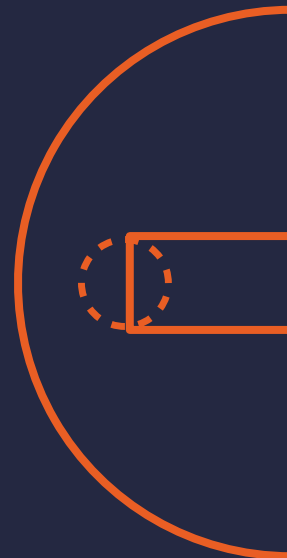# WHY ARE CERTAIN BASKETBALL TEAMS SUCCESSFUL?

An analysis by Cody Greene, Jenna Fishman, Lavanya Deshmukh, Shiressa Johnson

Part A) How does a team best use a "power partnership"?

Questions we're trying to answer:

- What makes a 'star player'? (p3-4)
- How do teams utilize their star players & power partnerships? Do they play them together or apart? (p5-6)
- Does this differ when playing against teams with 2 star players, 1 star player or no star player? (p5-6)
- How does average usage rate differ with number of star players? (p7)

IDENTIFYING STAR PLAYERS

Combined PER of Star Players for Each Team

- 3 star players
- 2 star players
- 1 star player
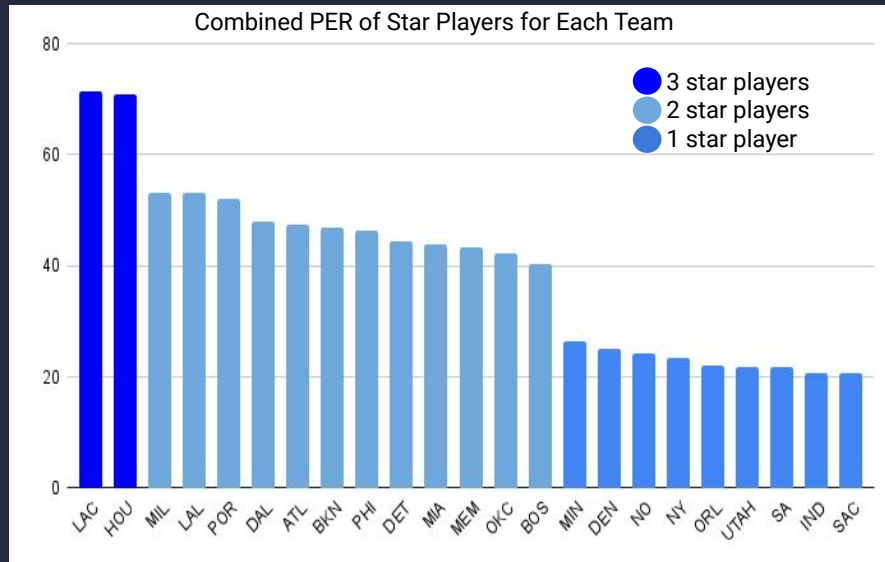
PER Reference Guide	
All-time great season	35.0+
Runaway MVP candidate	30.0–35.0
Strong MVP candidate	27.5–30.0
Weak MVP candidate	25.0–27.5
Definite All-Star	22.5–25.0
Borderline All-Star	20.0–22.5
Second offensive option	18.0–20.0
Third offensive option	16.5–18.0
Slightly above-average player	15.0–16.5
Rotation player	13.0–15.0
Non-rotation player	11.0–13.0
Fringe roster player	9.0–11.0
Player who won't stick in the league	0–9.0

To find 'power partnership' we used PER which is the most widely used metrics to measure a player's impact in the game. We defined a star player as a player with PER* > 20 & MPG* > 20. The chart on the left shows the combined PER of star players on each team.

*PER: player efficiency rating
*MPG: minutes per game

IDENTIFYING STAR PLAYERS (Contd..)

01

LAL - 2 Star Players

Anthony Davis & Lebron James

02

MIL- 2 star players

Giannis & Khris Middleton

03

MIN - 1 star player

Karl-Anthony Towns

For analysis purposes, we focused on power duos. Based on total PER, we noted that the strongest power duos of the 19-20 season was Giannis Antetokounmpo and Khris Middleton of Milwaukee Bucks, followed closely by Anthony Davis & Lebron James of Los Angeles Lakers.

A team with only one superstar with hughes PER is Minesota Timberwolves with Karl-Anthony Towns.

