

Impact of Physical Characteristics on NBA Player Performance

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Introduction

Between 1942 and 2023, the national basketball association has developed as a sport, changing rules. Over this time, a variety of factors have impacted player success. This project evaluates how factors like height, weight, BMI, and player position impacts success in the NBA between 1942 and 2023, focusing specifically on the 2022-2023 season.

Data and Methods

Data on NBA characteristics were taken from the NBA statistics website. We combined both a Body Measurement of NBA Players between 1944 - 2023 with a Player Game Statistics of NBA Players between 2021 - 2023 to create our dataset and begin our investigation. Our analysis focused on height, weight, BMI, and player position using the ggplot package in R to create visualizations.

Our main variable of focus was player position. Player positions include

- Centers - generally are the tallest players on the court, they are the main defensive players under the hoop
- Forwards - they can range in size and are versatile players
- Guards - are generally the smallest players on the team, they are the main ball handlers that start the offensive plays

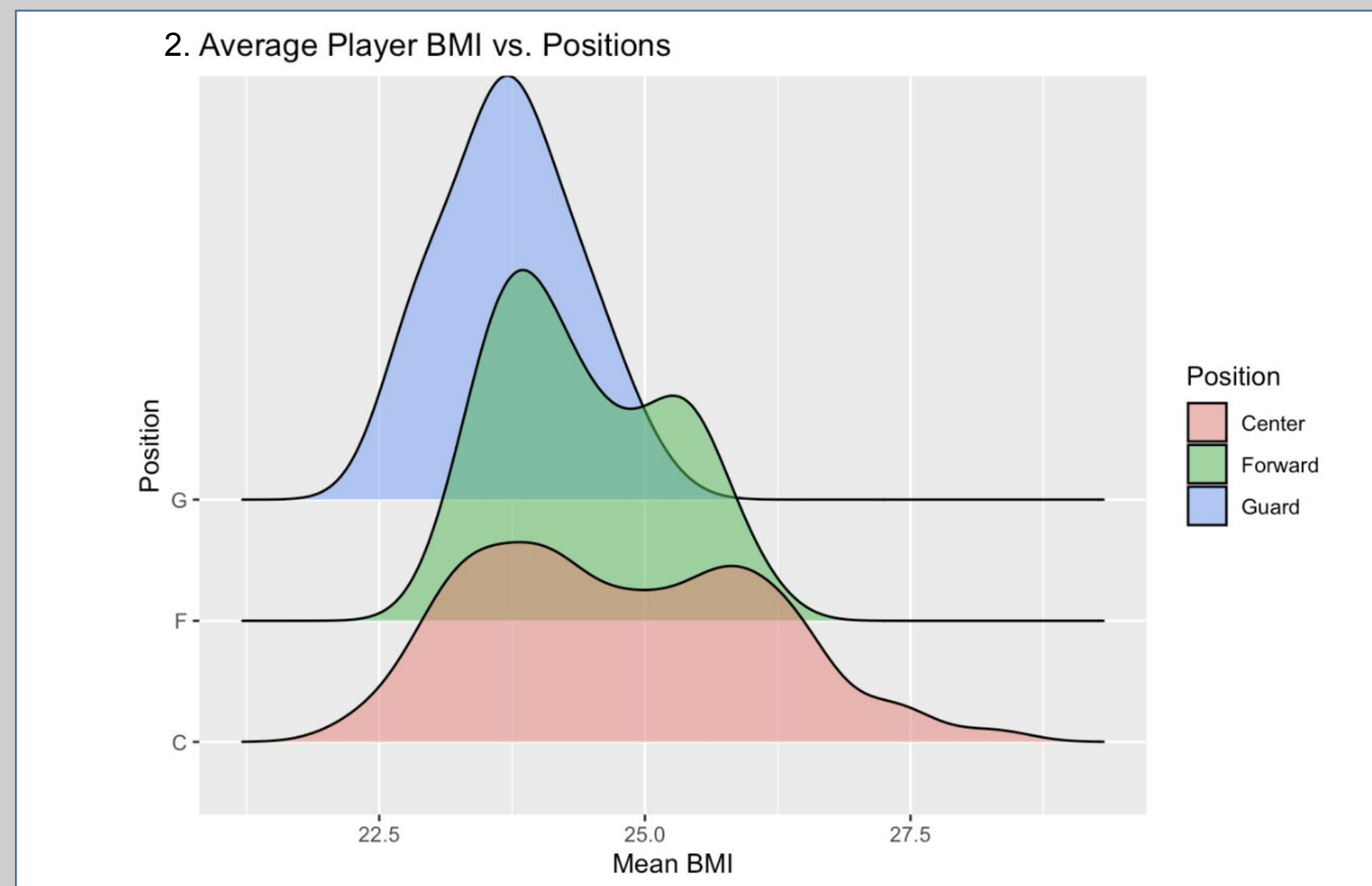


