

Do NBA Players Get More Consistent With Age?



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Take a second to think about your favorite NBA team and what you can rely on from each player in any given game. Maybe there's a reliable big man who can always be depended on for 20 points and 10 rebounds a night, and maybe there's an inconsistent scoring guard who will score 30 or even 40 points on some nights and not even crack double digits on others. There could be the steady sixth man who can always give at least 10 points off the bench, and there could be the young power forward who shows flashes of brilliance but is sometimes limited by foul trouble. Perhaps you could continue to expect your team to perform as they have over the season, but how about next season? What about in five years, when young players will be reaching their prime, yesterday's stars will be entering the twilight of their careers, and the aging veterans will have drifted off into the sunset? How should we expect NBA players to change in consistency as they age through their careers?

Consistency is among the most important attributes of any athlete. After all, if you have no idea what to expect out of a player's performance on any given night, then how can any coach feel comfortable relying on them to deliver? To investigate consistency quantitatively, however, we must first quantitatively define what consistency is. NBA players are defined by many metrics which different people value differently, but casual fans tend to look mostly at points, assists, and rebounds per game. These, in statistical terms, are the player's mean points, assists, and rebounds in games over a season or their career. To look at a player's consistency of these stats, we would look at the standard deviation, which tells us how much the player's points, assists, or rebounds deviate from their respective per game values.

In this analysis, I am looking at consistency of "game scores", which is a metric created by John Hollinger to estimate a player's statistical performance in a game. There are many metrics used to evaluate game performance that are more common in fantasy basketball scoring, but I chose to look at game scores because it considers every statistic on a box score. The exact formula used to calculate game score is $(\text{Points} + 0.4 * (\text{Field Goals Made} + 0.7 * (\text{Offensive Rebounds} + 0.3 * (\text{Defensive rebounds} + (\text{Steals} + 0.7 * (\text{Assists} + 0.7 * (\text{Blocked Shots} - 0.7 * (\text{Field Goal Attempts} - 0.4 * (\text{Free Throws Missed} - 0.4 * (\text{Personal Fouls} - (\text{Turnovers}))))))))))$. For reference, a game score of 10 would be considered average, while a game score of 40 would be considered outstanding.

Evaluating how players evolve as they age requires data over enough years so many players' entire careers can be included. For this analysis, I used NBA box score statistics from the last 25 seasons (1994-2018, which I scraped off the [Basketball-Reference.com](https://www.basketball-reference.com) play index using the 'rvest' R package. I only looked at players who played at least 10 minutes in a game to have an adequate sample of their contributions. From each season, only players who played at least 20 games of 10+ minutes are considered.

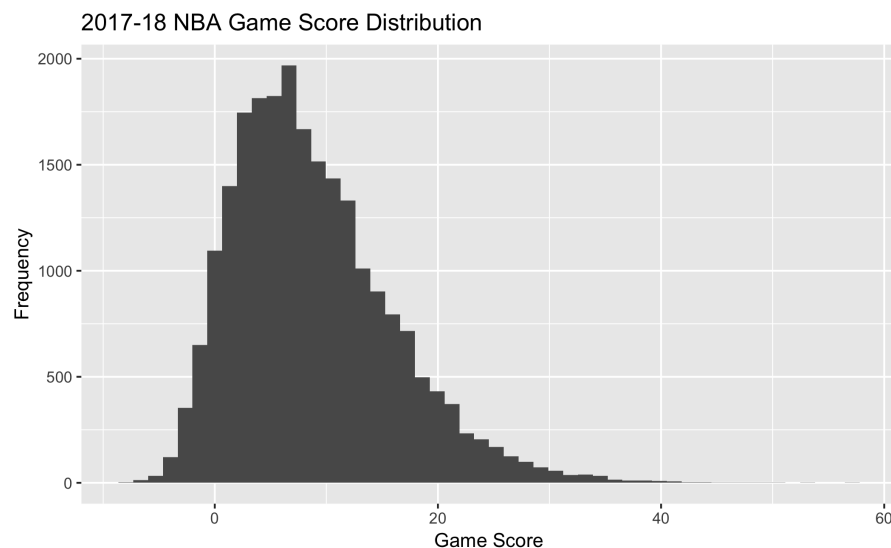
Intuitively, the way to evaluate game score consistency is to take the standard deviations of each player's game scores over each season. However, doing merely this produces some strange results. For reference, below are the five most consistent players from the 2017-18 NBA season, as defined by the standard deviation of their game scores. Note that since a smaller standard deviation means there is less variance in the data, players with a smaller standard deviation are more consistent.

