



Optimal Player-Play Synergy

July 29th, 2024

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Overview

In the high-stakes environment of the NBA, decision-making is crucial to a team's success. A single clutch moment can often be the deciding factor in many games. This research aims to leverage NBA situational play data and various player performance metrics—including points per play, turnover rate, rebounds, and effective field goal percentage (EFG)—to estimate the optimal plays for specific players and compare their performance to the league average.

Research Objectives

This study focuses on the following objectives:

1. Analyze NBA play-by-play data for situational insights.
2. Evaluate individual player statistics for performance metrics such as points, assists, turnovers, rebounds, and EFG.
3. Examine the plays run by all 30 NBA teams.
4. Identify the top play types for individual players on the chosen sample team, the Orlando Magic.
5. Determine the top play types for the Orlando Magic as a whole based on the frequency of occurrence in players' respective top play listings.

Specifications

The analysis was conducted using the Python programming language. Data was sourced from NBA statistics databases and compiled into CSV files for analysis. The study primarily involved data preparation, merging datasets, and calculating a custom efficiency metric termed "playoutputscore." The top play types for players were identified by sorting this metric, and the most frequently occurring top plays were determined to provide insights into team strategies.

End Goal

The primary goal is to identify the top three plays for each player based on selected performance metrics and compare these plays to the league average to determine their optimal usage frequency. The resulting model aims to provide actionable insights to optimize NBA teams' strategies and player utilization during games. Ultimately, this tool is intended for coaches and analysts to make data-driven decisions, improving team performance and success.

Step-by-Step Process

Data Preparation

- Import Libraries: We import the pandas library, which is essential for data manipulation and analysis.
- Load Data: The play type and free throw data are loaded from CSV files into dataframes.
- Modify Column Names: To ensure consistency, column names in the free throw data are adjusted to match those in the play type data.
- Merge DataFrames: The free throw data is merged with the play type data on the 'PLAYER_NAME' column, combining player statistics into a unified dataset.

Filtering Out Specific Play Types

The play-by-play database contained a redundant play type labeled as 'putbacks' which in theory, while efficient, are not a play that can be drawn up by coaching staff hence putbacks were filtered out to exclude irrelevant plays from the efficiency measurement.

Creating Efficiency Measurement (playoutputscore)

A new variable, playoutputscore, was created and calculated to measure player output proficiency with each play type quantitatively. The resulting “playoutputscore” is computed using performance metrics such as points per possession (PPP), free throw attempt frequency (FTA_FREQ), free throw percentage (FT%), and turnover frequency (TOV_FREQ). Specifically, $(PPP*100) + ((FTA_FREQ*100)*FT\%) - (TOV_FREQ*100)$ is the methodology to create this new statistic. This composite score measures the efficiency of each play type.

Splitting Data by Season

The play-by-play data on hand was then divided into separate DataFrames for the 2022-23 and 2023-24 seasons, allowing for targeted analysis of performance trends for each season.

Identifying Top Play Types for Each Player

For each player and season, the top three play types are identified based on the highest playoutputscore. This process involves filtering, sorting, and selecting the top entries to highlight the most effective play types.

Storing Results

The results are stored in distinct DataFrames for each season, enabling organized data retrieval and analysis. Doing so also allows for the user to digest the results in a structured and organized format.

Querying the Data

A query function allows users to retrieve the top play types for a specific player and season, providing a straightforward method to access detailed efficiency data.

Analyzing Team-wide Play Type Frequency

The frequency of play types across the entire team is analyzed by counting occurrences in the top three plays for all players. This helps identify the most common and effective play types at the team level.

