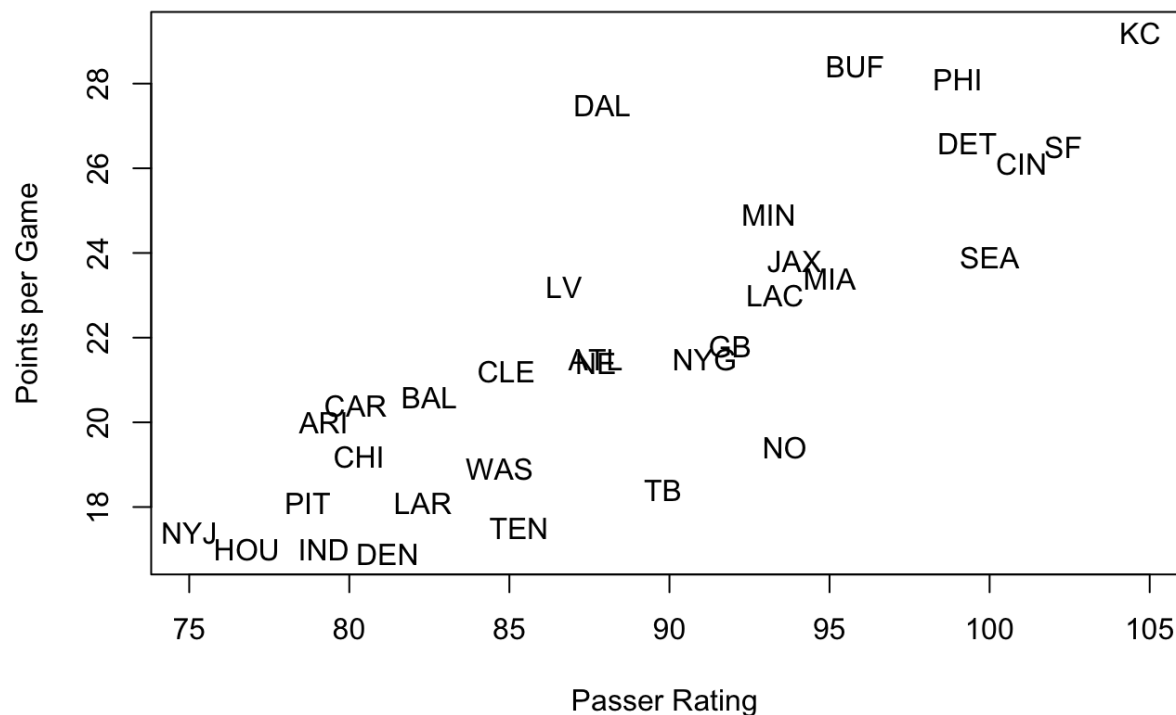
Any team can throw the ball 700 times, but not every team can throw for significant yardage. I wanted to see how much offensive success correlated to passing yardage, and you can start to see a greater connection between passing stats and offensive stats. Unsurprisingly, teams that have many passing yards have great offenses. Kansas City has by far the most passing yards and has the most points per game by a considerable margin. There are several outliers, Tampa Bay has some of the most yardage in the league but has an underwhelming offense while Dallas did not hit the prestigious 4000 yard mark and still had a respectable offense. Still, there is a non insignificant correlation, which is numerically 0.587.



Anyone can throw the ball, but not every quarterback can throw the ball well. Yards per attempt is one of the more underrated efficiency metrics (in my opinion), as it reflects how good a scheme is, how good a quarterback's decision making is, how good their completion percentage is (can't have many yards per attempt if you're throwing incompletions), how good their deep ball is, and in general how well a team can move the ball down field. These are the reasons why I chose to analyze Y/A, I believe it's too powerful a metric to ignore. Unsurprisingly, the correlation between offensive success and Y/A is quite high, it is 0.699. The Saints are essentially the only team with a high Y/A but have a bad offense, while Dallas is the only team to have a middling Y/A and a good offense. There is no team with underwhelming Y/As while having a good offense.



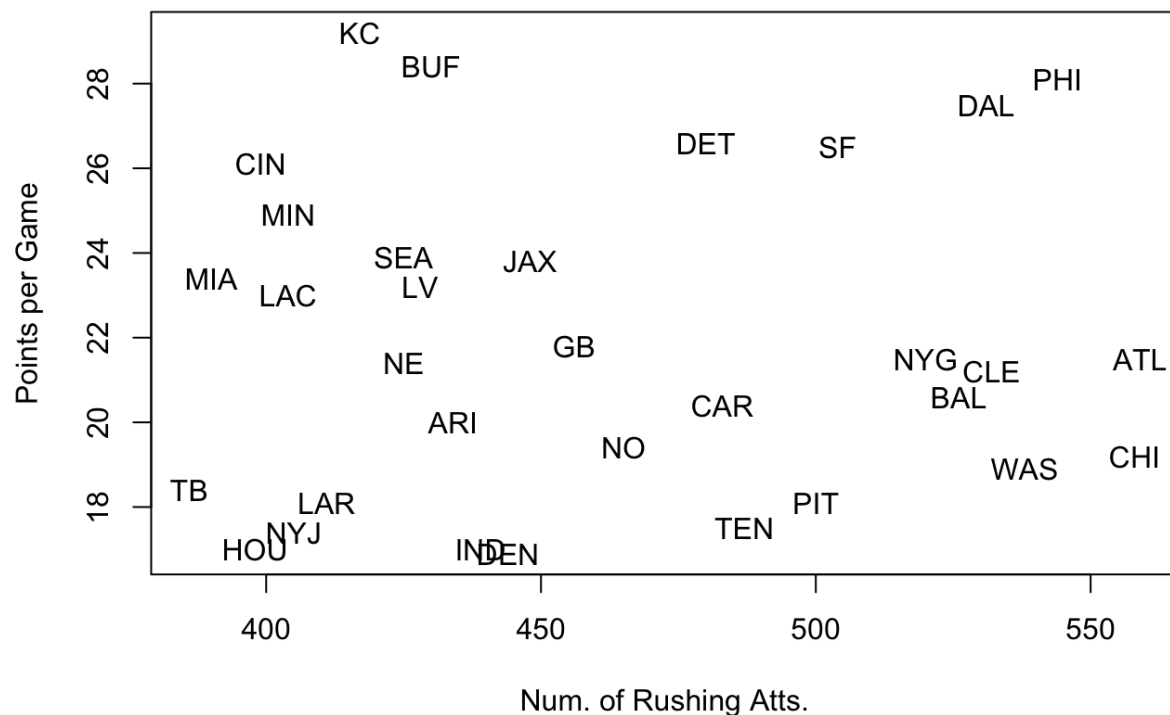
Getting the yards is the “easy” part, but the real challenge is hitting the endzone. Getting a touchdown gets you more points than getting a field goal, so it makes sense that the more times you hit the end zone the better your offense will be. Yards don’t mean anything unless they turn into points somehow. While I wasn’t shocked to see a high correlation between team offensive success and passing touchdowns, I was pretty astounded to see just how high it was. It was a whopping 0.811, considerably higher than I anticipated. Who knew?



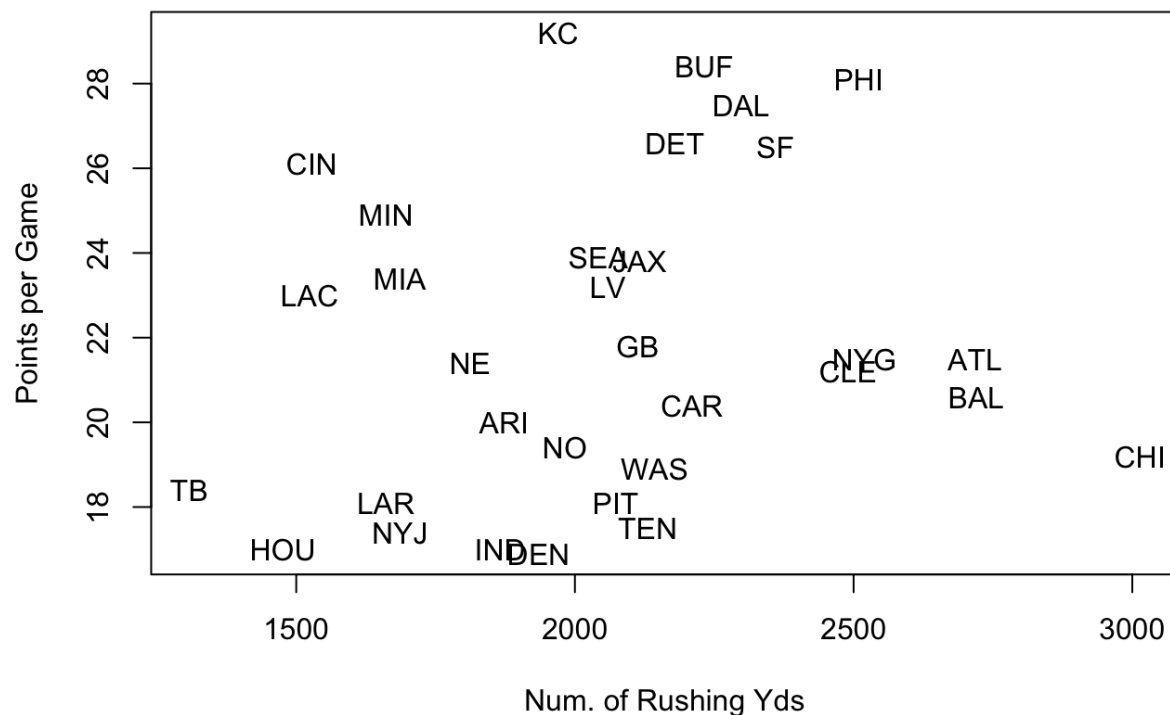
Passer rating is one of the most well-known efficiency metrics regarding quarterback performances. The average is roughly 90, an elite passer rating is generally considered above 100, and a dismal passer rating would be below 70. Passer rating accounts for things like Y/A, TD:INT ratio, completion percentage, but it doesn't account for sacks. Still, there's a reason why it's a commonly cited statistic. Once again, I wasn't surprised to see a high correlation between passer rating and offensive success, but I was astonished to see just how high it was. It was a whopping 0.829, slightly higher than the number of TDs. Once again, Dallas serves as an outlier with their middling passer rating and high offense, but there's virtually few other exceptions.