- 1. Josh Huestis (2.585381)
- 2. Arron Afflalo (3.071126)
- 3. Abdel Nader (3.072856)
- 4. DeAndre Liggins (3.110815)
- 5. Semi Ojeleye (3.114142)

Now, here were the top 5 most inconsistent players in the NBA last season according to the same measure:

- 1. James Harden (9.030980)
- 2. Anthony Davis (8.626362)
- 3. Lou Williams (8.560626)
- 4. Paul George (8.542909)
- 5. Victor Oladipo (8.336750)

The skill disparity between the two groups is obvious. However, while the most consistent players consistently post low game scores, star players can be inconsistent with just how strong their performances are. It's unfair to define consistency using a metric that treats the difference between a game score of 0 and a game score of 10 the same as the difference between, say, 30 and 40. Figure 1 shows the right-skewed distribution of game scores over the 2017-18 seasons.



[Figure 1: Distribution of 2017-18 NBA game scores](#)

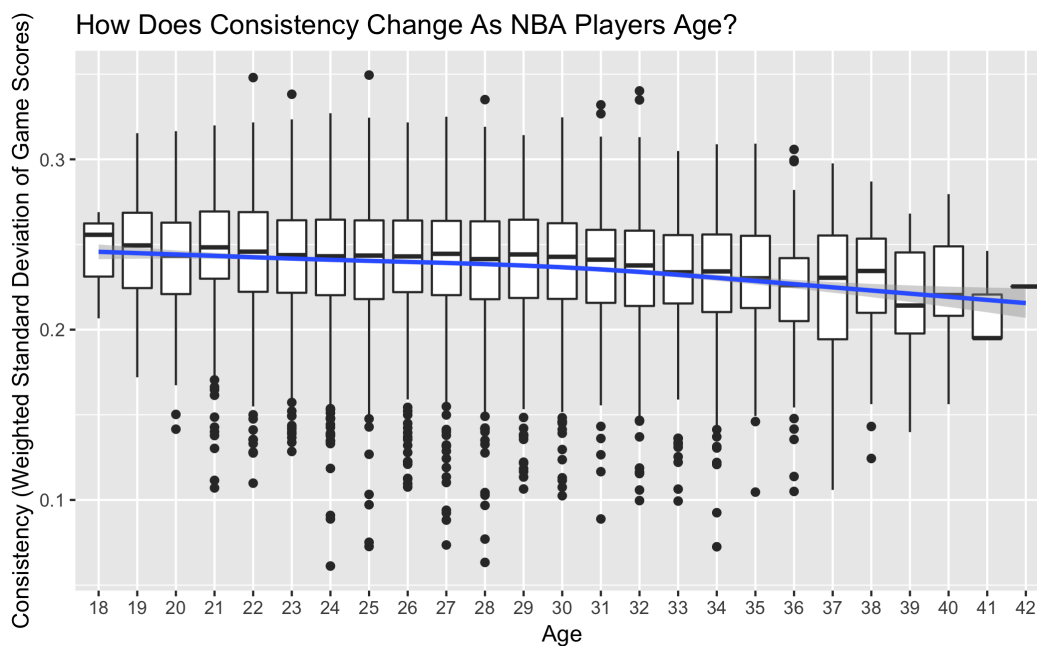
A better way to measure deviations of game scores would take the distribution of game scores into account given that not all game score differences represent the same level of difference in performance. Turning the game score values into percentiles is a good way to do this, and this can easily be done on R using the `ecdf()` function to turn the data into an empirical cumulative distribution function. For example, Andre Ingram produced a 18.7 game score in his NBA debut with the Lakers last season. This game score was higher than about 91% of all game scores in the NBA last season, thus placing his performance in the 91st percentile. After turning game scores into percentile values and taking the standard deviation of that, identifying consistent and inconsistent players is much more clear. Let's look at the five most consistent players from the 2017-18 NBA season according to this measure, with lower values still implying greater consistency:

- 1. James Harden (0.0968121)
- 2. Anthony Davis (0.1185201)
- 3. Josh Huestis (0.1320642)
- 4. LeBron James (0.1326402)
- 5. Kevin Durant (0.1355790)

And the 5 most inconsistent:

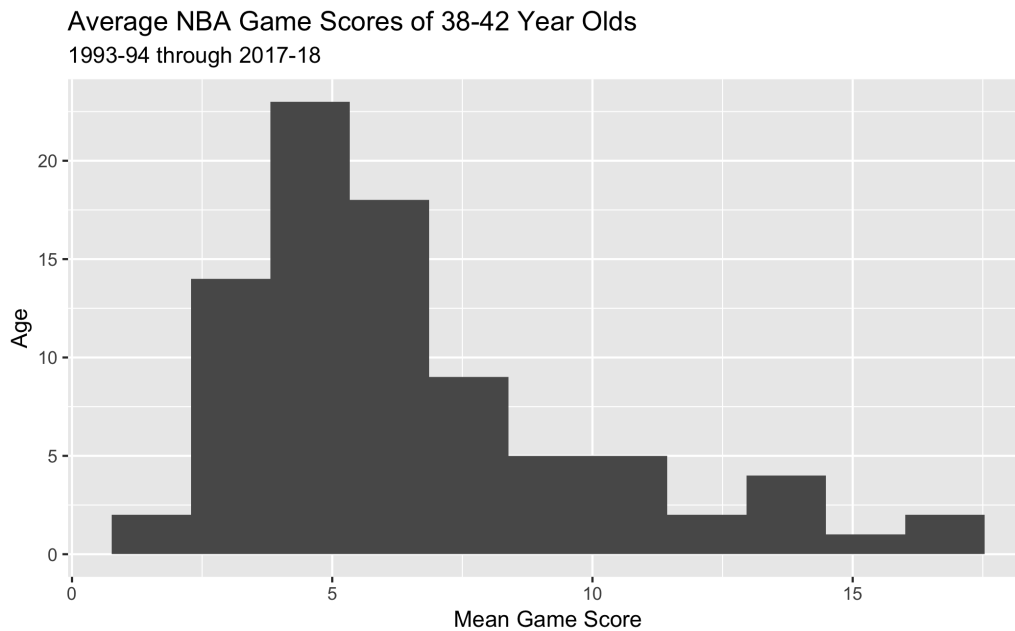
- 1. Zach LaVine (0.3480016)
- 2. Quinn Cook (0.3270556)
- 3. Wayne Selden (0.3132178)
- 4. D'Angelo Russell (0.3126981)
- 5. Jamal Murray (0.3080612)

The new measure of consistency rightfully paints superstar players such as Harden and Davis in a more positive light. In general, the most consistent NBA players tend to consist of the association's best players and, to put it nicely, players who consistently make contributions not seen through the box score. Using these consistencies and the [Basketball-Reference.com](https://www.basketball-reference.com) box score data, let's see the graph below to look at how consistency changes with age.



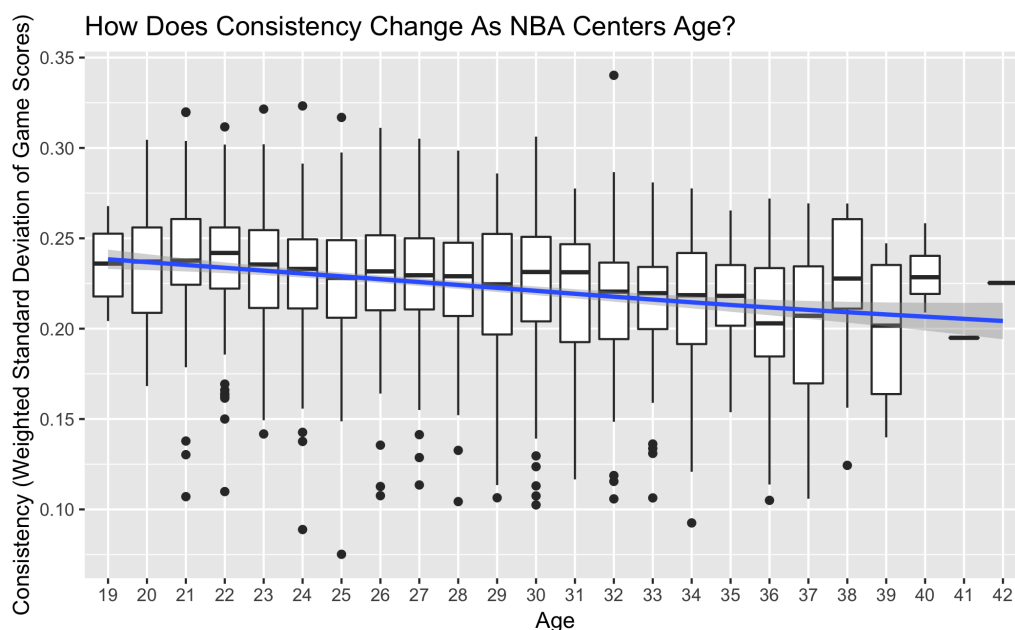
[Figure 2: Relationship between consistency and age](#)

As demonstrated by the boxplots and fitted trendline, NBA players see modest improvements in consistency until their 30s. The trendline indicates that players improve their consistency at a higher rate in their thirties, but the medians in the boxplots show an uptick in inconsistency from ages 35-37 until an improvement at age 38, which may skew the trendline. The decreasing consistency from 35-37 is probably true to how players generally age, as that is the age range where veteran players usually end their careers. However, though one could argue that the general increase in consistency from ages 38-40 is because of the skill and consistency required to remain in the NBA, the reality is that regardless of how good they may've been in their primes, 38-40 year old NBA players are often pretty washed up. Figure 3 shows that aside from the Stocktons, Malones, and Jordans of NBA lore, average game scores in a season for grizzled vets tend to be pretty low. Of the 10 most consistent old men (aged 38-42) of the last 25 seasons, the mean game score was 3.866043, which obviously isn't great.