Individual Proficiency Analysis Results

First Name	Last Name	Season	Play Type	PlayOutputScore
Markelle	Fultz	2022-23	Cut	137.3365
Markelle	Fultz	2022-23	Transition	110.1822
Markelle	Fultz	2022-23	Isolation	95.2851
Moritz	Wagner	2022-23	Cut	161.4548
Moritz	Wagner	2022-23	Postup	143.7598
Moritz	Wagner	2022-23	PnR Roll Man	117.3428
Cole	Anthony	2022-23	Cut	202.6236
Cole	Anthony	2022-23	Transition	108.4638
Cole	Anthony	2022-23	Off Screens	104.025
Franz	Wagner	2022-23	Cut	165.43
Franz	Wagner	2022-23	Transition	140.575

Franz	Wagner	2022-23	PnR Roll Man	139.01
Jalen	Suggs	2022-23	Cut	122.1216
Jalen	Suggs	2022-23	Handoff	103.002
Jalen	Suggs	2022-23	Transition	99.6592
Paolo	Banchero	2022-23	Cut	114.9
Paolo	Banchero	2022-23	Transition	114.7925
Paolo	Banchero	2022-23	Postup	95.19
Gary	Harris	2022-23	Cut	195.6252
Gary	Harris	2022-23	Transition	132.1168
Gary	Harris	2022-23	Spotup	117.59
Jonathan	Isaac	2022-23	Spotup	90
Wendell	Carter Jr.	2022-23	Cut	119.5936
Wendell	Carter Jr.	2022-23	Spotup	109.9782
Wendell	Carter Jr.	2022-23	PnR Roll Man	107.5498
Caleb	Houstan	2022-23	Off Screens	134.2528
Caleb	Houstan	2022-23	Spotup	103.9544
Caleb	Houstan	2022-23	Transition	50.2
Goga	Bitadze	2022-23	Cut	116.6265
Goga	Bitadze	2022-23	PnR Roll Man	107
Goga	Bitadze	2022-23	Spotup	50
Chuma	Okeke	2022-23	Spotup	93.7565
Chuma	Okeke	2022-23	Handoff	50.2408

Chuma	Okeke	2022-23	Transition	47.8378
Admiral	Schofield	2022-23	PnR Roll Man	120.7
Admiral	Schofield	2022-23	Cut	100
Admiral	Schofield	2022-23	Spotup	97
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First Name	Last Name	Season	Play Type	PlayOutputScore
Markelle	Fultz	2023-24	Handoff	98.6941
Markelle	Fultz	2023-24	PnR Roll Man	97.6487
Markelle	Fultz	2023-24	Transition	88.1426
Moritz	Wagner	2023-24	Cut	157.3962
Moritz	Wagner	2023-24	PnR Roll Man	142.615
Moritz	Wagner	2023-24	Spotup	120.0052
Cole	Anthony	2023-24	Cut	121.617
Cole	Anthony	2023-24	Handoff	112.4248
Cole	Anthony	2023-24	Spotup	105.3692
Franz	Wagner	2023-24	Cut	142.03
Franz	Wagner	2023-24	PnR Roll Man	119.125
Franz	Wagner	2023-24	Transition	117.545

Jalen	Suggs	2023-24	Cut	136.9692
Jalen	Suggs	2023-24	Transition	114.1328
Jalen	Suggs	2023-24	Isolation	111.8768
Paolo	Banchero	2023-24	Cut	139.2625
Paolo	Banchero	2023-24	Transition	115.5825
Paolo	Banchero	2023-24	Spotup	103.2925
Anthony	Black	2023-24	Cut	126.4343
Anthony	Black	2023-24	Transition	98.9594
Anthony	Black	2023-24	Spotup	83.1842
Gary	Harris	2023-24	PnR Ball-Handler	139.5748
Gary	Harris	2023-24	Cut	130.3108
Gary	Harris	2023-24	Spotup	104.8876
Joe	Ingles	2023-24	Spotup	131.724
Joe	Ingles	2023-24	Transition	106.7
Joe	Ingles	2023-24	Handoff	42.0664
Jonathan	Isaac	2023-24	Cut	148.048
Jonathan	Isaac	2023-24	PnR Roll Man	120.932

Jonathan	Isaac	2023-24	Transition	100.448
Wendell	Carter Jr.	2023-24	Cut	146.0576
Wendell	Carter Jr.	2023-24	Transition	124.2892
Wendell	Carter Jr.	2023-24	PnR Roll Man	102.328
Caleb	Houstan	2023-24	Transition	112.5968
Caleb	Houstan	2023-24	Spotup	111.2736
Caleb	Houstan	2023-24	Off Screens	99.04
Goga	Bitadze	2023-24	Cut	145.1515
Goga	Bitadze	2023-24	PnR Roll Man	111.197
Goga	Bitadze	2023-24	Postup	99.198