Rushing Success and Offensive Success

At this point I then took a look at rushing metrics and stats to see how they correlated to total team offensive success. The results were more underwhelming than what I expected. In fact, I was flabbergasted to see some of the numbers, but here they are.

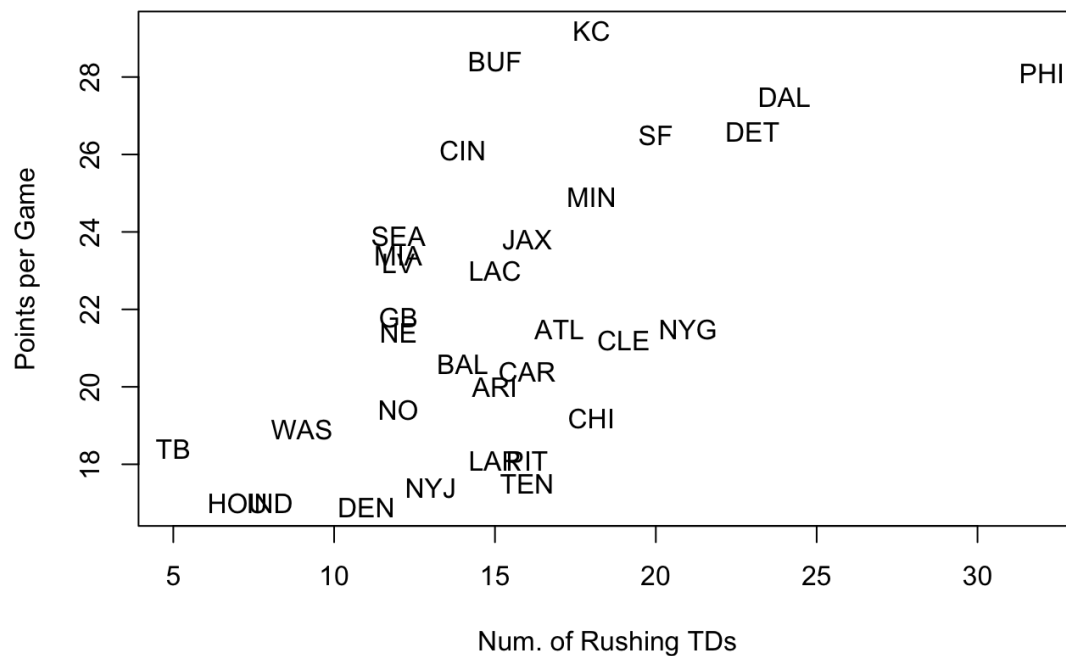


Simply running the ball seems to work well for some teams. The Giants have quite a few rushing attempts, but their offense pales in comparison to their division rivals Dallas and Philadelphia who have a similar number of rushing attempts. In fact, Philadelphia and Dallas are some of the few teams who have a significantly above average number of rushing attempts while also having an elite offense. The Chiefs and Bills are significantly below average in the number of rushing attempts and they are two of the top offenses in the league. The correlation is mathematically 0.032, not great but not too far off from what I was expecting. Still, I was not expecting it to be decently lower than the correlation of raw passing attempts and offensive success (which was 0.147).



Any team can run the ball 500 times, but few teams can get significant yardage. I was actually curious to see what the standard deviation of rushing yards was, and it was roughly 395. For reference, the standard deviation of passing yards was 614.7, so teams have somewhat more similar success running the ball but have varying success passing the ball. What this means is that most teams can have serviceable run games, but some teams don't have serviceable passing games. So I guess most teams can get significant yardage on the ground?

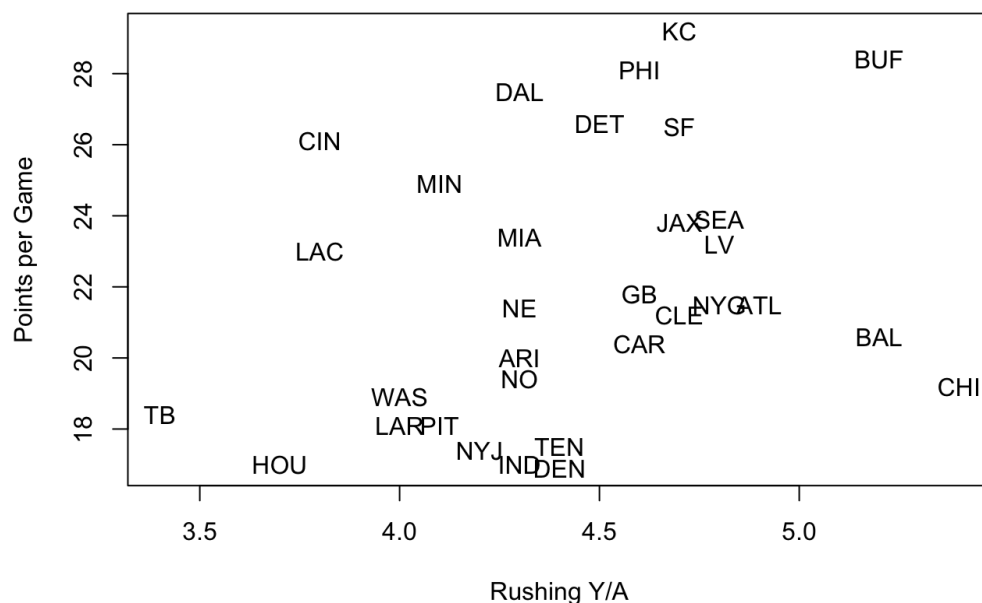
It seems like it doesn't matter if you do get the significant yardage, as the correlation for this graph is 0.173, pretty weak. Chicago comes first in rushing yards by a huge margin but are nowhere near the closest to the best offense in the league. The Giants and Eagles have a similar number of rushing yards, but the gap between them in offensive success is massive.



Yards don't matter as much if you aren't hitting the end zone, right? Well, apparently not. The correlation between this graph is 0.608. This is not surprising, as several teams do not rely on the ground attack to get yards but will rely on it to reach the endzone. This is partially the case for teams like the Vikings, Bengals, and Lions, as they were somewhat low in rushing yardage but are close to average or above average in rushing touchdowns.

However, it seems like if you have many rushing TDs, you don't necessarily have a good offense in general. The Giants are an example of this (the stats do not really make my team look good), as they have some of the most rushing TDs but are basically average in offense. The Bears are above average in rushing TDs yet are well below average offensively. Philadelphia has by far the most rushing TDs of any team (especially if Boston Scott is playing the Giants), and yet there are still several offenses within their stratosphere of success. The Chiefs, Bengals, Bills, Cowboys, Lions, and 49ers have similar success while having significantly fewer rushing TDs.

To be fair, there are virtually not teams with very few rushing TDs and are good offensively. No team with less than 10 rushing TDs comes even close to average, and only a few teams with less than 15 rushing TDs are above average. Is this a result of poor quarterback play not getting them the necessary yards to get close to the red zone? Some of the teams with low rushing touchdowns are the Broncos, Colts, Texans, and Washington, teams that were plagued with passing game woes. Meanwhile, the 49ers, Lions, and Eagles have benefited from their quarterbacks playing well to get an above average number of rushing TDs.