Figure 2 uses density plots to compare the body mass index (BMI) distributions of NBA players across different positions: centers, forwards, and guards. The peak of the center distribution is around a mean BMI of 25.0, while forwards have a slightly lower peak around 24.5, and guards have the lowest peak at approximately 22.5. The distributions show that centers generally have the highest BMIs, followed by forwards, and then guards, with some overlap between positions. This reflects the typical physical characteristics and body types associated with each position, where centers tend to be the largest, guards the smallest, and forwards in between, suiting their respective roles on the court in the NBA.

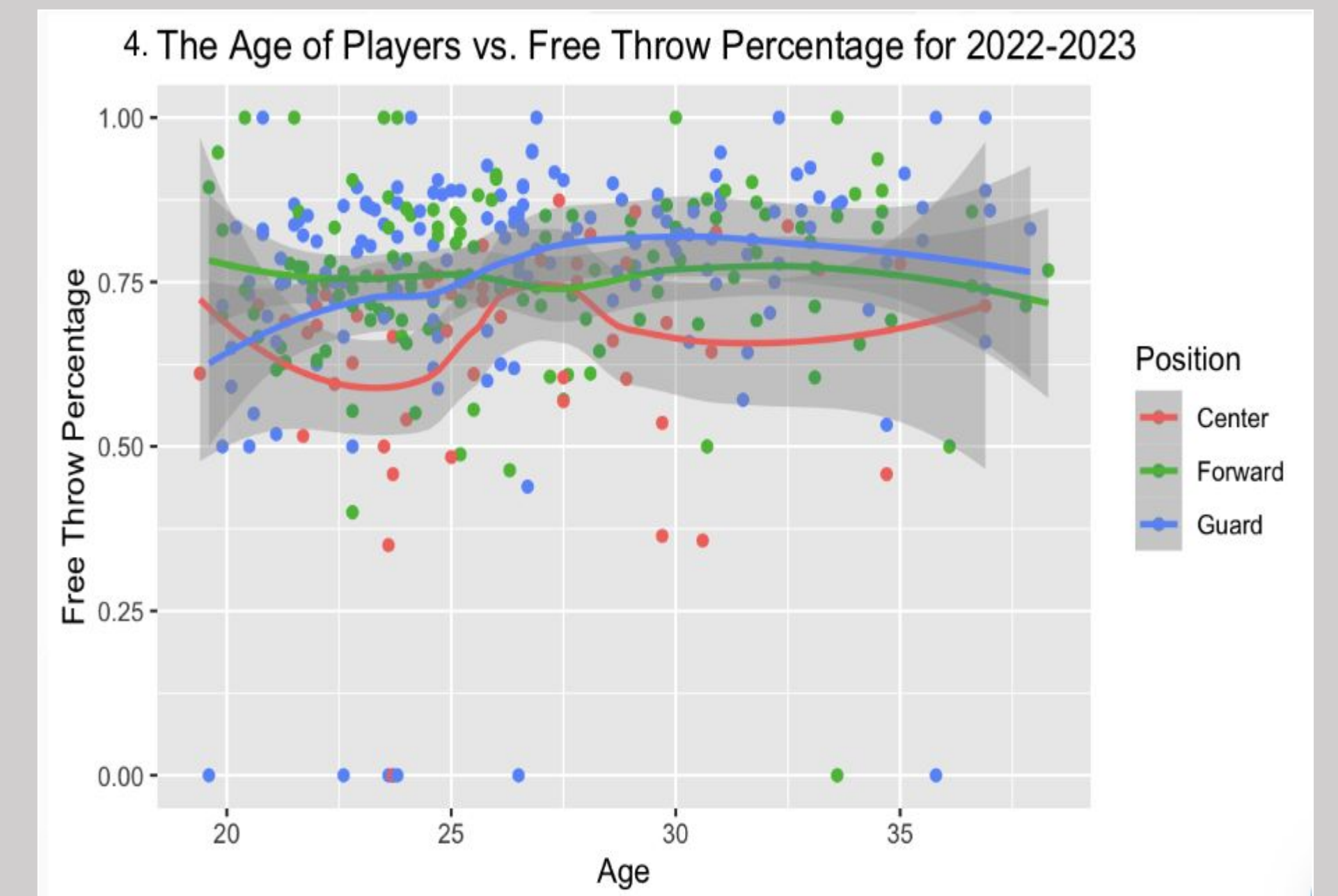


Figure 4 shows how the players free throw percentage changes over the course of the players career. As indicated by the relatively flat lines trends stay mostly consistent over the expanse of a career, with the acception of the increase in success rate for centers in between the age of 25 and 30. It is expected that as players adjust to the league they will improve or fall out. This graph may be deceiving but it is important to remember that only the best players have the longest careers and thus this graph doesn't take into account the vast majority of player retire around 33 years old