Team Proficiency Analysis Results

Based on the above-listed individual play type analysis results, the following play types were found to be the most effective in terms of output by the players on the Orlando Magic. For the 2022-23 season:

Play Type	Frequency
Transition	13
Cut	10
Spotup	8

And for the 2023-24 season:

Play Type	Frequency
Cut	10
Transition	9
Spotup	8

Findings and Implications for Offensive Design

-Individual Proficiency Analysis:

The detailed analysis of individual play types reveals valuable insights into the Orlando Magic players' performance, which can significantly influence offensive strategies.

2022-23 Season Insights:

- **Markelle Fultz** demonstrated high proficiency in **Cut** plays, with a PlayOutputScore of 137.34. This suggests that Fultz excels in moving to the basket off the ball, making him a key asset in plays designed to exploit defensive lapses and create scoring opportunities through quick, cutting movements. His effectiveness in **Transition** (110.18) also highlights his ability to capitalize on fast breaks, indicating that incorporating transition plays where Fultz can leverage his speed and agility will be advantageous.

- **Moritz Wagner** showed remarkable proficiency in **Cut** (161.45) and **Postup** (143.76), suggesting he is effective both as a dynamic cutter and in exploiting mismatches in the post. This versatility allows for a dual approach: using Wagner in quick, cutting plays to create immediate scoring chances and utilizing him in the post to leverage his size and skill against defenders.
- **Cole Anthony's** top play types were **Cut** (202.62) and **Transition** (108.46). His high score in **Cut** plays signifies a strong ability to move without the ball and create scoring opportunities in fast-paced situations. Designing plays that facilitate Anthony's movement off the ball and capitalize on transition opportunities will maximize his impact.
- **Franz Wagner's** effectiveness in **Cut** (165.43) and **PnR Roll Man** (139.01) indicates his strong performance in both off-ball movement and as a roller in pick-and-roll situations. Implementing a system that frequently utilizes Wagner in pick-and-roll scenarios and off-ball cuts can enhance the offensive flow and create high-percentage scoring opportunities.
- **Jalen Suggs** and **Paolo Banchero** both showed proficiency in **Cut** plays, highlighting a trend among the team's key players to excel in this area. This suggests a coaching strategy focusing on cutting and movement without the ball could be effective.
- **Gary Harris** displayed exceptional proficiency in **cut** (195.63), indicating that he is a valuable asset in quick, decisive movements to the basket. This is further supported by his effectiveness in **Transition** (132.12), underlining his capability to contribute significantly in fast-break situations.
- **Jonathan Isaac** and **Wendell Carter Jr.** both showed strong performance in **Cut** plays and **Spotup**, pointing towards their ability to effectively utilize spacing and create scoring opportunities in various situations.

2023-24 Season Insights:

- **Markelle Fultz's** continued high performance in **Handoff** (98.69) and **PnR Roll Man** (97.65) suggests that designing plays to utilize his skill in initiating handoffs and rolling in pick-and-roll scenarios can be beneficial. His ability to create scoring opportunities through these plays should be a focal point in offensive strategies.
- **Moritz Wagner** continued to show strong performance in **Cut** (157.40) and **PnR Roll Man** (142.62), confirming the effectiveness of incorporating him into plays that leverage his cutting ability and pick-and-roll skills.
- **Cole Anthony's** proficiency in **Cut** (121.62) and **Handoff** (112.42) indicates that incorporating him into plays involving quick cuts and handoffs can enhance his impact on the floor.