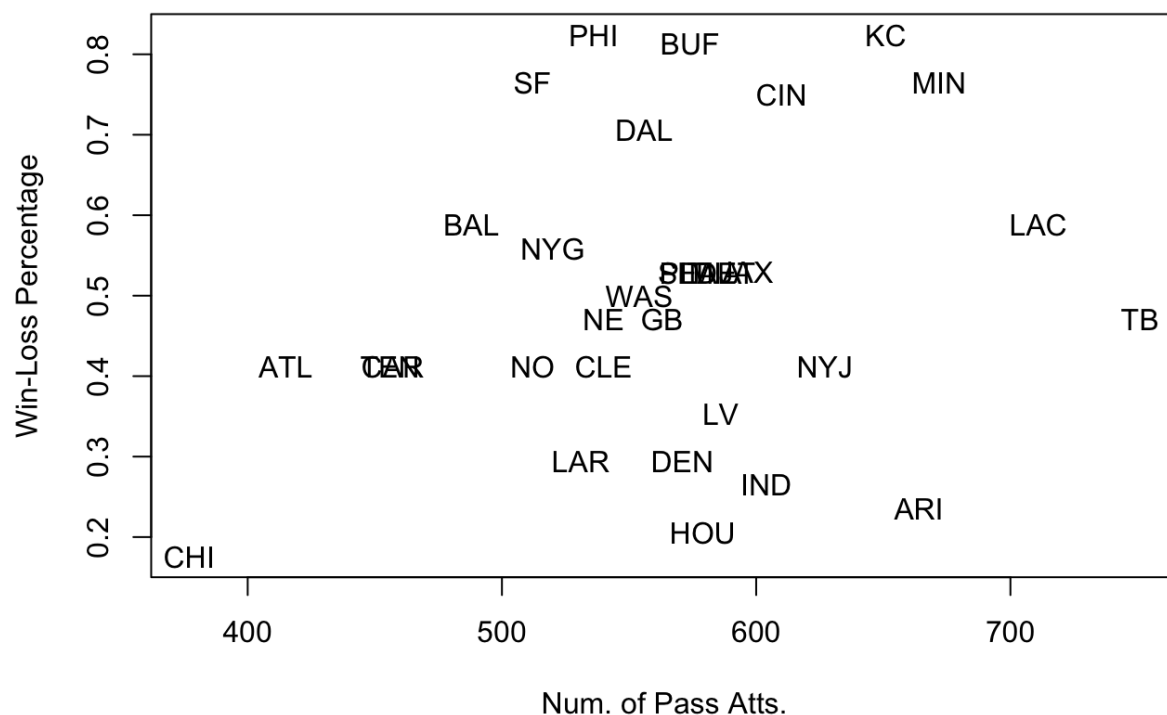
Unfortunately, there is no metric like passer rating for rushing stats (maybe one could make a formula using Y/A, number of TDs per attempt, and TDs:Fumbles ratio). Rushing Y/A is still a good efficiency metric for rushers in my opinion for the similar reasons why passing Y/A is a good efficiency metric. It accounts for how well a rusher can find holes to exploit, how well a rusher can get explosive runs, how good an o-line can block, and how good a rusher can break tackles. Surprisingly, the correlation for offensive success and Y/A is also low. The correlation is about 0.300, so by far the highest correlation between these statistical metrics, but it's still a weak correlation and nowhere near as high as the correlations with passing stats.

It should be worth noting that teams with high rushing Y/A also have mobile QBs, specifically Josh Allen, Lamar Jackson, and Justin Fields. [If you look at the rushing statistics](#), you can see that these QBs have high Y/As. In fact, they're the top 3 in the league among all players.

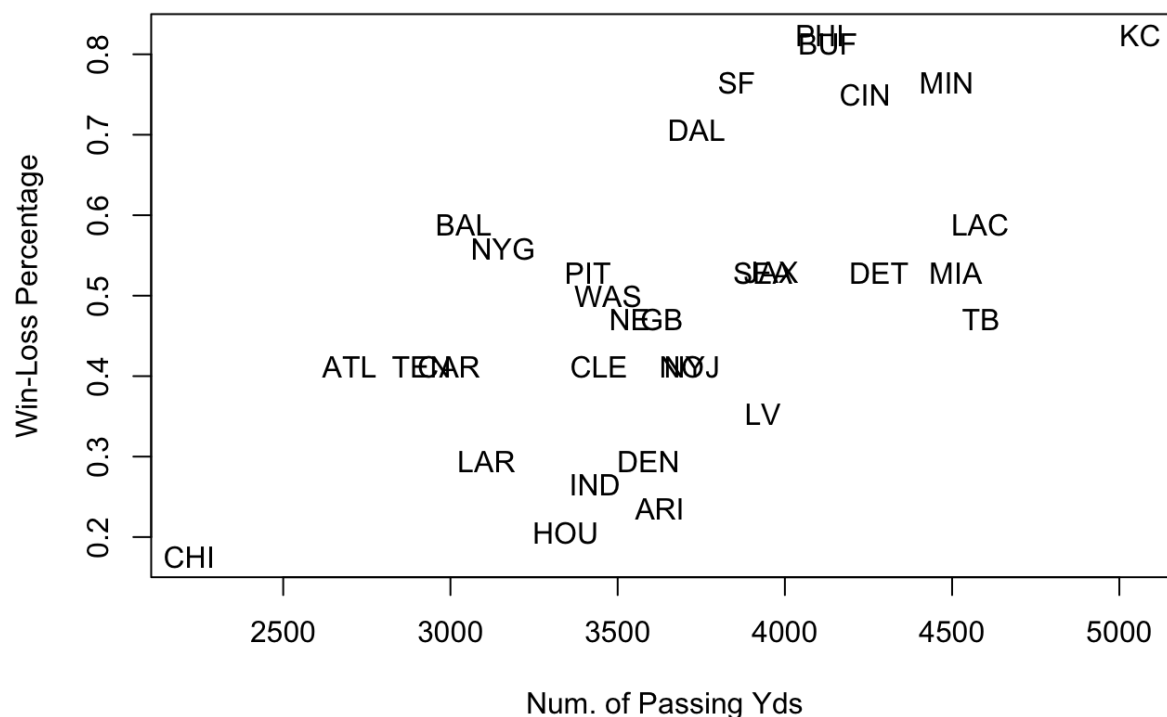
					Games		Rushing									
Rk	Player	Tm	Age	Pos	G	GS	Att	Yds	TD	1D	Succ%	Lng	Y/A ▼	Y/G	Fmb	
1	Justin Fields	CHI	23	QB	15	15	160	1143	8	65	56.3	67	7.1	76.2	16	
2	Lamar Jackson	BAL	25	QB	12	12	112	764	3	47	64.3	79	6.8	63.7	5	
3	Josh Allen *	BUF	26	QB	16	16	124	762	7	55	61.3	44	6.1	47.6	13	
4	Daniel Jones	NYG	25	QB	16	16	120	708	7	57	59.2	25	5.9	44.3	6	
5	Khalil Herbert	CHI	24	RB	13	1	129	731	4	26	47.3	63	5.7	56.2	0	

Passing Success and Team Success

Still, the most important statistic is wins. This section looks at how successful teams are based on how good their passing offense is. The results will probably be unsurprising to most people, but in conclusion, passing offenses are pretty important.