1. Position vs. Weight for Players from 1940 – 2024

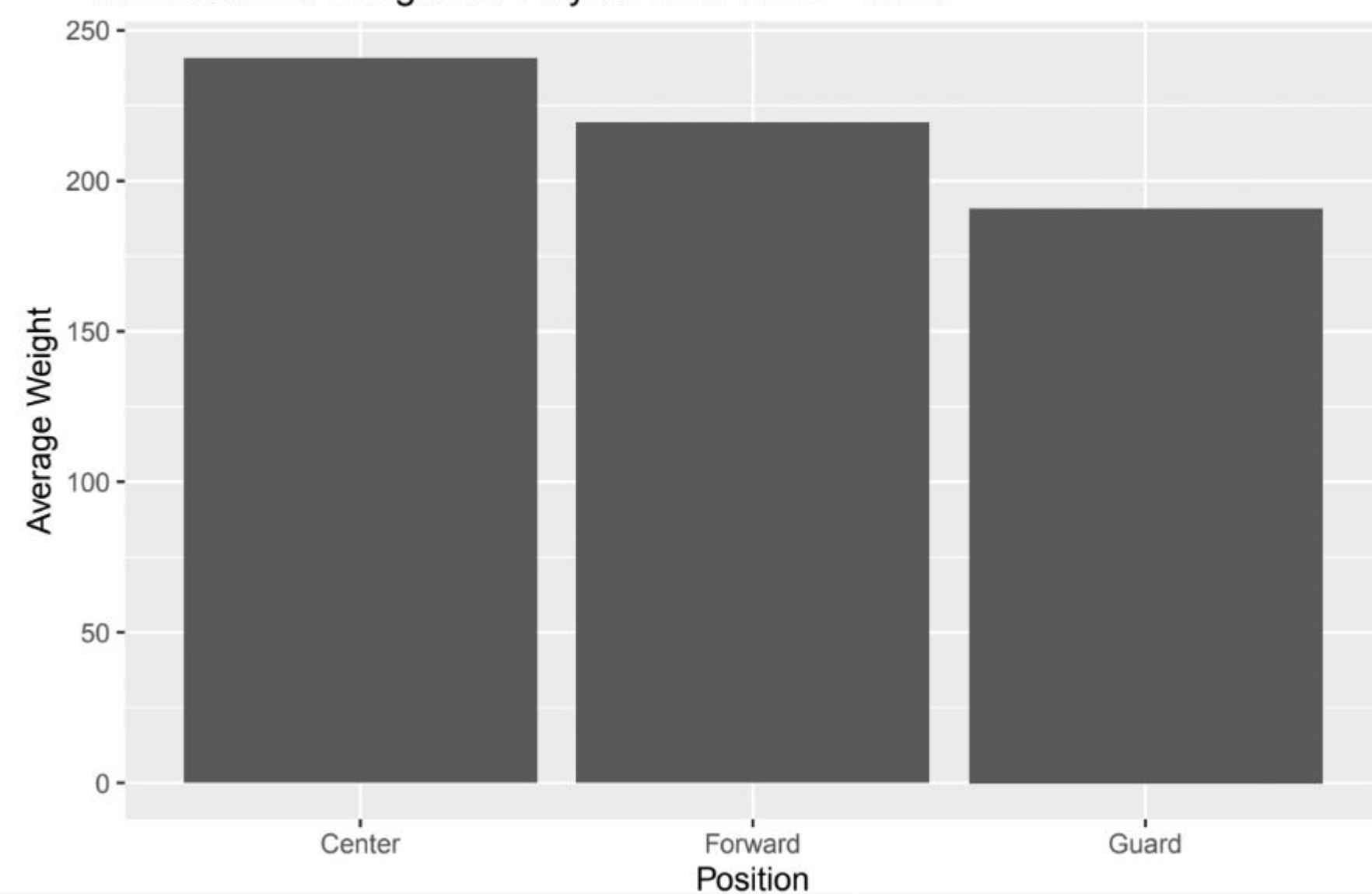


Figure 1 shows the average weight of players divided by position between the years 1940 to 2024. The centers are the heaviest, the forwards are in the middle, and the guards are the lowest average weight. This graph shows the averages between 1940 to 2024 illustrating that this is a trend encompassing the many years that basketball was around. This pattern makes sense and illustrates the uniqueness of each position, which is why for the remainder of this data exploration, we separate the player position in all of the characteristic studies.