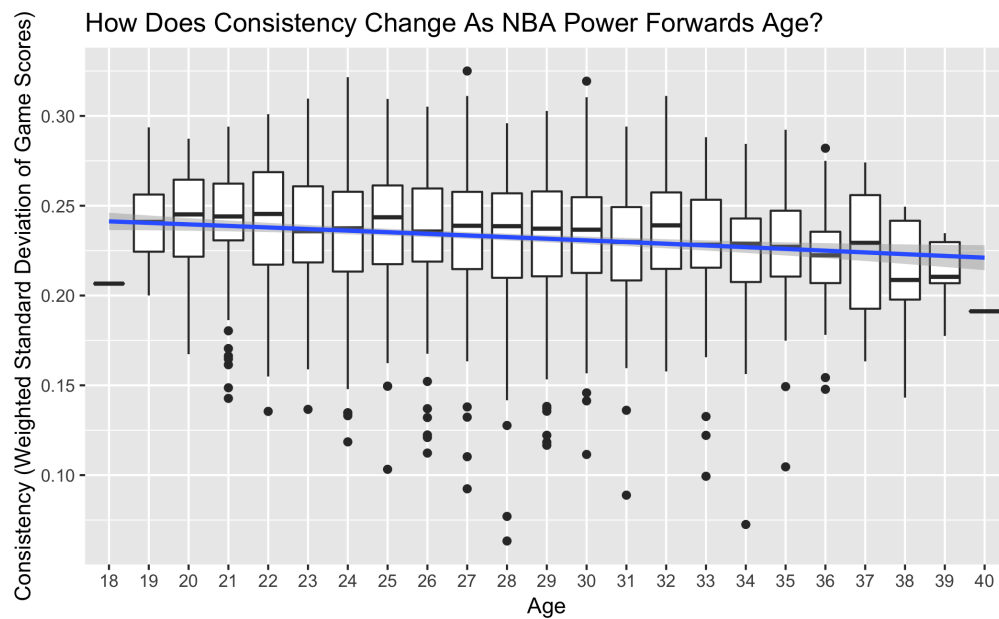


[Figure 3: Right-skewed distribution of mean game scores, players of age 38+](#)

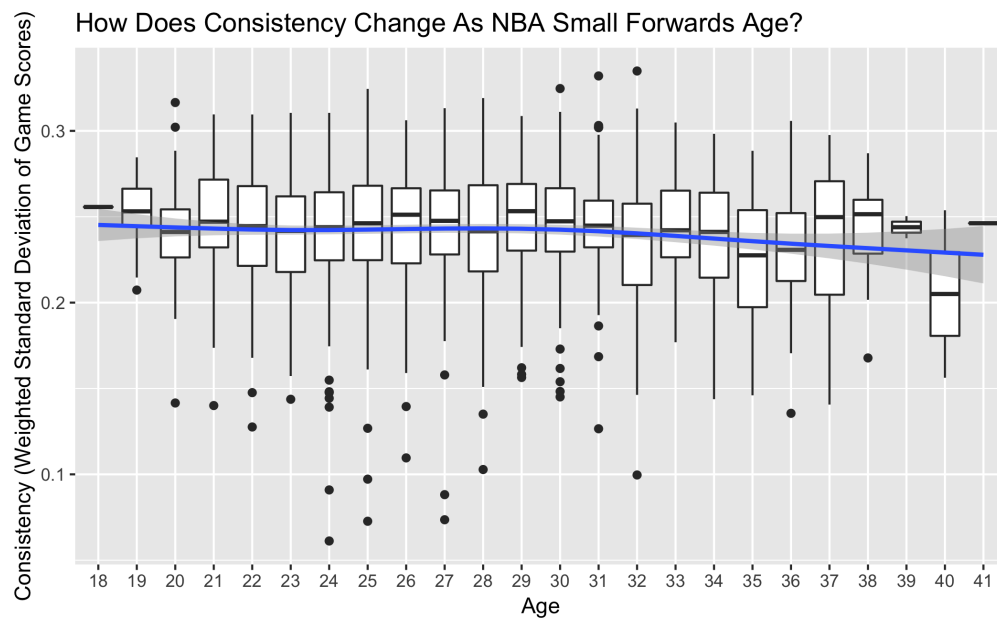
We can also look at aging trends by position, which are shown in Figures 4-8. Of the five positions, centers seem to become more consistent the quickest, with power forwards right behind them. Neither small forwards nor shooting guards show much of a change over time; small forwards fluctuate in consistency more towards their mid-late twenties, while the trendline for shooting guards is almost straight. Point guards show an interesting trend of steady increases in consistency until a bigger increase in their late thirties. While this is partly due to older players being more consistently bad, the John Stockton effect also plays a role here. Even in the final years of his career, Stockton consistently posted above-average game scores, and the limited number of older point guards helps him skew the data a bit here. Unfortunately, however, most point guards aren't John Stockton.



