WHAT'S WRONG WITH THIS GOLDEN STATE WARRIORS

Michael Wang

3/6/2022

Overview

At the right beginning of Season 2021-22, Golden State Warriors brought impressive energy on the court and made some effective strategic changes, which led to their high rank in west conference. The Warriors has experienced lots of events this season: Stephen Curry broke the all-time 3 point record of Ray Allen and the record of 3 pointers in all-star game, Klay Thompson got back on court, and Jordan Poole evolved to be a better scorer. However, they are recently experiencing the most devastating losing streak in this season since in Feb 9, 2022, Utah Jazz broke their winning streak. Why a team changes from one of the top teams in the league to a team that lost 8 games in last 10 games? Throughout the entire analysis, my major conclusions about the reason behind Warriors' losing streak are:

```
•The lineup issue. We need center, especially Draymond and Looney, being on the court.
•Klay. He's back, but with some negative effects on the court.
•Stability. Players with big fluctuation in FG% would impact the team.
```

All the data I used in this analysis are from the website **pbpstats**, which includes play-by-play data of Warriors and some advanced detailed analysis of players on/off and lineups. The data I use is the first 63 games in the season, from Oct 19, 2021 to Mar 3, 2022. And the losing streak period starts from Feb 9, 2022.

A Glance at Stephen Curry and His Shot Charts

During the first 63 games of Season 2021-22, Stephen Curry has attempted 1133 shots and made 486 of them. His Field Goal Percentage (FG%) is 0.429. Even though such a Field Goal Percentage doesn't make him as terrific as last season (0.482 of FG%), it still gives him a priority of double team from his opponents.

Stephen Curry
Regular Season, 2021–22

Made Shot   Missed Shot
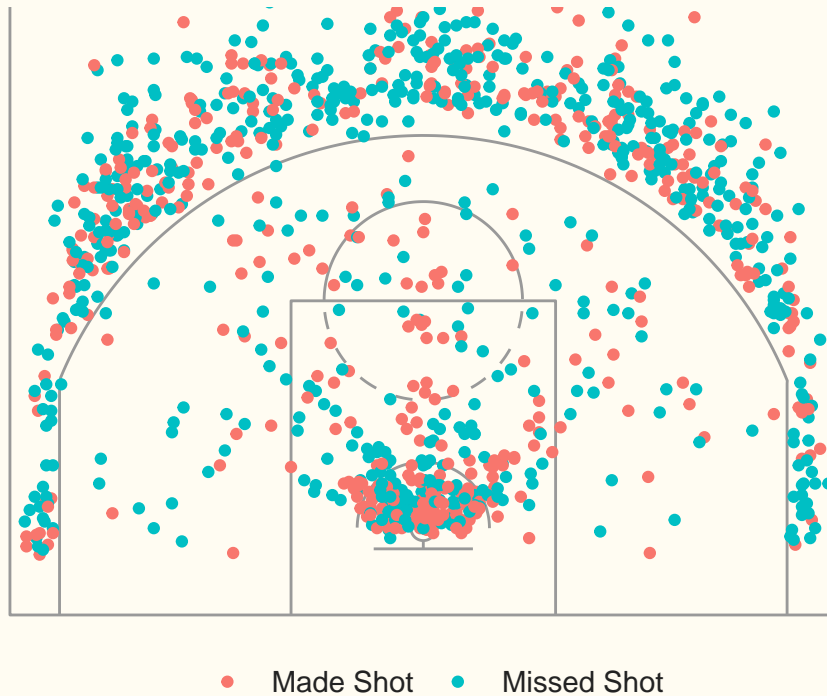
Stephen Curry Shots after Feb 9, 2022
## Regular Season, 2021–22

Made Shot • Missed Shot
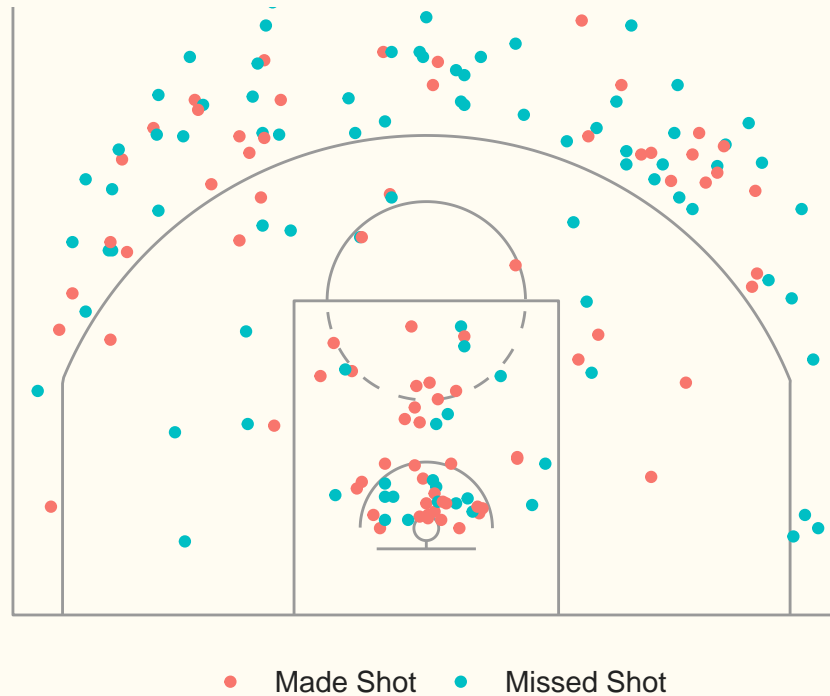
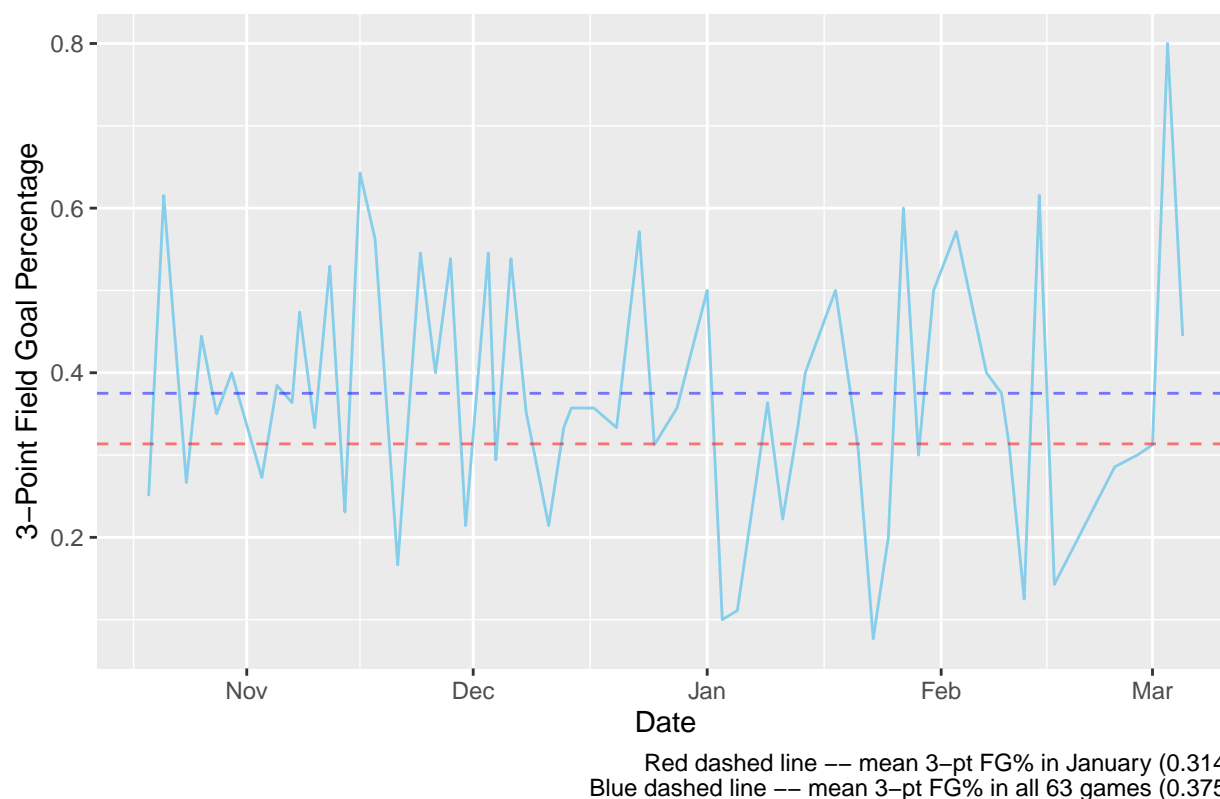**Stephen Curry's Field Goal Percentage Changes over Time**