- **Franz Wagner** maintained high performance in **Cut** (142.03) and **PnR Roll Man** (119.13), reinforcing the need for offensive schemes that utilize his strengths in cutting and pick-and-roll situations.
- **Jalen Suggs** and **Paolo Banchero** continued to excel in **Cut** plays, indicating that their effectiveness in movement without the ball should be leveraged in offensive designs.
- **Anthony Black**'s performance in **Cut** (126.43) and **Transition** (98.96) suggests that incorporating him into cutting and fast-break plays can optimize his contributions.
- **Gary Harris**'s high proficiency in **PnR Ball-Handler** (139.57) indicates a strong capability to lead pick-and-roll plays, which should be a significant component of the offensive strategy.
- **Joe Ingles** showed effectiveness in **Spotup** (131.72), suggesting that he should be utilized as a perimeter shooter, with plays designed to create open-shot opportunities for him.

-Team Proficiency Analysis:

2022-23 Season:

- **Transition** was the most frequent play type, utilized 13 times. This indicates that the team was heavily involved in fast-break opportunities, which is a crucial aspect of their offensive strategy. Emphasizing transition plays can leverage the team's speed and agility to create quick scoring chances.
- **Cut** plays were the second most common, with 10 instances. This suggests that off-ball movement was a key component of the offensive strategy, and continuing to utilize cutting plays will be essential for creating open shots and driving to the basket.
- **Spotup** was the third most frequent play type, observed 8 times. This indicates a reliance on perimeter shooting opportunities, which should be maintained and expanded upon to balance the offensive strategy.

2023-24 Season:

- **Cut** plays became the most prevalent, observed 10 times, highlighting a shift towards increased emphasis on off-ball movement and cutting strategies. This change suggests that the team has adapted its approach to focus more on creating scoring opportunities through movement without the ball.
- **Transition** remained a strong component, with 9 instances, reflecting the team's continued reliance on fast-break opportunities to capitalize on defensive mistakes.
- **Spotup** plays were observed 8 times, maintaining their importance in the offensive strategy as a method for creating open shooting opportunities.

-Recommendations for Coaches:

1. **Leverage Cutting Plays:** The consistent proficiency in cutting plays across both seasons highlights the importance of incorporating off-ball movement into the offensive strategy. Designing plays that create opportunities for players to cut to the basket can enhance scoring efficiency and exploit defensive weaknesses.
2. **Optimize Transition Opportunities:** The high frequency and effectiveness of transition plays suggest that maintaining a fast-paced offense can capitalize on the team's speed and agility. Encouraging quick transitions and designing plays to maximize fast-break opportunities will be beneficial.
3. **Utilize Key Players in Their Strengths:** Players like Markelle Fultz, Franz Wagner, and Gary Harris have shown strong performance in specific play types such as **Cut**, **PnR Roll Man**, and **Transition**. Tailoring offensive strategies to leverage these strengths will maximize their impact on the game.
4. **Incorporate Perimeter Shooting:** The importance of **Spotup** plays highlights the need for creating opportunities for perimeter shooters. Designing plays that free up shooters for open shots will balance the offense and improve scoring efficiency from beyond the arc.
5. **Adapt and Evolve:** The shift in emphasis from the 2022-23 to the 2023-24 season towards more cutting plays and continued focus on transition opportunities indicates a strategic evolution. Regularly assessing player performance and adapting offensive strategies accordingly will ensure continued success and improvement.

Conclusion and Future Possibilities

This study provides a comprehensive analysis of player performance and offensive play types for the Orlando Magic across the 2022-23 and 2023-24 NBA seasons. By evaluating individual and team proficiency in various play types, the research has illuminated key insights into effective strategies and player strengths. The findings highlight the importance of leveraging cutting plays, optimizing transition opportunities, and utilizing players' specific strengths in designing offensive schemes. Notably, players such as Markelle Fultz, Franz Wagner, and Gary Harris have demonstrated significant proficiency in certain play types, suggesting targeted strategies that could enhance overall team performance.

Looking ahead, this study lays a solid foundation for further research and application. Future work could expand on these findings by incorporating additional data points, such as defensive matchups and game context, to refine the analysis. Moreover, applying similar methodologies to other teams or comparing different seasons could yield broader insights into offensive strategies.

across the league. Further development of predictive models to anticipate player performance based on play type could also provide valuable tools for coaches and analysts. Overall, this research not only contributes to understanding the Orlando Magic's offensive dynamics but also offers a framework for ongoing exploration and improvement in sports analytics.