# HOW DO TEAMS UTILIZE POWER PARTNERSHIPS?
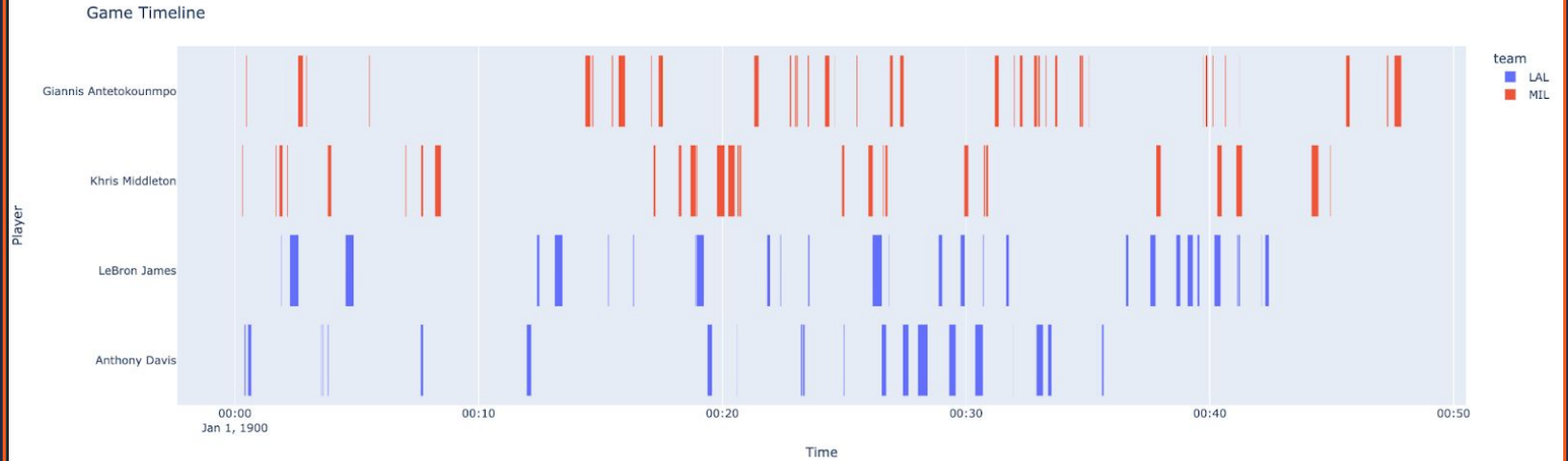
Game Timeline

 2-star player team match-up (MIL vs LAL)
The chart above represents the 48-min timeline of a game (*x-axis) and indicates the play length of each star player (y-axis). We can see that for LAL & MIL teams, star players are mainly being played at the same time. This indicates that they are often working in a partnership to get better results offensively, and on a task to defend the opponent star player by going against them. In this game, James had 37 points, eight rebounds and seven assists to win his showdown with Giannis, and the Lakers beat Milwaukee 113-103, a close win.

*the each block of the chart are the time the player made a play/move in the game, not the time he was on court
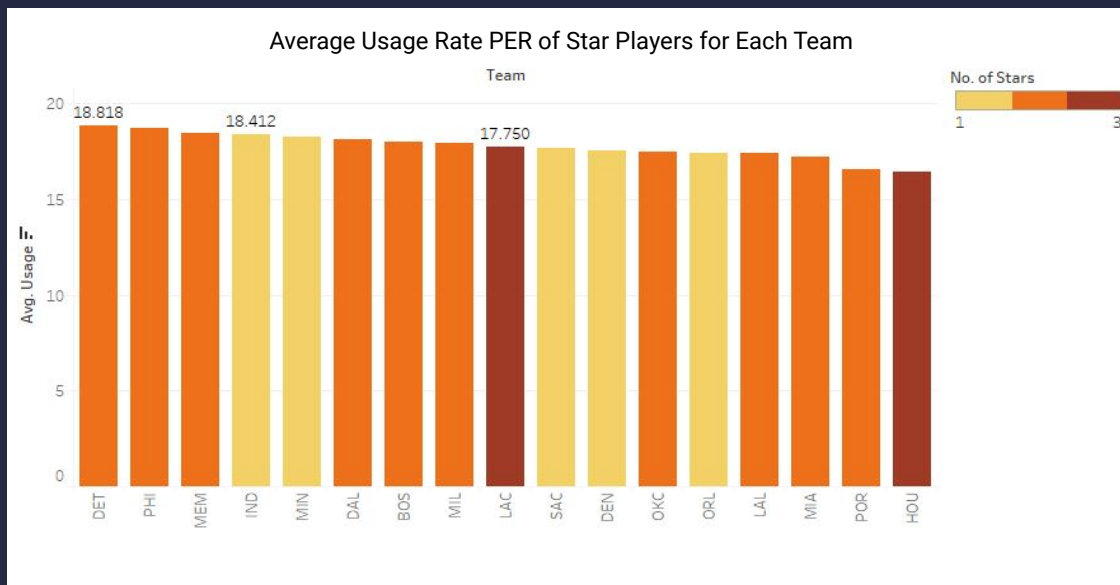
HOW DO TEAMS UTILIZE POWER PARTNERSHIPS?