But when we examine his FG% play by play throughout the 63 games, there has been a huge fluctuation in Curry's FG%, especially in his 3-point FG%.

```
## Rows: 59 Columns: 31
## -- Column specification ----------------------------------------------------------
## Delimiter: ","
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## dbl  (27): OffPoss, Points, FG2M, FG2A, Fg2Pct, FG3M, FG3A, Fg3Pct, NonHeave...
## date  (1): Date
## time  (1): Minutes
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

Graph1: Stephen's 2−Point Field Goal Percentage Changes over Time
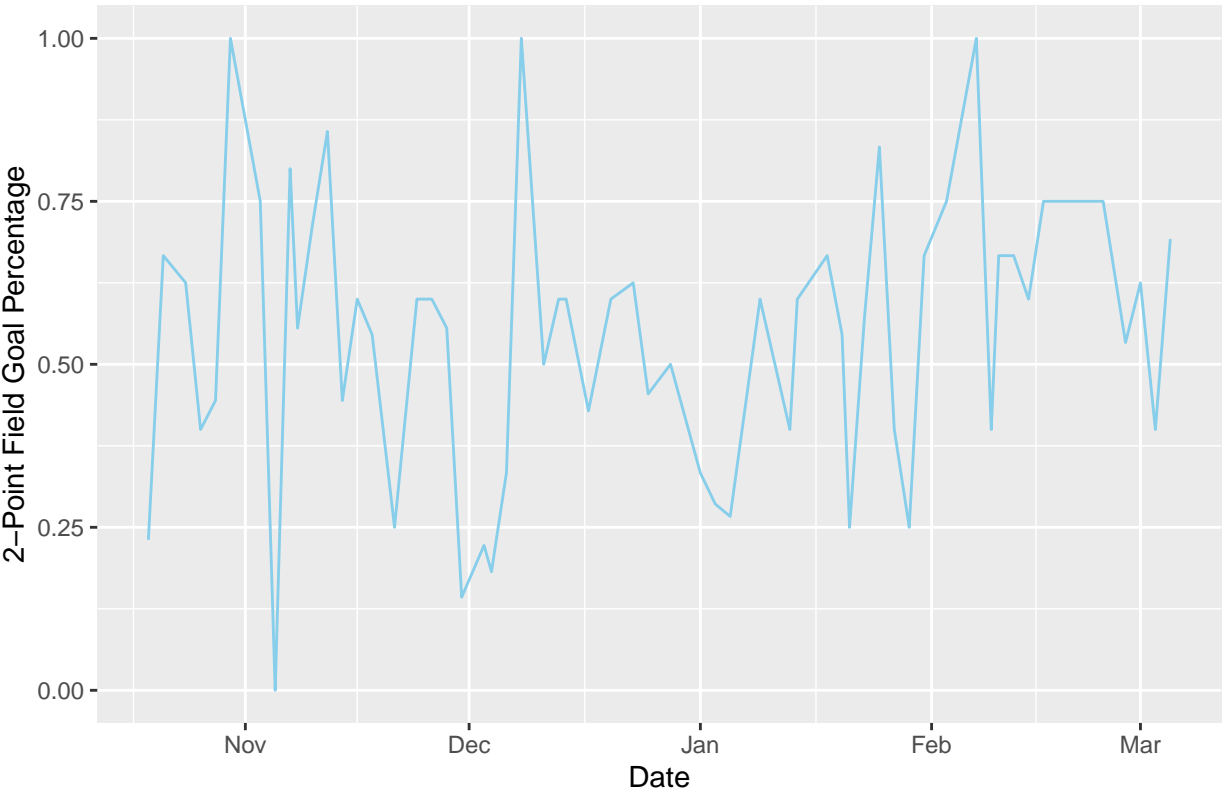
Graph2: Stephen's 3–Point Field Goal Percentage Changes over Time

Red dashed line –– mean 3–pt FG% in January (0.314)
Blue dashed line –– mean 3–pt FG% in all 63 games (0.375)

From the line graph we can clearly see the visualized fluctuation. He could have a 3-point FG% over 60%; He also could have a 3-point FG% less than 20%. I still remembered he struggled his 3-pt shots in January. The red dashed line in the Graph2 represents his mean 3-pt FG% in January (0.314), the blue dashed line in Graph2 represents his mean 3-pt FG% in all 63 games (0.375). We could easily tell his bad feelings of shots in January.

So, is Curry's bad shots a really important cause of their lose? I don't think so. Let's look at some data before and after Warriors losing.

Curry's FG% after They Start to Lose

SHOT_TYPE	FGA	FGM	FGP
2PT Field Goal	77	46	0.5974026
3PT Field Goal	90	32	0.3555556

Curry's FG% Before They Start to Lose

SHOT_TYPE	FGA	FGM	FGP
2PT Field Goal	355	175	0.4929577
3PT Field Goal	611	233	0.3813421

Before Feb 9, Stephen Curry has a 2-point FG% of 0.493 and a 3-point FG% of 0.381. After Feb 9, He has a 2-point FG% of 0.597 and a 3-point FG% of 0.356. Even though there is a decrease in 3-pt FG%, the

high increase in 2-pt FG% could make Curry keep his efficiency. Maybe he starts to make better choice on shooting 2 points during the losing streak, but still try to find his feeling of 3-point shot. Thus, despite some fluctuation in FG%, Curry is still using his own way to impact the game during the losing streak.

Would Draymond Be An Important Reason

Some voices attribute Warriors losing streak to Draymond's injury since Jan 6, 2022. From my perspective, Draymond's injury certainly can bring some negative impacts to the team.

Curry's FG% without Draymond

SHOT_TYPE	FGA_pergame_wo_Draymond	FGM_pergame_wo_Draymond	FGA	FGM	FGP
2PT Field Goal	6.807692	3.807692	177	99	0.5593220
3PT Field Goal	9.115385	3.269231	237	85	0.3586498

Curry's FG% with Draymond

SHOT_TYPE	FGA	FGM	FGA_pergame_with_Draymond	FGM_pergame_with_Draymond	FGP
2PT Field Goal	432	221	11.67568	5.972973	0.5115741
3PT Field Goal	701	265	18.94595	7.162162	0.3780314

What we could see from the FG% change is that Curry's 2-pt FG% increases but 3-pt FG% decreases after Jan 6, 2022 (Draymond injured). Without Draymond, a key offense starting point is lost. So, Curry has to decrease some off-ball play for a chance to shoot a three, making some of his shot qualities bad. But an increase in 2-point FG% doesn't necessarily mean something better happening due to Draymond's absence. Curry has experienced a huge fluctuation of his 2-point FG% before year 2022 (we could tell from Graph 1). The increase in 2-point could be resulted from Curry's own adjustment to his normal level of efficiency. Also, without Draymond, both of Curry's 2-point shots made and attempted and 3-point shots made and attempted decrease, which effectively illustrates Draymond's impact.

But his impact is not limited to only Stephen Curry. He is influencing the entire team positively when he's on court.

Impact of Draymond Being On/Off the Court to the Team

	Stat	Stat.Value.with.Draymond	Stat.Value.without.Draymond	Difference
87	Pace	99.205	97.321	1.88
88	Assists per 100 Possessions	29.900	26.570	3.33
89	Assist Points per 100 Possessions	71.761	64.789	6.97

Stat	Stat.Value.with.Draymond	Stat.Value.without.Draymond	Difference
Pts per 100 Possessions - Defense	103.522	108.045	-4.52
Second Chance Points Per 100 Possessions	12.340	13.130	-0.79

Stat	Stat.Value.with.Draymond	Stat.Value.without.Draymond	Difference
Seconds Per Possession - Offense	13.866	14.611	-0.75

One interesting data on the pbpstats is "On/ off players". Basically, it shows the difference/ impact when the player is on/ off the court. I listed the 6 largest impacts (differences) that Draymond being on/ off the court could bring (for both positive and negative), which could be divided into Offense and Defense. On offensive side, without Draymond, assist points per 100 possessions would decrease by nearly 7; assists per 100 possessions would decrease by 3.33. As a key starting point of the entire offensive attack, Draymond could indeed bring more effective passes and assists to the team using his basketball intelligence. On defensive side, without Draymond, the opponents will score 4.52 more points (Pts per 100 possessions - defense). This is a good indicator of Draymond's impact on defensive side of defensive efficiency.

With all those data and analysis combined, I think, to some extent, that this Warriors has lost a crucial part due to Draymond's absence, which might be a reason for their losing streak recently. But Draymond's absence can be only part of the story. There should be more.

What's Wrong with the Team

Warriors Offensive Efficiency