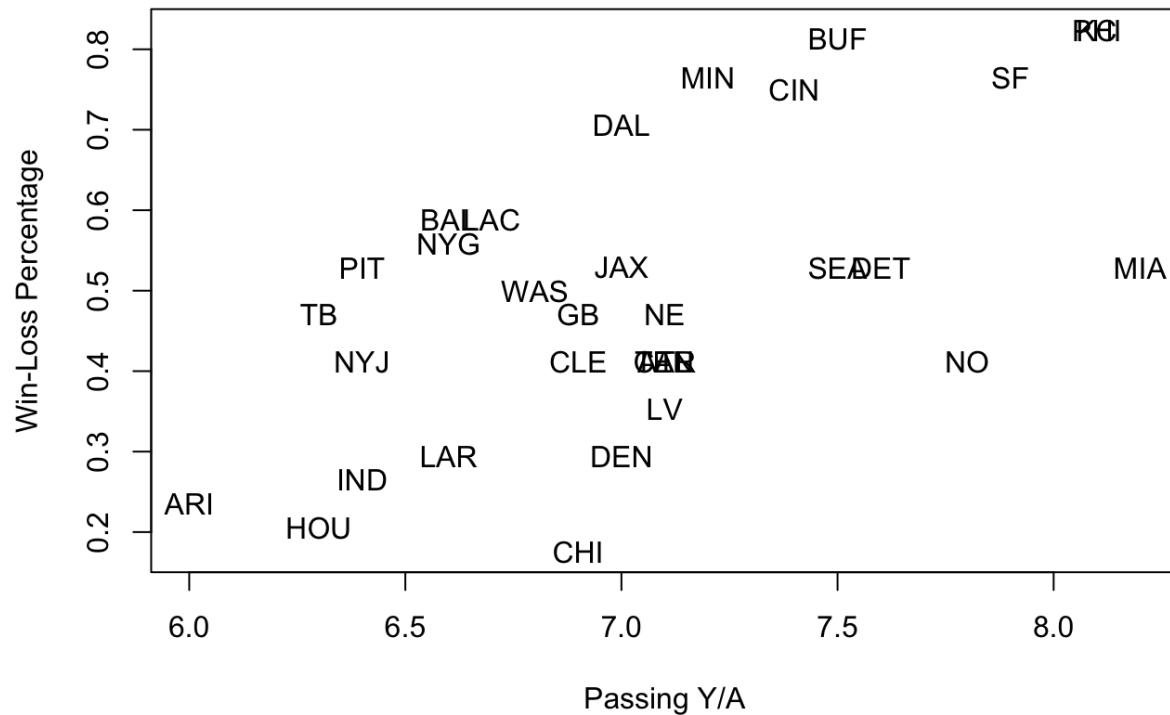


Once again, in terms of raw pass attempts there really doesn't seem to be much of a correlation. You can see that there's a huge overlap of teams that have a slightly above average number of pass attempts while being slightly above .500. In general, there are too many outliers to say that passing the ball equals success. The Bucs are a below average team despite having by far the most pass attempts, and the Cardinals are a bad team while having many pass attempts as well. Still, there are some teams that follow the convention that passing is important. Chicago has by far the least pass attempts and were the worst team in the league, Washington has basically an average number of pass attempts and ended with a perfectly mediocre .500 record, and the Vikings have many pass attempts and won 13 games.



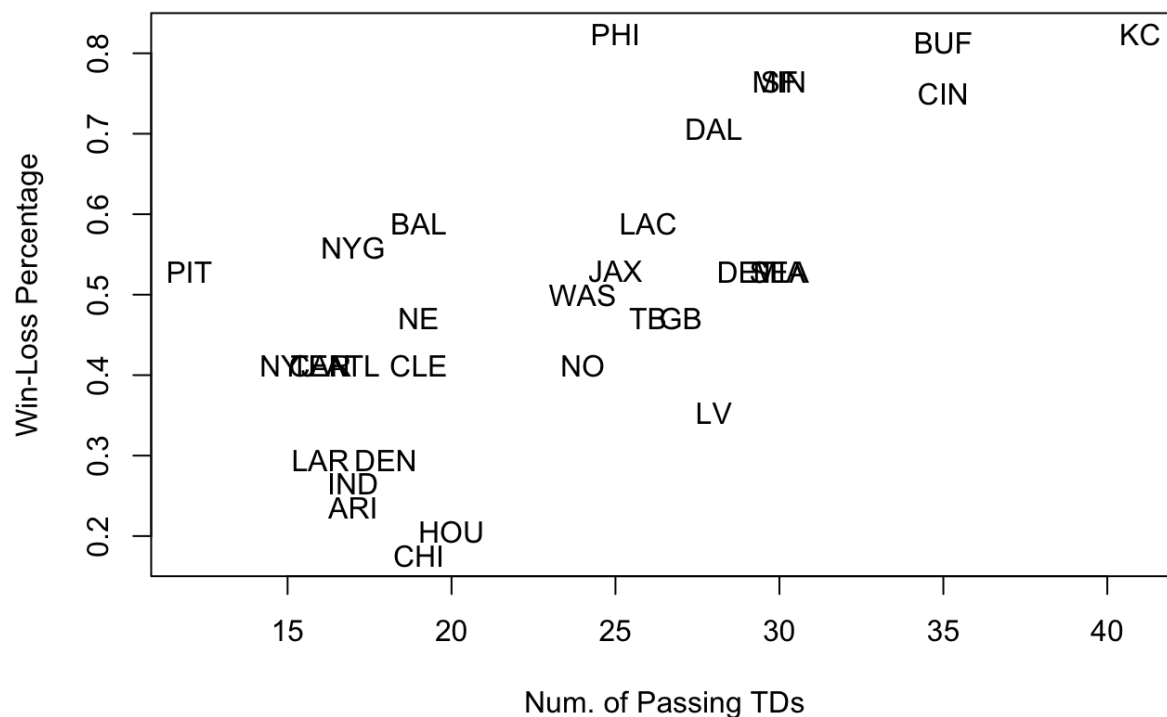
Once again, the more important stats than the number of passing attempts is the number of passing yards and TDs. In this case there is a .608 correlation between the number of wins you have and the numbers of yards you throw. Admittedly this was slightly lower than what I expected, but in retrospect I guess I should've expected it. The Bucs offense was pretty average despite having many passing yards, so it makes sense that the team would be pretty average. The Chargers with their maligned Joe Lombardi offensive scheming had a decent amount of team success despite having some of the most passing yardage. The Bills and Bengals have their passing yardage deflated due to playing one less game than the rest of the league, but Philadelphia has a similar number of passing yards as the Bills and have a better win percentage.

Within the bottom ten teams in passing yards, three had a winning record: the Steelers, Giants, and Ravens. The Steelers did not make the postseason either. Of the teams top ten in passing yards, all of them had a winning record (except for the Bucs) and only one did not make the postseason (the Lions, sorry).



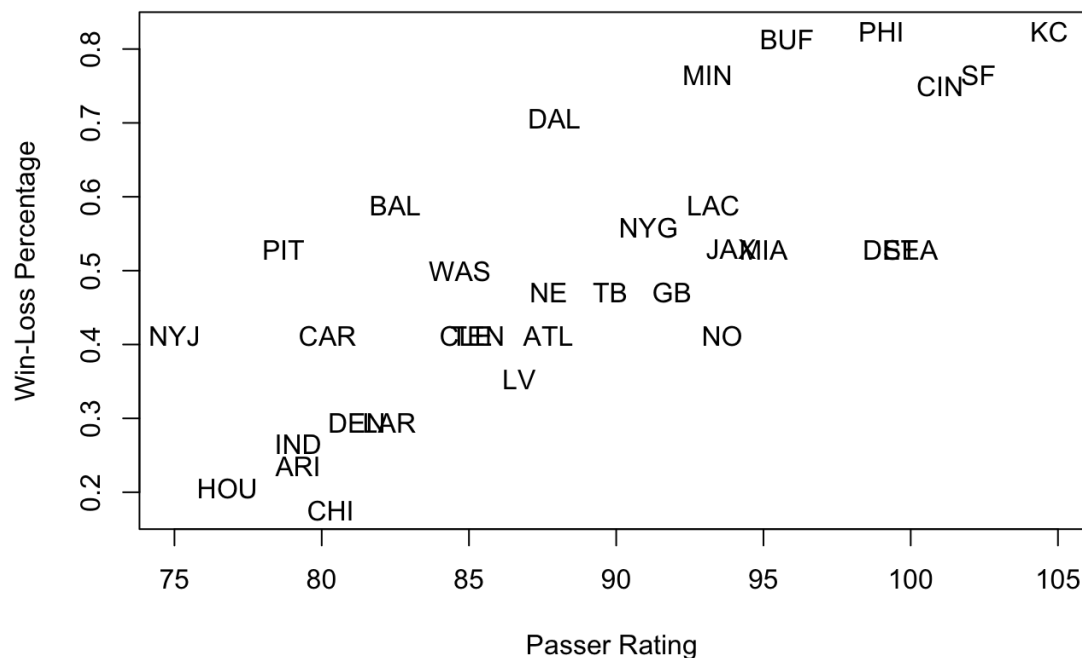
This ended up being perhaps the most surprising statistical finding when researching this section. So my beloved Y/A metric may be slightly flawed, as the correlation between Y/A and win percentage is actually *lower* than the correlation of pure yardage and win percentage. The correlation is 0.592, so it's not significantly lower, but the fact that it was lower at all was shocking.

There are a few outliers that may explain the lower correlation. Miami has the highest Y/A but finished 9-8. This can perhaps be explained by Tua's absence, as he possibly played enough games to boost the team's Y/A stat but did not play enough games to help the team win a higher record.



Unsurprisingly, there is a positive correlation between the number of passing touchdowns your team has and your win percentage. It's somewhat higher than the correlation of passing yardage at 0.689, but it does confirm the idea that the more TDs your quarterback scores the more likely your team will win. The correlation was slightly lower than I expected, considering the fact that the correlation between offensive success and passing TDs was above .800, but the lowered correlation of win/loss percentage can probably be explained by their team's dismal defenses. For example, the Cowboys don't have nearly as many passing TDs as some of their contemporaries, but they had an elite defense. The Lions finished with a high number of passing TDs but are basically average thanks to their horrid defense.

Of all the teams that finished top 10 in passing TDs, only one did not have a winning record (Raiders, sorry Derek Carr), whereas only two teams in the bottom 10 had a winning record (Giants and Steelers).