Total Play Minutes per Player (MIN vs LAL)

Game Timeline
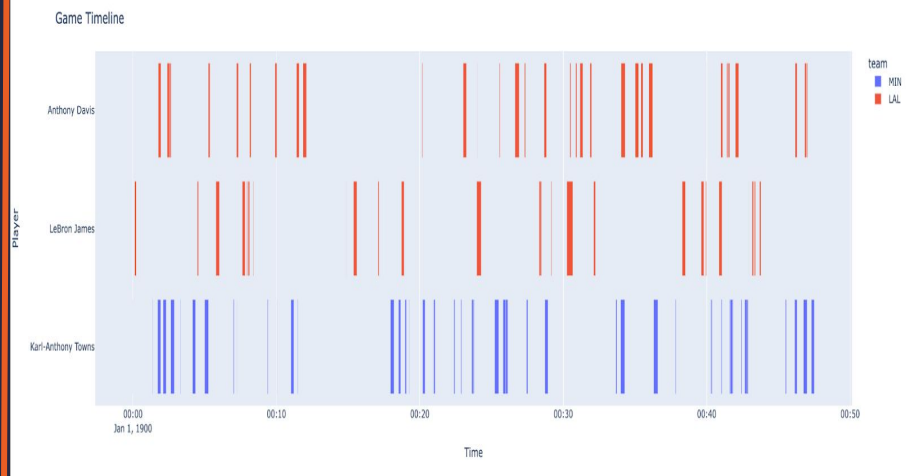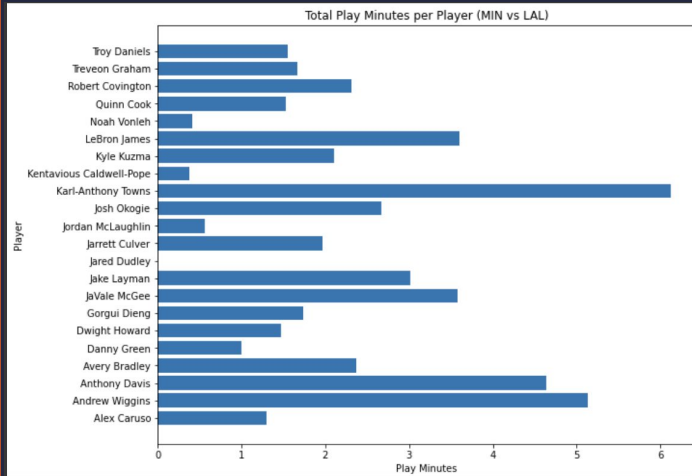
2-star player vs 1-star player team match-up (LAL vs. MIN)

Karl-Anthony Town as the only star player for the Minnesota Timberwolves, got utilized heavily, playing more minutes in the game than any player. As a 2-star player team, the LA Lakers were able to play them both without over-utilizing a single player. Lakers won 142 - 125.

USAGE RATE - COMPARING 1-3 STAR PLAYER TEAMS

Average Usage Rate PER of Star Players for Each Team

Team

No. of Stars

1   3

18.818   18.412   17.750

Avg. Usage

DET PHI MEM IND MIN DAL BOS MIL LAC SAC DEN OKC ORL LAL MIA POR HOU

Usage rate: the percentage of team plays used by a player when they are on the floor.

The average usage rate of star players does not appear to be impacted by the number of star players on a team. This indicates that each team are utilizing each star players as much as they can.

Part B) Do great players make their teammates better?