```
## 'summarise()' has grouped output by 'Date'. You can override using the
## '.groups' argument.
```


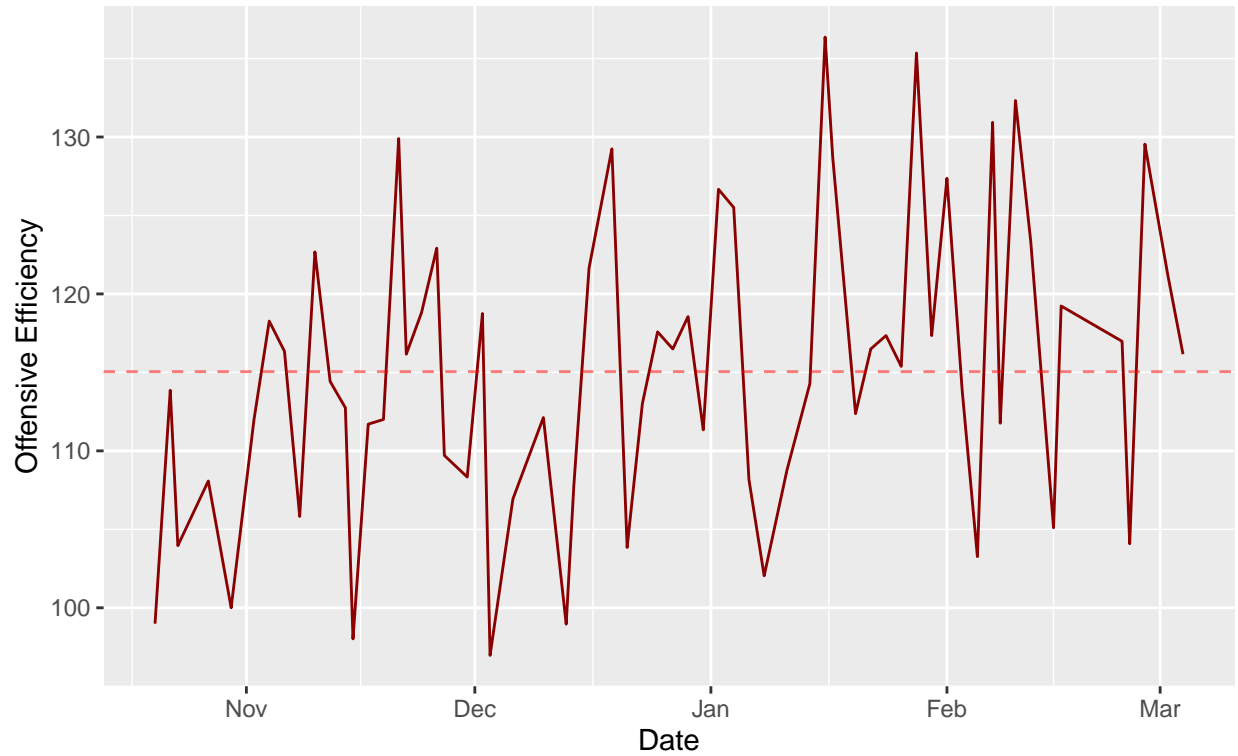Graph3: Warriors Offensive Efficiency Changes over Time
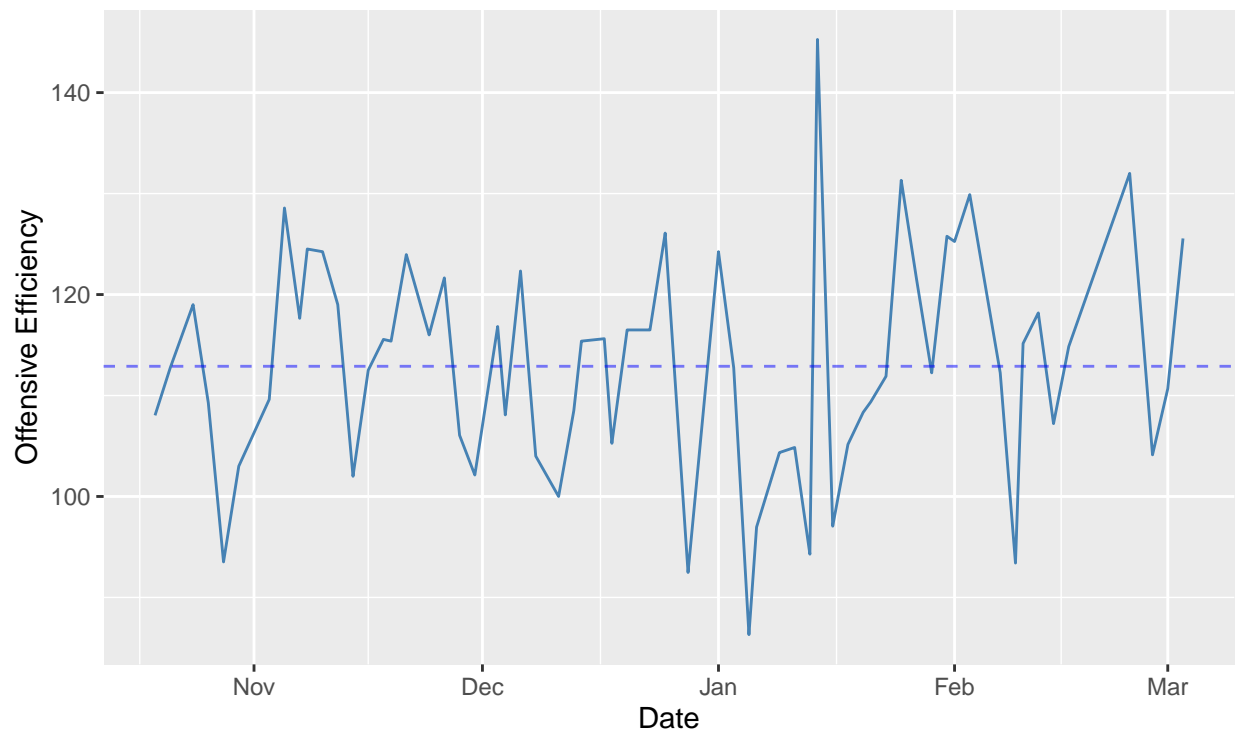
*Offensive Efficiency = Points in 100 Possessions
Blue dashed line –– Warriors mean offensive efficiency of 63 games (112.893)

Pheonix Sun Offensive Efficiency

```
## `summarise()` has grouped output by 'Date'. You can override using the
## `.groups` argument.
```
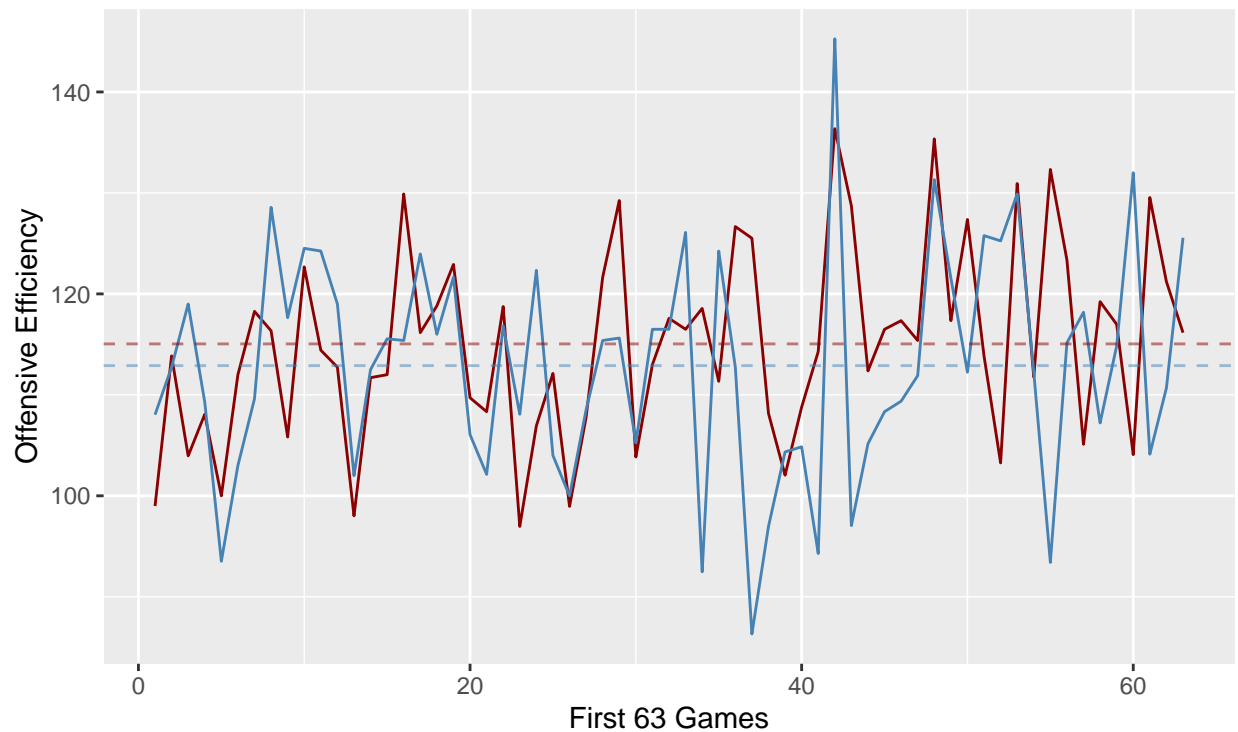
Graph4: Suns Offensive Efficiency Changes over Time

Red dashed line −− Suns mean offensive efficiency of 63 games (115.047)

Suns vs. Warriors

Graph5: Suns vs. Warriors (Offensive Efficiency)

Blue dashed line –– Warriors mean offensive efficiency of 63 games (112.893)
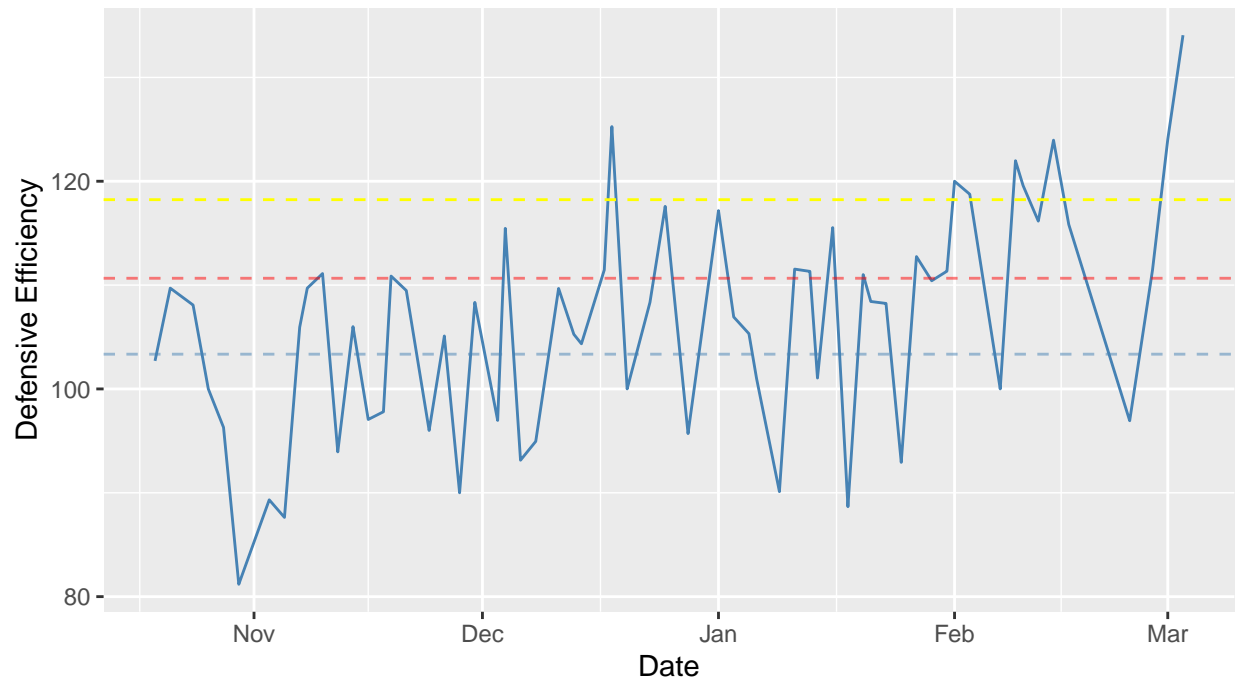Red dashed line –– Suns mean offensive efficiency of 63 games (115.047)

Warriors has an Offensive Efficiency (points in 100 possessions) of 112.893 in the first 63 games of the entire season. The offensive efficiency of Warriors is lower than that of one of their major opponents, Pheonix Suns, whose Offensive Efficiency is 125.047. If we take a closer look at the line graph (Graph 5), the variance/ amplitude of the lines of the Warriors Offensive Efficiency line is larger than that of the Suns line. Warriors Offensive Efficiency fluctuated from about 146 to about 85, whereas Suns Offensive Efficiency only fluctuated from about 136 to about 97. The large fluctuation/ variance/ amplitude in this case might also be a reason for the instability of their record.

Warriors Defensive Efficiency Changing by Time