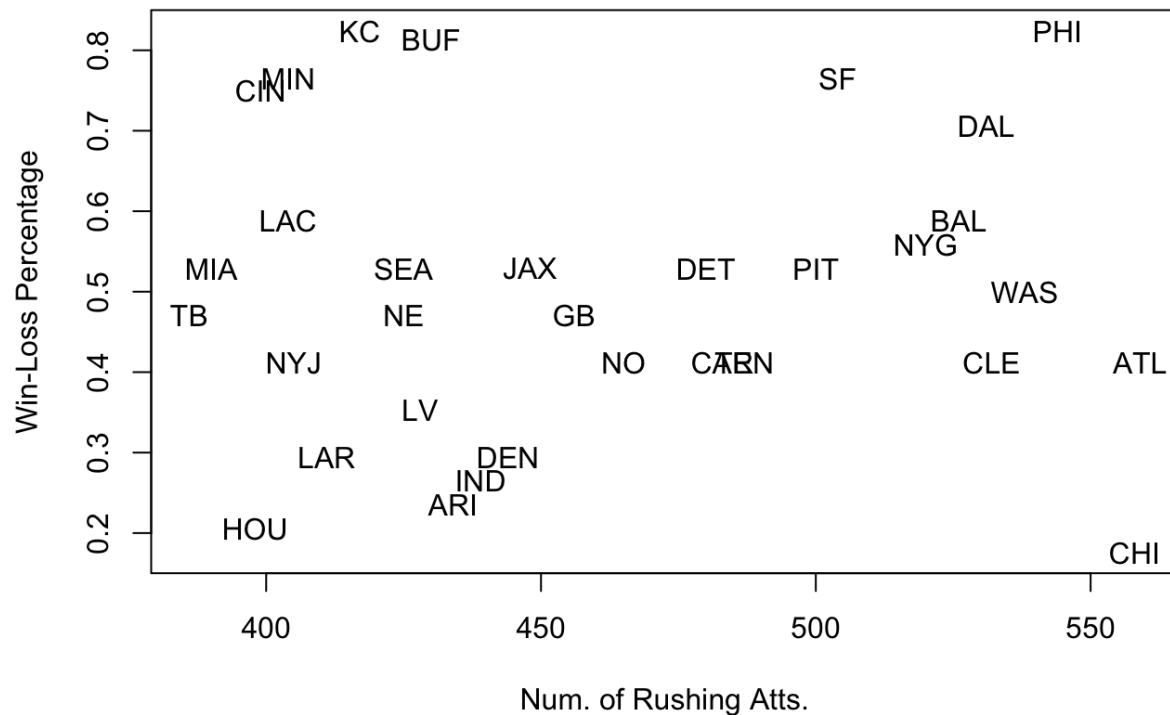
Not surprising is the correlation between the number team wins and passer rating. It's numerically 0.759, and there are few teams with a below average passer rating that have a winning record. Dallas is an exception (again), but once again their high win percentage can be attributed to their defense. It is true that their above average rushing attack can cover their deficiencies in their passing offense, but this is not the case for every team. The Giants have had good rushing numbers with middling passing production and passer rating, and the team finished with a middling 9.5 wins. The team's passing stats more accurately reflected their team success than their team's rushing stats.

While my team is catching strays, I'd like to point out that the other Metlife team has the lowest passer rating of any team in the league yet has a higher win percentage than teams with similarly bad passers. This can probably be explained by the Jet's defense, as the Texans, Cardinals, Bears, Rams, and Colts all had bad defenses and could not bail out their passers. Still, a defense can carry a team for so long, since despite having one of the best defenses the Jets couldn't finish with even an average record due to their dismal passers and offense.

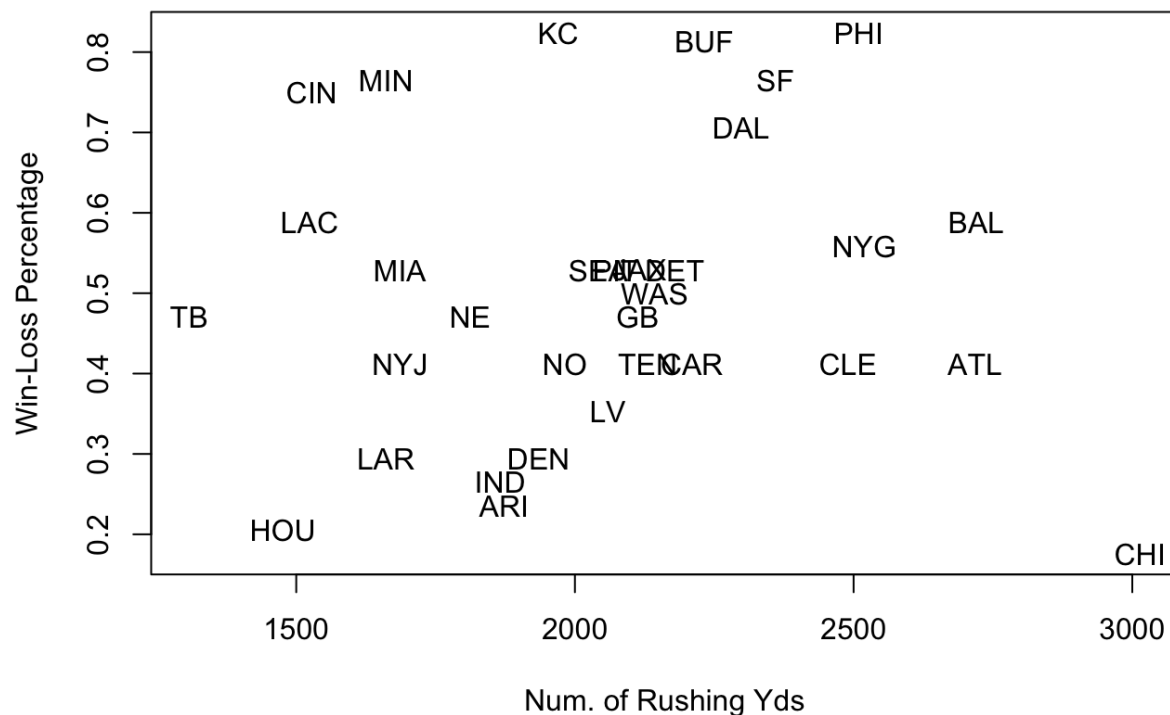
The Saints are the only team top 10 in passer rating that did not have a winning record despite having a good defense. This is likely due to their middling rushing offense, but their offense overall ranked 22nd in average points scored per game. The Ravens are the only team in the bottom 10 in passer rating to have a winning record, but their rushing attack was one of the best in the league and they had the third best defense in average points scored per game.

Rushing Success and Team Success

It's safe to say that team success almost always entails having a good aerial attack. There are very few teams with bad passing stats and a winning record, and conversely there are very few teams with good passing stats and a losing record. All teams with a passer rating above 95 have a winning record and Dallas is the only team with a below average passer rating and has a passer rating below average. Similar ideas apply to other passing statistic metrics such as yards and TDs. Can the same be said about rushing stats?

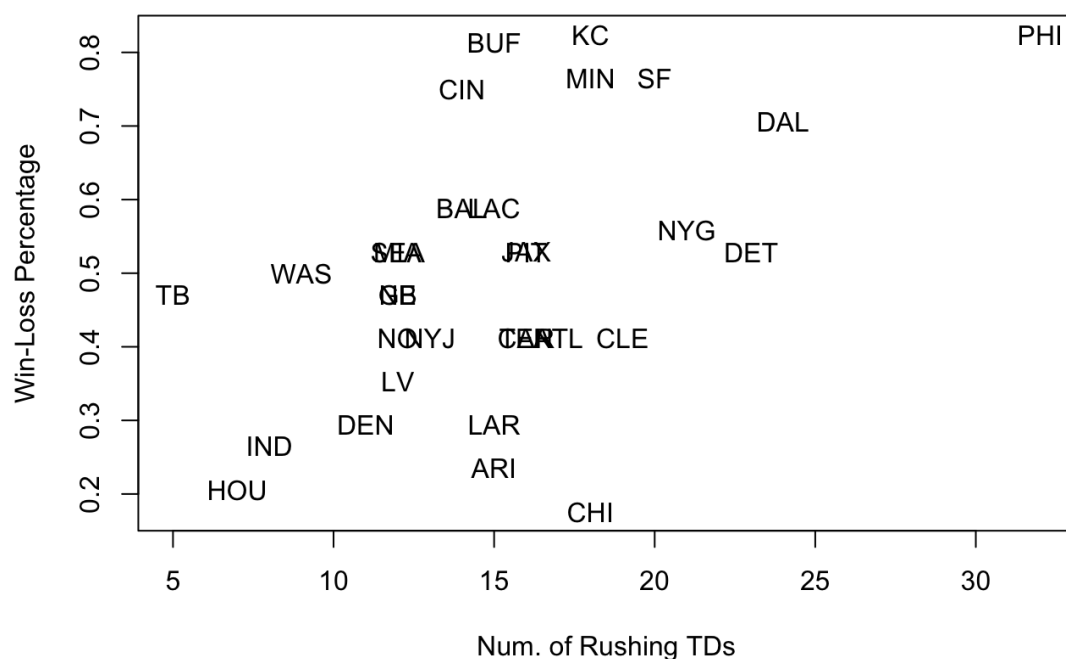


The correlation for this graph is 0.024. This shouldn't be surprising when seeing how sporadic this graph is. The subsequent graphs, however, gave me far more surprising results. To put it bluntly, if you wanted your GM to pay your running backs, you may want to reconsider.