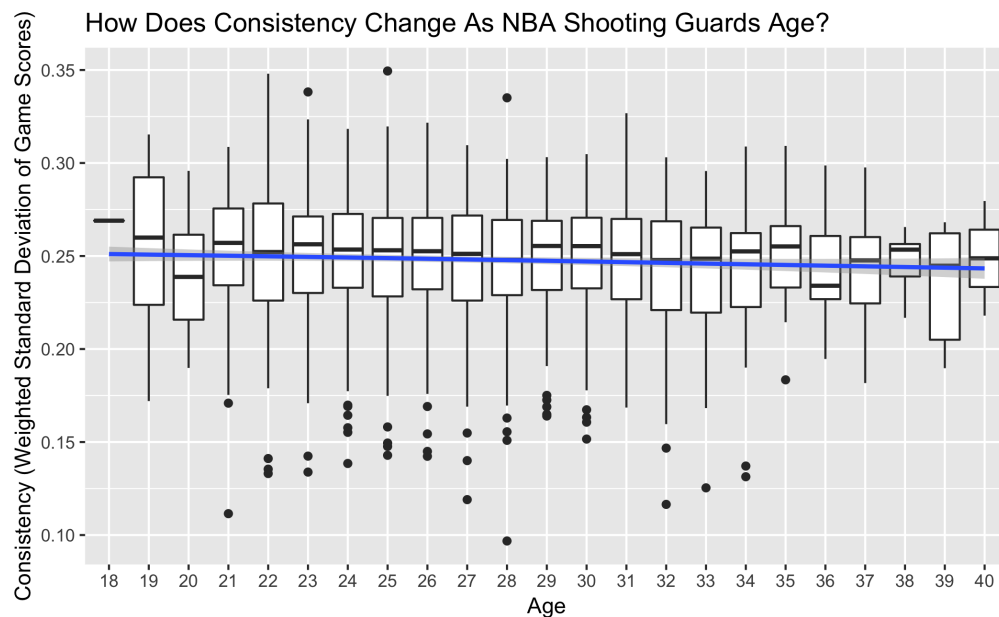
[Figure 4: Relationship between consistency and age, centers only](#)



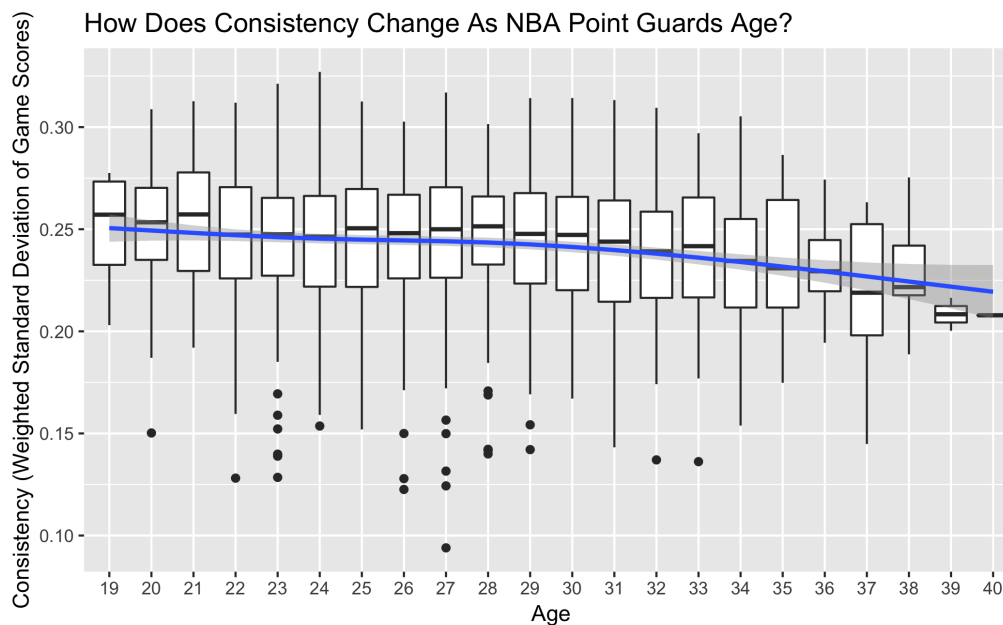
[Figure 5: Relationship between consistency and age, power forwards only](#)