```
## 'summarise()' has grouped output by 'Date'. You can override using the
## '.groups' argument.
```

## Graph 6: Warriors Defensive Efficiency Changes over Time

*Defensive Efficiency = Points allowed in 100 possessions
Blue dashed line –– Warriors mean defensive efficiency of 63 games (103.347)
Red dashed line –– Warriors mean defensive efficiency after Draymond left (110.657)
Yellow dashed line –– Warriors mean defensive efficiency during their losing streak (118.225)

If we say Warriors Offensive Efficiency is still kind of above average of the entire league, even almost catching with the top teams, their damaged defense after Draymond left and during their losing streak could certainly be one of the reason for their loss. For offensive efficiency, the higher the better, since we are measuring points a team will get in 100 possessions; for defensive efficiency, the lower the better, since we are measuring points allowed (the opponents' points) in 100 possessions. As we see in the graph, After Draymond has left, Warriors points allowed has skyrocketed, and it reaches a climax in the recent 10 games. Even though they are still among the best "average defensive efficiency" teams, their defensive plays recently are worse than most teams in the league.

Our goal for basketball is to outscore our opponents. Specifically for Warriors, we currently have a fair offense. But if we don't fix the issue on our defense, we could still lose the game, since our opponents can outscore us.
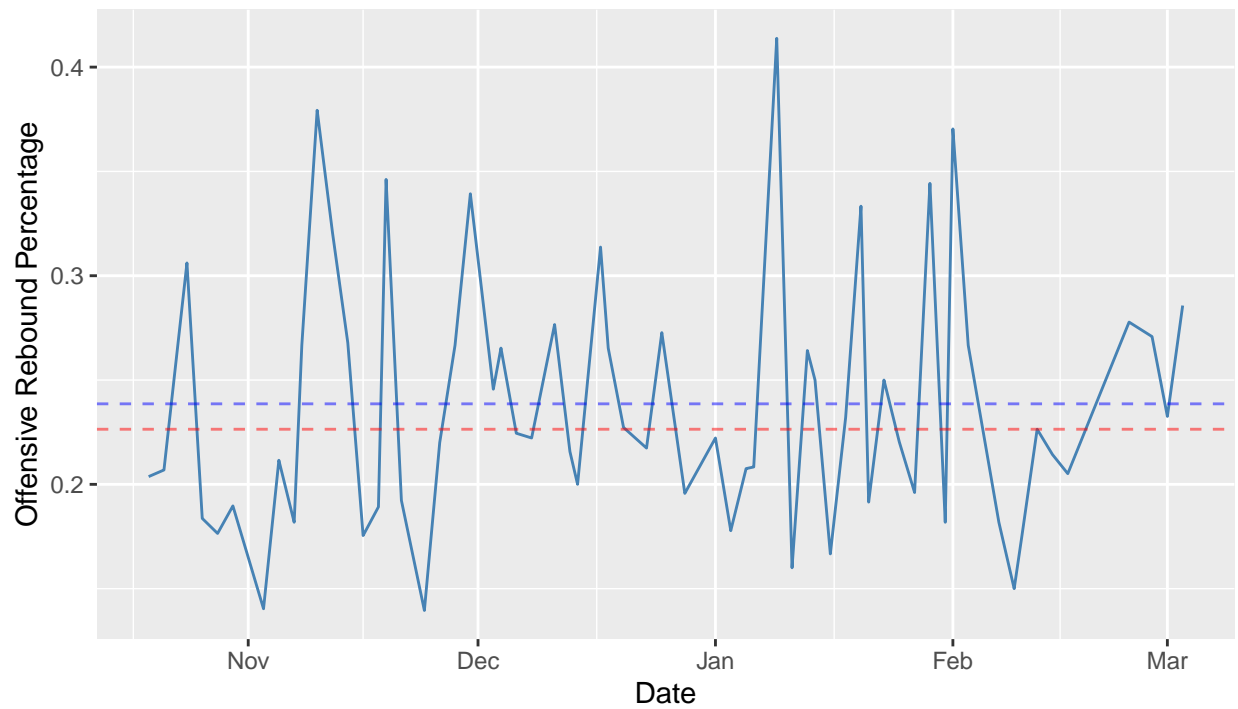
Warriors Rebound Before and After They Start to Lose

Graph7: Warriors Offensive Rebound Changes over Time
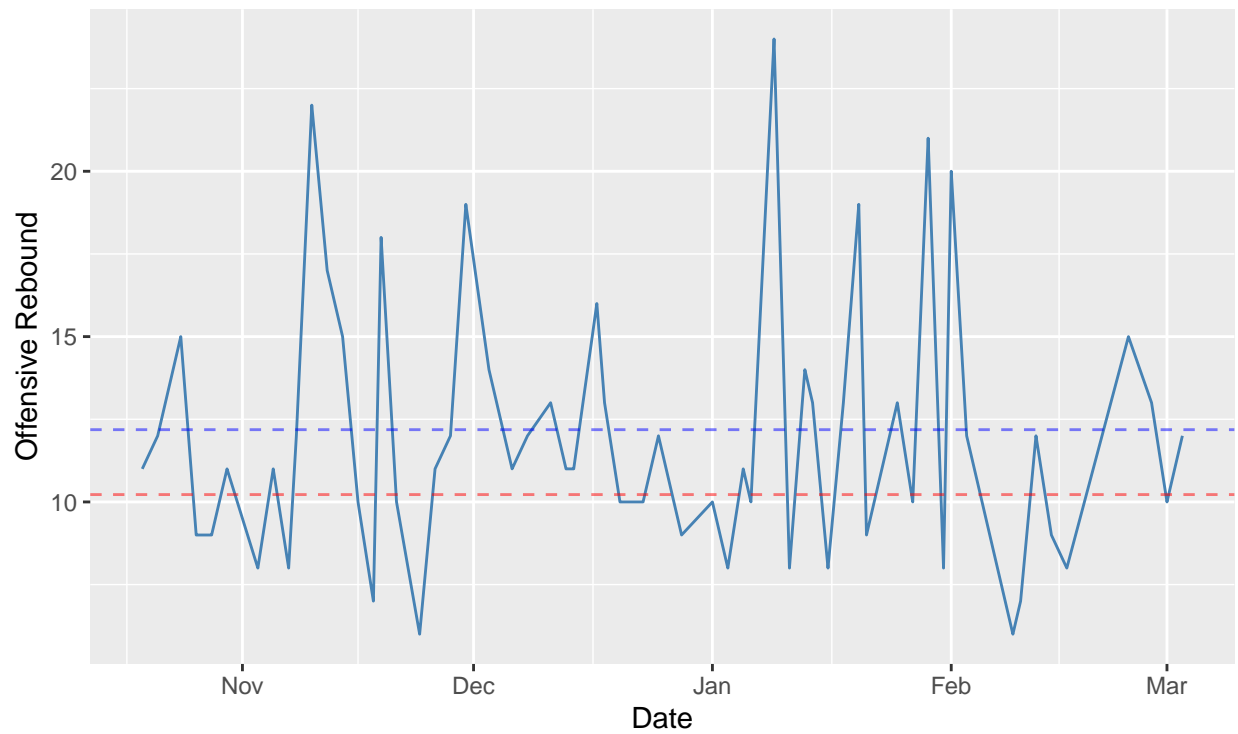
Blue dashed line –– Warriors mean offensive rebounds of 63 games (12.185)
Red dashed line –– Warriors mean offensive rebounds during their losing streak (10.222)
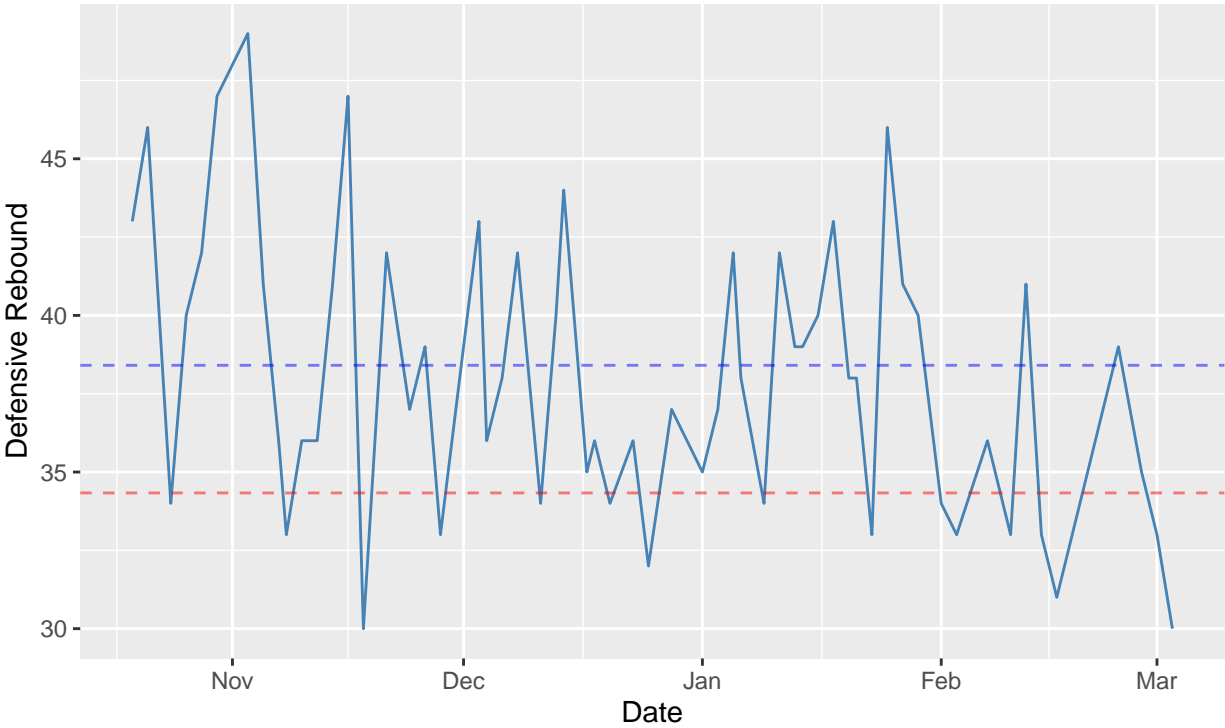
Graph 8: Warriors Offensive Rebound Percentage Changes over Time

*Offensive Rebound Percentage = Offensive Rebounds/ Total Rebound
Blue dashed line –– Warriors mean offensive rebounds percentage of 63 games (0.239)
Red dashed line –– Warriors mean offensive rebounds percentage during their losing streak (0.226)

If we look at both the offensive rebound and offensive rebound percentage, similar trend happens. Warriors gets less offensive rebound than before during this losing streak.

Graph 9: Warriors Defensive Rebound Changes over Time

Blue dashed line –– Warriors mean defensive rebounds of 63 games (38.407)
Red dashed line –– Warriors mean defensive rebounds during their losing streak (34.333)

Graph 10: Warriors Defensive Rebound Percentage Changes over Time
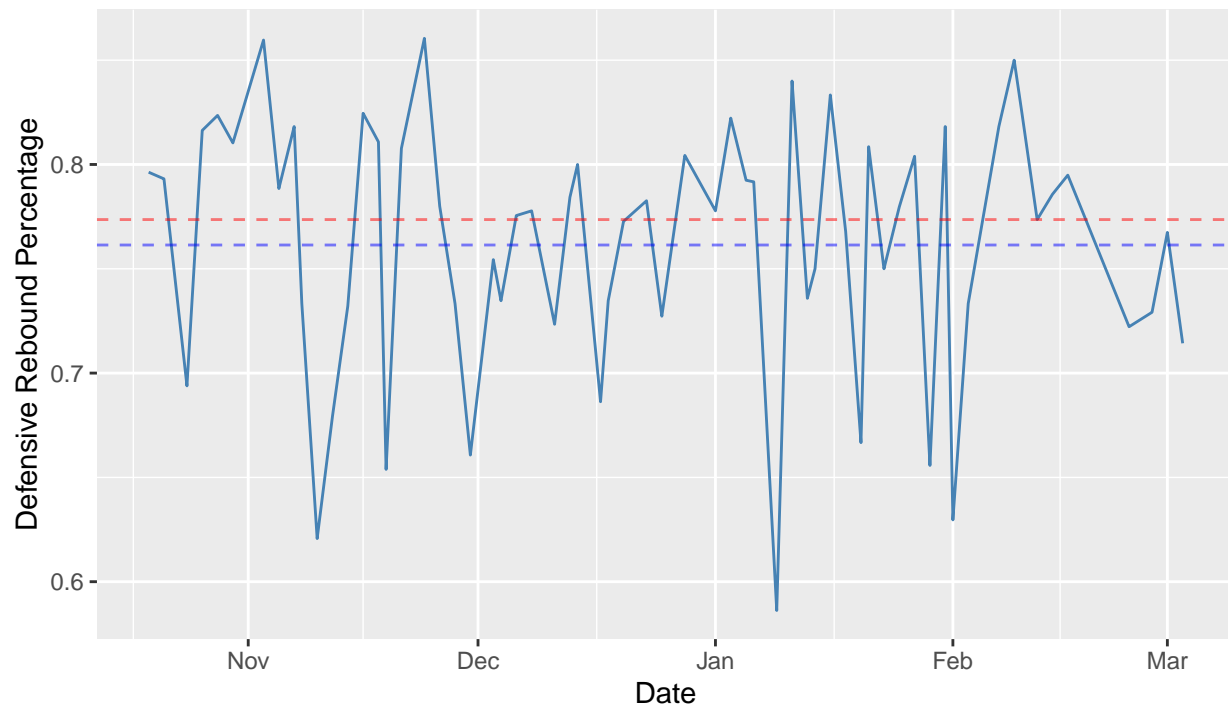
*Defensive Rebound Percentage = Defensive Rebounds/ Total Rebounds
Blue dashed line –– Warriors mean defensive rebounds percentage of 63 games (0.761)
Red dashed line –– Warriors mean offensive rebounds percentage during their losing streak (0.774)

When we look at the defensive rebound, the number of defensive rebound also decreases. With the decrease of the offensive rebound percentage, the defensive rebound percentage increases.

Both of the decreases in rebounds and defensive efficiency, from my perspective, could be related to an inappropriate lineup on the court, especially the inside players.

Coach Steve Kerr, one of the top 15 coaches of all time, has built the dub nation. In his strategies and mindset, smaller size of players on the court means better space. That's true, no doubt. But if we are currently encountering a losing streak, should we start to consider some drawbacks of the "small lineup"? We've seen some strange small lineup in this season, like Juan Toscano-Anderson (JTA) with 4 guards, or Otto Porter Jr. and Jonathan Kuminga (JK) with 3 guards, and we've seen those small lineups destroying both their offense and defense during 2nd or 3rd quarter (Warriors has lost many games when the opponents overcome large score deficit). Players like Stephen Curry, Klay Thompson, and Jordan Poole rely on their "hot hand", which makes them unstoppable if they have "hot hand" and easily stoppable if they don't. We've seen the fluctuation of Stephen Curry's efficiency. So, if our win or loss is depending on their "hot hand", it can definitely not be stable in long run, as it shows the losing streak after winning streak.