3. Average Player Height vs. Year Drafted between 1947 to 2022

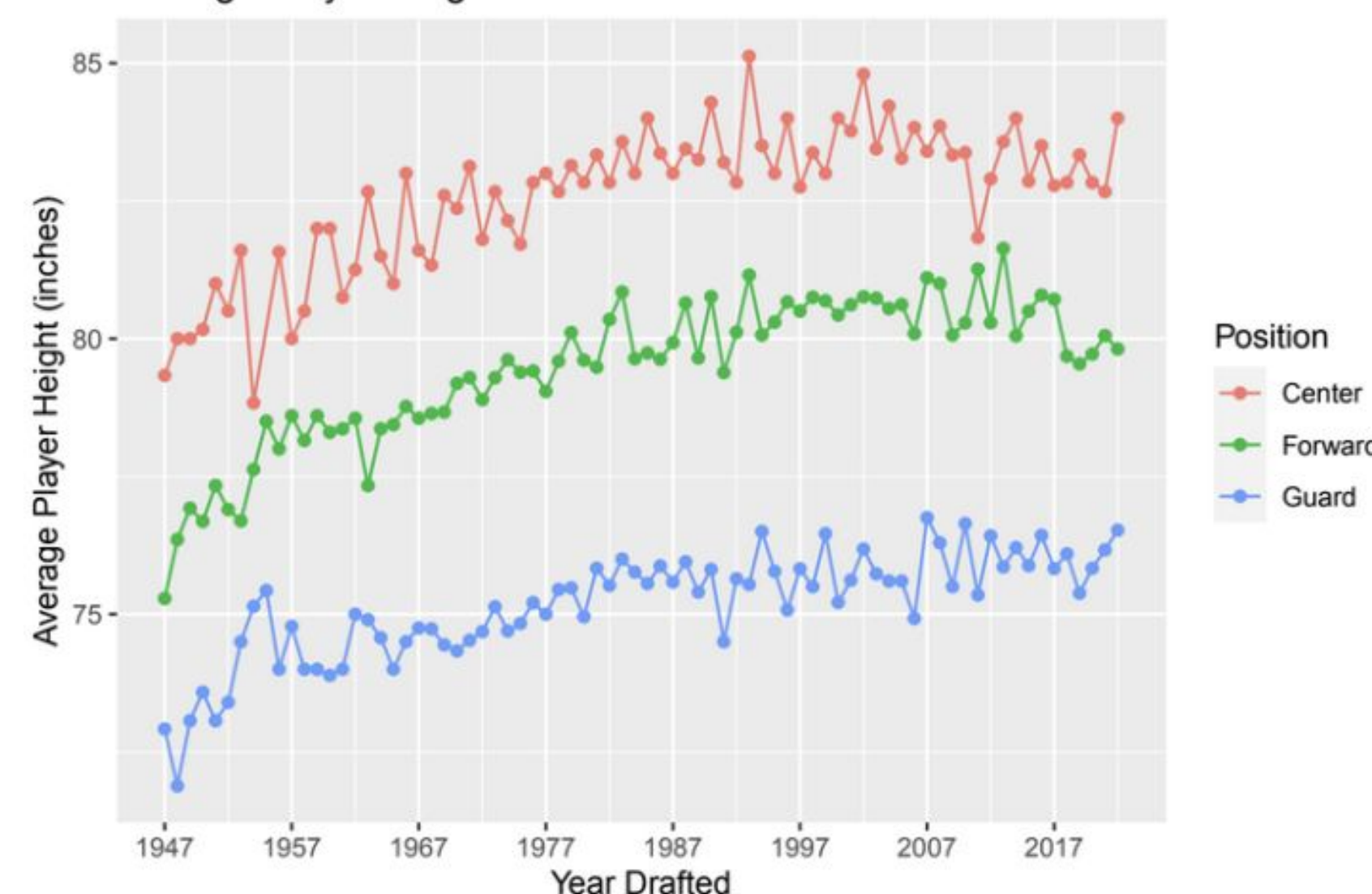


Figure 3 shows the average player height against the year drafted. This shows the trend that player height differed between centers who had the greatest average height, forwards who were in the middle, and guards who had the lowest average height. This graph also illustrates the trend between 1947 to 2022 where average heights increased for all 3 positions over the years in question. This pattern makes sense because average height has increased for the court in general, so each of the different player positions would also be increased.