[Figure 6: Relationship between consistency and age, small forwards only](#)



[Figure 7: Relationship between consistency and age, shooting guards only](#)

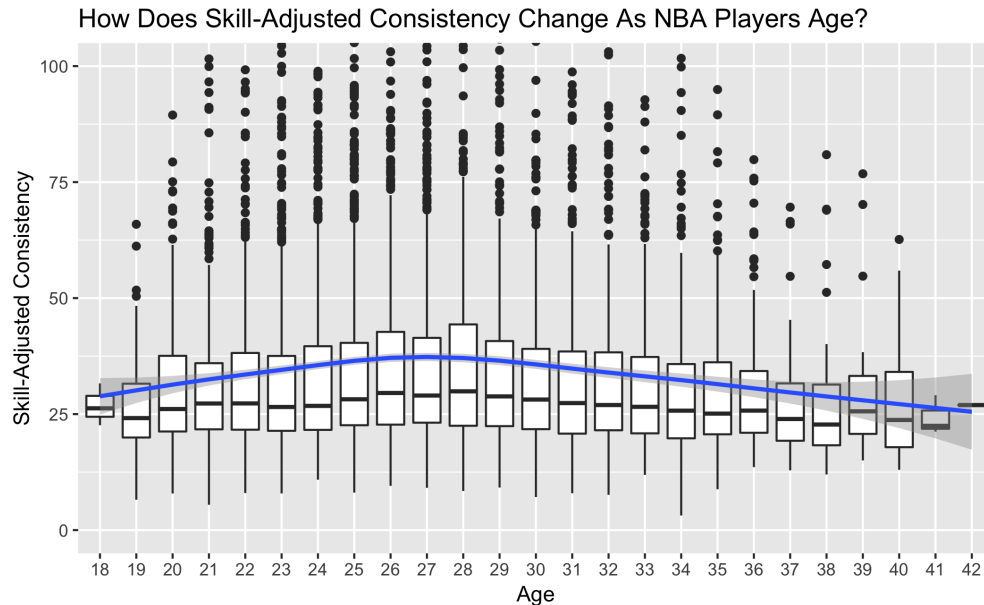


[Figure 8: Relationship between consistency and age, point guards only](#)

Though the last few graphs model consistency in general, they don't take skill into account. According to the consistency metric I used, a player could be just as consistent getting game scores of 20 as he could be at getting game scores of 3. No disrespect towards Josh Huestis, but being consistent doesn't matter much if you're simply not that good. To factor skill into the consistency equation, I divided players' average game scores by their consistencies. This methodology is based off of [Rotoworld.com](#)'s Ryan Knaus' consistency calculations for fantasy basketball, which he explains very well [here](#).

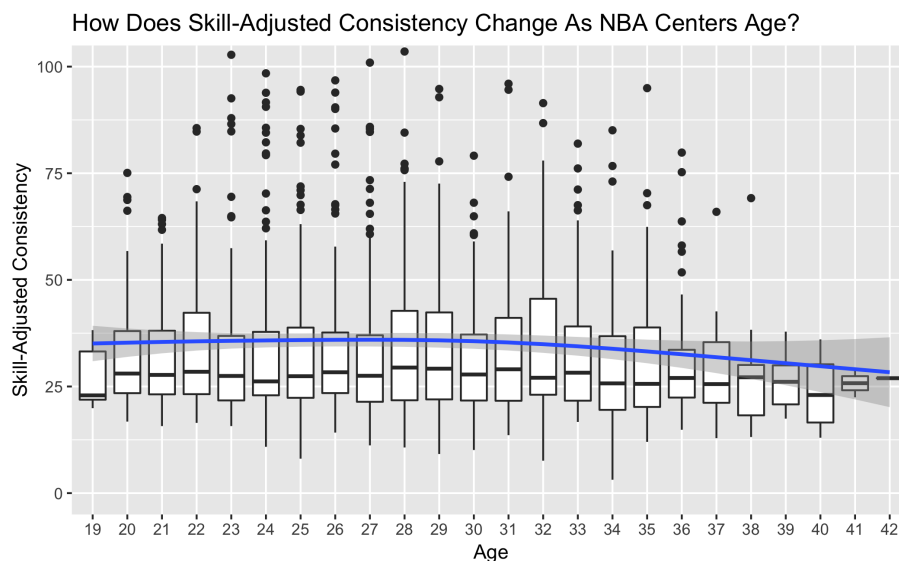
Figure 9 shows a trend akin to what traditional aging curves tend to look like. When factoring for skill, players do tend to become more consistent up until their decline around

age 27-28. There were many elite-level players with skill-adjusted consistencies well over 100, but I cut them off to best display the trend.