Small size also means weak play in the paint, both defense and offense. Throughout the season, if Warriors is facing teams with a strong inside player, like Jokic in Nuggets, Towns in Timberwolves, even Whiteside in Jazz, there is no way to limit their scoring in the paint and getting rebounds if Coach Kerr puts the small lineup on the court (and those big guys will become Shaq dominate the paint). Currently, Warriors doesn't have Draymond at this moment, things simply become even worse (we've seen the impact of his absence to the team).

Best Offense Lineup (with Best Offensive Efficiency)

So, if small size in lineup is not good, then what is good. Let's see some data about the "best lineups".

| ShortName	GamesPlayed	Minutes	Fg2Pct	Fg3Pct	Offensive_Efficiency
Looney, Payton II, Poole, Curry, Wiggins	12	36	0.6875000	0.5000000	145.5882
Looney, Poole, Curry, Porter Jr., Wiggins	11	88	0.5581395	0.3703704	125.5952
Toscano-Anderson, Poole, Curry, Green, Wiggins	11	32	0.5000000	0.4166667	122.3881
Looney, Poole, Curry, Green, Wiggins	29	347	0.5745856	0.3834586	114.1873
Poole, Curry, Green, Porter Jr., Wiggins	13	51	0.5128205	0.4081633	107.0175

Best Defense Lineup (with Best Defensive Efficiency)

ShortName	GamesPlayed	Minutes	Defensive_Efficiency
Poole, Curry, Green, Porter Jr., Wiggins	13	51	94.73684
Toscano-Anderson, Poole, Curry, Green, Wiggins	11	32	101.56250
Looney, Poole, Curry, Porter Jr., Wiggins	11	88	104.11765
Looney, Poole, Curry, Green, Wiggins	29	347	107.31034
Looney, Payton II, Poole, Curry, Wiggins	12	36	121.42857

The Best Offensive and Defensive lineup data are also generated from the website pbpstats, which helps us see and examine the lineups with best efficiency. If we take a closer look, the first 5 best defense and offense lineups, we could find that there is at least one inside player in every lineups (Draymond or Kevon Looney) to achieve a high efficiency. From both offensive and defensive efficiency side, we need size in the lineups rather than simply emphasizing the space using lineups like 1 forward plus 4 guards.

Is Warriors short of inside players? Yes. Warriors doesn't have Draymond and Wiseman now. But don't forget Looney! Does he have enough time being on the court?

Looney's Minutes on the Court
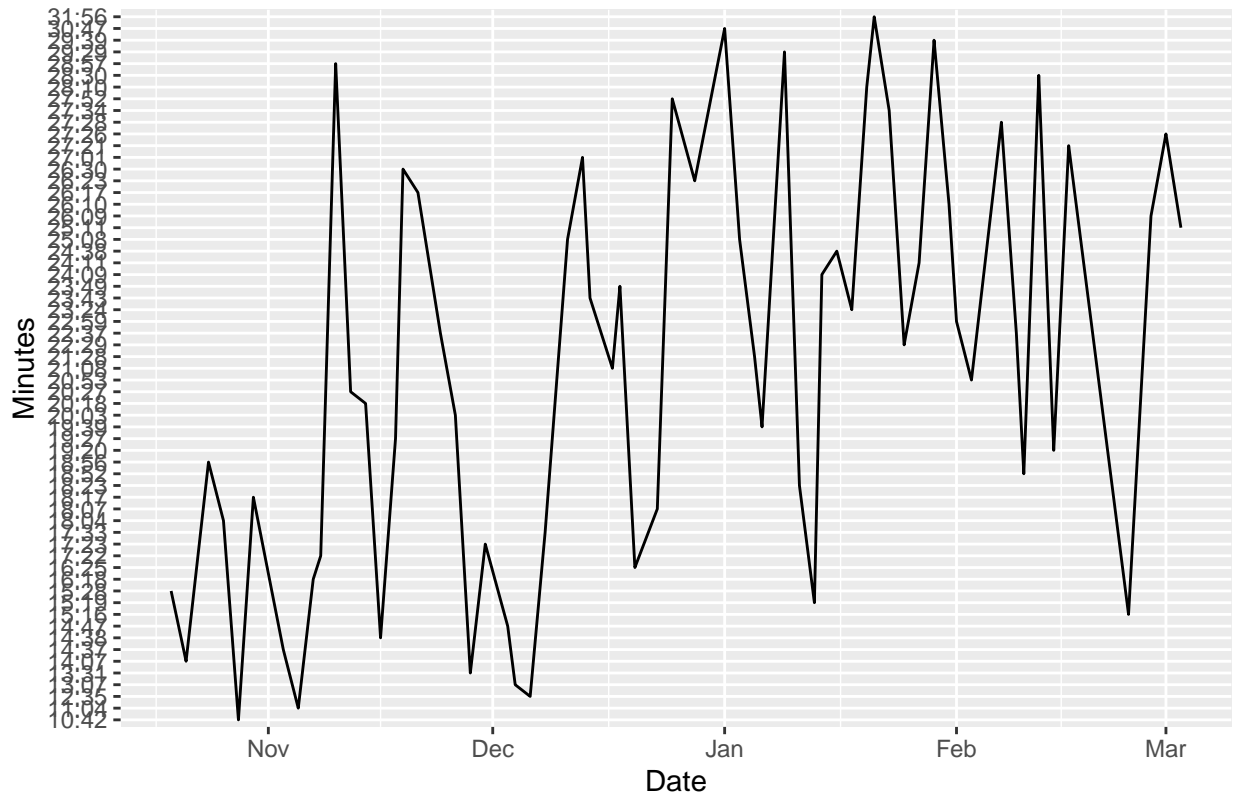
Why an crucial inside player who has never missed a single game has such a fluctuating minutes being on the court? This variable should be the one of the most consistent one. I know Coach Kerr values his small size of lineups, but we can't win without big guys. I assume that things will be better if we give Looney more time, because we need size on both defense and offense.

Another interesting point in this data frame is that we didn't see Kuminga in this best lineup list. This is reasonable because a freshman could make some turnovers and bad shots, which lowers the offensive and defensive efficiency of the lineup with him. But we also didn't see another name: Klay!

What's Wrong with Individual Players

Klay Thompson

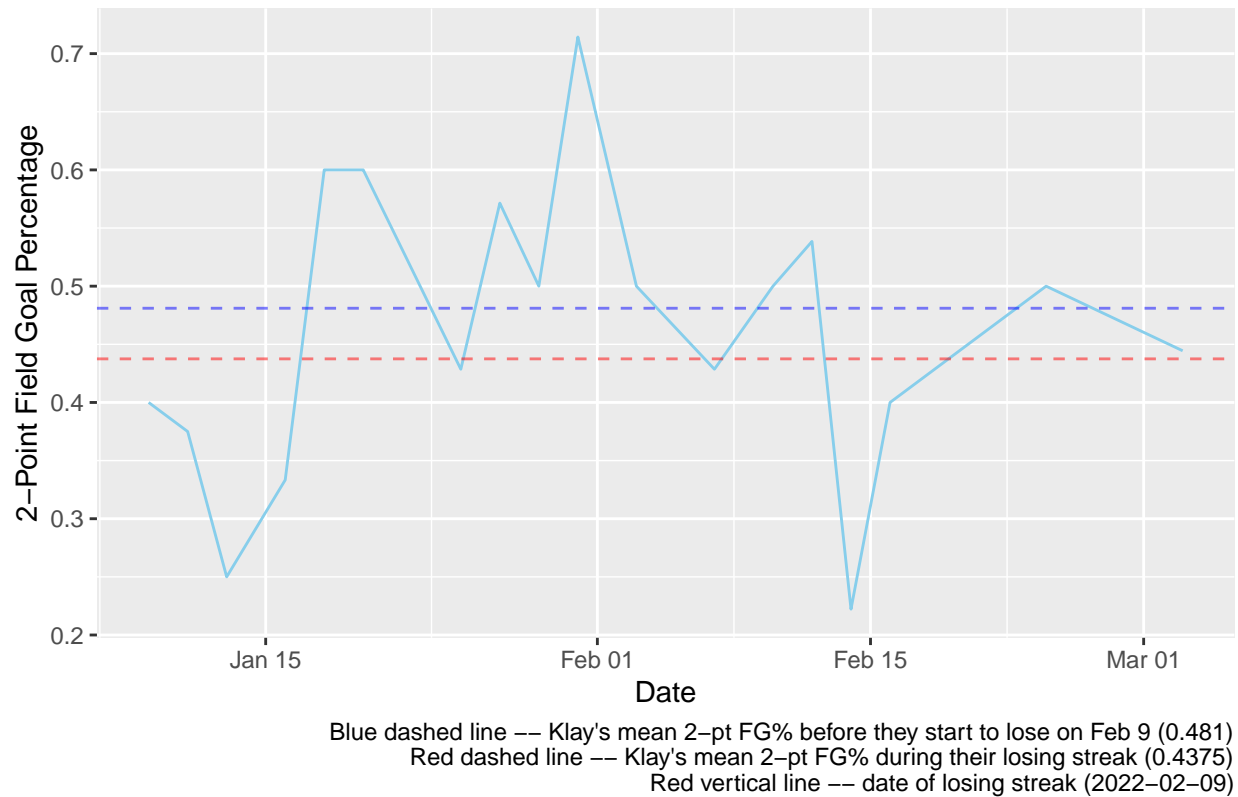|	Name	GamesPlayed	Minutes	OffPoss	Points	Fg2Pct	Fg3Pct
13	Klay Thompson	18	457	956	307	0.4645669	0.3768116

Fair Average FG% for both 2 point and 3 point! It's great pleasure to see Klay back on court and bring this FG% to fans. But average is, after all, average. It cannot depict the whole picture. Let's see some "Play by Play" data to reveal what Klay has done on court.

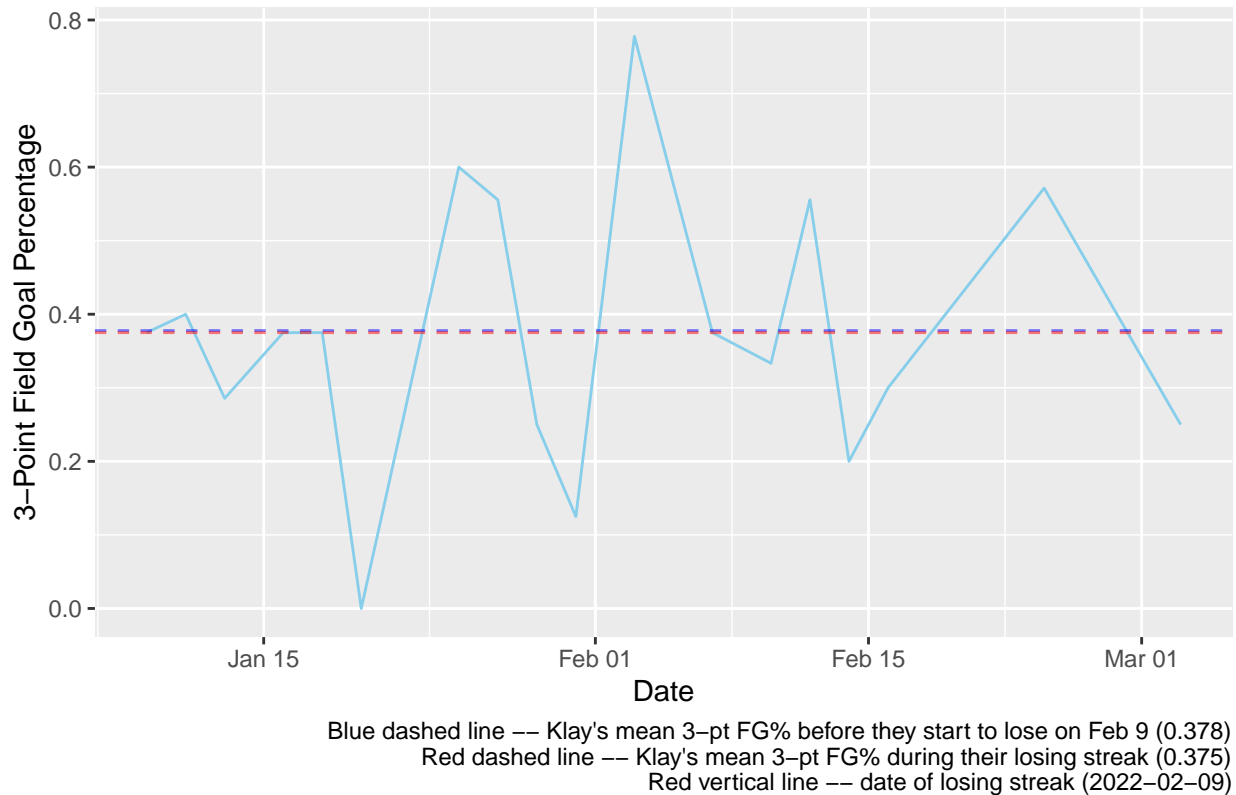**Klay's 2-Point FG% and 3-Point FG% Changes over Time**

