

# The Relationship Between Age and Statistical Performance for NBA Players

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**Abstract**—This research paper examines the relationship between NBA players' age and how that correlates with their statistical performances throughout their careers. Our main goal is to identify the age range in which players are most likely to experience their statistical peak in performance. We utilized One-Way ANOVA to confirm statistical deviations between age groups and Tukey's Honestly Significant Difference Test (HSD) to serve as the post hoc analysis which allowed us to measure the significant differences between groups. After running our ANOVA tests, we identified that statistically significant differences exist between each specified age group in terms of points, assists, and total rebounds. Afterward, Tukey's HSD showed that the age group 18-24 generally had the best performances regarding points and rebounds, and assists. The 25-29 group significantly outperformed the 35-39 age group for points and rebounds, but there isn't any significant statistical difference from the 30-34 age group. With this information, we could not conclude that the statistical peak for NBA players in terms of points, rebounds, and assists begins in the age range of 25-29.

## I. INTRODUCTION

As the sports industry continues to grow, franchises are now investing hundreds of millions of dollars in the selection of players for their teams. The ages of the players selected can heavily influence the performance and overall contributions to these franchises. In this research paper, we will attempt to determine which age range the statistical peak begins for NBA players in terms of points, total rebounds, and assists. This information is especially useful in the case of free agency, where players have the opportunity to be contracted by new teams or resigned by their current ones. At the start of their careers, NBA players are placed on cheaper team-controlled contracts, (rookie contracts, two-way, etc). After completion of their first contract, players are eligible to test their NBA market value in free agency to get paid a new salary for a desired number of years. The findings of this research would be especially useful in the case of free agency because accurate information about how age impacts performance in the NBA could help franchises make the best decisions when deciding on contract terms and how much to pay players. It is crucial for franchises to optimize their payroll in a way that sets their teams up for competitive success. A bad contract has the potential to hinder a franchise's

ability to compete for a championship for several years.

## II. RELATED WORKS

The NBA is very popular all around the world and many statistical research articles focusing on players' performances have been published prior to this one. A particular study called, "The Underpinning Factors of NBA game-play performance: A systematic Review (2001-2020)" was especially detailed with how they measured all of the different factors that determine a player's in-game performance including any physical, mental, and external conditions. This paper will be a continuation of that research because it focuses on the ages of the players in depth rather than looking at all of the different variables that contribute to performance.

## III. EXPERIMENTAL HYPOTHESIS

This research study hypothesizes three claims, all in regards to players age groups and their relationship with the three main statistics recorded in basketball, points, total rebounds and assists. They are as follows:

Null Hypothesis 1: If NBA players' **points** are compared across different age groups, then the age group 25-29 will not significantly differ from other age groups ('18-24', '25-29', '30-34', '35-39', '40+').

Alternate Hypothesis 1: If NBA players' **points** are compared across different age groups, then the age group 25-29 will significantly outperform other age groups ('18-24', '25-29', '30-34', '35-39', '40+').

Null Hypothesis 2: If NBA players' **assists** are compared across different age groups, then the age group 25-29 will not significantly differ from other age groups ('18-24', '25-29', '30-34', '35-39', '40+').

Alternate Hypothesis 2: If NBA players' **assists** are compared across different age groups, then the age group 25-29 will significantly outperform other age groups ('18-24', '25-29', '30-34', '35-39', '40+').

Null Hypothesis 3: If NBA players' **total rebounds** are compared across different age groups, then the age group 25-29 will not significantly differ from other age groups ('18-24', '25-29', '30-34', '35-39', '40+').

Alternate Hypothesis 3: If NBA players' **total rebounds** are compared across different age groups, then the age

group 25-29 will significantly outperform other age groups ('18-24', '25-29', '30-34', '35-39', '40+').

#### IV. STUDY

For the purpose of this study, we used web-scraping techniques to obtain every NBA players' data from 2010-11 NBA season through the previous 2023-24 NBA season via basketball-reference.com. The dataset contained information from all 1,729 players who logged any official playing time throughout that time span in the NBA, and their stats for each season/age. In this context, we elected to prioritize the discrete data from the three main performance metrics recorded in the NBA, points, total rebounds, and assists. We used those to measure each age-group's general performances in the NBA. In addition to that, the dataset also had continuous (age), ordinal (season number), and nominal data (players name). With this data, we decided that we would run One-Way ANOVA statistical tests for each performance metric in order to verify if any statistically significant difference exists. After that, we ran Tukey's HSD as a post-hoc analysis to identify the specific deviations between the different age groups and find the best performing group in the NBA for each statistic, points, total rebounds and assists.