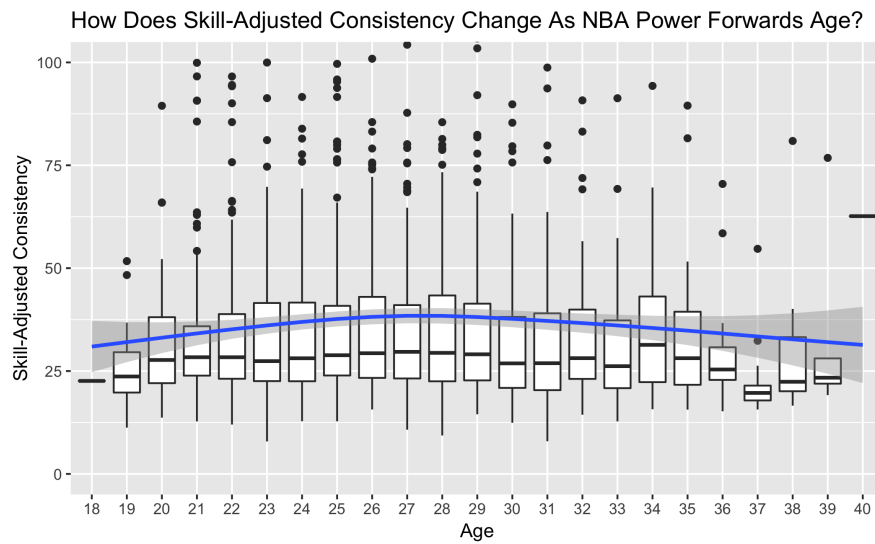


[Figure 9: Relationship between skill-based consistency and age](#)

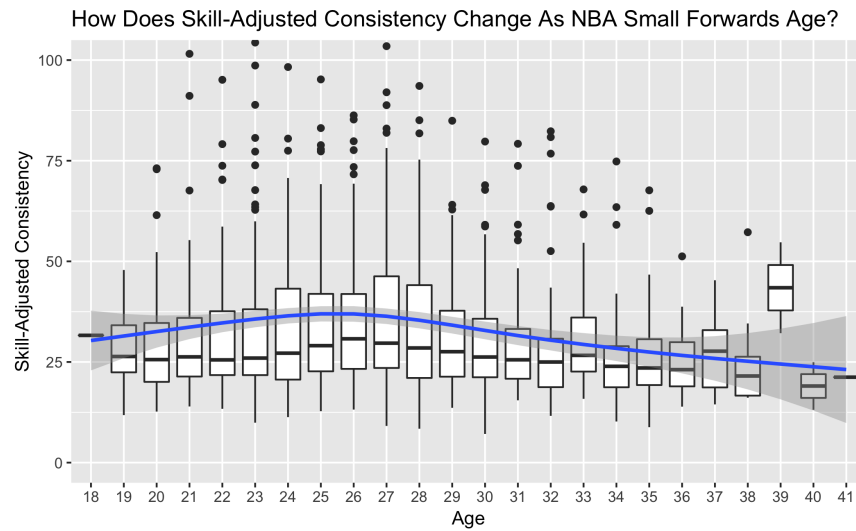
The graphs by position highlight a few interesting details. First of all, centers typically don't seem to have much room to grow with regards to consistency, with the trend through their twenties being almost a straight line. Power forwards and shooting guards have a more traditional aging curve with a peak around 28 years old. Small forwards appear to be the most consistent earlier in their careers; they tend to peak around age 26 with a steady decline after. Point guards follow a similar trend to power forwards and shooting guards, but their decline looks a bit more rapid and flattens out around age 33.



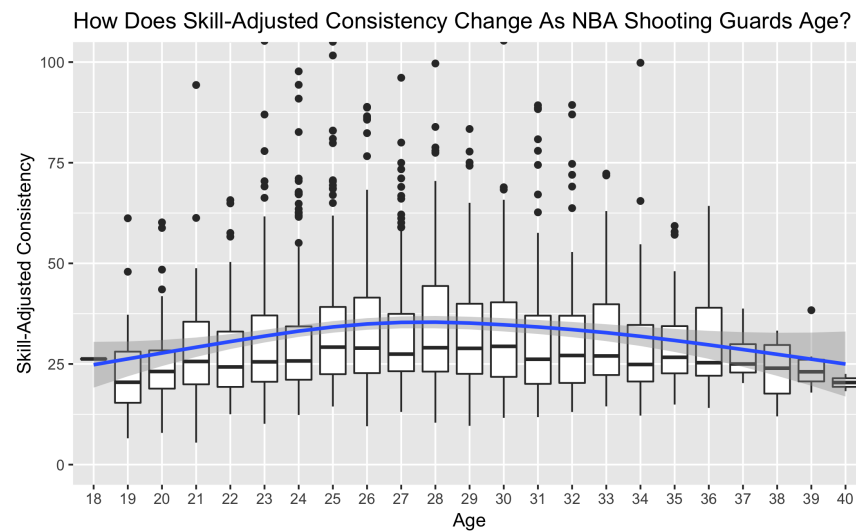
[Figure 10: Relationship between skill-adjusted consistency and age, centers only](#)