```
## Rows: 18 Columns: 31
```

```
## -- Column specification -----------------------------------------------------
## Delimiter: ","
## chr   (2): Team, Opponent
## dbl  (27): OffPoss, Points, FG2M, FG2A, Fg2Pct, FG3M, FG3A, Fg3Pct, NonHeave...
## date  (1): Date
## time  (1): Minutes
##
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
```

Graph11: Klay's 2−Point Field Goal Percentage Changes over Time

Blue dashed line −− Klay's mean 2−pt FG% before they start to lose on Feb 9 (0.481)
Red dashed line −− Klay's mean 2−pt FG% during their losing streak (0.4375)
Red vertical line −− date of losing streak (2022−02−09)

Graph12: Klay's 3–Point Field Goal Percentage Changes over Time

Blue dashed line –– Klay's mean 3–pt FG% before they start to lose on Feb 9 (0.378)
Red dashed line –– Klay's mean 3–pt FG% during their losing streak (0.375)
Red vertical line –– date of losing streak (2022–02–09)

Would the FG% fluctuate too much? He could have a 2-pt FG% over 70%, but he could also have a 2-pt FG% less than 30%; he could have a 3-pt FG% nearly 80%, he could also have a 3-pt FG% of 0. This is certainly not an indicator of stability. Also, during the losing streak, his FG% decreases, for both 2pt and 3pt (a little bit). I know he's been injured for 2 years, and I know he played some amazing games after he's back. But the thing is, if his FG% fluctuate like this, and if he keeps his time on court over 26 minutes, the win or loss of the team seems to be on his decision.

Klay's Impact on the Team

If only the FG% is not persuasive enough, Let's look at some advanced data (acquired from pbpstats) to see his impact to his teammates when he's on the court.