#### V. STUDY RESULTS

Statistic	F-Statistic	p-Value (PR(>F))
Points (PTS)	29.30	$2.99 \times 10^{-24}$
Total Rebounds (TRB)	19.68	$3.74 \times 10^{-16}$
Assists (AST)	32.40	$7.11 \times 10^{-27}$

TABLE I

ANOVA RESULTS FOR POINTS (PTS), TOTAL REBOUNDS (TRB), AND ASSISTS (AST) ACROSS AGE GROUPS

After performing One-Way ANOVA, we reviewed the p-values shown in Table 1. Using these p-values, we can confirm that there are in fact statistically significant differences between each age group in terms of points, total rebounds and assists. After confirming that all three metrics would require post-hoc analysis, we used Tukey's HSD to identify specific differences between each age group for all of the aforementioned metrics of performance. The points, total rebounds, and assists from players aged 25-29 were compared to each different age group(18-24, 30-34, 35-39, and 40+) using the statistical test in each comparison. The results of that are shown in table 2. We can see that the age group 18-24 generally outperforms all of the other age groups in all of the metrics of performance with solid statistical significance. Additionally, we found that there was a significant statistical difference between age groups 25-29 and 35-39 for points and rebounds. These were the only statistically significant findings as all of the other tests returned p-values that were not small enough to fit the 0.05 threshold indicating statistical insignificance.

Points		
Age Groups Tested	Mean Difference	p-value
18-24 vs 25-29	97.1199	0.0
25-29 vs 30-34	-23.9511	0.321
25-29 vs 35-39	-130.6335	0.0
25-29 vs 40+	-252.5627	0.1959
Total Rebounds		
Age Groups Tested	Mean Difference	p-value
18-24 vs 25-29	32.3947	0.0
25-29 vs 30-34	-6.6287	0.6943
25-29 vs 35-39	-37.9802	0.0004
25-29 vs 40+	-103.1364	0.188
Assists		
Age Groups Tested	Mean Difference	p-value
18-24 vs 25-29	25.2046	0.0
25-29 vs 30-34	-3.0727	0.3564
25-29 vs 35-39	-17.4361	1.0
25-29 vs 40+	-58.1061	0.3522

TABLE II

STATISTICAL RESULTS FOR POINTS, TOTAL REBOUNDS, AND ASSISTS ACROSS AGE GROUPS

#### VI. DISCUSSION

From our analysis, we fail to reject all of our null hypotheses because the results from Tukey's HSD indicate that there is no evidence that supports any of our alternative hypotheses. At the beginning of our study, we hypothesized that the 25-29 age group would overwhelmingly prove to be the statistical "peak" of NBA players, as that group would significantly outperform their counterparts in the three measured metrics. While the age group 25-29 outperforms certain other age groups, it is actually the 18-24 group performs the best, showing statistically significant higher performance in all the metrics, points, total rebounds, and assists when compared to the 25-29 group. With that being said, the 25-29 age group performance is relatively consistent across the age groups, and is notably stronger than the 35-39 age group in terms of points and total rebounds.

This research is important as teams begin to commit more money to players long term in the sports industry. A poorly planned contract can prove to be heavily detrimental to a team's future success as it prohibits them from affording to sign more productive players. Knowing which age range is statistically the best in terms of points, total rebounds, and assists can prove useful to front offices to prioritize only offering higher valued contracts to players who can maintain the same if not higher levels of production on the court.

#### VII. FUTURE WORK

It is crucial to recognize that the statistics measured during the study are not necessarily the only metrics to measure an NBA players value to a team. While points, total rebounds, and assists do create a large part of the

game, there are advanced metrics both offensively and defensively that do an exceptional job at measuring a players value. Unfortunately, the more advanced metrics have only began to be recorded in the past decade, therefore making it difficult to measure the impact of career longevity may have on them. In the future, utilizing such metrics in 10+ years when there is more usable advanced data may provide a more resourceful study for franchises around the league. Future work would more likely revolve around more advanced and particular metrics than the three focused on in this study.

## VIII. CONCLUSION

Our study aimed to identify generally when in terms of age can we expect the best statistical performance for each; points, total rebounds, and assists for NBA players' careers. First, we utilized One-Way ANOVA to confirm with astronomically low p-values that there are in fact significant statistical differences between age groups in the NBA. Next, we performed Tukey's HSD to find each age groups' individual differences from the hypothesized peak age group(25-29). After doing this, we ended up failing to reject all three of our null hypotheses because we found that the 18-24 group generally had the best performances in all three metrics. With this, we were unable to confirm that NBA players generally experience their peak performances within the age range of 25-29.

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