

Sports analytics analysis reveals that past shared success among team members improves odds of future wins

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When LeBron James, Dwyane Wade, and Chris Bosh signed with the National Basketball Association's (NBA) Miami Heat in 2010 as free agents, basketball fans and sports pundits heralded the arrival of the league's first "super team." Yet despite boasting a starting lineup featuring three of the league's best players, the Heat began the 2011 season with a disappointing 9-8 record as its stars acclimated to their new roles as teammates.

Looking back at the team's inauspicious start, Northwestern Engineering's Noshir Contractor isn't surprised.

"Of course, individual players on a team make a difference, but so much focus is spent on finding those with the most talent," Contractor said.

"Other factors, like how people get along together or how well they trust each other, suggest that teams are not just an aggregation of individuals and their attributes, but also the relationships that exist previously among them."

Contractor, the Jane S. and William J. White Professor of Behavioral Sciences and professor of industrial engineering and management sciences in the McCormick School of Engineering, worked with a team of researchers to put this paradigm to the test. Analyzing statistical data from professional sports leagues and online games, the group has found that past shared success among team members improves their odds of winning future games—findings that have implications far beyond the sports arena, into business and even space research.

The study, titled "Prior shared success predicts victory in team competitions," was published December 3 in the journal *Nature Human Behaviour*. Satyam Mukherjee, assistant professor at the Indian Institute of Management Udaipur and former postdoctoral fellow within the

Northwestern Institute on Complex Systems, served as the paper's corresponding author. Contractor and Brian Uzzi, Richard L. Thomas Professor of Leadership and Organizational Change at the Kellogg School of Management and (by courtesy) industrial engineering and management sciences at Northwestern Engineering, were the paper's co-authors.

Accounting for Chemistry

"There's a general sense in sports about the importance of 'team chemistry,' but it's a nebulous concept," Contractor said. "We wanted to be more rigorous about how we think about team chemistry. Psychology has shown that when you enjoy success together, you learn more from the experience, so we focused on players who played together on winning teams."

The researchers studied individual player statistics from five data sets: NBA games and English Premier League (EPL) soccer matches played between 2002-2013, Indian Premier League (IPL) cricket matches from 2008-2012, and Major League Baseball (MLB) games from 2002-2012. The group also studied 2011 game logs for Defense of the Ancients 2 (Dota 2), a multiplayer, team-based online battle game.

For each sport, researchers determined a team's overall skill—the strength of their individual player attributes—by calculating player averages in key statistical categories, like points per game and assists per game in basketball, or goals per game and shots on goals in soccer. They also measured the number of times a pair of players were part of the same winning team, a metric they called "prior shared success."

In addition to accounting for each team member's individual skills, researchers measured repeated interactions among players, with the thickness of a link being proportional to successful interactions.

The group used linear regression modeling to examine the impact of a team's past success on predicting the outcome of games during the season following each league's data set. They found marked improvement across each sport when prior shared success was included with the team's overall skill compared to accounting for team skills alone. The rate of correctly predicted games increased between 2 and 7 percent for the 2014 NBA and EPL seasons, the 2013 IPL and MLB seasons, and December 2011 virtual matches in Dota 2.

"We looked at the results and thought, 'Is this too good to be true?'" added Contractor, who is also a professor of communication studies in the School of Communication, and professor of management and organizations at Kellogg. "We even tested the robustness of the findings by using alternative measures of individual player statistics used to compute skills variables, and the results held up."

The outcome was surprising, according to Contractor, considering the unique cultural differences between the sports that were studied. Baseball, for example, is driven by an "ethos of three"—three strikes before a player is out, three outs before an inning ends. Although the standard is unique to this iconic American sport, the same patterns held true.

"You would think that differences that are more culturally constrained impact one-on-one team dynamics, but to find that they don't, that our results transcend games and cultures—including a global enterprise like Dota 2—is notable," Contractor said. "To me, it's an illuminating and robust insight into what happens in teams."

Moving Beyond Sports

While the public availability of sports analytics made it a natural industry to test, the insights gained from the team's research applies to far more

contexts, including business, academia—and space travel. Contractor is currently working with NASA to study space crew simulations in hopes of better predicting the right combination of astronauts to maximize the crew's performance and viability when they are sent to Mars.

"Once you've gained as much as you can from bringing the right people together, you have to look for the next competitive advantage," Contractor said. "Whether it's in the workplace of the future on Earth or in deep space, understanding the relational predictors of team success is going to be very important."

More information: Satyam Mukherjee et al, Prior shared success predicts victory in team competitions, *Nature Human Behaviour* (2018). [DOI: 10.1038/s41562-018-0460-y](https://doi.org/10.1038/s41562-018-0460-y)

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