```
## Rows: 14 Columns: 6
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr (1): Player
## dbl (5): Minutes with Klay, Munites without Klay, At Rim Assisted % with Kla...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

Graph13: Difference in At–Rim Shots % Assisted with or without Klay
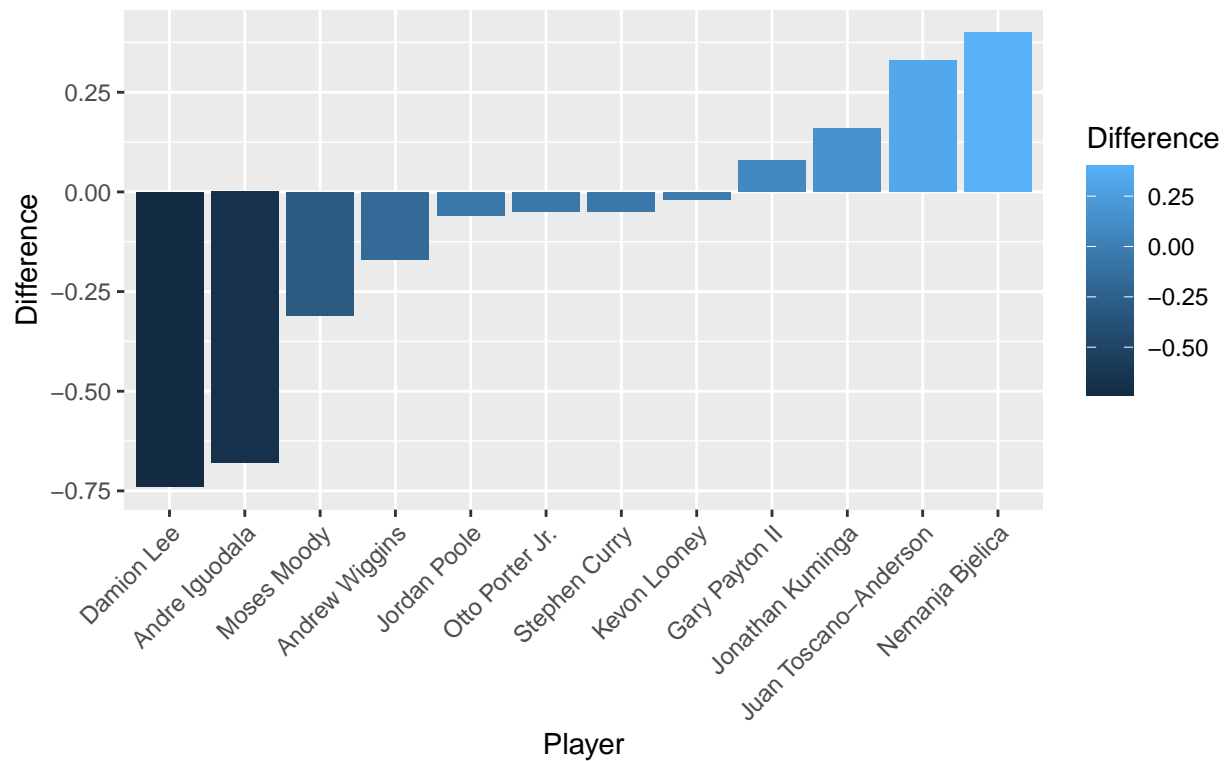
At–rim shots % assisted means the percentage that at–rim shots is assisted

```
## Rows: 13 Columns: 6
## -- Column specification ------------------------------------------------------
## Delimiter: ","
## chr (1): Player
## dbl (5): Minutes with Klay, Minutes without Klay, At Rim or 3pt Shot Frequen...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```
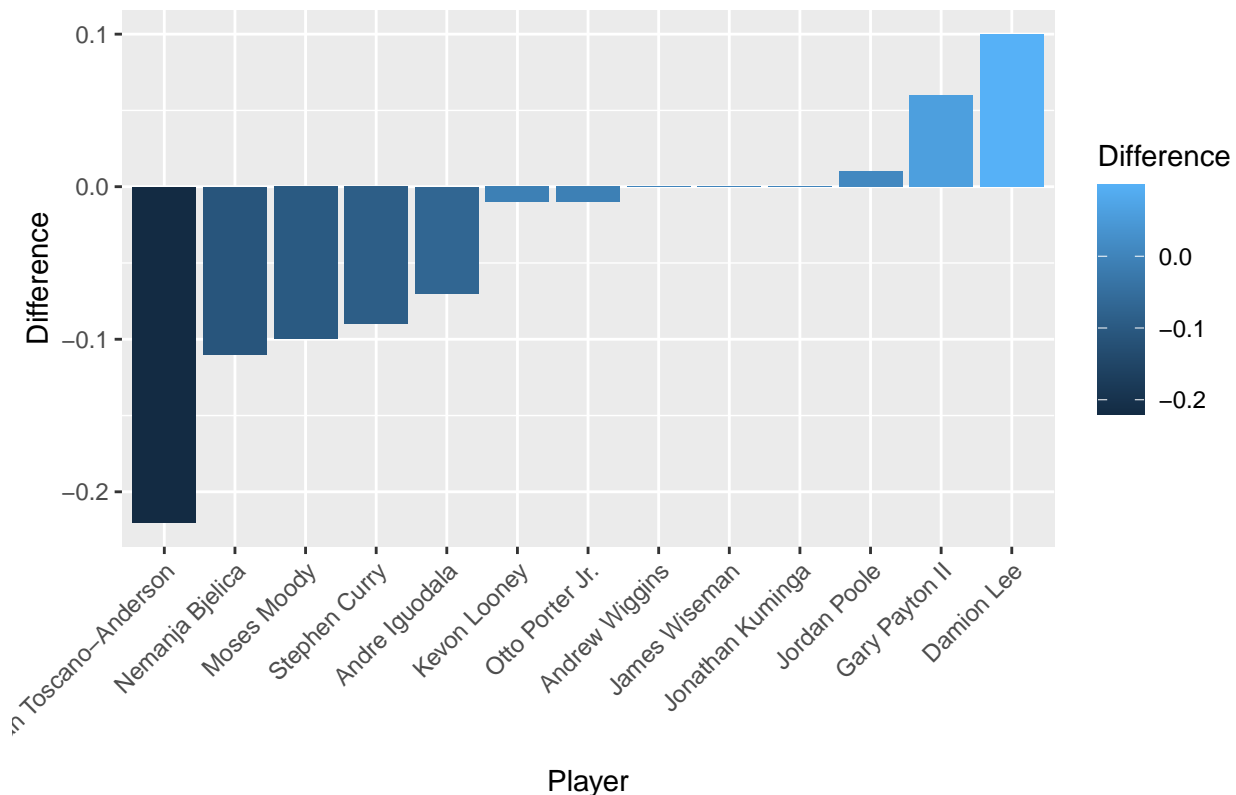
## Graph14: Difference in %At–Rim Shots and 3pt Shots with or without Klay

In graph 13, it shows the difference in the percentage of at rim shots that are assisted when Klay's on/ off the court. More than half of the players are experiencing a decrease in that stats when Klay is on the court. Why? Well, if you see the game, you would notice a big change in Klay's play: he increases a lot of plays with ball. It means that he will be more likely to use his play to end this possession, instead of continuing playing the set strategy, to pass the ball and find cutting teammates or wide-open chance of three. In this case, with big fluctuation of his FG%, how could we guarantee whether it's appropriate to do this? But there are some players like Bjelica and JTA whose at rim % assisted increases. I guess one reason for why this happens is that those players will make a shot attempt close to rim only if they are assisted to have a better chance. Other contextual-related factors are also needed to be considered. It doesn't necessarily mean that Klay would pass the ball more to them than to others.

In graph 14, it shows the difference in the percentage of at rim shots and 3 point shots when Klay's on/ off the court. Still, more than half of the players are experiencing a decrease in the stats when Klay's on the court. If he always ends the play all by himself like what he does now, his teammates would certainly have less chance to make a three or at rim shots as the strategy prescribed. As we know, the expected values of 3 pointer and at rim shot are higher. So, if we produce less those shots, our offense will certainly be worse.

```
## Rows: 17 Columns: 6
## -- Column specification --------------------------------------------------
## Delimiter: ","
## chr (1): Player
## dbl (5): Minutes with Klay, Minutes without Klay, Pts per 100 Possessions wi...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