This is perhaps my most shocking discovery in this paper. As you can see, this graph is almost as sporadic as the previous graph. There are some pretty big overlaps in the middle where a bunch of teams around .500 had an average number of rushing yards, but there are few teams with a significant amount of rushing yards that finished above .500. In fact, of the ten teams that finished top 10 in rushing yards, six had a winning record (Ravens, Giants, Cowboys, 49ers, Bills, Eagles). Of the teams that finished bottom 10 in rushing yards, four still had a winning record (Chargers, Bengals, Dolphins, Vikings), and the Bucs still made the playoffs at 8-9. Compare this with the teams that finished top 10 or bottom 10 in passing yards, as finishing top 10 in passing yards basically guaranteed a playoff berth or winning season, while finishing bottom 10 almost always doomed you. Numerically, the correlation is 0.049.

Simply put, the yardage gained from passing is significantly more valuable from the yardage gained from rushing. In fact, it's not even close which type of offense is more vital to team success.



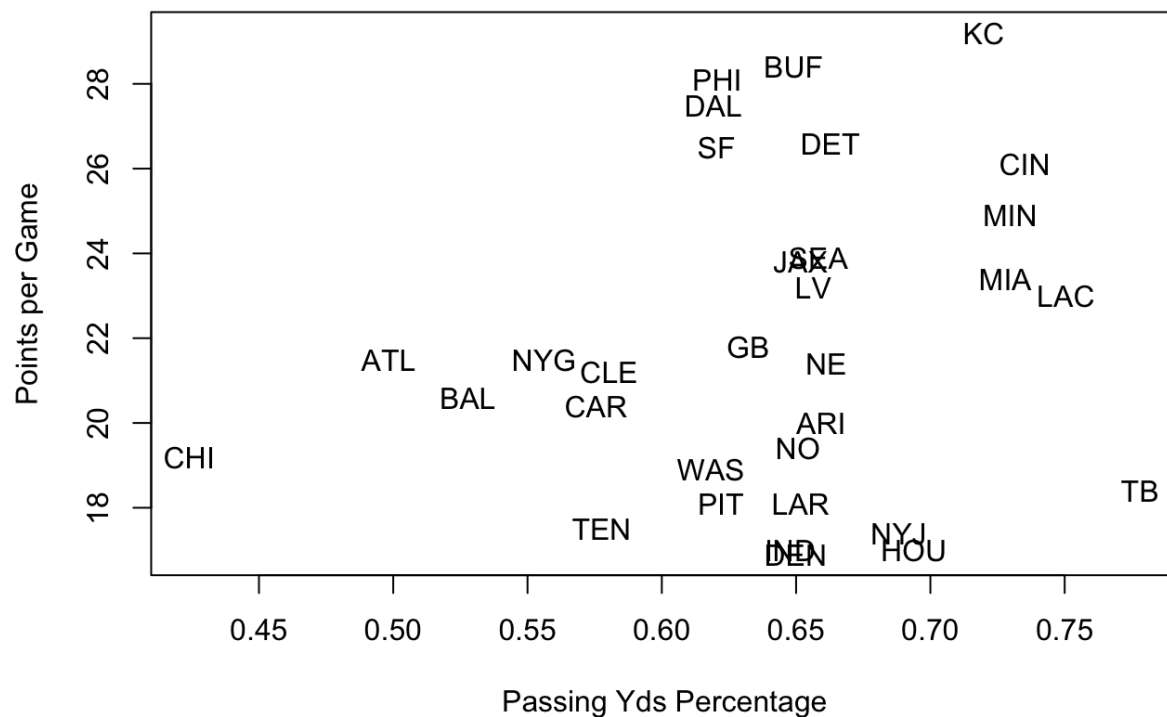
As you can see, the number of rushing touchdowns has a far stronger correlation, it is roughly 0.50. The numerical correlation is 0.50, so teams who score many rushing TDs generally have a decent enough offense. As I alluded to earlier, some of these teams have had strong passing attacks that put their rushers in the red zone, making it easier for the backs. Still, the correlation is dwarfed by the correlation of passing TDs and win rate (about 0.18 lower). This makes sense since the correlation between rushing touchdowns and offensive ranking was significantly smaller than the correlation of passing TDs and offensive ranking (about 0.2). So while scoring more rushing TDs does help you a modest amount in winning games, it doesn't help teams as much as passing TDs on average. The Chiefs and Bears have the same number of rushing TDs but they are polar opposites in win percentage. Notice that the Chiefs and Bears are polar opposites in passing metrics as well.

Of the teams that finished top 10 in rushing touchdowns, seven finished with a winning record. Of the teams that finished bottom 10 in rushing touchdowns, two finished with a winning record (but the Bucs had a playoff berth). In general, it is important to be able to have rushers to find the endzone, but to be able to reach the red zone you need a strong passing offense to lead you there.

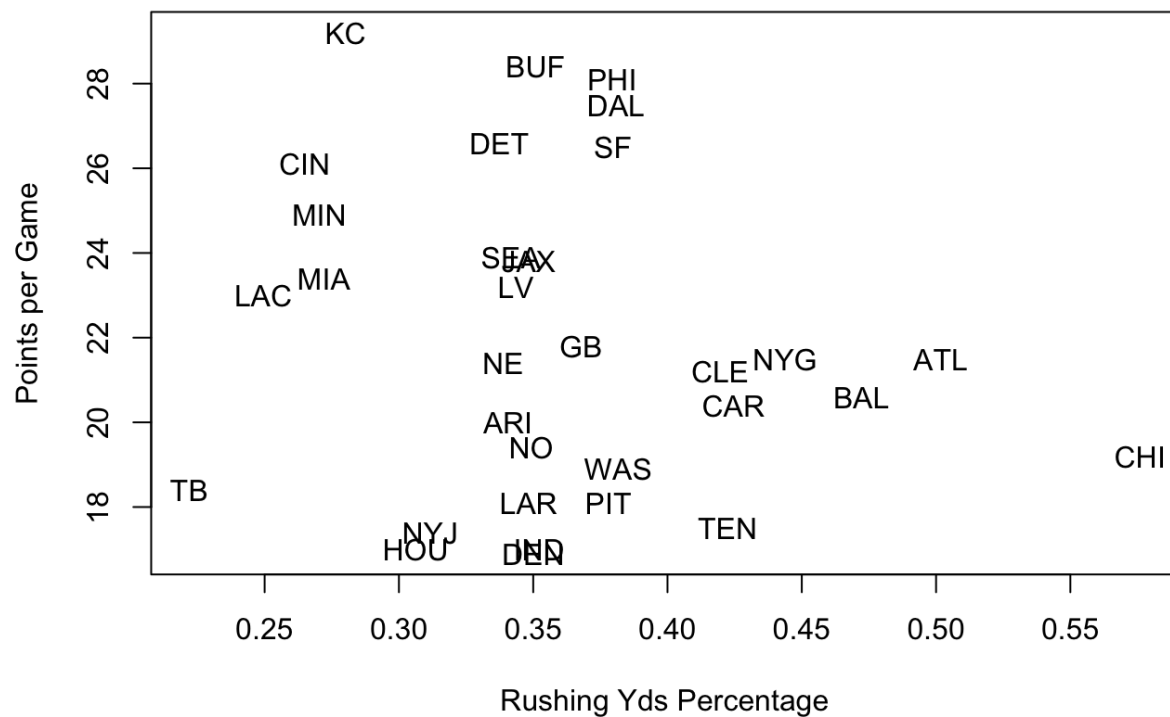
Notice that there are few teams with winning records that have a below average number of passing TDs. The Giants and Ravens were bailed out by rushing offenses and a solid defense, but they're very much exceptions. Cleveland and Chicago had an above average number of rushing TDs and they both had bad records. Essentially, to have a winning record you pretty much always have to have a high number of passing TDs, but you don't need a substantial number of rushing TDs (e.g. Seahawks, Dolphins, and Bengals).