In our efforts to answer the above question, we decided to focus on 2 teams with only one star player - MIN & DEN. The star player on MIN is Karl-Anthony Towns and for DEN is Nikola Jokic

Our Hypothesis:
H0: Performance of team while a star player is on the court = Performance of team w/o a star player on the court

Ha: Performance of team while a star player is on the court ≠ Performance of team w/o a star player on the court

Formulas Used:
Points per minute w/ star player =
(Total points made by the team while a star player is on the court) / (total minutes)

Points per minute w/o star player =
(Total points made by the team while a star player is not on the court) / (total minutes)

OUR T-TEST RESULTS

	MIN (Karl-Anthony Towns)	DEN (Nikola Jokic)
Offence	t-statistic: 3.78 p-value: 0.00 **Reject H0** **The presence of Towns makes a difference**	t-statistic: 55.40 p-value: 0.00 **Reject H0** **The presence of Jokic makes a difference**
Defense	t-statistic: 0.88 p-value: 0.375 **Fail to Reject H0** **The presence of Towns does not make a difference**	t-statistic: -1.13 p-value: 0.255 **Fail to Reject H0** **The presence of Jokic does not make a difference**

The results of our t-test can be corroborated by the fact that offensive rating of Jokic was 58th and Karl-Anthony Towns was 49th in the league while defensive rating for Nikola Jokic was 280th and Karl-Anthony Towns was 491th for 2019-2020 season (Source)

So we can conclude that Star Players do improve the performance of other members on their team when they are playing their strengths, in this case, offensively.

Correlation Between Team PER and Win Ratio (Season 2019 − 2020)
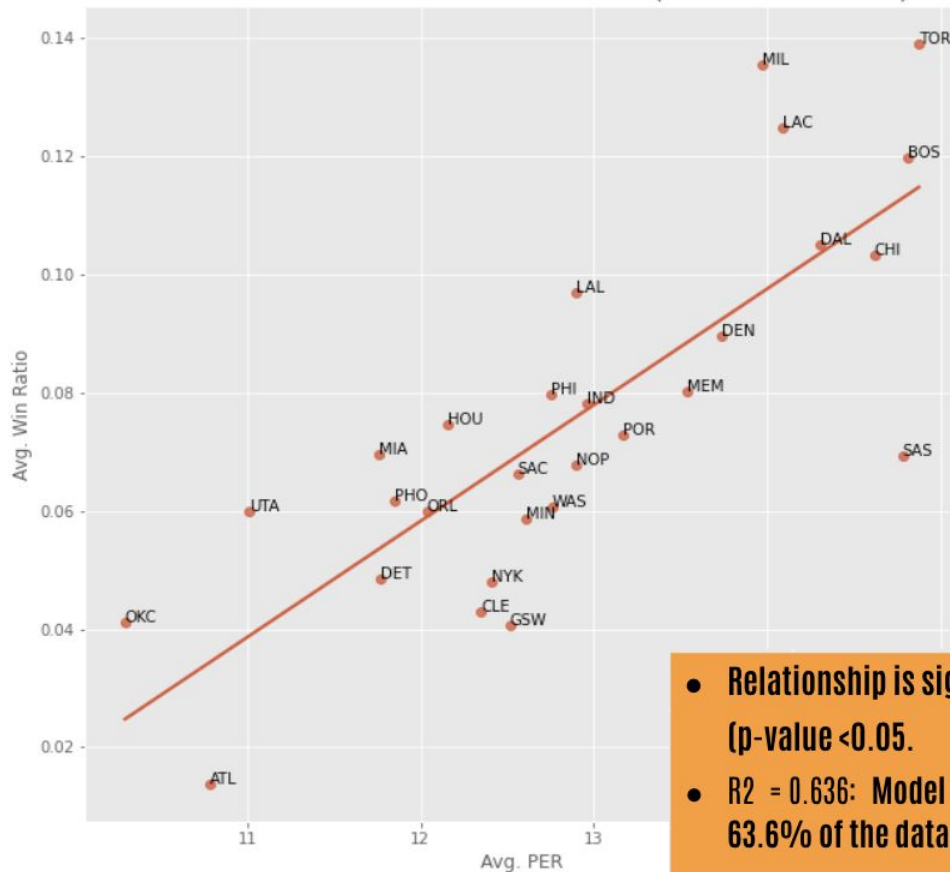
- Relationship is significant (p-value <0.05.
- R2 = 0.636: Model explains 63.6% of the data

Win Ratio & PER

The model confirms that to a large extent, a team win ratio is linearly correlated to avg. PER of team. Teams that have players with higher efficiency ratings (great players) tend to win more.

ANOMALIES:
SAS: High Avg. PER, but lower win ratio than expected
LAL: Higher win ratio than its team PER would suggest
GSW, CLE : lower win ratio than their team PER would indicate

These Anomalies illustrate that teams with star players (those with high PER) such as the San Antonio Spurs (SAS) can still underperform, but overall, the model illustrates that star players make a team better.

Thank You!