Graph15: Difference in Offensive Efficiency with or without Klay

Offensive Efficiency = Points in 100 Possessions
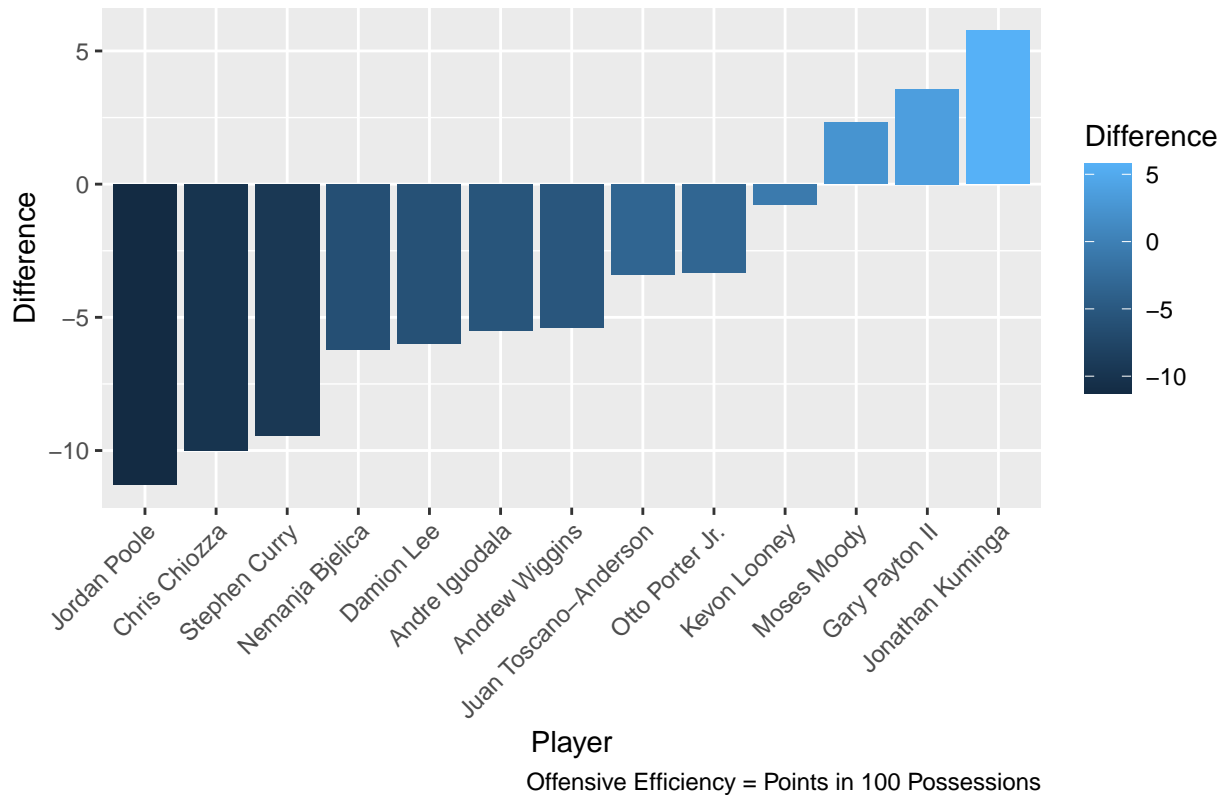
In graph 15, it shows the offensive efficiency of players with or without Klay, a more direct indicator of Klay's impact. The fact is that most players are experiencing an decrease in Offensive Efficiency when Klay is on the court, especially for Jordan Poole and Stephen Curry, two core players in Warriors. Before Klay got back, JP and Curry are playing well and they've got a really impressive record. But Klay substitute the JP's position as a starter. I guess this change might be one reason for JP's decrease in offensive efficiency. Overall, the decrease in offensive efficiency actually offsets those increase of the young guys, and Klay's return indeed brings some negative impact to the team, not as fans expected before (at least for me: the union of warriors stars would make them better).
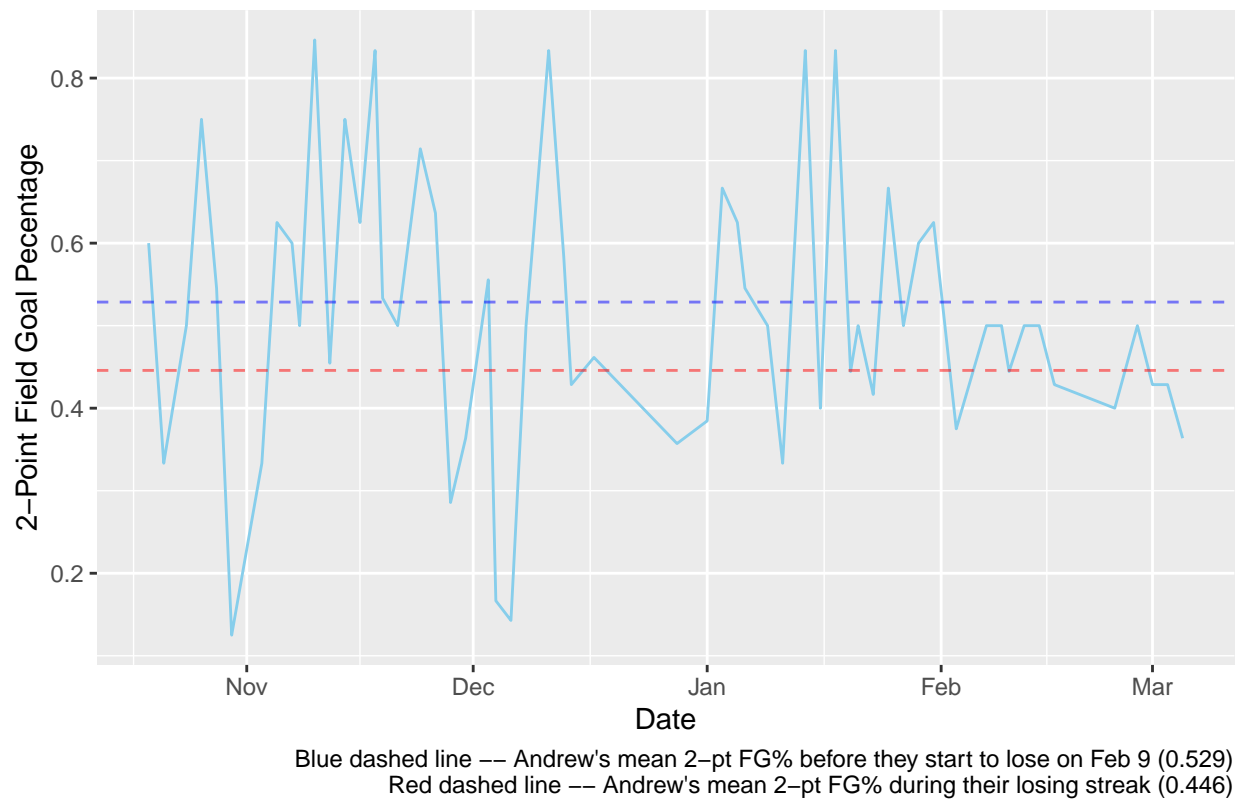
Andrew Wiggins

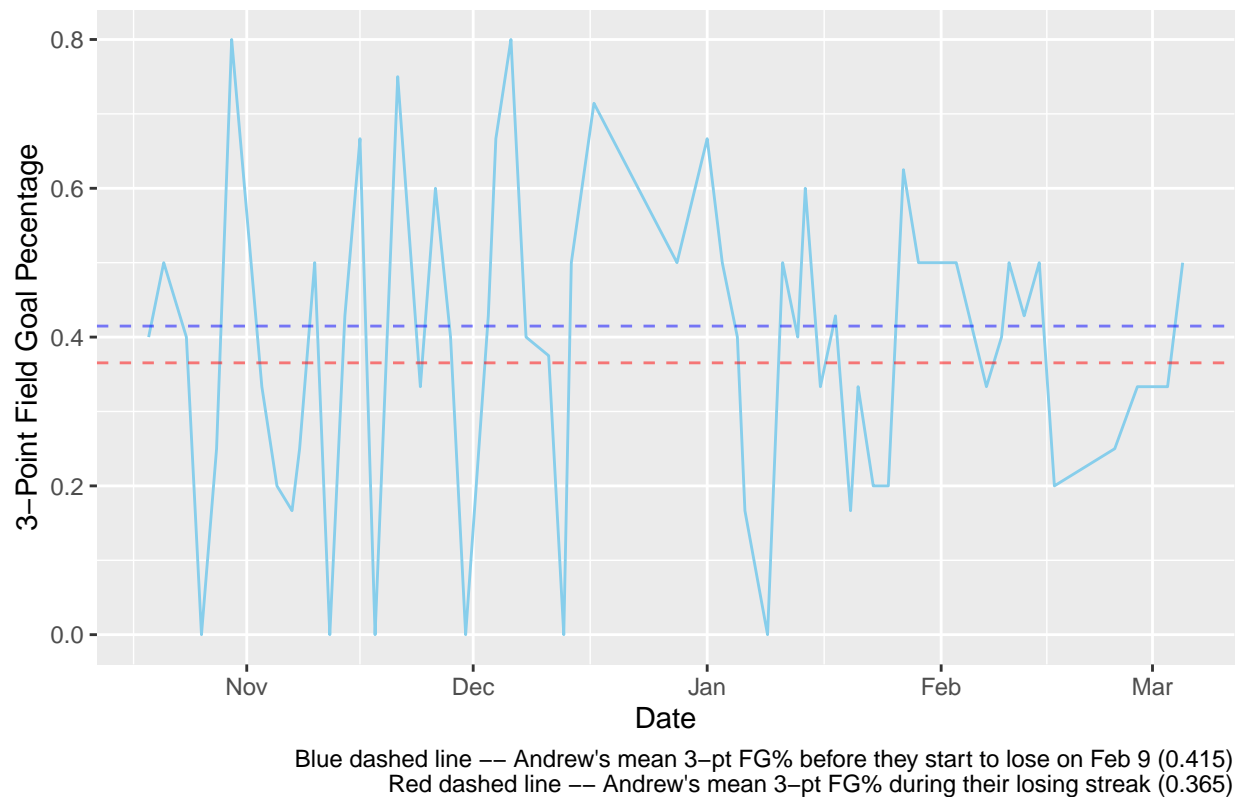|	Name	GamesPlayed	Minutes	OffPoss	Points	Fg2Pct	Fg3Pct
2	Andrew Wiggins	58	1840	3749	1014	0.5182927	0.4056604

Andrew Wiggins could be one of the most surprising players for Warriors fans. He could contribute a 2-point FG% of 0.518 and a 3-point FG% of 0.406 during the first 63 games. Again, it is a really outstanding FG%, but we could look at something more.

Graph16: Andrew's 2−Point Field Goal Percentage Changes over Time

Blue dashed line −− Andrew's mean 2−pt FG% before they start to lose on Feb 9 (0.529)
Red dashed line −− Andrew's mean 2−pt FG% during their losing streak (0.446)

Graph17: Andrew's 3–Point Field Goal Percentage Changes over Time

Blue dashed line –– Andrew's mean 3–pt FG% before they start to lose on Feb 9 (0.415)
Red dashed line –– Andrew's mean 3–pt FG% during their losing streak (0.365)

Similar thing happens to Andrew Wiggins: fluctuate too much and a clear decrease in FG% during the losing streak. But we could see the fluctuation is decreasing gradually, which is at least a good sign.

Conclusion

Based on the analysis, Warriors has several major issues to solve: 1. **The Lineup**. We can't play well without big guy (maybe after Draymond back). But we can't give our hope to all small lineup. 2. **Klay**. This is a special case. We can't easily put an All-star player on the bench. But what we could do is to let Klay change back to an off-ball Shooter as he was and moderate his time on court. 3. **Stability**. Nobody could guarantee a stable play for every game. If Stephen has "hot hand", just let him play more and don't be strict on the 12-6-12-6 (fans know Curry's schedule: play full of 1st and 3rd quarter, half of 2nd and 4th quarter). If we keep changing the lineup on the court, nobody would have a "hot hand".

All the suggestions above are from subjectivity of myself. But the issues are truly revealed from the data. As a fan of Warriors, I really hope the team could make some changes. Curry's 34th birthday is approaching. How many years left could he play? Most top teams are in the East now. This season could be his last chance to fight for a championship. Don't waste his last few years in the league!