Consider the Balance of Passing vs Rushing

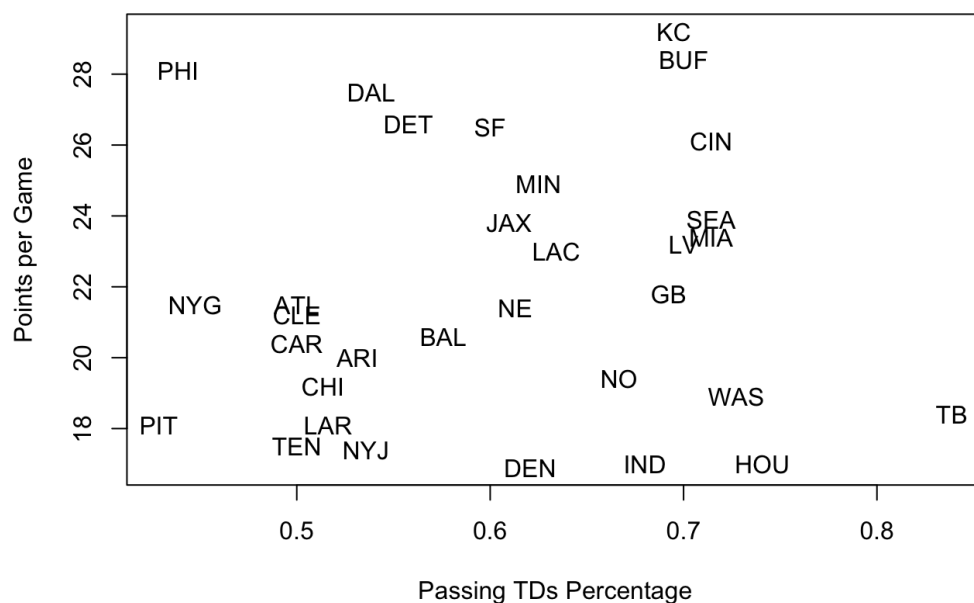
Is the best offense a balanced offense? The previous analysis has shown that you need at least a serviceable rushing offense that can get touchdowns. In order to consider the significance of offensive balance, I created new data frames which contained the percentages of yards and TDs gained from passing or rushing. For instance, to find the proportion of TDs from rushing I did (Rushing TDs/(Passing TDs + Rushing TDs)). The results were... interesting.



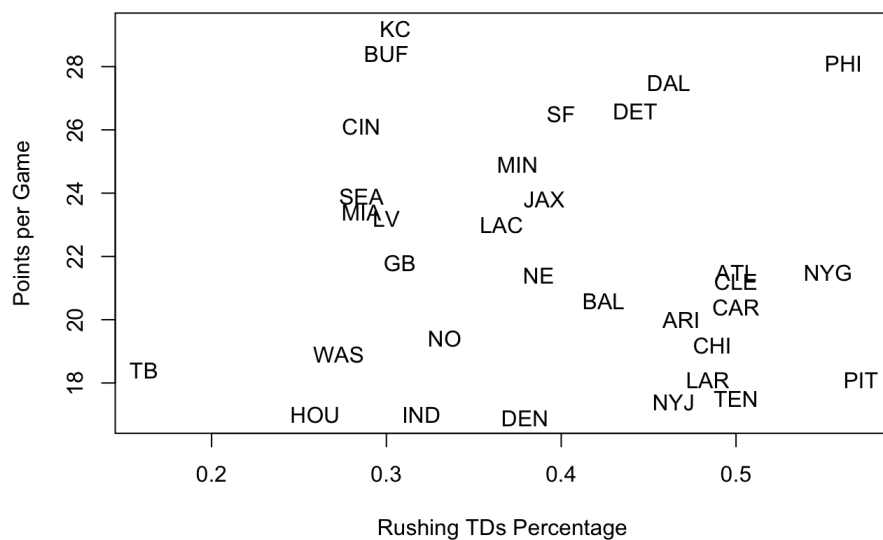
The numerical correlation is 0.189. In other words, to have a good offense it really didn't seem to make that much of a difference if more of your yards came from passing or rushing. Right? Well, considering the fact that the rushing yards percentage is essentially the converse of the passing yards percentage, this would mean that the numerical correlation for rushing yards percentage is...

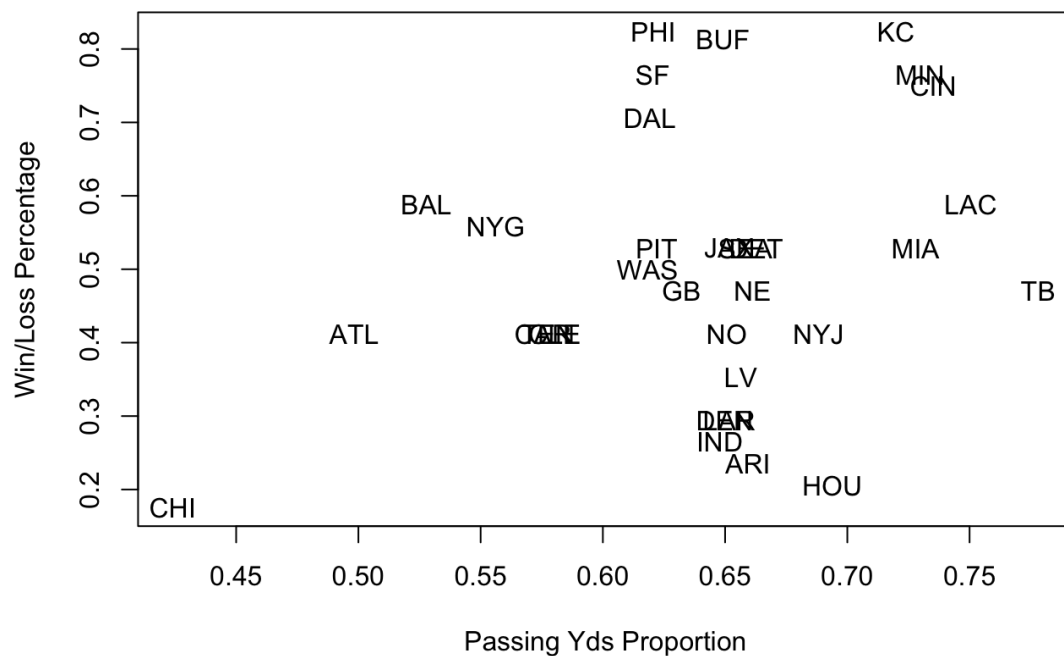


... -0.189. There's only one team where more yards came from the ground than the air, and it was Chicago. No team where more than 40% of their yards came from the ground had a good offense. It does seem like if about a third of your yards come from the ground, then you could either have an amazing offense or the literal worst offense in the league. There is only one team who has less than 30% of their yards come from the ground with a below average offense, and it's Tampa. The Chargers, Dolphins, Vikings, Bengals, and Chiefs all had an above average to elite offense

