

Is APM the best way to evaluate NBA players?

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A recent study by sport analytics professors shows the Adjusted Plus-Minus (APM) statistic used to evaluate the performance of NBA players is sometimes misleading because it does not accurately account for the quality of a player's teammates.

The study "Measuring individual worker output in a complementary team setting: Does regularized adjusted plus minus isolate individual NBA player contributions?" was published recently in the *PLOS ONE* scientific journal.

Lead author Justin Ehrlich, an assistant professor of Sport Management at Syracuse University, said most NBA [players](#) remain on the same team and in the same types of lineups during the season. The study closely examines the impact of the quality of a team's lineup on a player's APM score.

"We find evidence of complementarity effects: The better are your teammates, the better you will look according to adjusted plus-minus," Ehrlich said. "This is interesting because adjusted plus-minus purportedly controls out teammate and opponent effects. However, it does not have the benefit of

out-of-sample information about how a player would play when put in other lineups and on other teams."

APM is considered by many to be the best single statistic for rating players. The idea is that to get an accurate feel for a player's value, you need to account for the presence of other players, both on offense and defense.

For example, a player with a +1 means an average lineup would score 1 more point per 100 possessions with this player added. Milwaukee's Giannis Antetokounmpo led the NBA at 10.3 during the pandemic-shortened 2019-20 regular season.

The *PLOS ONE* study says that in all likelihood, some of Antetokounmpo's teammates have higher APM ratings than they would without his presence.

According to the study, "APM measures use seasonal play-by-play data to estimate individual player contributions. If a team's overall score margin success is figuratively represented by a pie, APM measures are well-designed to slice the pie and attribute individual contributions accordingly. However, they do not account for the possibility that better players can increase the overall size of the pie and thus increase the size of the slice (overall APM value) for teammates."

The study's research team included Syracuse University Assistant Professor of Sport Management [Justin Ehrlich](#); Syracuse University Professor of Sport Management [Shane Sanders](#); and Western Illinois University Assistant Professor of Economics [Shankar Ghimire](#).

The researchers say that based on this study, more adjustments to the APM rating methodology should be explored to determine an NBA player's true value. In the meantime, team officials should understand the limits of the current methodology when making decisions about trades and free agents.

"If a player is traded or picked up as a free agent and changes from a good team to a poor team, his APM is expected to take a hit," Sanders said. "If a player changes from a poor team to a good team, his APM is expected to rise.

Provided by Syracuse University

"This also has player rotation implications," Sanders added. "If a player changes from a bench to starting role, his APM is expected to rise. If a player changes from a starting to a bench role, his APM is expected to take a hit."

Conclusions from study

The results provide strong evidence that regularized adjusted plus minus player productivity measures are not, in fact, "teammate-independent." Rather, we find evidence that lineup-teammate productivity positively influences a given player's real plus minus value. As this result is conditional upon a given player's baseline productivity via player fixed effects and age, we interpret this as a significant and fairly strong complementarity effect that is uncontrolled in adjusted plus minus measures such as real plus minus.

While real plus minus may control for in-sample teammate effects well, it appears that the measure does not control for out-of-sample lineup-teammate quality effects. We find this within a model that accounts for teammate quality changes from season to season. We note that basketball leagues are not natural experiments in which players are randomly paired and resampled. Rather, players are organized into often stable team environments and resampling occurs infrequently such that players have often aged by the time they receive a new set of teammates with whom to play. In such an environment, counterfactuals concerning player value will go largely unobserved. From this estimation, further (out-of-sample) adjustments to the APM estimation methodology can be explored in future work.

More information: Shankar Ghimire et al. Measuring individual worker output in a complementary team setting: Does regularized adjusted plus minus isolate individual NBA player contributions?, *PLOS ONE* (2020). [DOI: 10.1371/journal.pone.0237920](https://doi.org/10.1371/journal.pone.0237920)

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