5. The Height of Players vs. Free Throw Percentage for 2022-2023

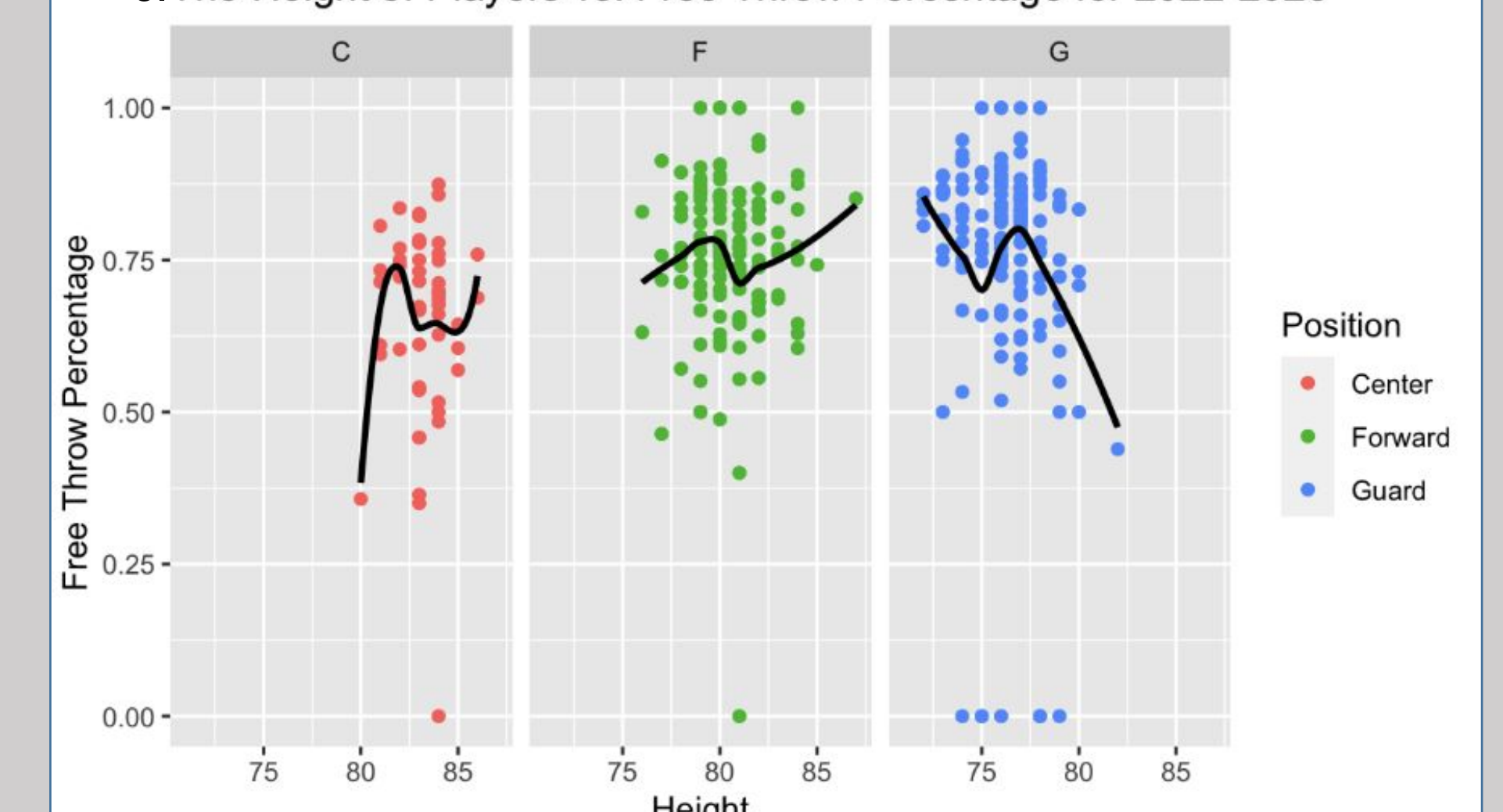


Figure 5 shows the players free throw percentage as the players height changes. This visualization is grouped by position. It is clear that guards and forward have a higher success rate compared to canters. However, guards experience the most extreme drop off in success as the height increase. On the other hand taller centers appear to have higher free throw percentages compared to shorter ones. Forwards appear to be the most stable, with the lowest variance in successful free throws across a wide range of heights.

Summary

The height of players increased between 1947 to 2024, however the way they are correlated to FTP is impacted by each player's position depending on its demands. Each position has different optimal characteristics, particularly weight, BMI, height, age.