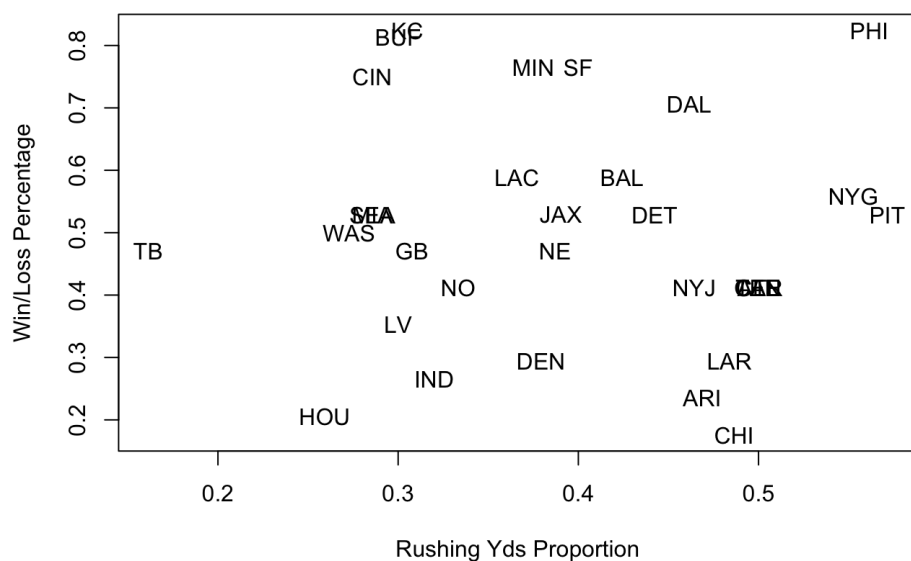


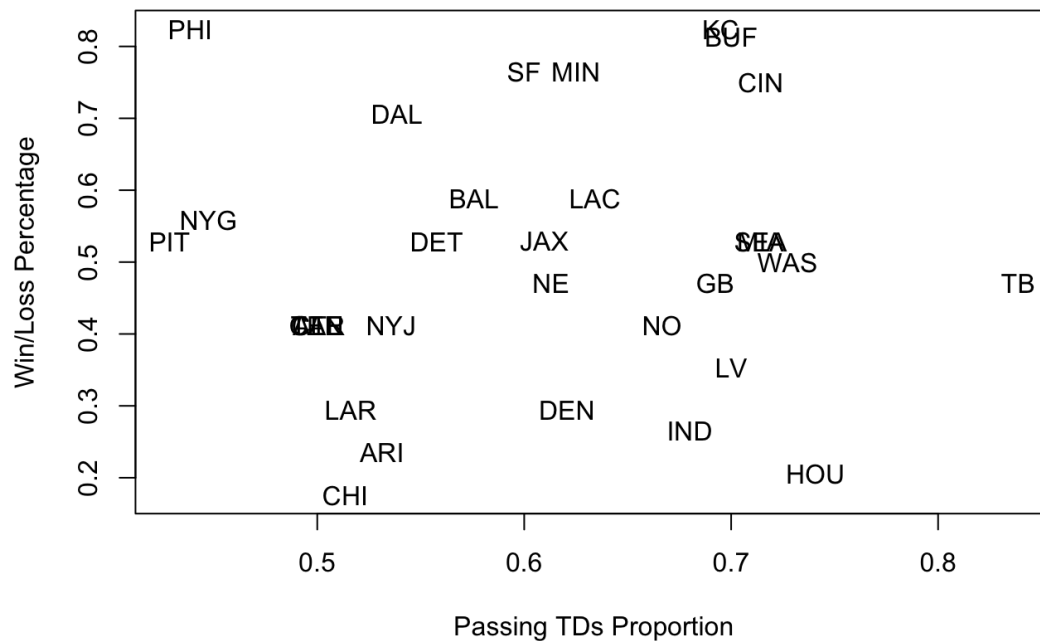
Not surprisingly, the proportion of passing touchdowns don't matter as much as the proportion of passing yards. The correlation is 0.064 (so the below graph's correlation is -0.064), and the only team where more than 80% of their touchdowns came from the air is Tampa's poor offense. Still, of the three teams where less than 50% of their touchdowns came from the air, the Eagles are the only one whose offense is good (and remember they had an elite passing game as well).



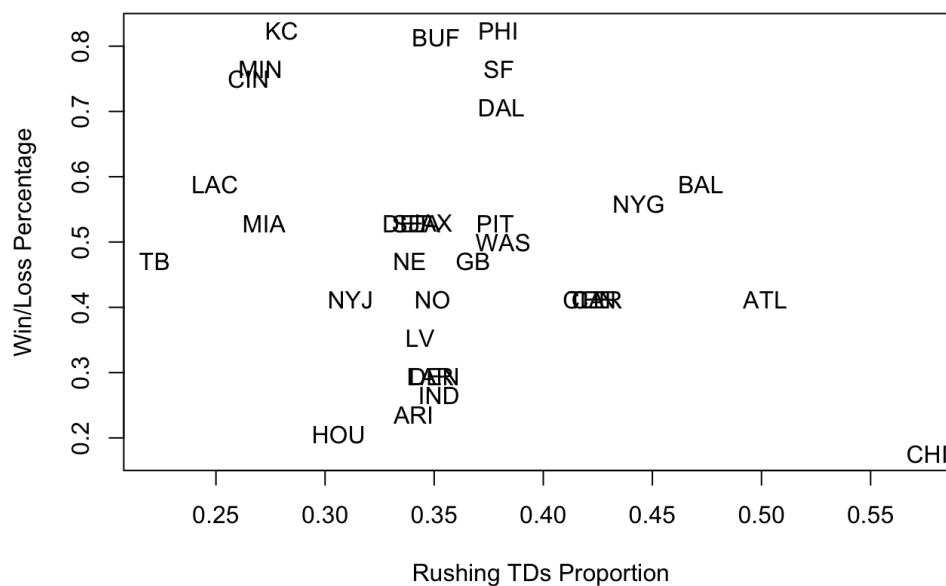


In terms of team success, there are only two teams with winning records and less than 60% of their yards came from the air. The Bears are the only team where less than 50% of their yards came from the air, in fact no team comes even close. Unsurprisingly, they are also the worst team in the league. The numerical correlation is 0.281.





The numerical correlation for this stat is 0.056. Once again, there are only two teams who had less than half of their touchdowns come from the air and also win more than half of their games. However, of the teams who had roughly 70% or more of their TDs come from the air, most of them have winning records. Still, the correlation is basically nonexistent.



Conclusion

So, is running the ball important in the NFL?

No.

Every metric used has not been kind to the contrary response. You won't have a successful offense if you *only* have a good rushing offense, but you can have a successful offense if you only have a good passing offense. In fact, if you want to have a successful offense, it's basically mandatory to have a strong passing game. The same idea applies to team success: if you want to win games, you need to have a solid passing game.

It's evident that Saquon's injury has impacted the Giants offense. In fact, it's pretty much broken. Since Saquon's injury the Giants have scored 15 points over the course of two games and have averaged a whopping 11.5 points per game this season. [As of the end of week 4](#) the Giants are last in points scored with a dismal 46. The average is 90. Here's another depressing stat: Eagles kicker Jake Elliot has scored [48 points](#). The Giants are second to last in passer rating (thanks Joe Burrow for being the last), third to last in passing yards, tied for last in passing TDs, one INT from leading the league in that category, and the offense is going nowhere due to our disastrous passing game.

Does the current state of the Giants prove Saquon's point? In my opinion, no. In fact, it proves the idea that if your running back is key to your offense, then your offense is fundamentally terrible. While Saquon is clearly vital to the offense, if he's frequently injured, then what do we do? Do we just hope that he won't get injured in subsequent seasons in order to have a semi-functional offense? This season it seems like Schoen tried to invest in both Saquon and a viable passing offense by extending Jones, but unfortunately neither investments panned out.

Barkley is not the only star running back injured this season. The Chargers lost Ekeler early in the season and they have the 7th most points scored this season. They scored 110 points in total so far, 76 of which came in Ekeler's absence. It's thanks to Herbert's 109.8 passer rating (third highest so far), having the fifth most passing yards, fifth most TDs, and only one interception. The Colts without Taylor also have a respectable offense. They have 97 points scored, 14th most in the league, although they are 16th in passer rating, 15th in TDs, 18th in passing yards, but only one interception. It should be worth noting that the Falcons have the 25th best offense at 62 points scored due to having the 25th best passer rating, the least amount of passing yards, 29th in TDs (they have 3), and 3 INTs. This is despite them having the 11th most rushing yards, 11th highest rushing Y/A, and 16th most rushing TDs. As you can notice the correlation of general offensive success and passing success has continued.

In my opinion, keeping Saquon is like keeping a boat after your house burned down. You're better off selling that boat to your wealthy friends upstate (in this metaphor it'd be the Bills) so they can use and maintain the boat while you can focus on rebuilding your home. Let him play behind a real o-line with a viable offense and earn his championship there. It's a cliché to say this, but the stats prove that running backs are a luxury item, and if you need a luxury item to survive then you need to consider how you sustain yourself. I doubt that if Saquon wasn't injured this season we'd be close to being *average*.

While it is true that rushing touchdowns can be important to offensive and overall team success, it is also true that many successful teams do not have many rushing touchdowns. The Bills, Bengals, and Chargers have an average to below average amount of rushing TDs. In fact, they have similar amounts to teams like the Cardinals and Rams, proving that playoff teams are buoyed more by their passing attacks than running backs.

Additionally, relying on rushing yardage to get to the endzone is not practical. The statistical metrics have proven that relying on running for yards is basically a proverbial kiss of death for your offense. Teams like the Giants and Ravens, where they have middling passing offenses but strong rushing offenses, rarely have success. The Giants and Ravens are outliers in this category and are backed by solid defenses (and in the Giants' case a very easy schedule as well). Neither team won more than 10 games or came close to winning their division. Additionally, Lamar's injury severely affected the team's performance, as they went 3-4 (including postseason) in his absence. When they relied significantly more on their run game the team never scored more than 17 points.

Having this "old school" rushing offense puts a massive ceiling on how successful your team can be, in fact your offense will be average at best. For the cases of the Giants and Ravens it was sort of done out of necessity. The Ravens relied on the run game due to Lamar's injury and the Giants relied on the run game due to their WR1 being Kenny Golladay and a guy from the Bills' practice squad. No team or front office wants to completely rely on a running game, or at the very least they shouldn't want to (looking at you Arthur Smith).

Many running backs are some of my favorite players (Ekeler, Chubb, Jacobs, CMC, and of course Barkley), and it's unfortunate the analytics have persuaded me to agree with the front office. It's difficult to justify paying them lofty contracts. A large part of me wanted Barkley to have the contract he demanded, but it's sadly safe to say that the front office made the right decision. It doesn't help that he most likely won't be a Giant next year, the team is heading towards a rebuild and will most likely trade Saquon for draft picks to facilitate the task. Fans should trust the process of their GMs (unless it's Gettleman).