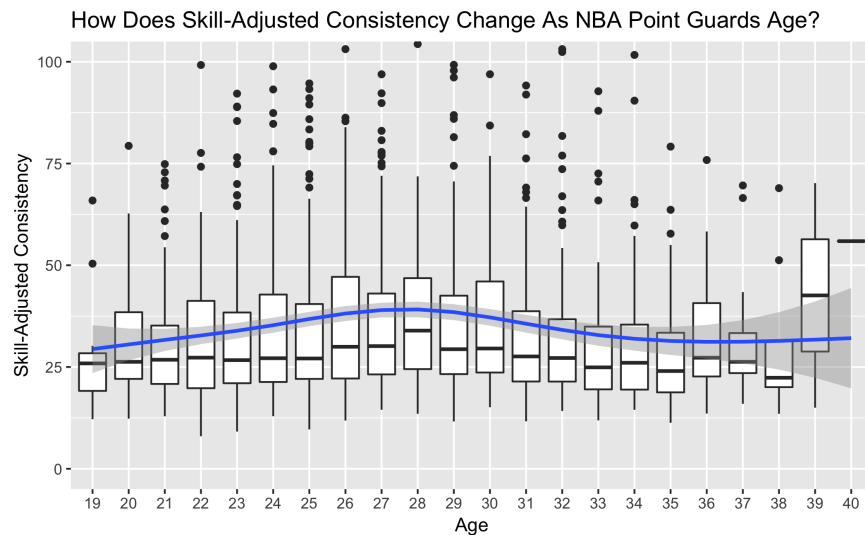
[Figure 11: Relationship between skill-adjusted consistency and age, power forwards only](#)



[Figure 12: Relationship between skill-adjusted consistency and age, small forwards only](#)

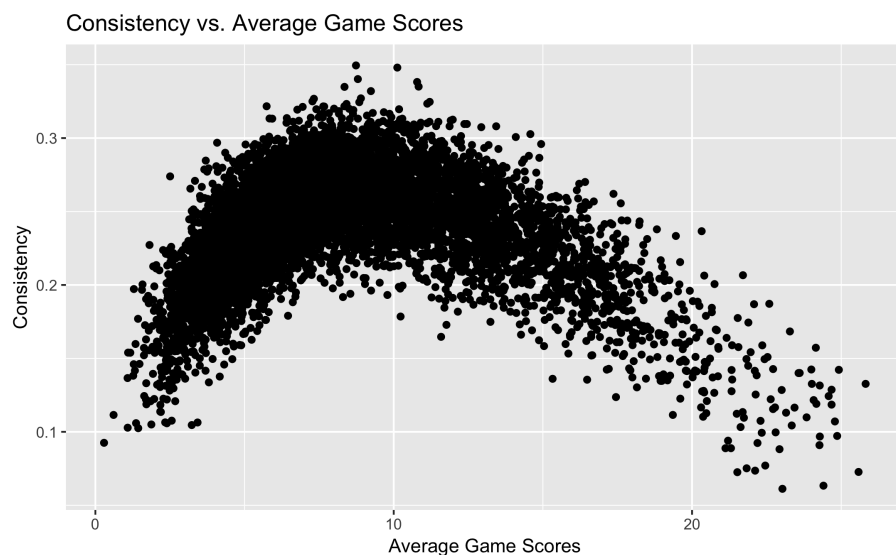


[Figure 13: Relationship between skill-adjusted consistency and age, shooting guards only](#)



[Figure 14: Relationship between skill-adjusted consistency and age, point guards only](#)

Consistency can be defined in two different ways; it's either about how consistent a player is at being good or how consistent they are in general. Both measures are important. On one hand, it's valuable to know which players are the most reliable to perform at an elite level on any given night. On the other hand, understanding the range of how a player can contribute is important for figuring out how to fit that player into the team's game plan. Figure 15 shows that consistent players, when not taking skill into account, are consistent at performing really, *really* well or really, *really* bad. Inconsistent players tend to be much more average, as their bad games can cancel out their good games. The next step of the process of studying consistency would be to evaluate how consistent a player performs compared to how consistent one would expect them to be given their skill level.



[Figure 15: Relationship between consistency and average game scores](#)

The biggest takeaway of looking at general consistency is how consistent the NBA's best players are. The consistency of players like James Harden and Anthony Davis is a huge

part of what makes them great, and the fact that such players can generally be relied on for an outstanding performance on any given night is what makes the NBA so exciting.